



VIIth

**International Scientific Symposium for Young Scientists,
PhD Students and Students of Agriculture Colleges**

**Innovative researches
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15-17 September 2016 Bydgoszcz, Poland

Technical work
mgr Patrycja Fereni-Morzyńska

The materials were published as manuscripts.
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UTP University of Science and Technology Press,
Bydgoszcz 2016

UTP University of Science and Technology Press
Editor-in-Chief Prof. dr hab. inż. Józef Flizikowski
20, Kordeckiego, 85-225 Bydgoszcz. Phone: +48 52 3749482, 3749426
E-mail: wydawucz@utp.edu.pl <http://www.wu.utp.edu.pl/>

First edition. Printed 150 copies. Author's sheets 11,5. Printed sheets 9,6.

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PAPERS

CLONING MATURITY GENES IN SORGHUM BICOLOR

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ON THE IMPORTANCE OF CEREALS

Cereal grains provide more than half of the caloric intake each day for most people on earth. Domestication of cereal crops, other plants and animals coincides with a major cultural reorganization that is recognized as the origin of human civilization. Nascent human civilizations are associated with the mastery of cultivating at least one cereal grain: with rice in Asia, wheat and barley in the Middle East, and maize/corn in Mesoamerica as examples. The genes controlling agronomic traits in cereal plants have been selected through millennia as humans domesticated each of the cereal crops from their wild grass progenitor species, at first by selecting genes based on obvious and beneficial phenotypic differences resulting from mutation or recombination. Our efforts to master cereal cultivation are as important now as ever given population projections for the coming decades.

IDENTIFYING GENES RESPONSIBLE FOR AGRONOMIC TRAITS IN CEREALS

With an ever-increasing array of genetic tools at our disposal, identifying genes and even complex genetic networks responsible for plant traits is possible. Perhaps one of the most important traits affecting grain yield in cereals is the timing of floral initiation. Taking the small-grain cereal crop *Sorghum bicolor* as an example, a description of tactics and methods used to identify the genes responsible for the control of flowering is addressed. The genes controlling flowering in *S. bicolor* are collectively referred to as *MATURITY* genes [1], and the focus will be on the *MATURITY*₁, *MATURITY*₅, and *MATURITY*₆ genes.

SOME OF THE TOOLS AND TACTICS FOR SORGHUM GENOMICS

While the genome of *S. bicolor* has now been sequenced [2], much less genomic information was available for *S. bicolor* at the initiation of the search for these genes. A genetic map is essential for describing locations of genes within a genome, and a high resolution integrated genetic and physical map of *S. bicolor* was developing as work on identifying these *MATURITY* genes was conducted [3]. Concurrently, identification of genes for many flowering QTLs was progressing in the model plant *Arabidopsis thaliana*, although a comparative genomics approach was limited by differences in genomic architecture between *A. thaliana*, an herbaceous dicot, and *S. bicolor*, a monocot. Fortunately, two draft sequences of the rice (*Oryza sativa*) genome were published during the early stages of this project [4, 5], and the genomes of the cereal crops have significant chromosomal synteny [6], enabling a more fruitful application of comparative genomics approaches when searching for flowering gene orthologs. Additionally, a substantial amount of work to identify rice genes controlling flowering was being carried out, where the genes controlling flowering were collectively labeled *HEADING DATE (Hd)* genes [7]. Importantly, it is necessary to create a population of individuals that are segregating for a phenotypic trait in order to map and identify the gene or genes responsible. Large populations consisting of thousands of individual sorghum plants were screened phenotypically and genotypically to narrow the genetic interval for *MATURITY* gene locus identification. As the QTL for each sorghum *MATURITY* gene was narrowed by recombinant plants, candidate genes were identified, sequenced, and compared for expression differences. The genes were also sequenced in sorghum *MATURITY* germplasm standards, leading to a model of how these genes contribute to the control of floral initiation.

References:

1. Quinby J.R., Karper R.E., 1945. *The inheritance of three genes that influence time of floral initiation and maturity date in milo*. Journal of the American Society of Agronomy, 37: p. 916-936.
2. Paterson A.H., et al., 2009. *The Sorghum bicolor genome and the diversification of grasses*. Nature, 457(7229): p. 551.
3. Menz M.A., et al., 2002. *A high-density genetic map of Sorghum bicolor (L.) Moench based on 2926 AFLP, RFLP and SSR markers*. Plant Molecular Biology, 48(5/6): p. 483-499.

4. Goff S.A., et al., 2002. *A draft sequence of the rice genome (Oryza sativa L. ssp. japonica)*. Science, 296(5565): p. 92-100.
5. Yu J., et al., 2002. *A draft sequence of the rice genome (Oryza sativa L. ssp. indica)*. Science, 296(5565): p. 79-92.
6. Moore G., et al., 1995. *Cereal Genome Evolution: Grasses, line up and form a circle*. Current Biology, 5(7): p. 737-739.
7. Yano M., et al., 1997. *Identification of quantitative trait loci controlling heading date in rice using a high-density linkage map*. Theoretical and Applied Genetics, 95(7): p. 1025-1032.

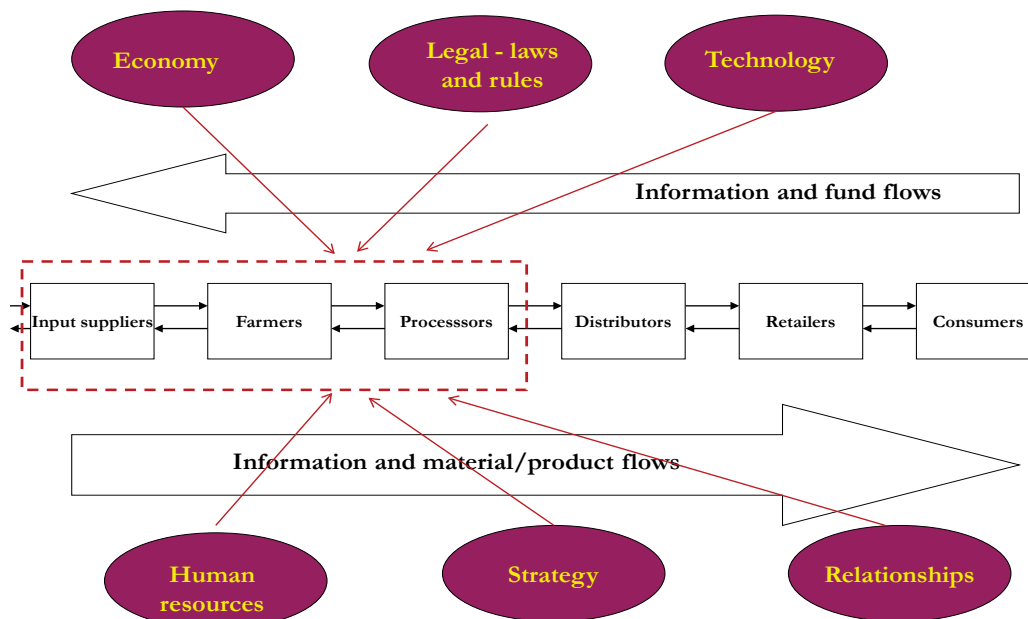
FOOD SUPPLY CHAIN FROM FARMERS' ANGLE

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Supply chain management has been discussed from many aspects by scholars and practitioners, however it is still a concept with questions. The scientific community have been paying attention to it and there was a boom in articles on the issue started in around 1995. This paramount interest is assisted by practitioners who consider supply chain management (SCM) as very important and critical in the work of business executives. A business to compete in the rapidly globalizing environment must admit that there is a new angle of business management how to run. Academics stated that competition works at a higher level of interactions, changing from individual businesses to supply chains (Wen et al., 2007) and coordinated supply chains elevated competition between companies to competition between supply chains (Mentzer, 2004; Lambert, 2008). What has changed is the business context, becoming more chain-like or network-like. A supply chain is a network of independent companies, from raw material producers to the final customers. At the same time we can realise a move away from the chain analogy to the network analogy. As such a network includes partners such as suppliers, third-party service providers, intermediaries, and customers, while they interact in physical, information, and fund flows.

A schema of an agri-food supply chain and some influencing factors

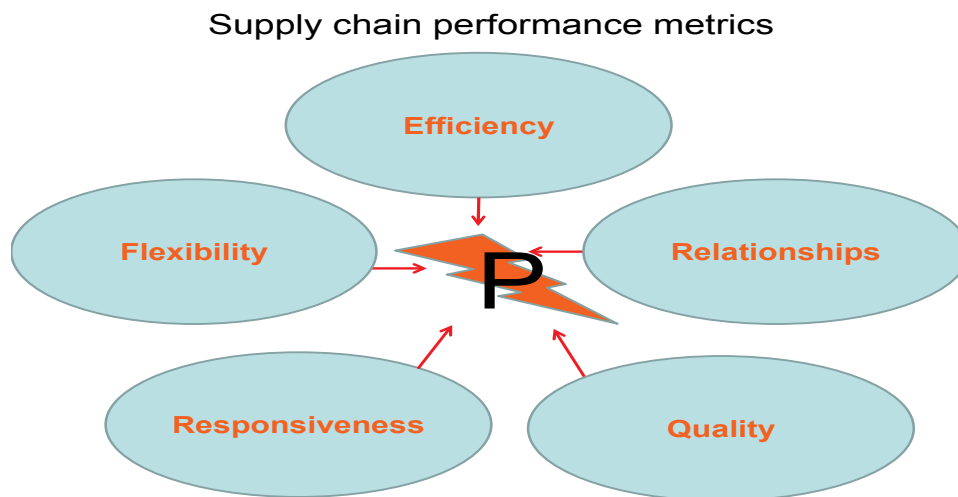


Stock and Boyer (2009) put forward an overwhelming definition of SCM, stressing the benefits stemming from the management of this network of relationships, such as adding value, enhancing efficiency, higher level of customer satisfaction, and higher profitability through them. They stated that SCM is complex, providing a structure of themes encompassed by SCM.

Farmers, just like other business entities in the economy, work in business networks. Therefore, they must be aware of how to behave in such environment. The key to this is relationship. Business relationships can make enterprises able to compete with other business entities. Hakansson and Ford (2002) advocates that an interaction can be understood only with “reference to the relationship of which it is a part”, whether it is a delivery, purchase, sale, or payment. They drew the attention to three paradoxes which managers must face with in business relationships.

The business relationships, which are necessary to establish, wash away the strict boundaries between partners. This comes from the inter-connecting nature of relationships, therefore, a business net-

work can be considered as a set of connected business relationships. To meet the expectations and fulfill all the members' requirements of a supply chain, chain actors must collaborate. Collaboration encompasses the business units in the chain that are actively working together, doing efforts towards a common goal by sharing information, resources, risks, and benefits. Stock and Boyer (2009) pointed out three types of benefits, namely value creation, efficiency improvements, and customer satisfaction. Through collaboration businesses can develop such capabilities in the enterprises through which corporate performance is improved and might even lead to competitive advantages. A reasonable collaboration can improve the supply chain performance, to which each actor is expected to contribute. This performance can be measured, and a lot of metrics and measures have been developed, identified and classified in different studies.



Probably the most frequently cited and applied groups of measures fall into the above mentioned categories of five.

Unfortunately, today's chain actors, mainly farmers, have relationships worked which are dyadic and very limited in nature with some selected partners of suppliers and customers, not extending the activities beyond ordering and some operational tasks.

This paper is to present the main changes in the business context and to provide facts about farmers from SCM angle. The objective of the paper is to reveal and stress upon the attributes which are related to farm business management in terms of the concept of SCM. From this point of view, relationship will be highlighted as a critical area and concluding challenges such as confidence and information sharing.

**DEVELOPING BIOMARKERS FOR LIVESTOCK SCIENCE – ONGOING RESEARCH
AND FUTURE DEVELOPMENTS**

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The mission of WageningenUR is to Sustainably produce enough high quality food for all people on the planet with an ecological footprint as low as possible. The growing number of people on the planet induces a growing demand on both (space for) food production and space for living (housing, working, recreation, etc.). It simultaneously increases the ecological footprint of humans affecting the living conditions for future generations on our planet. Therefore, the WageningenUR slogan is: “Produce two times more with two times less”: i.e. produce 2x more food with 2x less ecological footprint (use of space, use of resources, pollution, etc.). This can be done with smart agriculture producing both animal and plant food products keeping the environment and the people on the planet in mind. Biomarkers can be a tool that help to reach this goal.

To understand the concept of biomarkers for livestock it is important to realize that all (production / economic) traits of livestock are regulated by biological processes. Biological processes include physiological pathways in which genes (proteins) act together. Genetic variation (breeding) and environmental factors (e.g. feed composition, animal housing, etc.) affect the activity of genes, and therefore the activity of pathways. Because the biological pathways regulate the livestock traits a changed activity of the pathways result in a different outcome of the traits. Knowledge of the biological pathways therefore highlights potential genes (proteins, metabolites) that can act to **monitor** the activity of the pathways, which relate to the value of the regulated traits. Such genes or proteins are biomarkers. Knowledge of the relation between the value of the biomarker and the outcome of the trait can be used to predict the trait by only measuring the value of the biomarker. If a trait is difficult to measure (e.g. when it is expensive to measure, or when it can only be measured at specific moment – for example meat quality traits can only be measured several hours / days post mortem, for certain products (e.g. dry cured ham) even months or years post mortem) measuring the biomarker can **predict** the trait. Also during an intervention study (e.g. change of food composition) the outcome of the intervention may be predicted before the experiment starts and monitored during the intervention. Finally, biomarkers may be used as **diagnostic** tools in livestock – for example to study the interactions between traits if traits share common biological pathways.

Biomarkers can be developed using omics technologies. Omics methods can be used to make genome wide tissue wide screens relating a trait (phenomics) to the expression of the genome at the DNA (genomics or methylomics / epigenomics), RNA (transcriptomics), protein (proteomics), or metabolite (metabolomics) levels. Bioinformatics and systems biology provide tools to highlight the relation between omics profiles and (changes of) the traits. During my presentation I will show examples of my team’s work of the development of biomarkers using transcriptomics, proteomics, and metabolomics.

In a living organism the interactions between the genes at all biological levels are important. So, to really understand a trait it is vital to integrate the genome, methylome, transcriptome, proteome, and metabolome levels and compare with the physiology of the animal. While this seems to be a future dream the first analyses are underway in human and laboratory animals. For livestock science the lack of availability of data hampers the start of such “big data” analysis. I will finish my presentation with some examples of the start of integration analyses and systems biology in livestock science in the Animal Breeding and Genomics Group of WageningenUR.

VOLATILE ORGANIC COMPOUNDS AND PLANT “PRIMING”

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Plants may respond to herbivores by emitting mixtures of volatile organic compounds (VOCs) that attract herbivore enemies or repel aggressors. They release blends of volatile compounds from many of their organs. Volatiles are commonly used by herbivores as cues in choosing host plants, where each plant species could emit a distinct blend of VOCs, and thus be recognizable to herbivores and their enemies. However, the major herbivore-induced volatiles shows that the same constituents are released by most plant species, like the monoterpenes ((E)- β -ocimene, linalool), the sesquiterpenes ((E,E)- β -farnesene, (E)- β -caryophyllene), and the fatty acid derivatives known as green leaf volatiles (GLVs) – (e.g. (Z)-3-hexen-1-ol, (Z)-3-hexenyl acetate) are frequent components of volatile blends released after herbivore damage or pathogen infestation from a wide range of plant.

Plants release a large variety of VOCs into the surrounding atmosphere what is associated with a range of biotic and abiotic stress. Abiotic stress factors alter the levels of VOCs, what was first recognized for high temperature stress nearly 30 years ago. Among other abiotic stresses, high light intensity, water stress, salt stress and oxidative stress imposed via ozone treatment also can stimulates VOCs emission in a variety of different plants. Not surprisingly biotic stresses also induce the emission of VOCs. Herbivore damage to vegetative parts has been repeatedly shown to cause increased release of inducible VOCs, especially GLVs and terpenes. In addition to herbivore feeding, oviposition by insects also may trigger an increase in VOCs emission. Finally, mechanical damage or pathogen attack to plants may cause an elevated level of VOCs release.

The primary function of VOCs is to defend plants against herbivores and pathogens, to attract pollinators and to serve as signals in plant-plant communication. Chemically, VOCs belong to the large group of terpenoids, fatty acid derived C6-volatiles and derivatives, phenylpropanoid aromatic compounds, as well as certain alkanes, alkenes, alcohols, esters, aldehydes, and ketones. Today more than 1700 VOCs have been isolated from more than 90 plant families. Some VOCs can serve as repellents to the attacking insect itself as a direct defense, as well as attractants to the natural enemies, where an herbivore induced VOCs blend may comprise more than 200 compounds.

“Priming” is the physiological state of a plant that prepares its metabolism to respond more effectively to injury and is a physiological process by which a plant is conditioned for a more rapid or higher-magnitude response. “Priming” follows recognition of pathogen-derived effectors or colonization by beneficial organisms. On the other hand the process can also be induced by treatment with some natural or synthetic compounds and wounding. “Priming” is the phenomenon that enables cells to respond to very low levels of a stimulus in a more rapid manner. Thus, primed plants show faster and/or stronger, activation of defense responses to insects, or abiotic stress. Plants “remember” such events and, depending on the type of primary stimulus can deploy a diverse set of defense mechanisms. “Priming of defense” results in a stronger induction of basal resistance mechanisms, however basal resistance is too weak to protect against biotic or abiotic stress. Furthermore, the primed defense state can be maintained long after the initial stimulus. Thus, priming of defense allows plants to boost their innate immune system. Stress “memory” in plants is an essential feature of “intelligent” behavior and can be recognized at three levels. First, seed priming that can improve seed stress tolerance through “priming memory”. Second, memory of plants, where plants are not exposed to a continuous stress, but are exposed to various stress factors. Third, transgenerational “memory” effects may be transmitted to the following generations.

ABSTRACTS

THE EFFECT OF ADDITION OF ZEOLITE ON CHANGES IN SURFACE CHARGE OF SELECTED SOILS

WPŁYW DODATKU ZEOLITU NA ZMIANĘ ŁADUNKU POWIERZCHNIOWEGO WYBRANYCH GLEB

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Zeolites are natural aluminosilicates composed of AlO_4 and SiO_4 tetrahedra arranged into ordered crystallographic network. They were formed after volcanic ash settling in ancient alkaline lakes.

Zeolites have been widely used in agriculture (Reháková et al. 2004), microelectronics, optics, medicine, environmental protection and chemical industry. In agriculture zeolites are used as fertilizers, feed additives and soil conditioners. One of the main advantages of a zeolite is a high sorption capacity and its ability to bind cationic nutrients and water molecules (Mansouri et al. 2013). As a result, zeolites prevent the elution of the nutrients from the soil, thereby increasing their availability to the plants as well as increase water retention in the soil during periods of drought. Furthermore zeolites have a storage capacity for gases (eg. air) and have a positive effect on soil ventilation.

Potentiometric titration method enables estimation of surface charge amount as well as determination of distribution function of the apparent dissociation constants of surface charge generating functional groups-

The aim of this study was to determine the effect of different doses of zeolite on surface charge of the two soils – black earth and brown soil formed from loess using back-titration method according to the procedure described in Matyka-Sarzyńska et al. 2000. The experimental apparatus Titrino provided by Mettler Toledo equipped with Orion combined electrode was applied for titration.

References:

1. Reháková M., Čuванová S., Dzivák M., Rimár J., Gaval'ová Z., 2004. Agricultural and agrochemical uses of natural zeolite of the clinoptilolite type. *Current Opinion in Solid State and Materials Science* p. 379404.
2. Mansouri A., Rikhtegar N., Panahi H.A., Atabi F., Shahraki B., 2013. Porosity, characterization and structural properties of natural zeolite – clinoptilolite – as a sorbent. *Environment Protection Engineering*: 39 (No. 1).
3. Dubach P., Metha N.C., Jacob T., Martin F., Routlet N., 1964. Chemical investigations on soil humic substances. *Geochim. Cosmochim. Acta*, 28, p. 1567-1578.
4. Matyka-Sarzyńska D., Sokołowska Z., Józefaciuk G., 2000. Variable surface charge of selected peat materials as determined from back titration. *Acta Agrophysica*, 26, p. 51-58.

**EVALUATION OF STABILIZATION EFFICIENCY OF MINERAL SORBENTS
IN SOILS CONTAMINATED WITH HEAVY METALS**

**OCENA EFEKTYWNOŚCI STABILIZACYJNEJ SORBENTÓW MINERALNYCH
NA GLEBACH SKAŻONYCH METALAMI CIĘŻKIMI**

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Mineral sorbents (bentonite, zeolite) can effectively immobilized contaminants in soil contaminated.

The aim of the study was to reduce the content of active forms of Cd and Pb in soils contaminated with these metals by using bentonite and zeolite. The natural ability of mineral sorbents for binding heavy metals was taken into consideration in scheduling the current trial.

Bentonite and zeolite have been applied in the study for sorbing and stabilizing Cd and Pb. They were incorporated at different rates into soils with different degrees of contamination (0-IV wg *Kabata-Pendias, 1995*) by Cd and Pb. The treatments were incubated for Chemical analyses were performed on soils samples for determining the levels of reactive Cd and Pb (extracted by 0.11 mol CH₃COOH dm⁻³).

The incorporation of bentonite and zeolite to contaminated soil has limited the mobility of investigated metals. Bentonite has revealed much higher stabilizing efficiency as compared to zeolite. The quantities of reactive forms of Cd and Pb were lower in treatments with bentonite and zeolite with reference to the control.

**CHANGES IN SOME PHYSIOLOGICAL PROPERTIES AND PROTEINS OF BROAD BEAN
IN RESPONSE TO CADMIUM STRESS**

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This study was conducted to investigate the effects of cadmium (Cd) stress on broad bean (*Vicia faba* L. cv. Sakız). Plants were exposed to cadmium stress by applying 0 (Control), 2.5, 5, 7.5 mM Cd for 14 days after sowing in a climate chamber under 20°C, 70% relative humidity and 8/16 h (day/night) photoperiod. The effects of Cd on leaf number and area root and stem length, leaf and stem color along with fresh and dry weight, percentage of cell membrane injury and malondialdehyde (MDA) content of leaf, stem and root parts. The protein profiles of different portions of plants were evaluated by SDS-PAGE. The Cd treatments led to inhibition of growth and development, reduction of fresh and dry weight. Cadmium treatments caused darkening in the stem color. The ascending Cd concentrations caused an increase in the cell membrane injury and lipid peroxidation. The highest injury rate and lipid peroxidation was determined in the root part, followed by the stem. According to the SDS-PAGE analysis different protein bands, in mass range 11-145 kDa (in root, stem, and leaf) and 6-179 kDa (seed), were detected. The intensities of some proteins generally decreased and/or disappeared especially at 7.5 mM Cd. Besides, a few new proteins appeared, especially in root, in response to Cd stress.

**TOLERANCE AND PRODUCTIVITY OF SOME POTATO CULTIVARS
TO LONG-TERM SALT STRESS***

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Salinity in agricultural land is a major problem worldwide; led to reduction in growth, quality and productivity of crops. In presented research, the effect of salt stress on some currently used potato cultivars will be investigated. For this purpose, tubers will be planted in 14 Lt pots, containing garden soil: peat: vermiculit (2: 1: 1) and plants will be grown in controlled greenhouse conditions, 25-18 (± 2)°C (day/night). Salt treatment was initiated 1 week after all the seedlings where emerged. Control plants will be irrigated with tap water and salt stress conditions in the growing medium will be provided with NaCl (5 dSm⁻¹). Salt stress tolerance of potato plants will be determined with ion leakage the indicator of cell membrane injury and malondialdehyde (MDA) content. Tuber number and yield per plant, single tuber weight, tuber diameter, stem number per pot were examined. The protein profiles of different portions of plants were evaluated by SDS-PAGE. It was found that Lady Olympia and Hermes cultivars showed the highest tuber flesh and skin injury, while Désirée cultivar showed the lowest injury and MDA content at the end of 90 days. Besides, the highest MDA content of the tuber flesh and skin varied between cultivars. The salt stress decreased the total and marketable tuber yield due to the decrease in the tuber number per plant and average tuber weight. Moreover, salt stress had no adverse effect on stem number per pot. According to the SDS-PAGE analysis the intensities of some proteins generally decreased and/or disappeared in the salt-sensitive cultivars. Besides, a few new proteins appeared and/or heavily stained due to higher stress tolerance.

* This study is part of the Ph.D. thesis project of Cigdem Aydogan supported by Eskisehir Osmangazi University Research Foundation as project no. 201423A216

CONSUMERS' PREFERENCES REGARDING HUNGARIAN MANGALICA

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EU farmers confront worsening terms of trade and declining real incomes, and generally remain dependent on direct payments and other subsidies for survival (European Commission, 2014). In 2012, subsidies accounted for over 50 per cent of EU farmers' net income, and farm incomes are lower in absolute and relative terms in the New Member States (NMS) from Central and Eastern Europe (European Commission, 2014; Matthews, 2014). Rural areas in the NMS are more dependent on agriculture as a source of income and employment, with opportunities for gainful employment in the non-farm rural economy relatively scarce (Davidova et al., 2013).

To boost competitiveness and profitability, the EU seeks to stimulate enhanced value-added production, drawing on its reputation for quality goods (European Parliament and the Council of the European Union, 2012). One potential type of quality goods are Traditional Food Products (TFPs). A traditional food may be classified as: 'a product [...] made accurately in a specific way according to the gastronomic heritage, [...] and known because of its sensory proprieties and associated with a certain local area, region or country' (Guerrero et al., 2009, p. 348). These goods generally possess positive images due to superior taste, nostalgia and / or ethnocentrism (Almli et al., 2011; Vanhonacker et al., 2010). However, the ability of TFPs to contribute to improved farm incomes, without recourse to subsidies, depends on whether consumers are willing to pay a premium for them compared to cheaper alternatives. In other words, with TFPs not receiving any direct, supplementary subsidies, additional value added has to come on the demand side but the willingness of consumers to pay for such goods, and specific attributes that may be attached to them, remains unclear.

The paper addresses this central question, building on recent advances in Willingness to Pay (WTP) methodologies, which are applied to an exemplary case of a Traditional Food Product (TFP) – that of Hungarian mangalica salami. Mangalica salami is an ideal product for exploring WTP for a TFP as the main motivation for its purchase in Hungary, as discussed below, is its indigenous origin and heritage. Data collection occurred in the North Great Plain of Hungary, a lagging region, which is characterized by a relatively high dependence on agriculture and real farm incomes below the EU average (MARD, 2011). The study seeks to understand consumer perceptions of value and identify promising segments for targeting. Specifically, using a Discrete Choice Experiment (DCE), explicitly accounting for unobserved heterogeneity in correlated WTP coefficients and observable demographic/socio-economic characteristics, our model is estimated in WTP space.

Train and Weeks (2005) advocate this approach and reparametrize the random parameter (mixed) logit model (RPL) by defining the distribution of WTP directly. Nevertheless, despite the clear advantages of the WTP space framework, it has been used, notwithstanding some notable exceptions (e.g. Balcombe et al., 2010), infrequently in the food policy literature. As a result most previous food-related WTP studies assume that the price coefficient is fixed across consumers, so that the moments of WTP are equal to the moments of the non-monetary attribute coefficient scaled by the price coefficient. However, this is an unnecessarily strong assumption of homogeneous price sensitivities. Moreover, as Train and Weeks (2005) note, a fixed cost coefficient implies that the scale parameter, and consequently the variance of unobserved utility or the degree of certainty in decisions, is the same across respondents. Hence, in such models, potential scale heterogeneity across decision-makers may be falsely attributed to variations in WTP.

Results indicate that traditional food products can command a substantial premium, albeit contingent on effective quality certification, authentic product composition and effective choice of retail outlet. Promising consumer segments and policy implications are identified.

PORK MEAT QUALITY ASSESMENT IN REALTION TO ITS COLOUR

OCENA JAKOŚCI MIĘSA WIEPRZOWEGO W ZALEŻNOŚCI OD JEGO BARWY

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The aim of the study was to assess the relation between meat color lightness and other quality traits and its technological suitability. A criterion of meat divide into groups was its colour lightness L^* : Group I – to 55, group II from 55 to 57 and group III above 57. The experimental part of this paper was carried out on pork from purchase retail sales. Evaluation consisted of *longissimus lumborum* samples of 30 pigs 48 h after slaughter. There were determined an acidity of muscle tissue pH48, visual assessment of colour intensity, marbling and meat firmness, water holding capacity, drip loss, thermal drip and meat pigment content. The meat tenderness was determined by INSTRON 3342 apparatus. Basic chemical composition of meat was determined: water, total protein, intramuscular fat and collagen content. The meat color traits was measured after 48 h and 96 h post mortem using Minolta CR 310 camera in CIE system: L^* – lightness, a^* – redness, b^* – yellowness, color saturation C^* and hue angle h° .

Based on the obtained results there was demonstrated that the best quality and technological suitability had the meat samples of group I with the darker colour.

**THE INFLUENCE OF TIME INSEMINATION, EFFICIENCY, SERVICE NUMBER,
AND TIME BETWEEN SIGNS OF ESTRUS AND INSEMINATION
ON SEX CALVES REGULATION IN DAIRY HERDS IN POLAND**

WPŁYW OKRESU INSEMINACJI, WYDAJNOŚCI MLECZNEJ, NUMERU LAKTACJI
ORAZ ODSTĘPU CZASU OD OBJAWÓW RUJOWYCH DO INSEMINACJI,
NA REGULACJĘ PŁCI CIELĄT W STADACH BYDŁA MLECZNEGO W POLSCE

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The use of sexed semen in the dairy industry has grown rapidly. However, high costs and low fertility have limited the use of this potentially valuable tool. Breeders have tried to manipulate the sex of offspring at conception for centuries. Historically, female offspring from all heifers and cows were needed to produce enough dairy replacement heifers to replace culled cows. Control of offspring sex ratio is very important for breeders, since it is associated with the improvement of production profitability.

The aim of this study was to find out if the correlation between the particular factors (such as time of artificial insemination, time interval between artificial insemination and estrus symptoms, service number, section of heifers and cow breeding) and sex of offspring.

In the experiment three different provinces were chosen in Poland, (śląskie, opolskie and podkarpackie). Data consisted of 154 cows and heifers (n = 154) from selected production farms. Consisted of three years (2009-2011), to subsequent specify. Corresponding information was divided in to 2 groups (A-heifers, B-cows) and the same fixed effects along with calf sex were examined for them. To artificial insemination the semen portion between 1.97-2.5 ml were used for effective pregnancy rate. Again, heifer and cow breeding were analyzed separately because performance differed greatly between heifers and cows for some traits. This study used linear fixed effects model to explain the percentage of sexed semen used for cow and heifer breeding.

It was found that time of artificial insemination can affect sex ratio in calves. The effects of milk performance and the choice of heifer or cow as a dam were not significant. Also, the correlation between the sex of calves and the consecutive lactation proved to be not significant. The same results were found for the time between artificial insemination and estrus symptoms. For conventional semen, slightly more single male calves than single female were reported to have been born to heifers but considerably fewer for cows.

THE EFFECT OF INFRARED RADIATION ON THE LINSEED (*LINUM USITATISSIMUM L.*) OF DIFFERENT VARIETIES ON THEIR COMPOSITION, NUTRITIONAL VALUE AND EFFICIENCY IN CALVES REARING

WPŁYW NAŚWIETLANIA PROMIENIAMI PODCZERWONYMI RÓŻNYCH ODMIAN NASION LNU (*LINUM USITATISSIMUM L.*) NA ICH SKŁAD, WARTOŚĆ ODŻYWCZĄ I EFEKTYWNOŚĆ W ODCHOWIE CIELĄT

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Flax (*Linum usitatissimum L.*) is an annual plant from the family *Linaceae*. In Poland the spring form of flax is mainly cultivated, including varieties such as: Szafir, Oliwin and Jantarol. Seeds of different varieties of flax are light brown (Szafir) or yellow (Jantarol, Amon, Oliwin). Flax is an attractive nutrition crop because of the high content of: polyunsaturated fatty acids high value protein, lignans, mucous substances, non-starch polysaccharides and other bioactive substances present in its seeds.

The aim of the study was to investigate the effect of infrared radiation on the linseed (*Linum usitatissimum*) of different varieties on their composition, nutritional value and choose the most suitable form and variety of flaxseed that would apply into ruminants feeding.

The research material consisted of four different varieties of flax seeds, available on the Polish market: Jantarol, Oliwin, Szafir and Amon. The seed samples were subjected to infrared radiation. The process of infrared radiation was performed on flaxseed at temperature: 180°C and for four times: 90, 120, 150 and 180 s. The material exposed to radiation were subjected to chemical analyses. In seed samples the following parameters were determined: the contents of basal nutrients: dry matter, crude protein, crude fiber, ether extract, nitrogen free extract (AOAC, 2011), fatty acid profile (Perkin-Elmer method, gas chromatography Varian GC), micro- and macroelements (emission spectrometer with inductively coupled plasma (ICP-AES company Leeman, model PS 950)) and hydrogen cyanide (HCN) content. Based on the results of seed analysis, using a software WINWAR (2007), the feeds value for ruminants was determined. The results were subjected to statistical analysis using the SAS 9.4 (2013).

Basic composition of tested, processed flax seed varieties differed significantly. Exposing flaxseed to infrared radiation resulted in significant differences in dry matter, crude protein, crude fiber, ether extract, nitrogen free extract content of seeds. Exposing the seeds to the infrared radiation also affects the fatty acid profile as well as micro- and macroelements content. Infrared radiation resulted in a significant lower content of HCN in seed samples of all varieties which is a positive from a nutritional point of view. The optimal results in decreasing HCN content in all linseed varieties indicate 180°C and 180 s as the optimal parameters if infrared irradiation is used.

Summarizing the obtained results regarding chemical composition and nutritional value, the Oliwin and Amon variety can be considered as the best one among the 4 studied linseed varieties on the ground of ether extract content and the best fatty acid profile. Szafir variety can be considered as the best one among the studied linseed varieties on grounds of the highest content of crude protein. This linseed varieties can be used in the next study with animals. Previously the seeds must be subjected to infrared radiation to reduce the HCN content. It is believed that seeds processed in this way, will have a better digestibility of nutrients which can result in the production effects. Different processing methods can affect the composition of seeds in different ways.

**THE EFFECTS OF RESTORATION ON REPRODUCTIVE SUCCESS AND BREEDING
MICROHABITAT OF NORTHERN BOBWHITE IN NORTH-CENTRAL TEXAS**

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The decades long decline in northern bobwhite (*Colinus virginianus*) populations in the United States is inferred as a hallmark of changing land use. Although known to exhibit a boom-bust cycle, rapid population growth followed by rapid population recession, the northern bobwhite is listed as “near threatened” according to the International Union for the Conservation of Nature and Natural Resources. The northern bobwhite is a small, non-migratory gallinaceous game bird species widely distributed across the eastern United States and Mexico. Adult northern bobwhites are primarily granivorous while chicks utilize insects as a main food source. Northern bobwhite inhabit a range of ecosystems characterized by frequent disturbances that maintain an open, grassy ground layer including hard pine forests, thorn-scrub brush, and grasslands. Overgrazing, suppressed fire regimes, and woody vegetation encroachment have altered optimum northern bobwhite habitat in the Rolling Plains ecoregion of Texas. The once open grassland plains of the ecoregion have seen increased invasive plant species and decreased populations of native species. This decline has prompted managers to seek habitat improvement strategies for northern bobwhite. Due to their economic importance and status as a healthy grassland indicator species, attention focused towards proper habitat management for northern bobwhite benefits other grassland avian species as well as livestock. While several studies focus on the conservation of northern bobwhite, this study addressed the effectiveness of landscape conservation practices. The Oaks and Prairies Joint Venture established a landowner incentive program in north-central Texas for land managers that have conducted approved land management activities (i.e. prescribed grazing, prescribed burning, and mechanical and chemical brush removal). Our study evaluated the effects of various land manipulation practices within 2 years before the study on reproductive success and microhabitat selection of nesting and brood-rearing northern bobwhite through comparisons among treated and control sites. Using radio-marked northern bobwhite we examined how land manipulation practices influence spatial heterogeneity, microhabitat selection, and nest predator assemblages. Differences in plant species between restored and non-restored areas were visibly noticeable. We radio-marked 21 females by May 2016 and located the birds every 3 to 5 days to gather pre-breeding data on habitat use. In preliminary evaluations, plant species in restored areas included low-shrubs that provided greater canopy cover to northern bobwhite than in tree-dominated non-restored areas. Canopy cover provides northern bobwhite protection from extreme heat and concealment from aerial predators. Grass cover, an important component of nest sites, did not differ between area types. By late May, 5 of the 21 females began nesting. Nesting females utilized dead grass as the main nest concealment with little presence of woody plants. After nesting is completed, we will measure vegetation characteristics and compare between successful and failed nest. We placed infrared, time-lapse video cameras within 5m of nests to identify potential nest predators. We checked nest cameras twice a week to determine the cause of a failed nest whether predator or non-predator (i.e. trampling, mowing, flooding). We followed radio-marked females with successful nests, defined as >1 chick, during brood-rearing to evaluate diurnal and nocturnal habitat use. Further assessments of nest camera predators, differences between successful and failed nests, and brood-rearing habitat use will be available August 2016. Previous literature suggests northern bobwhite nesting and brood rearing microhabitats vary widely in vegetation characteristics. More complex spatial heterogeneity reduces predator search time thus, it reduces the opportunity to overexploit their prey. Managing land to increase spatial heterogeneity may be an alternative to predator control. Understanding northern bobwhite productivity may be the most imperative factor associated with their current population size. The results of this study can be applied to limited-dispersal species and species with equivalent habitat requirements.

EFFECTIVENESS OF PRODUCTION OF PORK HAMS AFTER APPLICATION OF ARGININE ADDITIVE IN MIXTURES FOR FATTENERS

EFEKTYWNOŚĆ PRODUKCJI SZYNEK WIEPRZOWYCH PO ZASTOSOWANIU W MIESZANKACH DLA TUCZNIKÓW DODATKU ARGININY

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Meatiness of fatteners and participation of valuable cuts in carcass are constantly improved via the targeted, systematic breeding work. The number and size of muscular fibres is shaped during the prenatal period, as affected, *inter alia*, by nutritional factors (Świątkiewicz 2010, Che et al. 2013; Wu et al. 2013, Rekiel et al. 2015). In the period of weaning the piglets and growth of young pigs, nutritional modifications serve the mentioned purpose although the intensity of processes of differentiation, growth and development of muscular fibres is considerably lower during the discussed period (Wu et al. 2004, Morrison et al. 2008). There was conducted the experiment, the aim of which was to increase the meatiness of the commercially valuable element of pork carcass, i.e. of *musculus quadriceps femoris*.

For fattening, 40 weaners at the age of ca. 12 weeks and body weight of ca. 30 kg was at random chosen and classified into two groups: control (C) and experimental (E), 20 animals in each group. The pigs were kept in groups and fed the complete ration mixtures, Grower (30-80 kg) and Finisher (80-115 kg). The mixture Grower contained (in 1 kg): metabolic energy – 13.1 MJ; total protein – 175 g, lysine – 9.8 g, methionine plus cysteine – 5.5 g; threonine – 5.8 g; arginine – 0.8 g; calcium – 5 g; the mixture Finisher contained respectively; 12.2 MJ; total protein – 152 g; lysine – 9 g; methionine plus cysteine – 5 g; threonine – 5.5 g; arginine – 0.7 g and Ca – 5 g. The both mixtures (G and F) for experimental fatteners were enriched with arginine in the quantity of 0.5 kg per 1 tonne of feed. The fatteners were managed in uniform conditions, satisfying the zoo-hygienic standards and fed ad libitum. After reaching the slaughter weight, ca. 115 kg in average, the animals were slaughtered, with the preservation of standards connected with pre-slaughter, and of slaughter procedures. In the processing plant (situated at farm and slaughtering plant), there were obtained the hams were from semi-carcasses (without leg and knuckle but with skin, subcutaneous fat and bone) and then, the desirable commercial element i.e. *musculus quadriceps femoris* with tensor muscle. At slaughter, the fatteners from group E and C weighed respectively 113 and 118.4 kg in average; their daily weight gains during fattening were equal to 945 g and 942 g, respectively and the time of its duration was 97.1 days (9 fatteners from E group) and 98.4 days (fatteners from C group). Dressing percentage in groups E and C was the same – 78%. The estimated meatiness of the fatteners was as follows: 57.8% for group E and 56.7% for group C (+1.1 percentage point in favour of group E). The weight of cold carcass (weighing was carried out after obtaining internal temperature of + 6°C in *m. quadriceps femoris*) amounted to 88.4 kg in group E and 92.4 kg in group C; the weight of total ham was 10.54 kg and 10.15 kg, respectively. The weight of *m. quadriceps femoris* was 1.05 kg and 0.88 kg, respectively. The participation of ham weight and *m. quadriceps femoris* in relation to the weight of a living fattener in groups E and C was equal to 18.64% and 17.00% and 1.86% and 1.48%, respectively. The participation of ham weight in relation to the weight of carcass was 23.8% and 21.98%, respectively (by 1.3 percentage points more in favour of group E vs. C). The analysis of the born costs (production of weaner, nutrition of fattener, additional costs) and of the obtained revenues shows that the mixture for fatteners E vs. C group, as being enriched with arginine, is more expensive what increases the costs of nutrition but its application results in profit, coming from the additional weight of *m. quadriceps femoris*.

Better effectiveness of production of commercially valuable element (profit – difference of 1.58% in favour of group E vs. C) indicates the justness of applying the mixtures, enriched with arginine in the quantity of 0.5 kg/1 ton of feed in the process of fattening.

**EFFECT OF WATER EXTRACT FROM MINT (*MENTHA PIPERITA* L.)
ON SELECTED CROP PESTS FEEDING, BEHAVIOR, SURVIVAL AND THEIR RESPONSE
TO THE ODOR OF THIS PLANT**

WPŁYW WODNYCH WYCIĄGÓW Z MIĘTY PIEPRZOWEJ (*MENTHA PIPERITA* L.)
NA ŻEROWANIE, ZACHOWANIE I PRZEŻYWALNOŚĆ WYBRANYCH SZKODNIKÓW ROŚLIN
UPRAWNYCH ORAZ ICH ODPOWIEDŹ NA ZAPACH TEJ ROŚLINY

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The aim of the study was to determine the effect of aqueous extracts of dried mint (*Mentha piperita* L.) in concentrations of 2%, 5% and 10%, and fresh parts of this plant, in concentrations of 10%, 20% and 30% on feeding of *Sitona lineatus* L. (pea leaf weevil) and survival of black bean aphid (*Aphis fabae* Scop.) on the leaves of broad bean (*Vicia faba* L.) (variety "Bartek") and on feeding of larvae of Colorado potato beetle (*Leptinotarsa decemlineata* Say.) on the potato leaves (*Solanum tuberosum* L.). An olfactory response (response to odour stimuli) abovementioned insects in relation to the mint was also investigated.

In the studies of the effects of aqueous extracts of mint on the dynamics of *Sitona lineatus* feeding on the beans leaves, 15 laboratory's observation in 8-hour intervals was made. Leaves injuries on their edge surface caused by adult individuals were measured. Observations were carried out in 6 replicates divided into males and females.

In these researches on impact of water extracts from mint on mortality of wingless females and larvae of black bean aphids, observations were carried out in the 8-hour intervals.

Effect of water extracts of mint on feeding of larvae *Leptinotarsa decemlineata* Say. on potato leaves was assessed during 5 observations in laboratory, conducted in 24-hour intervals. We examined changes in body weight of larvae (L2, L3 and L4 stages) and mass of eaten potato leaves.

In studies on the olfactory reaction an olfactometer with glass "Y-tube" in the case of *Sitona lineatus* beetles and Colorado potato beetles was used, and in the case of winged female black bean aphids, 4-arm arena olfactometer, used in multiple choice tests was chosen.

The studies showed that the aqueous extract of fresh mint parts in concentrations of 20% and 30% the most limited the feeding of females *Sitona lineatus* L. Feeding of male of *Sitona lineatus* L. was reduced the most by 10% extract of dried mint and 30% of fresh mint parts. The mortality of females and larvae of black bean aphids under the influence of the mint extracts was increased. In general, it increased with increasing of concentration of the plant extract, wherein the extract of the fresh parts of mint showed stronger activity than that prepared from dried parts of this plant. All the used plant extracts limited the increase the body weight of larvae of Colorado potato beetle *Leptinotarsa decemlineata* Say., wherein the strongest activity showed the extract from fresh parts of nettle in the strongest concentration. All used extracts limited the amount of food eaten by the larvae of Colorado potato beetle, wherein there was no differentiation depending of the plant extract concentration or a process its preparation. In studies on the olfactory reaction, it was showed deterrent response for odors emanating from *M. piperita* L. against Colorado potato beetle females, but there was no effect on the behavior of beetles of *Sitona lineatus* L. and winged females of black bean aphid.

EFFECTS OF SOME BACTERIA ON AVENA SATIVA L. GROWTH

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Usege of the unconscious and excessive doses of pesticides and chemical fertilizers to ensure increased efficiency in the agricultural sector along with causing the accumulation of vast amount of toxins in the plant, disrupts soil structure, causes the land to desertification and the loss of vitality. Therefore, to avoid negativity that occurs excess use of chemical pesticides and fertilizers, microorganisms can be used instead of chemicals. *Rhizobacteria* which induces plant growth, besides their stimulatory effects, they are effective in biological control of diseases.

In the study five different *Avena sativa* varieties were used along with six bacteria species plus negative control. Bacteria species used in the study were *Azotobacter* sp., *Bacillus subtilis* ATCC 6633, *Bacillus cereus* ATCC 11778, *Pseudomonas aeruginosa* ATCC 35032, *Enterobacter aerogenes* ATCC 13048 and *Serratia marcescens* ATCC 13880. Sterile distilled water was used as negative control. Bacterial suspensions were prepared at the concentration of 10^8 cfu/ml and injected 5 ml for each variety. Surface sterilization of the seed were made with %5 hipochlorite solution. After sterilization 100 of seeds were put in petri dishes and left at 25°C for 3 days for germination. At the end of the period germinated seed were counted. Another set of seeds, 5 seeds for each variety, will be sterilized and put in the soils in flowerpots. Flowerpots were left in climate chamber at 25°C at 13 h of light and 11 h of dark for 10 days. After ten days of growth period measurements of stem length, root length, stem radius, root radius and leaf width were measured with digital compass and recorded.

In petri dish experiments it can be seen that three bacteria species induced germination ratio while other three decreased germination ratio. While control group has a germination ratio of 62.6%, experiment group's germination ratio varies between 24%-84.8%. Among these six bacteria *Pseudomonas aeruginosa* has highest inducement ratio (84.8%) while *E.aerogenes* has lowest t ratio (24%). Kahraman was the most effected variety among all five varieties. It's germination ratios change between 30%-95% while control group has 78% germination ratio. Kırklar was the least effected varieties with the control group 20%, experiment group between 8%-61%.

In soil experiments only *B.subtilis* increased all the selected criteria. *E.aerogenes* effected all the varieies most while *B.cereus* was the least effective species. *E.aerogenes* increased all criteria except root radius. Leaf width had increased for all bacteria that tested. When we looked to the overall effects of the bacteria on the selected criteria we can say that bacteria increased more than half of the selected criteria. It can be said that soil contamination can be useful to *Avena sativa* until further experiments are done.

THE BEHAVIOUR OF GROUP HOUSED SOWS TREATED WITH STRESNIL®

ZACHOWANIE LOCH UTRZYMYWANYCH GRUPOWO Z ZASTOSOWANIEM PREPARATU STRESNIL®

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Council Directive EU 2008/120 /EC specifies that sows and gilts have to be kept in groups during a period starting from four weeks after the service to one week before the expected time of farrowing. Pigs must have a stable hierarchy, therefore, breeders and producers of pigs in the EU fear the increase in violence in the newly created groups. This is an actual problem that can be solved in many ways, such as changing the housing system or environmental enrichment such as straw, sawdust, wood etc. In many industrial farms using slatted floors such changes are not possible. In this situation often animals are treated with sedatives (Shackleton and Tan, 1990). The most commonly used psychoactive remede is Stresnil® with Azaperone as the active substance. This substance has a calming, sedative, antiemetic effect, reduces physical activity and inhibits the secretion of catecholamines (dopamine and norepinephrine). The official indication for azaperone is to control aggression during mixing and the rearrangement groups of pigs (Callear and Gestel Van, 1971).

The aim of the study was to compare the behavioural profiles of two groups of sows – treated and not treated with Stesnil®. Each group consisted of 12 sows. Groups were formed using sows in a similar phase of gestation, about 4 weeks after service. The first group (Group A) received by injection Stresnil (Azaperone 40 mg / ml) in an amount of 1 ml per 100 kg body weight. The injection was made twice. The first dose was given before mixing, and the second after the first day of staying sows in a group. The second group (B) did not receive any pharmacological remedy. Sows of both groups were housed in two identical pens with an area of 2.34 m²/head. The behaviour of sows was recorded using cameras with IR function and digital recorder. Observation began when sows entered to pens at 7:00 am and lasted for the next four days. The recordings were then analyzed taking into account the activity and resting phases. The activity phase included the duration of the following behaviours: movement in the pen, feeding and aggression. The frequency of aggressive behaviors was calculated, as well. The obtained data was statistically analyzed with nonparametric U Mann-Whitney test for the comparison of two independent groups.

In the first day of observation the sows treated with Stresnil® (group A) were more active (26.06%) than the sow in the control group (group B) (16.76%). The difference was statistically confirmed ($P < 0.05$). Despite the lower activity during this day sows from the group B showed higher levels of aggression (0.64%) than sows in group A (0.03%). Similar results were found with the frequency of aggressive behaviors. The mean number of such behavior in group A was 1.33/head and was statistically significantly lower ($P < 0.05$) than in group B – 13.50/head. The differences were statistically significant ($P < 0.05$). In the following days the activity of all sows decreased in comparison to the first day.

The duration of aggressive behaviour decreased in subsequent days of observation in comparison to the first day in both groups. During the third day we did not observe aggressive behaviour at all in group A. Aggressive behaviour during the mixing process is inevitable, but the duration of aggression usually is short. The stabilization of the static group takes place after 24-48 hours because during that time the social hierarchy is established (Marchant-Forde and Marchant-Forde, 2005). In our study a stable hierarchy was achieved just in the first day of research. The above results show that the injection of sedatives had a positive impact on the decrease of aggression in sows housed in groups.

ESTIMATION OF GENETIC PARAMETERS FOR AGE AT FIRST CALVING IN CHAROLAIS AND ABERDEEN ANGUS

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Beef cattle fertility is one of the most important traits affecting profitability of beef production. Nowadays farmer focused on improving beef cattle fertility traits and fertility should be included in breeding goal. Age at first calving includes the period that a cow needs to reach maturity and to reproduce for the first time. It is one of the most economically important fertility traits in beef cattle breeding. The aim of this study was to estimate genetic parameters for age at first calving for Charolais and Aberdeen Angus. Charolais is a breed with late maturation in the contrast to Aberdeen Angus with early maturation. These two breeds are two most common beef breeds in the Czech Republic. Data of performance testing of 64 thousands of cows with repeated records of twelve beef breeds and crosses between 1995 and 2014 were used for analysis. This database is used for routine genetic evaluation of growth traits of beef cattle in the Czech Republic. Data were edited to ensure an appropriate data structure for the genetic parameter estimation. The minimum size of HYS (herd-year-season of calving) was at least 5 cows, each cow had to have at least 4 half-sisters. After these edits the dataset contained 7.219 records of Charolais cows and 5.562 records of Aberdeen Angus cows with age at first calving records. The statistically significant environmental effects were determined using GLM procedure in SAS analytical software. Genetic parameters for age at first calving were estimated separately for these two breeds by animal model using AI-REML. The model equation contained fixed effect of age of dam, fixed effect of year of first calving, random effect of contemporary group (herd-year season) of first calving and direct additive genetic effect of the animal. Estimated phenotype variance (σ_p^2) was 21.879 (days) for Charolais and 38.122 for Aberdeen Angus. The variance of herd-year-season effect was 7.310.9 for Charolais and 15.995 for Aberdeen Angus. HYS had bigger influence on the total variability of age at first calving in both breeds then additive genetic variance (σ_G^2) which was 5.133 for Charolais and 10.407 for Aberdeen Angus. of Residual error variance was 9.435.1 for Charolais and 11.720 for Aberdeen Angus. The heritability estimated for age at first calving for Charolais was 0.23 and for Aberdeen Angus 0.27. Difference of heritability could be due to many factors like breed of animal, size and structure of data, management system or environmental factors. Heritabilities are low because all fertility traits are greatly influenced by environmental factors. We conclude that genetic parameters did differ among the investigated breeds, which should be taken into account in breeding value estimation.

**TUMOR NECROSIS FACTOR IN THE UTERUS OF NONPREGNANT BITCHES:
AN IMMUNOHISTOCHEMICAL STUDY**

CZYNNIK MARTWICY NOWOTWORU W MACICACH NIECIEŻARNYCH SUK
– BADANIE IMMUNOHISTOCHEMICZNE

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In domestic species, maternal recognition and establishment of pregnancy required participation of both the maternal and foetal immune system. Many studies have been performed, especially in humans, rodents, ruminants and horses. In the bitch, few similar studies have been performed. Tumor necrosis factor (TNF) is a pleiotropic cytokine that regulates cell growth and differentiation as well as the synthesis of the cytokines, has been identified in the uterus of several species describing a cyclic pattern, eventually under ovarian steroid regulation. TNF, formerly named as TNF alpha or cachectin, is a pro-inflammatory cytokine that shows a wide spectrum of activities, frequently in a dual, dose-dependent way.

TNF possesses strong proinflammatory and immune-stimulatory actions and is involved in the control of cell differentiation, proliferation and migration, as well as in tumorigenesis.

Nowadays information is yet limited on the presence of TNF protein in the canine endometrium during the oestrus cycle and early pregnancy. This study depicts the temporal immunolocalization of TNF in the bitch endometrium along the oestrus cycle. Based on a review of available, professional literature TNF immunolabelin was found in both the stromal fibroblasts and epithelial components of the canine endometrium. Stromal immunostaining was more intense than of the epithetic, in all the stages of the oestrus cycle. Despite the aforementioned studies, information on the TNF protein expression and localization in the canine endometrium remains sparse.

THE INFLUENCE OF ASHES FERTILIZATION FOR GRAIN QUALITY OF SPRING WHEAT, VARIETES "MONSUN"

WPŁYW NAWOŻENIA POPIOŁEM NA JAKOŚĆ ZIARNA PSZENICY JAREJ ODMIANY "MONSUN"

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The essence of the future of agriculture will depend largely on the search for alternative fertilizer solution. Currently, experiments are distributed based on agricultural biomass. The aim of this study was to evaluate the impact of unconventional fertilizing ashes from the burnt grain oats for grain quality of spring wheat varieties "Monsun". Test methods based primarily on the identification of technological value of wheat grain fertilized test both mineral fertilizers and ash derived from burnt whole grain oats. The dose of ash in the experiment were as follows: 430, 1290, 2150, 3010, 3870, 4730, 5590, 6450 kg · ha⁻¹ with the nitrogen fertilization of 100 kg · ha⁻¹ in the form of ammonium nitrate. Laboratory analyzes were related to the following parameters: weight of thousand seeds, hectolitre weight and grain fraction.

The weight of grain reflects desired grain size and its qualitative characteristics, ie. water content, content of starch and protein. The use of mineral fertilizers and ash had a significant impact on the 1000 grain weight. The highest values were obtained in variants where the fertilization ash was applied in high doses 5590, 6450 kg · ha⁻¹.

The weight of hectolitre is used to determine the suitability of grain for milling purposes. By specifying this parameter, there was no significant differences by using different doses of fertilizers. The highest values occurred in the variant of fertilization with ash 1290 and 4730 kg · ha⁻¹.

The fractionation of grain is the primary parameter in determining the suitability of grain, as it allows to specify the range for the appropriate grain size. The experiment observed a significant influence of fertilization with ash fractions of 2.5-2.8 mm and above 2.8 mm. They accounted for the largest number of grain fractions above 2.8 mm, with the result gave an average value of 91.10 g.

Laboratory research showed significance between the general characteristics of the varietal and shaping the quality parameters for appropriate fertilization. The experience has allowed to prove that the effect of unconventional solutions fertilizer is comparable to the quality of the grain obtained after the application of mineral fertilizers.

COMPARISON OF QUALITY OF DRY CURED HAMS OBTAINED FROM MEAT OF NATIVE BREEDS OF PIGS AND HIGH PRODUCTIVE CROSSBREDS

PORÓWNANIE JAKOŚCI WĘDZONEK SUROWYCH DOJRZEWAJĄCYCH Z MIĘSA ŚWIŃ RAS RODZIMYCH I TUCZNIKÓW TOWAROWYCH

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Dry cured hams belong to the luxury products group. Choice of correct raw meat and method of preparing them, make that these products are characterized by high quality. Their value could be higher because of using to their production meat of native breeds of pigs. Meat of these animals is characterized by high quality which is reflected in the finished dry cured product.

The aim of this study was evaluation of some physicochemical traits of dry cured hams obtained from meat of native breeds of pigs – złotnicka spotted and puławska pigs and high production crossbreds.

The 15 hams were processing. They were obtained from three groups of pigs: puławska, złotnicka spotted pigs and crossbreds F₁ (Polish Large White x Polish Landrace) x F₁ (Duroc x Pietrain), 5 hams in each analyzed group of pigs. Cold meat – *semimembranosus* muscle were cured and matured. Cuts were smoked and then stored in cooling conditions to obtain by them 75-80% final yield. On so prepared products and also before smoking the acidity of final product was measured. Color of hams was also measured by using Minolta colorimeters CR400, setting the parameters of the components in the system L*, a*, b*. There was made the instrumental evaluation of ham tenderness.

The pH values, before and after the smoking process, were aligned in all groups. The hams were characterized by different color brightness. The darkest on the section were hams made from meat of złotnicka spotted pigs and they were significantly different in range of this parameter from hams of crossbred fatteners ($p \leq 0.05$). Dissimilarity of złotnicka spotted pigs was marked by significant differences in the range of share of red color (a*) ($P \leq 0.05$) – it was the biggest in this breed. Slightly better tenderness was stated in smoked hams obtained from meat of puławska pigs, however, there weren't stated statistic differences between analyzed groups in this trait.

Dry cured hams obtained from meat of native breeds of pigs were characterized by darker, more characteristic color for this kind of products. Described above the advantages of physicochemical traits for native breeds of pigs may largely determine the choice of the product by consumers.

EFFECTS OF SOME BACTERIA ON *HORDEUM VULGARE* L. GROWTH

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Usege of the unconscious and excessive doses of pesticides and chemical fertilizers to ensure increased efficiency in the agricultural sector along with causing the accumulation of vast amount of toxins in the plant, disrupts soil structure, causes the land to desertification and the loss of vitality. Therefore, to avoid negativity that occurs excess use of chemical pesticides and fertilizers, microorganisms can be used instead of chemicals. *Rhizobacteria* which induces plant growth, besides their stimulatory effects, they are effective in biological control of diseases.

In the study five different *Hordeum vulgare* varieties were used along with six bacteria species plus negative control. Bacteria species used in the study were *Azotobacter* sp., *Bacillus subtilis* ATCC 6633, *Bacillus cereus* ATCC 11778, *Pseudomonas aeruginosa* ATCC 35032, *Enterobacter aerogenes* ATCC 13048 and *Serratia marcescens* ATCC 13880. Sterile distilled water was used as negative control. Bacterial suspensions were prepared at the concentration of 10^8 cfu/ml and injected 5 ml for each variety. Surface sterilization of the seed were made with %5 hipochlorite solution. After sterilization 100 of seeds were put in petri dishes and left at 25°C for 3 days for germination. At the end of the period germinated seed were counted. Another set of seeds, 5 seeds for each variety, will be sterilized and put in the soils in flowerpots. Flowerpots were left in climate chamber at 25°C at 13 h of light and 11 h of dark for 10 days. After ten days of growth period measurements of stem length, root length, stem radius, root radius and leaf width were measured with digital compass and recorded.

In petri dish experiments it can be seen that, although germination ratios were very close, two bacteria species (*B.subtilis*, *P.aeruginosa*) induced germination ratio. While control group has a germination ratio of 97.2%, experiment group's germination ratio varied between 93.6%-98.8%. Among these six bacteria *B.subtilis* has highest inducement ratio (98.8%) while *E.aerogenes* has lowest inducement ratio (93.6%). Harman was the most effected variety among all five varieties. It's germination ratios change between 86%-100% while control group has 95% germination ratio. Martı was the least effected variety with the control group 98%, experiment group between 96%-100%.

In soil experiments three bacteria species (*B.subtilis*, *E.aerogenes*, *P.aeruginosa*) reduced the selected criteria while others (*B.cereus*, *S.mercencens*, *Azotobacter* sp.) increased selected criteria. *B.subtilis* increased all criterias most effectively while *Azotobacter* sp. reduced all selected criterias most effectively. When we looked to the overall effects of the bacteria on the selected criteria we can say that bacteria decreased half of the selected criteria. It can be said that soil contamination can be harmful to the crops until further experiments are done.

**GENETIC DIVERSITY OF HUNGARIAN DRAFT HORSE (*EQUUS CABALLUS*)
DETERMINED BY USING MITOCHONDRIAL DNA
D-LOOP POLYMORPHISM**

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For the preservation of genetic values of a native breed we need to bred by determined numbers in accordance with the strict rules of gene preservation. That means crosses cannot be used and selection is only appropriate if it suits to genetic preservation in accordance with maintaining all that is in the breed still exists today. In the case of Hungarian cold-blooded horse, especially regarding to the mare families the situation is not so clear. Today's entire stock can be derived from three 'nests' in Hungary. Their breeding areas, and forming varieties and for this reason their appearance had slightly different. Due to these reasons, we can say that till 1900 s our cold-blooded horses showed unbalanced, not uniform picture with no character because of the incorrect mating plans without a uniform destination. The kind of organized breeding began only in 1913. The Herd-book registration started in 1922, when purposefully selected Belgian import stallions are also used for breeding. After the Second World War French and Belgian Ardennes stallions were purposefully used for converter crosses, in this way till 1953 the Hungarian draft became a state-recognized breed. In this way we could say that Hungarian draft is a horse breed with a recent mixed ancestry. It was developed in the 1920 s by crossing local mares with draught horses imported from France and Belgium.

We are lacking of written documentation of previous breeding flocks that is the reason why it is important to explore existing original mare groups, in order to be able to use the original maternal founders for breeding. Therefore, it could be realized to use the most valuable breeding mares maintaining the classic family breeding. The mtDNA D-loop has been widely used in evolutionary or phylogenetic studies because of its higher mutation rates compared with other regions of mtDNA. We have cloned the equine D-loop region by PCR and determined its nucleotide sequence, then clarified the characteristic features of the D-loop sequence.

One hundred and twenty-four 256 bp long mtDNA D-loop sequences were analyzed and revealed 34 polymorphic sites representing thirty-four haplotypes ($h = 34$). High haplotype and nucleotide diversity values ($Hd = 0.953 \pm 0.001$; $\pi = 0.024 \pm 0.001$) were detected. Following the determination of haplotypes, we calculated the pairwise genetic distance between them. We separated the haplotypes for different group by these values, in this way we have determined 12 candidate maternal lineages. The haplotypes according to the variable positions have also been classified into haplogroups defined by Jansen (2002). The used reference sequence was also determined by Jansen (2002), which is available from GenBank, and its accession number is: X79547. From the 17 determined haplogroups by Jansen our samples represent 12 haplogroups, reflecting the high level of diversity.

The study involved a total population of mares about 16% of the total, among which there are certainly individuals that carry the marks of the original type. However, can also say that the mare stock showing such a large diversity in the population is a great advantage in terms of breeding. In some cases haplogroups are prominently separable, on the other hand there were some cases when there were higher variance within the groups than among them. That is the reason why in our future work we intend to extend the study for more animals and our other plans include the usage of more genetic markers.

WATER VAPOR SORPTION IN HAPLIC LUVISOL: COMPARISON THE BET AND ARANOVICH MODEL

SORPCJA PARY WODNEJ NA GLEBIE PŁOWEJ – PORÓWNANIE MODELU BET I ARANOVICH'A

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The adsorption isotherm is the most popular expression of adsorption data. BET theory aims to explain the physical adsorption of gas molecules on a solid surface and serves as the basis for an important analysis technique for the measurement of the specific surface area of a material. In 1938, Brunauer, Emmett and Teller extended the Langmuir evaporation – condensation mechanism to second and higher molecular layers. The state of affairs when equilibrium is reached at any given pressure may be represented as varying number of molecules being condensed on any one site. The BET model assumes that the surface is energetic uniform i.e. that all adsorption sites are exactly equivalent. This model takes into account only the vertical interactions, no interactions between the molecules within the adsorption layer. It also postulates that the heat of adsorption the higher layers is equal to the latent heat of condensation.

The standard BET model is considered to be thermodynamically incorrect. The range of validity of BET equation not always extend to relative pressure as high as 0.30 or 0.5. Mathematically similar Aranovich equation is thermodynamically correct and fits to the experimental adsorption data in a broader vapor pressure range.

The BET equation described localized multilayer adsorption on the homogenous surface of adsorbent:

$$\frac{x}{N(1-x)} = \frac{1}{C_{BET}N_m} + \frac{(C_{BET}-1)}{C_{BET}N_m}x$$

where $x = p/p_0$ is the relative pressure of water vapor, N is the amount of adsorbed water vapor, C_{BET} is a constant.

Aranovich model, in contrast to the standard BET model, allows for the presence of vacancies in the adsorbed layer:

$$x/[N(1-x)^{1/2}] = 1/(N_m C) + x/N_m$$

The studies were conducted on the Haplic Luvisol formed from the loess, taken from 0-20 cm and 20-40 cm depth, from fallowed plots and grassed plots.

The aim of the study was to compare the Brunauer – Emmett – Teller and Aranovich model of water vapor sorption on Haplic Luvisol soil.

The soil samples were air – dried and sieved through a sieve of 1 mm mesh. The adsorption – desorption isotherms of water vapor were measured by the gravimetric method in accordance with Polish standard method (PN – Z – 19010 – 1). The adsorption measurements were replicated three times, keeping the temperature constant, $T = 20 \pm 5^\circ\text{C}$.

References:

1. Aranovich G.L., 1992. The theory of polymolecular adsorption. *Langmuir*, 3, 736-739.
2. Gregg S.J., Sing K.S.W., 1978. Adsorption, surface area and porosity. *Acad. Press.*, 1-356.
3. Józefaciuk G., Shin J.S., 1996. Water vapor adsorption on soils: I. Surface areas and adsorption energies as calculated by the BET and a new Aranovich theories. *Korean J. Soil Sci. and Fertilizer*. 29/2, 86-91.
4. Ościk J., 1979. Adsorpcja. PWN, Warszawa, (Wyd. drugie), 54-141.
5. Sokołowska Z., Józefaciuk G., Bowanko G., 2004. Physical chemistry of soil surface and pore properties. Adsorption of gases or vapors on solids, 30-40.

ANALYSIS OF RABBIT SEMEN PARAMETERS

ANALIZA PARAMETRÓW NASIENIA KRÓLIKA

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Accurate assessment of sperm morphology depends on painstaking preparation, fixation and staining of sperm cells, as this affects the morphometry of the sperm head and the entire cell. This makes the choice of staining technique especially important; the method used should interfere as little as possible with the cells being stained while at the same time showing as many details as possible of the structure of the sperm cell, so that each of its parts can be precisely identified.

The sperm of farmed fur-bearing animals are not often described in publications devoted to reproduction. The increasingly common use of artificial insemination of these animals presents a challenge for researchers to precisely define the morphology and morphometry of sperm and to determine the optimal staining technique for the sperm of particular species of farmed animals. The lack of uniform recommendations for sperm staining and the lack of reference values for morphometric parameters of rabbit sperm was the inspiration for a study aimed at detailed morphometric analysis of rabbit sperm.

Sperm cells of rabbits were assessed in the study. Smears were stained with silver nitrate AgNO_3 in a gelatine colloid solution. Tygerberg's criteria, which most precisely characterize the sperm head, were used for morphological evaluation of the sperm. Morphologically normal sperm cells from each individual were analysed. Morphometric measurements included the length, width, circumference and area of the sperm head; the area of the acrosome; the percentage share of the acrosome in the total area of the head; the length of the midpiece, the percentage share of the midpiece in the total length of the tail; tail length; and total sperm length. Four additional shape indices characterizing the head were calculated: ellipticity, elongation, roughness and regularity. After staining with silver nitrate the following mean values for the morphometric parameters of the sperm cell and for the shape indices of the sperm head were obtained: head length – 6.01 μm ; head width – 3.40 μm ; head perimeter – 18.50 μm ; head area – 16.08 μm^2 ; acrosome area – 10.97 μm^2 ; acrosome coverage – 68.29%; mid-piece length – 8.11 μm ; mid-piece coverage – 18.12%; tail length – 48.81 μm ; sperm length – 50.82 μm ; head ellipticity – 1.78; head elongation – 0.28; head roughness – 0.59; head regularity – 1.00.

Abnormal ultrastructure of spermatozoa may be a marker of pathology in the spermatogenesis process, resulting in reduced fertilization capacity and increased risk of embryonic death. Numerous sperm defects involve abnormalities in the midpiece, often resulting in reduced motility. Sperm morphology evaluated according to Tygerberg's strict criteria can be an excellent biomarker of sperm dysfunction, identifying the cause of impaired fertility in the male, and may find application in predicting the results of assisted reproduction. Morphological assessment may also to some degree indicate sperm abnormalities resulting from acrosome defects. Semen containing sperm with a high percentage of abnormally developed and damaged acrosomes may be the cause of problems with fertilization of the egg cell.

COMPARISON OF THE STRUCTURE OF CINCILA SPERM ISOLATED FROM SEMEN AND FROM THE TAIL OF THE EPIDIDYMIS

PORÓWNANIE STRUKTURY PLEMNIKÓW SZYNSZYLI Z NASIENIA I OGONA NAJĄDRZY

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The reaction of spermatozoa to a stain is a species-specific trait, and a technique used to stain the sperm of one species will not always find application in the case of another species. Moreover, sperm cells of the same species isolated from the testes display different morphological details in comparison with sperm from semen, even when the same staining technique is used. In the case of species for which no reference values for sperm dimensions have been established, it is important to compare the results of measurements made following the use of different staining techniques, in sperm isolated from the tail of the epididymis and in classical smears of ejaculated semen. In this study we used staining with silver nitrate in a gelatine colloid solution to determine the structure of chinchilla sperm. Sperm cells isolated from the tail of the epididymis and from the semen of the same individuals were analysed.

Following silver nitrate staining, the heads of the sperm from semen were uniformly stained and it was not possible to define the acrosome boundary. The tail was uniformly stained as well; the midpiece could not be clearly distinguished.

The use of silver nitrate to stain sperm cells isolated from the tail of the epididymis made it possible to identify structures that were not visible in the sperm from semen. Silver nitrate very clearly distinguished the acrosomal and distal parts of the sperm head. Following silver nitrate staining the sperm isolated from the tail of the epididymis were characterized by dark 'collars' in the distal part of the head. These 'collars' are not visible in the sperm cells isolated from semen. Silver nitrate staining shows that the chromatin of the sperm nucleus has a different composition in the acrosomal part than in the distal part, which probably contains acidic proteins reacting positively to silver salts.

A structure very easily identified by silver nitrate is the sperm midpiece. Eighty percent of the volume of the midpiece is composed of mitochondria, which ensure an optimal amount of energy for sperm motion. When mitochondrial defects occur in a large number of sperm, they lead to reduced fertility or complete infertility in the individual. In the case of humans, identification of functional disorders in the mitochondria is considered an essential test. Changes in the mitochondria are among the more common sperm defects. Mitochondrial defects include both morphological anomalies in these organelles and functional disorders. These disorders often have molecular and genetic causes, and in many cases lead to apoptosis of germ cells. Moreover, abnormal sperm mitochondria affect the dividing zygote. They can be unrecognizable to the egg cell, which may result in abortion. In the face of such diverse defects, precise morphological and functional diagnostics of sperm mitochondria should supplement routine semen diagnostics in cases of infertility.

Silver nitrate staining is a simple, inexpensive and fast technique. Silver nitrate makes it possible to identify the acrosome and post-acrosomal region of the sperm head and to clearly identify the midpiece. Therefore it can be successfully used to supplement routine techniques for evaluating sperm morphology or as an independent technique.

THE USE OF SILVER NITRATE TO EVALUATE SPERM MORPHOMETRY IN ROOSTERS

ZASTOSOWANIE AZOTANU SREBRA W OCENIE MORFOMETRII PLEMNIKÓW KOGUTÓW

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Studies by many authors have focused on the search for relationships between the dimensions and morphology of sperm and fertility in birds, both domestic and wild. Semen is believed to be subject to strong selective pressure, and sperm competition may be an evolutionary force leading to differentiation of the morphology and function of spermatozoa. It has also been demonstrated that sperm cells with longer tails have a competitive advantage over shorter-tailed sperm.

Accurate diagnosis of semen is particularly important on farms where artificial insemination is used, as the labour input and associated costs may be incommensurate with the quality of the semen collected and its fertilization capacity. Where the semen of several males is combined, which is a common insemination practice, some of the ejaculates may be of lower quality, which can reduce the fertilization capacity of the entire ejaculate.

Microscopic analysis of the sperm of birds makes it possible to distinguish the head, composed of the acrosome and the nucleus, and the tail. According to the literature, clear separation of the nucleus and acrosome within the head is only possible with a scanning electron microscope. The objective of the study was to use two combined staining techniques in a precise evaluation of the morphometry of rooster sperm, with particular focus on distinguishing the nucleus and acrosome. The semen of ten roosters of the Green-Legged Partridge breed was analysed. The sperm cells were stained with a silver nitrate solution and Giemsa stain. Detailed measurements were made of 50 sperm cells from each rooster. The length of the head (and within it the length of the acrosome and cell nucleus), the length of the tail, and the total length of the spermatozoon were measured.

The following mean results were obtained: head length – 12.89 μm , acrosome length – 1.91 μm , cell nucleus length – 10.98 μm , midpiece length – 3.46 μm , tail length – 76.56 μm , total spermatozoon length – 92.92 μm .

Combined staining with silver nitrate and Giemsa stain as used in our study enables precise determination of the size of the sperm head and accurate measurement of the acrosome and cell nucleus. This is a relatively inexpensive technique which provides a result within a short time. It does not require a scanning electron microscope; the result is clearly visible under a light microscope.

EVALUATION OF RENOVATED MID-FOREST MEADOWS FEED ATTRACTIVENESS FOR FREE-LIVING POPULATION OF RED DEER BASED ON JACOBS SELECTIVITY INDEX

OCENA ATRAKCYJNOŚCI POKARMOWEJ ŁĄK ŚRÓDLEŚNYCH PODDANYCH RENOWACJI DLA JELENIA SZLACHETNEGO NA PODSTAWIE WSPÓŁCZYNNIKA SELEKTYWNOŚCI JACOBSA

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Red deer (*Cervus elaphus*) is an intermediate feeder and food, among other factors, has underlying importance in their habitat choice. Due to this fact, that forest and agricultural crops become attractive feeding places for this species, the growing population of red deer causes increasing damages in cultivated vegetation. Reduction of this problem has become one of the most important tasks for game species management. Possible solutions of this problem, besides traditional methods of wild ungulates population regulations, could be relocation of red deer foraging activity from cultivated areas. Mid-forest meadows (grassland areas surrounded by forest which are grazed by wild animals and/or mown 1-2 times per year for conservation of hay or silage) are habitats, which potentially can allow to control red deer food base. Nevertheless, forest proximity, which effects on several parameters, often leads to decrease of economic value of this areas. It seems appropriate to increase productivity and nutritional value of forage available on mid-forest meadows using various sward treatments and sowing seed mixtures, suitable for red deer. The aim of this investigation was to evaluate the feed attractiveness of renovated mid-forest meadows for red deer on the basis of sward intake.

Studies on red deer foraging activity on renovated mid-forest meadows was conducted in 2014 and 2015. Two experiments on mid-forest meadows located on Polanów Forestry District (RDSF Szczecinek) territory were established. Experiments have included different method of renovation – overdrilling (O) and full tillage combined with sowing of specialised seed mixtures – two commercially available (Blühende Wildäsung – M1 and Weidgreen Hochwildweide – M2), and one author's mixture (M3), which were compared with control (C) areas without renovation.

Sward intake was calculated as difference between yield of dry matter from foraged and non-foraged areas. For this purpose three caged grazing enclosures made of wire mesh, with size 2 m x 2 m, were placed on every experimental area. Samples were manually harvested from area 0.5 m x 0.5 m inside cages and in reference points at the distance of 3-4 meters from cages. The collected herbage was dried in a forced-draft oven. Feed attractiveness for red deer was estimated using Jacobs's Selectivity Index (JSI), which allows to compare sward utilization between various experimental treatments. JSI varies from -1 (never used areas) to 1 (exclusively used areas). Results are given as an average from four sampling terms. Based on camera traps monitoring, it was confirmed, that 95% of wild animals grazed the investigated area were red deer.

Most preferred was mixture M1 (Blühende Wildäsung) ($JSI_{M1} = 0.21$), subsequently author's mixture M3 ($JSI_{M3} = 0.17$) and M2 mixture (Weidgreen Hochwildweide) ($JSI_{M2} = 0.14$). The method of overdrilling ($JSI_O = -0.42$) had no statistically significant effect on sward utilization compared to the control areas ($JSI_C = -0.54$).

Increasing foraging efficiency on mid-forest meadows by renovation using full tillage method combined with sowing of specialised seed mixtures affects positively on feed attractiveness for red deer, in contrast to surfaces renovated by overdrilling and control ones, which were avoided or grazed occasionally by red deer.

**DEVELOPMENT PERFORMANCES OF AGRICULTURE: COMPARATIVE ANALYSIS
OF SERBIA AND POLAND**

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Serbia and Poland had very similar stages of economic development after World War II. Both of them were centrally-planned socialist economies and the political changes that have occurred in these countries in the late 20th century caused changes in the whole economic system, as well as in the agricultural sector. The trend analysis in the agricultural sector of these countries refers to period after 2004 when Poland has joined EU, and it begins with the determination of the agricultural importance in the overall economy. The importance of agriculture in the overall economy is determined by the following indicators: the share of agriculture in GDP, the share of economically active population in agriculture in the total economically active population and the share of agriculture in foreign trade. As a rule, relevance of agriculture is lower in the countries with higher level of economic development. The development performances of agriculture in Serbia and Poland are considered according to the production and export performances of this economic sector, using a comparative approach. The agricultural production growth, level and growth of the partial agricultural productivities – labour and land, as well as the value of exports in relation to engaged labour and agricultural land, are analysed in such a context. The empirical research was based on the data of the Food and Agriculture Organization (FAO), World Bank and Laborsta.

ECONOMICS OF VARIOUS MANAGEMENT SYSTEMS FOR MEAT-TYPE POULTRY

EKONOMIKA ZRÓŻNICOWANYCH SYSTEMÓW CHOWU DROBIU RZEŻNEGO

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It is believed that highly productive birds are unable to realize their genetic potential under not optimal rearing conditions. That is why for extensive system just local breeds of birds, or slow growing birds, especially dedicated for this system are used. From the other hand, birds with lower growth rate are very rarely available on the market, prices of chicks are high and generally extensive system is regarded as unprofitable. The aim of the study was to evaluate economic effects of meat-type poultry rearing depending on growth rate of birds and their rearing system. Two species of fowl were considered: hens (broiler chickens) and turkeys.

The first experiment included meat type chickens, characterized by various growth rate (fast-, middle- and slow-growing). Hybrids from mating a commercial broiler's male component (C) with Green-legged Partridge (GP) or Sussex (Sx) hens were compared with Cobb broilers. The material consisted of 720 chickens of 3 genetic groups. Up to the 3rd week of age, all birds were fed with balanced mixtures recommended for broiler chickens. From 4th week, the mixture was weekly reduced by 10% for birds kept extensively (E). The deducted part was replaced with wheat bran, and from 7th week with crushed wheat. E groups had access to runs and received green fodder. Birds were slaughtered in 12th week of life.

The second experiment included 100 female turkeys from two commercial lines, BUT9 (middle-heavy) and BIG6 (heavy), which, after the 6th week of rearing, were randomly divided into two groups: control (C) and extensive (E), with 5 replications in each. In the 7th week of life, birds from the E groups were transferred to a building with open access to runs. All birds were given balanced diets appropriate to their age. Birds from the E group were fed the balanced diets diluted with crushed wheat in various proportions and were additionally given green fodder and steamed potatoes. Turkeys were slaughtered after 16 weeks of rearing.

In both experiments of the following traits were registered: body weight at 3rd, 6th, 9th, 12th (chickens) and 16th (turkeys) week of rearing, feed intake, feed conversion ratio, survivability. After slaughter simplified dissection done and carcass yield, giblets and carcass elements proportions were estimated. Among economical indices European Efficiency Factor (EEF), protein conversion ratio and mean cost of feeding were calculated.

Productivity results indicated a good suitability of Cobb chickens for an extensive rearing system. Hybrids, made of local breeds, were characterized by a considerably smaller proportion of breast muscle, slightly bigger thighs and drumsticks, compared with Cobb, what could result from their greater motor activity. However, the results obtained by C×Sx and C×GP chickens, i.e. final body weight, proportions of abdominal fat and carcass elements, point at their usefulness as a meat-type chicken under extensive housing conditions.

Significantly smaller body weight gains were observed in the heavier line of turkey females in treatment E, suggesting that lighter birds may be more useful for extensive rearing system. This fact shows better usefulness of middle heavy turkeys for the extensive rearing system. Bigger effectiveness of rearing (EEF) characterized turkeys of commercial BUT 9 strain than BIG 6 as well as the birds from intensive than extensive groups. Mean cost of feeding in groups kept in various systems of rearing differed by almost 30% to the extensive groups advantage. A slightly lower mean cost of feeding (5%) related to middle heavy than heavy turkeys. With respect to feeding cost, the main cost in poultry production, females fed with the participation of wheat, green forage and potatoes than birds from the control groups turned out to be most profitable.

OBSERVATIONS OF HORSES BEHAVIOR FROM THE TARA FOUNDATION

OBSERWACJE ZACHOWAŃ KONI Z FUNDACJI TARA

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Horses as herd animals have a very strong herd instinct and the associated social propensity, designed to maintaining closeness with other individuals and avoiding loneliness. In a herd horses feel safe, what is particularly apparent in young individuals that in case of danger instinctively hiding in the center of the herd. Forming in this way the hierarchy is particularly evident in the conditions without stable and grazing breeding. Ensuring the horses ability to satisfy these impulses is a guarantee proper growth, development and functioning of the body. It also has a significant impact on animal welfare. Climate occurring in our country, forcing the owners to keep the horses in the stables. Prevailing in these stables conditions also affect animal welfare. It is important to ensure an adequate amount of motion, light, proper nutrition, and enabling social contacts. Any deviations, combined with mistreatment and use, can be the cause of horses behavioral disorders.

The study included a selected group of 30 horses residing in the Tara Foundation, which is a shelter for animals bought from traffickers, provided in the form of a donation and received after the intervention, which deals badly their owners. In most of individuals occurred various types of disorders. The aim of the observation was to establish and characterize the observed disorders. Observed animals the whole time were at pasture. Each of the individuals was identified, he had documented "the past", which affects the behavior of the animal. The study was conducted during the pasture time. In the study group, observed mainly: biting people and aggression relative to man, no intention of socialization, kicking other horses. Only one horse was seen weaving, in the next - cribbing. There was no effect on the weather conditions on the occurrence of disorders associated with aggression. Despite a reduction of stressors and human intervention, some of the observed horses, showed a lot of disorders of behavior. It was found that this was the result of mistreatment and bad conditions in the stables, where has previously been resident observed individuals. It was confirmed that prolonged exposure to the pasture causes a shedding of the behaviors associated with avoiding contact with other individuals. Confirmed previous studies that proper psychological and physical development of horses is possible mainly by providing large amount of animal movement and socialization opportunities. Pasture is an environment that meets the most important necessities of horses life.

**CHARACTERISTICS OF HORSES USED
IN THE SELECTED HIPPOThERAPEUTICAL CENTERS**

**CHARAKTRYSTYKA KONI UŻYTKOWANYCH
W WYBRANYCH OŚRODKACH HIPOTERAPEUTYCZNYCH**

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Hippotherapy as a form of rehabilitation can be carried on a horse also next to a horse. The horse is a tool of this therapy, the aim of which is to restore the physical and psycho-emotional patient. The horse and horse riding have enormous therapeutic possibilities. Using various types of exercise improves the neurophysiological efficiency. The horse as a motion simulator reduces muscle spasticity, produces three-dimensional arrangement of movements, causing involuntary movement of the pelvis and shoulders. The first mention of the therapeutic impact of the horse's movement, date back to the V century AD, when it was observed beneficial effects of these animals during the rehabilitation of wounded soldiers. It was found that the horse rhythmic movements positively affect the regulation of breathing, stimulates act on the endocrine system, autonomic and immune systems. Working with a horse teaches concentration, patience, promotes the development of personality. The horse used during class, should be specially trained. His movement should be rhythmic and responding movement of the pelvis in a healthy person.

The aim of the study was the biometric characteristic of horses used in the selected hippotherapy centers in the Kujawsko-Pomorskie. Based e survey, it was found that:

- To work in hippotherapy are selected most often horses race like Haflinger, Fjord and Hucul. These are animals with small requirements existentially – food, resulting in significantly lower maintenance costs of animals. No race horses accounted for 8% of the analyzed groups of animals.
- In most of the centers predominant part geldings. Mares accounted for 1/3 of the population.
- Elected older horses, 60% of the study population were horses over 10 years of age.
- An increase of horses depended on the age of the patients, 67% of the study group were horses with an increase from 140 to 145 cm. Chest varied greatly in 37% of subjects ranged from 176 to 185 cm. The majority of the study population circuit cannon was 26-28 cm.

Patients using hippotherapy in the surveyed centers suffered mainly cerebral palsy, Down syndrome, autism, various postural and motor hyperactivity. These were mainly children aged 2 to 15 years. All lectures are held under the supervision of qualified instructors, the patients were admitted on the basis of a medical certificate and a statement about the absence of any contraindications.

REARING RESULTS OF PIGLETS FROM NAĪMA SOWS DURING NINE SUBSEQUENT PARITY

PRODUKCYJNOŚĆ LOCH NAĪMA UŻYTKOWANYCH W WARUNKACH FERMOWYCH

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The efficiency of pig production depends on the results obtained in reproduction, which ultimately results of the number of piglets reared per sow from one litter and throughout the year. Good production results in rearing piglets depends on many factors, ie. genetic and environmental.

The aim of the study was to analyze the efficiency of rearing piglets by sows during 9 subsequent parity.

The study was conducted in one of the farms, where basic herd had a population of 410 NaĪma sows. The analysis was carried out in groups of sows differ in number of completed parities, from 1st to 9th. The mean fertility, the number of stillborn piglets, the number of reared piglets and number of deaths during rearing were evaluated.

Specification	Parity								
	1	2	3	4	5	6	7	8	9
Number of litters, n	171	141	129	101	71	53	45	68	4
Number of live born piglets in litter, n	11.6	12.1	12.6	12.4	12.4	11.6	11.2	11.4	10.2
number of stillborn piglets in litter:									
– n	1.5	1.6	1.6	2.1	2.2	2.8	2.8	2.7	3.0
– %	11.5	11.7	11.3	14.5	15.1	19.4	20.0	19.2	22.7
Numer of piglets weaned in one litter, n	10.9	10.8	11.0	10.8	10.9	11.0	10.8	10.7	10.2
Deaths piglets during lactation									
– n	0.7	1.3	1.6	1.6	1.5	0.6	0.4	0.7	0.0
– %	6.0	10.7	12.7	12.9	12.1	5.2	3.6	6.4	0.0

The 778 litters obtained from sows from 9 subsequent parity were analyzed. The most litters were obtained from sows in 1st parity – 171, the least litters – 4 in 9th parity. Fertility (numer of live born piglets in litter) was at a satisfactory level. The least number of litters (average of 10.2 piglet) were obtained from sows in 9th parity. Slightly more numerous litters (more than 11 piglets) were obtained from sows during 1st, 6th, 7th and 8th parity. The most numerous litters were obtained from sows in 2nd, 3th, 4th and 5th in the range of 12.1 to 12.6 piglet. Analysis showed a high percentage of stillborn piglets, between 11.5% in the 1st parity with the upward trend to 22.7% in 9th parity. The most numerous litters were reared by sows during 3th and 6th parity (average 11.0) whereas in all other parities, the number of reared piglets was greater than 10 (from 10.9 in 9th parity to 10.9 in 1st and 5th parity). Deaths of piglets during rearing were varied. During 3rd and 4th parity average in litter was 1.6 piglet dead per litter, while during the 9th parity the sows reared all born piglets.

Fertility sows in all analyzed parities was satisfactory. There should be pay attention to the causes of a large number of emerging dead piglets.

GENETIC VARIABILITY IN EIGHT GENES RELATED TO MEAT QUALITY AND HEALTH TRAITS IN GENETIC RESOURCE PIG BREED – PŘEŠTICE BLACK-PIED PIG*

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The study of molecular variability in genetic resources of farm animals is necessary for optimal conduct of their breeding, for understanding of relations between molecular markers and traits, and for preservation of genetic diversity within small populations. Eight genes with significant relationship with meat quality, reproduction and health traits were chosen: CRC, ESR2, FUT1, MUC4, Mx1, MC4R, TEAD3, CYP2E1.

The CRC gene effects manifestation of malignant hyperthermia syndrome (MHS), carcass traits with important impact on meat quality and reproduction. Associations between the ESR2 polymorphism and litter size in pigs have been observed many times. The FUT1 gene influences susceptibility to adhesion of *E. coli* F18 to intestinal mucosa and an outbreak of illness. The MUC4 gene is associated with diarrhoea piglets and post-weaning pigs caused by enterotoxic *E. coli* with F4 fibres. Gene Mx1 is connected with resistance against influenza virus. The MC4R polymorphism affects carcass fatness, feed intake and weight gain traits. The TEAD3 gene is considered as a candidate gene of QTL for accumulation of androstenedione in fat. The CYP2E1 gene influences level of skatole as one of the malodorous compounds. Variability of genotypes is caused by single nucleotide polymorphisms in these genes.

The study group consisted of 167 Přeštice black-pied pig breeding boars. The extraction of genomic DNA from blood cells or hairs was performed using Genomic DNA Mini Kit (Blood/Cultured Cell; Tissue) (Geneaid) according to the instructions. The PCR-RFLP method was used to determine genotypes.

Mostly dominant homozygous, just two heterozygous and no boars of recessive homozygous genotypes were detected for CRC gene. The frequency of the allele CRCn (0.006) was markedly lower than the frequency of the allele CRCN (0.994). In ESR2 locus, the higher frequency of the ESR2C allele was determined (0.976) than ESR2D (0.024). A higher frequency of the allele FUT1G (0.828) compared with the allele FUT1A (0.172) was found. Higher frequency of homozygous FUT1G was detected. We observed lower frequency of the allele MUC4B (0.239) than MUC4A (0.761) and no genotype MUC4B/MUC4B was observed. Markedly higher presence of the allele Mx1O (0.825) was recorded in comparison with Mx1P (0.175) and very low number of genotype Mx1P /Mx1P. Similar allelic frequencies were found out in the MC4R gene – MC4RA (0.500) and MC4RB (0.500). Heterozygous MC4RA/MC4RB individuals dominated. The allelic frequency of TEAD3C (0.617) was higher than TEAD3T (0.383) and number of homozygous TEAD3T /TEAD3T was very low. The frequency of CYP2E1C allele (0.305) was lower than CYP2E1T (0.695) and just one homozygous CYP2E1C /CYP2E1C was detected.

In the research we detected considerable molecular genetic variability in genes connected with economical traits in Přeštice Black-pied breed. The results confirmed an importance of preservation and conservation genetic resources.

*The research was supported by the Ministry of Agriculture of the Czech Republic, Project no. QJ1210253.

COASTAL BERMUDAGRASS SUPPRESSION IN TEXAS GRASSLANDS

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Coastal bermudagrass [*Cynodon dactylon* (L.) Pers.] [BG] is an invasive grass dominating southwestern U.S. grasslands linked to decreased northern bobwhite [*Colinus virginianus*] survival. It forms a dense sod that impedes chick movement and quail in bermudagrass-dominated areas reach lethal-temperature thresholds more quickly than in native habitats. To preserve quail populations and increase area wildlife habitat value through native-grassland restoration projects, it is first necessary to remove invasive BG. I evaluated five removal methods in four Texas ecoregions, seeking to determine which most effectively suppresses BG growth in varying environmental conditions. In each ecoregion, I arranged nine treatment replications into randomized, complete blocks to account for soil differences. I applied treatments to 355-m² plots throughout summer 2015, and measured aboveground, living-plant biomass, groundcover, C, and N content within plots in April-June 2016. In addition to assessing BG-suppression, I measured soil pH, NO₃-N, P, K, Ca, Mg, Na, S, DTPA Zn, Fe, Cu, Mn, and organic-matter content within plots. Three treatments reduced ($P \leq 0.05$) BG groundcover compared to control plots. Across ecoregions, plots treated with a combination of glyphosate, imazapic, and imazapyr-containing herbicides showed the greatest decline in BG groundcover, up to 100% in blocks within the Cross Timbers and Blackland Prairie regions. A cover crop, hairy vetch [*Vicia villosa* Roth] [HV], did not consistently decrease BG groundcover. Linear regressions show, however, increased live HV height, and mass are associated with decreased BG mass ($P_{HVheight} = 0.00972$, $P_{HVmass} = 0.000589$). Increased live HV mass is also associated with decreased BG height ($P = 0.00072$). By utilizing my results to effectively remove BG, pastures can be prepared for conversion to native rangeland and prairie ecosystems supporting an array of native Texas plant and animal species. This research is part of an ongoing 6-year study funded largely by the Texas Parks and Wildlife Department.

**EXTENSION OF THE POLICY ANALYSIS MATRIX ON RICE COMPETITIVENESS:
NEW EVIDENCE FROM MALAYSIA MAJOR GRANARY AREA**

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The advent of free trade agreements, including the Asean Free Trade agreement (AFTA) and WTO accession, hampers the Malaysian rice sector as the sector must compete with low-cost exporting countries. This implies that structural changes in trade and adjustments at the farm level are needed to improve competitiveness. Previous literature had discussed the impact of policies on agricultural competitiveness using the Policy Analysis Matrix (PAM) in many developing countries. However, one major drawback of almost all applied PAM analysis to date is that it is carried out with aggregate data, for example for average or representative farms. This will provide an incomplete picture of sectoral competitiveness since results based on average data may conceal important variations in competitiveness among heterogeneous producers. We have addressed this shortcoming, using a unique, farm level survey data from rice farmers in the major granary area in Malaysia over the period 2010 to 2014. Our contribution to the existing literature is twofold. First, we provide new evidence on rice competitiveness using an extension to the Policy Analysis Matrix approach proposed by (Monke and Pearson (1989)). This extension allows us to take farm-level heterogeneity into account and derive competitiveness score distributions for each rice farm. To improve the usefulness of SCB indicator, we use a kernel-based estimate to demonstrate the distribution of competitiveness scores and determine the proportion of farms that are producing competitively and the proportion of total production/output value of the product that is produced competitively. Second, we develop a panel regression model to examine the factors that influence rice competitiveness at the individual farm level. This approach may also be useful for other evaluation in other contexts, thus contributing to the broader research direction on future agricultural competitiveness.

CONSUMERS' PERCEPTION OF CARP AS A FOOD

MIĘSO Z KARPI JAKO ŻYWNOSĆ W OPINII KONSUMENTÓW

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Fish are very precious source of nutrition elements. Fish have a very high level of omega-3 acids, magnesium iodine, selenium, vitamin A, and the composition of exogenous amino acids. Fish food is very tasty, easily digested and recommended in the prevention of the diseases related to contemporary civilisation. Poland is the country with good opportunities to produce carp. Unfortunately this kind of fish is still only the occasional kind of food.

The goal of the research was to get the knowledge about the consumers' preferences for fish consumption.

The research was conducted in January 2014, using questionnaires in many shops in Krosno and in villages around this town. The number of survived people was 418; 260 women and 158 men. 222 of respondents were city dweller and 196 of them were country dweller.

370 respondents (which is 88.52%) were ordinary fish consumers, but only 232 people (which is 55.50%) eat carp. Both men and women have the same level of carp consumption. Taking the place of residence into account, we can see that higher carp consumption is for city dwellers. The respondents were asked for the main reason of carp consumption. They choose carp because: (for 71.12% of respondents) it is polish tradition of eating carp on Christmas Eve, (50.43%) it is chosen on account of its good taste, (28.02%) carp makes the diet various, (21.69%) carp guarantee a good nutritional quality of the food. Only 16.81% of carp consumers eat it because they took this custom from their family home. Around 4% of respondents eat carp on account of nutritional management. Most people (46.55%) eat carp during Christmas. There is a big assortment of carp on the market. All respondents often make different choices. Most of the respondents (45.69%) buy live fish, 40.52% – buy fresh fish fillets, 33.19% – buy gutted fish. Around 18.97% of the respondents buy just ready-made fish (carp) meal.

The research has shown that one of the most consumed fish is fried carp (57.76% of choices) and jellied carp (42.24%). The carp consumers include: Greek style fish (30.17%), jeddah fish (26.29%), grilled carp (27.59%) and smoked carp (11.21%). There is one very important factor taken into account when buying fish – it is the quality. More than 85% of carp consumers defined the fish trade as very good and 58.62% of consumers get carp only from domestic market.

The research that have been conducted show the effective multi-faceted actions of introducing carp into our everyday diet.

EVALUATION OF SELECTED INBRED LINES OF WINTER RYE SUSCEPTIBILITY TO INFECTION BY BROWN LEAF RUST AND ITS INFLUENCE ON YIELDING

OCENA PODATNOŚCI WYBRANYCH LINII WSOBNYCH NA PORAZENIE PRZEZ RDZĘ BRUNATNĄ ŻYTA I JEJ WPŁYW NA PŁONOWANIE

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Rye (*Secale cereale* L.) is a cereal species grown in many countries of Europe specially in Poland and Germany, where it is mainly cultivated crop. In both countries brown leaf rust (*Puccinia recondita* f.sp. *secalis*) is the most frequent and the most damaging disease of rye. Epidemic occurrence of the rust on crop causes yield losses ranging from 14 to 29% in this countries (Räder et al., 2007).

In this research susceptibility of inbred lines (DIL) of rye to brown rust in relation to the two reference cultivars Dańkowskie Żłote and Bosmo was evaluated. Seed materials were five breeding institutions in origin. The main objectives of this study were: (1) the evaluation of the response of rye inbred lines to infection by brown rust under field condition in two localities, provinces of Great Poland and West Pomeranian, (2) determination of crop qualitative and quantitative yielded in one locality, province of Great Poland – Choryń. The rust infection was scored based on a scale from 0, health plants to 5, severely infected plants (Zamorski et al., 2001).

The results of the two years observations (2013-2014) in two localities indicated diversity of rye genotypes susceptibility to brown leaf rust. Some inbred lines were very susceptible to infection by *Puccinia recondita* f. sp. *secalis*, so disease index reached 5. The results showed that the infection of most tested lines ranged between 3 (average) and 4 (strong) degree. Only single inbred lines do not show any symptoms of rust infection. It was observed that significantly higher severity of rust during two seasons occurred on rye growing in Great Poland – Choryń than in West Pomeranian province.

In the laboratory tests the number and weight of rye ears were evaluated. Infection by brown leaf rust seriously affected the total grain yield and weight of thousand grains. Obtained results showed that the weight of a thousand grains decreased with increasing level of rust infection. Also the high degree of rust infection caused the reduction of ears weight. Infection of brown leaf rust significantly influenced on reduction of grain yields and quality parameters.

References:

1. Räder T., Racca P., Jörg E., Hau B., 2007. PUCREC/PUCTRI – a decision support system for the control of leaf rust of winter wheat and winter rye. Bulletin OEPP/EPPO Bulletin 37: 378-382.
2. Zamorski Cz., Nowicki B., Wakuliński W., Schollenberger M., 2001. Źródła odporności na rdzę żółtą, rdzę brunatną i rdzę żdźbłową w polskich materiałach hodowlanych pszenicy. Biuletyn Instytutu Hodowli i Aklimatyzacji Roślin 218/219:137-145.

THE INFLUENCE OF HIERARCHY ON PIGLETS MOTOR ACTIVITY

WPLYW HIERARCHII NA AKTYWNOŚĆ MOTORYCZNA PROSIĄT

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The animals ability to express natural behavior patterns is one of the indicators of the welfare evaluation. Increasing awareness of farmers about that topic makes that they try to provide the best conditions for animal welfare. Behavioral observations in some part allows a human to know specific speech animals. The understanding the behavior of domestic animals can significantly improve production efficiency. The aim of the study was to evaluate the impact of the hierarchy in the group of piglets on their motor activity.

The experiment was performed in the individual farm in Żnin commune, which is located in the Kuyavian and Pomeranian Region. Sows with piglets were kept according with the welfare requirements, in individual pens on shallow litter in the traditional system. The piglets were kept with their mothers until 42 days of age. Observation of the piglets behavior was conducted on 90 individuals of hybrids breeds: Polish Large White and Polish Landrace (PLW x PL) which derived from 8 litters. Specified types of piglets behavior and their affiliation to the particular hierarchical classes (dominant, subdominant, subordinated, dominated and marginal) according to the indications Jezierski and Judy (1976). Recorded the following types of behavior: lying, standing, walking, running, rooting, fun, fight, sucking, water and feed intake, feces and urine excretion.

Based on the 90 piglets behavior were 8 individuals with the status of a dominant, which constitute 9% of the study population, 16 subdominants (18%), 35 subordinated (39%), 20 dominated (22%) and 11 marginal (12%). Dominants devoted less time on lying and more on feeding behavior in comparison to the marginal individuals. On the second day of observation shown that dominants devoted to walk on average of 2.17% of the time, while marginal individuals 1.88%. Day 21 brought greater differences in the amount of active behavior of dominant and marginal individuals. On 21st day dominants devoted on exploratory behavior (standing, walking, running, rooting, fun) on average 30.92% of the time, while marginal individuals 29.08%. A similar association was found in 42nd (the day of weaning) and 43rd day of observation. On 42nd day dominant animals on exploratory behavior devoted an average 43.43% of the time of observation and 41.92% marginal individuals, while on 43rd the time of dominant piglets active behavior was on average 42.36% and marginal piglets was 41.95%. The time spent for lying on 2, 21, 42 and 43 day in the case of dominant piglets was 70.10%, 44.00%, 45.00% and 45.80%, in turn, in the case of marginal piglets was 70.09%, 46.77%, 47.60% and 47.23%. On 21st day of age piglets shown that dominant individuals devoted 1.35% of the time on feed intake and marginal individuals 0.68%. A similar situation formed in the 42nd and 43rd observation day. On the weaning day on feed intake dominant individuals devoted 7.55% of the time and marginal individuals 6.98%, while in the 43rd day promotion of forage occupied the dominant individuals 7.40% of the time and individuals a marginal 7.03% of the time. It should also be noted that individuals receiving more constant feed receive any more water.

The analysis showed that in most cases the dominant individuals showed greater locomotor activity compared to individuals marginal.

EFFECTS OF TWO FUNGI SPECIES ON *TRITICUM AESTIVUM* L. GROWTH

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Usege of the unconscious and excessive doses of pesticides and chemical fertilizers to ensure increased efficiency in the agricultural sector along with causing the accumulation of vast amount of toxins in the plant, disrupts soil structure, causes the land to desertification and the loss of vitality. Therefore, to avoid negativity that occurs excess use of chemical pesticides and fertilizers, microorganisms can be used instead of chemicals. *Rhizobacteria* which induces plant growth, besides their stimulatory effects, they are effective in biological control of diseases.

In the study five different *Triticum aestivum* varieties were used along with two fungi species plus negative control. Fungi species used in the study were *Aspergillus terreus* and *Aspergillus fumigatus*. Sterile distilled water was used as negative control. Fungal suspensions were prepared at the concentration of 10^5 cfu/ml and injected 5 ml for each variety. Surface sterilization of the seed were made with %5 hipochlorite solution. After sterilization 100 of seeds were put in petri dishes and left at 25°C for 3 days for germination. At the end of the period germinated seed were counted. Another set of seeds, 5 seeds for each variety, will be sterilized and put in the soils in flowerpots. Flowerpots were left in climate chamber at 25°C at 13 h of light and 11 h of dark for 10 days. After ten days of growth period measurements of stem length, root length, stem radius, root radius and leaf width were measured with digital compass and recorded.

In petri dish experiments it can be seen that all bacteria induced germination ratio. While control group has a germination ratio of 77.4%, experiment group's germination ratio is above 81.6% and 94%. Among these two fungi *A.terreus* has higher inducement ratio (94%) while *A.fumigatus* has lower inducement ratio (81.6%). Pehlivan was the most effected variety among all five varieties. It's germination ratios were 30% and 80% while control group has 20% germination ratio. Aldane was the least effected varieties with the control group 92%, experiment group between 95%-98%.

In soil experiments both fungi reduced general selected criteria except root length, stem radius and root radius. When we looked to the overall effects of the fungi on the selected criteria we can say that bacteria decreased more than half of the selected criteria. Although further experiments must be done it can be said that soil contamination can be harmful to the crops.

THE ASPECT OF ANIMAL WELFARE IN INTENSIVE PIGS PRODUCTION

ASPEKT DOBROSTANU W INTENSYWNEJ PRODUKCJI TRZODY CHLEWNEJ

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The intensification of livestock production has contributed to the rearing systems creation which are not very friendly to animals and may have bad affect on welfare. At the same time it is observed increased interest in terms of keeping and the treatment of domestic animals alike by scientists and breeders but first of all by consumers. The concept of welfare already appeared in the XXth century and can be variously interpreted. However, all definitions indicate the humane treatment of animals in accordance with their nature and with attention of the environment. The livestock should be surrounded with such care to satisfy all of their physiological needs. The most important factor which is responsible for the adequate formation of animal welfare is the human directly related to breeding.

The regulations of pigs welfare at the EU level is the directive No. 2008/120/WE of 18 December 2008 about the minimum keeping conditions for pigs. In Poland its implementation constitute the Regulation of the Minister of Agriculture and Rural Development of 15 February 2010 in the case of requirements and keeping procedure of domestic animals species, for which the protection standards were established in the European Union regulations (EU) (Journal of Laws 2010, No. 56, item. 344).

The necessity of obtaining the economic efficiency of realized processes, meet the requirements of competition and the unification realized methods led to the implementation of over 60 years many industrial production methods. It is known that technology solutions designed for the human convenience significantly modify not only the pigs behavior, but also the physiology of the organism and thus affecting the quality of the obtained products. Because of the high production efficiency of current breeding pigs, they are more sensitive and have greater problems with adaptation to the environment. Animal welfare should constitute an important aspect during the entire production.

In order to achieve a high and satisfactory results in the production of pigs, animals must have appropriate environmental conditions, apply proper veterinary prevention and adequate keeping system in accordance with the requirements of welfare. Furthermore, it is important to feed animals according with their age and physiological needs. Thus creating an appropriate conditions for the animals you can be assured that their genetic potential will be fully utilized, and they will feel the comfort of living. Healthy and happy pigs will be characterized by higher productivity than animals treated and kept badly.

**EARLY DETECTION OF PLANTS DISEASES BASED ON HYPERSPECTRAL
AND THERMOGRAPHY IMAGING**

WCZESNA DETEKCCJA CHORÓB ROŚLIN W OPARCIU O OBRAZOWANIE HIPERSPEKTRALNE
I TERMOGRAFIĘ

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Thermography and hyperspectral imaging are especially valuable for early detection of biotic stresses (Baranowski et al., 2009). These non-destructive imaging methods are able to visualize infections at an early stage, before tissue damage appeared (Chaerle et al., 2004). We applied this non-invasive techniques to monitor early changes in a plant's physiological status upon pathogen attack. The aim of the study was to evaluate the thermography and hyperspectral imaging as a non invasive methods for the detection of presymptomatic changes caused by tobacco mosaic virus (TMV) on three genotypes of tobacco, which differ with the levels of resistance to infection.

Plants were grown in a growing chamber under controlled conditions (14 hour day-light photoperiod, 25/20°C day/night temperature, 70% air humidity). The measurements were conducted on 30 plants. The thermography analysis were made using the camera SC620, (FLIR Systems, Inc., USA); hyperspectral imaging was done using VNIR camera (400-1000 nm) and SWIR camera (1000-2500 nm), (SPECIM, Finland) equipped with spectrometers.

On the basis of reflectance spectra obtained from hyperspectral images, analysis of change of Normalized Difference Vegetation Index (NDVI) (Rouse J.W. et al., 1973) were performed to describe the rate of infection development. Thermal images of treated and untreated plants were analysed to indicate the localization of presymphomatic changes on the leaf surface, where finally necrotic changes occurred. It can be concluded, that reaction of the plant to infection leads to stomata closing resulting in decreasing of transpiration.

References:

1. Baranowski P., Mazurek W., Jędrzycka M., Babula-Skowrońska D., 2009. Temperature changes of oilseed rape (*Brassica napus*) leaves infected by fungi of *Alternaria* sp., Oilseed Crops, 30, pp. 21-33.
2. Chaerle L., Hagenbeek D., Bruyne E., Valcke R., Van der Straeten D., 2004. Thermal and Chlorophyll-Fluorescence Imaging Distinguish Plant-Pathogen Interactions at an Early Stage, Plant & Cell Physiology, 45, pp. 887-896.
3. Rouse J.W., Haas R.H., Schell J.A., Deering D.W., 1974. Monitoring vegetation systems in the Great Plains with ERTS. In: Fraden S.C., Marcanti E.P. & Becker M.A. (eds.), Third ERTS-1 Symposium, 10-14 Dec. 1973, NASA SP-351, Washington D.C. NASA, pp. 309-317.

RELATIONSHIP BETWEEN THE RATE OF DESMIN DEGRADATION AND THE LEVEL OF DRIP LOSS IN TURKEY BREAST MUSCLE DURING COLD STORAGE*

ZALEŻNOŚĆ POMIĘDZY TEMPEM DEGRADACJI DESMINY A POZIOMEM WYCIEKU SWOBODNEGO W MIĘŚNIU PIERSIOWYM INDYCZEK W CZASIE PRZECHOWYWANIA CHŁODNICZEGO

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During meat formation, postmortem changes in muscle tissue determine the subsequent usefulness of meat for production and culinary purposes and they depend, among others, on the rate of cytoskeletal protein degradation. Cytoskeletal proteins are a dense network of fibrous structures that constitute more than 85% of all cell proteins. They are formed by three types of fibres: microtubules, microfilaments, and intermediate filaments. Desmin is one of the principal intermediate filament proteins. It is located peripherally at the Z line and around myofibrils, forming a three-dimensional complex network, which runs perpendicular to the myofibres. At other locations desmin occurs as filaments that connect structural elements of the cell, and binds to mitochondria and endoplasmic reticulum. The main functions of desmin include the correct distribution of cell elements, mechanical unification of the contractile actions of myofibres, and regulation of the shape and tension of muscle cell structure.

The aim of the study was to determine the rate of postmortem desmin degradation and to examine the relationship between the rate of desmin degradation and the level of drip loss in breast muscle of turkey hens during 72-h refrigerated storage.

The study was conducted with 20 16-week-old turkey hens with an average body weight of 9.5 kg. Fragments of breast muscle (*musculus pectoralis major*) sampled from the left side of turkey carcasses were investigated at 45 min, 24 h and 72 h of refrigerated storage (+4°C). The rate of desmin degradation and the level of drip loss were analysed. Relationships were also determined between the level of undegraded desmin and drip loss.

The results obtained indicated that storage time had a significant effect on rate of desmin degradation. Thus, immunohistochemical analysis revealed that desmin was degraded gradually with time postmortem. However, the rate of desmin degradation is also associated with its localization in muscle fibre. In all examined muscle fibres desmin was degraded more rapidly within muscle fibres, where desmin forms a fine network between the myofibrils, compared to the periphery of the fibres, where desmin was often present even after 72 h of meat storage. In the case of drip loss, the present study showed that the cumulative drip loss increases with increasing period of meat storage, but the highest level of drip loss was observed during the first 24 h of storage.

Moreover, the intensity of intact desmin at 24 h postmortem was positively correlated with drip loss after 24 h ($r = 0.126$) and 72 h ($r = 0.287$) of storage. Our results indicate that high levels of desmin degradation were associated with low drip loss values in fresh turkey meat.

* Research funded as part of the projects BM-4259/2016 and DS-3253 funded by a targeted research subsidy from the Ministry of Science and Higher Education.

**QUANTITATIVE REDUCTION OF PIG SLURRY USED AS A SUBSTRATE
IN AGRICULTURAL BIOGAS PLANT**

**REDUKCJA ILOŚCIOWA GNOJOWICY ŚWIŃSKIEJ UŻYWANEJ JAKO SUBSTRAT
W BIOGAZOWNI ROLNICZEJ**

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Intensive pig farming generates large amounts of by-products, especially organic wastes such as manure and slurry. Due to environmental threats posed by pig slurry, such as greenhouse gases (GHGs) and odours emission, eutrophication and contamination by pathogens, it is important to search for proper methods of its management. Pig slurry can be utilised as a substrate in anaerobic digestion, effectively reducing total volume of wastes produced by pig farm, by being converted to biogas – renewable fuel. Such approach could significantly reduce aforementioned environmental threats.

The aim of this study was estimated quantitative analysis of anaerobic digestion substrates and products, and estimation of feedstock biomass reduction level in agricultural biogas plant located near a pig fattening farm with 6680 positions for animals located in West Pomerania, Poland. The biogas plant runs two-stage, continuous, thermophilic anaerobic digestion with maize silage and pig slurry from pig farm as a substrates. Biogas produced in fermentation process is combusted in a cogeneration unit generating electricity and heat. Quantitative data regarding daily feedstock input, digestate output, and produced biogas from 6 months were collected. Data was statistically analysed in terms of the law of conservation of mass. It has been found, that biomass of digestate was statistically significantly reduced relative to feedstock biomass of 11.86% ($p < 0.01$). The amount of reduced biomass is not statistically different from the amount of produced biogas, which mass is 10.21% of the feedstock. This indicates that observed reduction of biomass was a result of conversion to biogas only, and the installation is working hermetically under the law of mass preservation.

Anaerobic digestion, in addition to other benefits, reduces amount of pig slurry due to conversion of biomass to biogas, and finally electricity and heat. It has ecological and economical importance, especially in pig industry. A small scale research should be carried out to investigate which factors have major impact on level of the quantitative reduction of pig slurry.

**ASSESSMENT OF RAM SEMEN QUALITY AND APOPTOSIS AFTER CRYOPRESERVATION
IN EXTENDER MODIFIED WITH NANOWATER***

ANALIZA NASIENIA TRYKA PODDANEGO KRIOKONSERWACJI
W MEDIUM ZMODYFIKOWANYM NANOWODĄ, POD KĄTEM PROCESU APOPTOZY
ORAZ CECH ŚWIADCZĄCYCH O JEGO WARTOŚCI BIOLOGICZNEJ

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Nanowater obtained through cold plasma treatment of deionized water, acquires specific properties, such as lower viscosity and lower freezing point than ordinary deionized water, and thus might have a particular impact on living cells. Among others it was found, that it could influence the tempo and effectiveness of seed germination. Our previous study showed significant effect of nanowater used for ram semen deep freezing on reproductive performance of inseminated ewes. The aim of present study was to evaluate selected ram semen parameters after freezing in the medium modified with nanowater. Ejaculates from 7 rams were divided into two equal parts and after dilution in Triladyl (MiniTüb GmbH, Tiefenbach, Germany) prepared with deionized (D) or nano (N) water, semen was frozen in liquid nitrogen. After thawing, the samples were examined for sperm survival time and morphology using Sperm Class Analyzer (Barcelona, Spain) and light microscopy. The data were analyzed using paired t-Student test. The results showed significant differences ($p < 0.05$) between groups in pace survival decrease (D: 0.55 ± 0.2 vs. N: $0.41 \pm 0.1\%/min.$) and in sperm survival time (D: 205.71 ± 65.8 vs. N: 252.86 ± 40.09 min.) after thawing. Significant difference ($p < 0.05$) was noticed in total amount of morphological damages (D: 64.86 ± 34.2 vs. N: $37.14 \pm 16.2\%$). Mainly because of highly significant difference ($p < 0.01$) in percentage of damaged heads after thawing (D: 10.81 ± 13.7 vs. N: $6.19 \pm 8.1\%$). Significant difference was also observed in the percentage of loose heads (D: 10.81 ± 13.7 vs. N: $6.19 \pm 8.12\%$). Present study was also conducted to detect apoptosis in thawed semen. Six ejaculates were thawed in water bath ($37^\circ C$) and subjected to flow cytometric analysis (C6 BD Accuri, Becton, Dickinson and Company, USA) using method with Annexin V and propidium iodide (PI). Though the differences in lifespan expressed in differences in percentage of healthy (D: 73.72 ± 5.76 vs. N: $76.59 \pm 6.75\%$) and necrotic (D: 7.72 ± 1.46 vs. N: $6.77 \pm 2.11\%$) spermatozoa were not significant ($p < 0.05$) the slight difference in favour of nanowater occurred. Similar situation arise in comparison of late apoptotic spermatozoa in both groups. In samples with deionized water mean percentage of cells in late apoptotic stage reached $10.81 \pm 6.46\%$ while in nanowater group $8.89 \pm 6.5\%$ ($p < 0.05$). There were no significant differences between groups in mean percentage of early apoptotic spermatozoa (D: 7.76 ± 2.42 vs. N: $7.75 \pm 2.26\%$) ($p < 0.05$). Results of this study taken collectively indicate that, in addition to a substantial improvement in biological parameters of ram semen, frozen in the media prepared with nanowater in comparison to media prepared with ordinary deionized water, addition of nanowater into cryopreservation diluent may cause a delay of apoptosis process in post thawed spermatozoa.

* Supported by a grant “Badania Młodych” – BM-4247

**MEASUREMENT OF FAECAL CORTISOL METABOLITES LEVELS OF SOWS
AND PIGLETS IN “KINDERGARTEN” KEEPING-SYSTEM**

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Piglets in commercial intensive pig husbandry are often abruptly weaned between 3 and 4 weeks for economic reasons. They are exposed to unfamiliar piglets around weaning which results in a period of vigorous fighting. Stress plays an important part in welfare research. Mixing piglets at weaning increases plasma cortisol concentrations and agonistic behaviour. Traditionally glucocorticoids are measured in blood samples but their use is often limited as the act of sample collection may stress an animal. Measurement of faecal cortisol/corticosterone metabolites is a non-invasive method for evaluation adrenocortical activity. The aim of this study was to examine the effect of litter's let-together system (“kindergarten” system) in the farrowing house by measuring faecal cortisol metabolites.

In the experiment we examined litters of 28 sows (Large White x Landrace hybrids; primiparous vs. multiparous; n = 302 piglets). There were 12 control litters and 4 experimental groups (4 experimental groups = 4x4 litters).

The sows were kept in groups during gestation and moved into the farrowing house (28 sows/unit) using crates with solid concrete floors, 3 or 4 days before the expected date of farrowing. Sows with piglets were kept under identical conditions in individual pens. The piglets are housed with their mother for a period 28 days (weaning). On day 2 postpartum, all piglets received industry standard processing (tail docking, ear notching, iron injections and castration of males). Experimental groups: One week before weaning (20th-21st day) we opened 4 adjacent farrowing pens together. The sows stayed in their cradles, but the piglets could walk, move and get to know each other for a week. We collected faeces from the sows uniquely and from the piglets box commixture when we opened the farrowing pens and at the weaning. We collected 132 specimens from 28 sows, 4 experimental groups and 12 control litters. Sample collection commenced at 10 am. and continued at 6 pm and next day morning 10 am.

The measurement of cortisol level we used H3 cortisol RIA home made essay by right of Csernus (1982).

The cortisol level of animals is very different, every animal showed individual values. The relative standard deviation was high, the measured values of sows were between 2.72 and 30.62 ng/g at the zero time. We correlated the individual values to each other, and we analyzed the increment per cent and percent decrease. The significant crucial point was $\pm 30\%$ in variation.

There were no significant differences in cortisol metabolite levels between the control and the experimental groups. Contingently we supported the meteorological (warm-front) stress effect, as the faecal cortisol metabolite levels appreciably decreased both the control and the experimental sows within 24 hours.

Based on our results the „kindergarten-system” hasn't got any stressor effect for the sows and piglets, respectively. Further investigations are going on in line the behaviour of the animals nursing in different systems. We would like to prove the beneficial effect of “kindergarten” system in the farrowing house in animal welfare aspects.

INFLUENCE OF LONG-TERM MANURE AND MINERAL NITROGEN ADDITION ON THE CONTENT OF SELECTED TRACE METALS IN SOILS

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Negative health effects are associated with exposure to high levels of trace metals such as Cu, Ni, Pb, and Zn. Therefore, accumulation of trace metals in agricultural soils, especially those receiving manure and other amendments, is a concern. Soil samples from a Long-Term Agricultural Research (LTAR) field in Wierzchucinek, Poland, the Research Station of the UTP University of Science and Technology in Bydgoszcz, was evaluated for this study. The field, in operation since 1978, has received manure and different levels of N fertilizer treatments in a randomized complete block design. Nitrogen was applied in 0, 60, 120, and 180 kg/ha. 32 composite surface soil samples were collected in June 2015 and analyzed for content of trace metals and organic matter as well as pH, base cations, cation exchange capacity, and texture. The relationship between the measured parameters were calculated statistically using Tukey's test ($p = 0.05$) on 10.0 Statistica. Also analysis of variance and Pearson's correlation coefficients were calculated with a confidence level of 95%.

The aim of this study was to assess the relationship between the application of manure and different doses of nitrogen fertilizers on concentration of Cu, Zn, Pb, and Ni.

Samples were Loamy Sand texture with pH in H₂O ranging from 4.85 to 6.64, and in KCl from 4.14 to 5.73, mainly resulting from applied fertilization. Cation exchange capacity ranged from 3.70 to 9.48 cmol/kg.

The content of analysed trace elements was: 2.98-7.56, 19.84-33.71, 4.76-22.11, and 3.74-7.93 mg/kg for Cu, Zn, Pb, and Ni respectively. These values did not exceed baselines for these metals and was rather typical for uncontaminated soils of this region. The content of Cu and Pb did not correlate with any analyzed factor, but content of Zn and Ni were significantly correlated mainly with organic carbon ($r = 0.596$ and $r = 0.457$ respectively) and CEC ($r = 0.410$ and $r = 0.545$ respectively). Moreover Zn content was positively correlated with pH.

Long-term application of manure and different doses of nitrogen fertilizers significantly influenced on concentration of Zn and Ni, this relation was not confirmed in the case of Cu and Pb content.

THE EXAMINATION OF THE BODY SIZE OF WILD BOARS SHOT IN ENCLOSED WILD BOAR PARKS

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One of the most important big game is the wild boar in Hungary. According to the National Game Management Database 128365 animals were shot in 2014, and further 12212 (9.5%) in enclosed parks. The Hungarian wild boar population is growing in recent decades. In the 1960 s there were only 8300 registered wild boars, out of which 3900 were shot. This rate is significantly changed for the year 2012, at this time there were 109708 wild boars registered, and 159257 were shot. This tendency shows us that within 52 years the wild boar population became 19 times bigger. The wild boar appeared in areas which were previously only deer and small game hunting territories. Nowadays there is a growing demand on the collective hunting of the wild boar. In this accelerated world hunters don't want to spend so much time with hunting because they don't have enough time to be away from their workplace for several days. Recognizing the economic potential of this process, the number of the wild boar parks is increasing. These parks promise a high number of shooting chances and many wild boars on the ground. It is not uncommon that during 1-2 days 300 wild boars are shot. It means that a relatively small place has to be used, with high population densities and it raises a lot of problems. The wild boar traditionally lives in wetlands and in the 1800 s and 1900 s there were water regulations, which caused the shrinking of their habitat. But at this time the Hungarian agriculture began to change, the farming on great parcels developed, and it made greater and more coherent coverage and food to the wild boars. Due to these factors the population of outdoor wild boars is increasing constantly.

The wild boar is an omnivorous animal, consuming a wide range of food. Generally they consume everything, but they also like the food which contains animal and vegetable proteins. Their presence in small game territories will cause problems in the wild life management. Their body size and growth rate depends on the region, but largely on the food they consume and its accessibility. For cost optimization it is important to keep our population densely, but this requires more thorough and diverse complementary feeding. Nowadays more and more hybrids have appeared in the parks, this phenomenon has several reasons, firstly that the hybrids have higher growth rate and bigger bacon thickness. Secondly it is believed that wild boar and domestic pig hybrids better utilize the nutrition offered, and it reduces the feed costs, and promises us a higher profit. Hybrids build bigger size and body fat within the same length of time as the wild boars. My research aims to examine these hybrids and wild boars.

I carried out my research in two wild boar parks in the South-Eastern region of Hungary. I collected the data in the 2015/16 hunting season. I recorded 25 data in Csikéria and 29 data in Ásotthalom immediately after the hunts. The recorded body measurements were: head length, ear length, body length, height at the withers, tail length and abdominal fat thickness. I used IBM SPSS Statistics 23.0 software to analyze the data.

According to the results, concerning the head size for example, there was a significant difference in favour of the Ásotthalom wild boars. That is to say the average head length was 37 cm in Ásotthalom, while in the park of Csikéria it remained below 30 cm. The reasons for the difference were in the age and higher presence of hybrids in the park of Ásotthalom. The average age of wild boars in Ásotthalom was almost 26 months, while in Csikéria it was about 11.5 months. Furthermore, the average weight of the wild boars in Ásotthalom was close to 58 kg, while in Csikéria it was about 35 kg. Comparing the data between the two parks we can conclude, that the wild boars were bigger and older in Ásotthalom, and they had more in common with domestic pigs, than the boars in Csikéria.

**STUDY OF LIFETIME PERFORMANCE IN THREE PIG BREEDS
ON A HUNGARIAN COMMERCIAL FARM**

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The aim of the present study was to perform lifetime performance analysis in three pig breeds; Hungarian Large White (n = 295), Duroc (n = 76) and Pietrain (n = 91) on a Hungarian commercial farm using analysis of survival sows.

We took into consideration the age of sows at the time of their inclusion into breeding, their age at the time of culling, time spent in production, number of mating and parities, parity percentage, intervals between litters, number and mean of piglets born alive and born dead, number of raised piglet litters, number and mean of 21 days old piglets, the weight and mean of raised litter and raise percentage.

We carried out the analysis by SPSS 22.0. Single factor analysis of variants, Kaplan-Meier analysis and Cox PH model were used.

The determination of the significance of risk rates differences was done by Wald chi square test. Our results showed that the average culling age were 1056 (+- 33.52) days for the Hungarian Large White, 735 (+-73.56) days for Duroc and 818 (+- 71.98) days for the Pietrain. The log rank test of the survival analysis indicated a significant difference between the three tested genotypes (x2 16.981, P<0.001), which means that the survival percentage of the individual breeds varied significantly from one another. In comparison with the Hungarian Large White genotype the Duroc genotype has a 1.6 times higher (P<0.001) culling risk while that of the genotype Pietrain was 1.36 times higher (P<0.001). Our results can be used to compare the breeds kept under the same conditions and to compare the life span of one genotype under different farming conditions. Factors that increase survival and improve the profitability of pig farming can be determined by this method.

**THE INFLUENCE OF SEX AND HYBRID COMBINATION
ON THE FATTENING PARAMETERS OF PIGLETS UNTIL WEANING***

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In the experiment, we investigated the effect of the hybrid combination and sex on the fattening parameters of piglets until weaning. The experiment was performed in the Experimental Centre of the Farm Animals at the Slovak Agricultural University in Nitra. The analysed group consisted of 27 animals. We used the final hybrids of LW x L x PIC (17 animals) and LW x PIC (10 animals) for the testing purposes. Feeding piglets with the mixture was the same for all the tested pigs. We evaluated the birth weight, the weight at 21 days and the weaning weight in kilograms (kg), the average daily gain at 21 days and at the weaning (ADG) in grams (g), the feed consumption ratio at the weaning (FCR) in grams (g). The results were processed in the SPSS 20 program. The differences between groups were tested using the analysis of variance (ANOVA). We used the Pearson correlation coefficient in order to evaluate the correlation relations.

We found out higher birth weight in the hybrid LW x L x PIC (1.628 ±0.180 kg) in comparison LW x PIC (1.511 ±0.197). The differences were not statistically significant (p>0.05). Piglets with a higher birth weight reached a higher weight also in other monitored periods. Hybrid LW x L x PIC achieved weight at 21 days 6.493 ±1.126 kg and at the weaning 7.991 ±1.398 kg. Hybrid LW x PIC achieved lower weights, at 21 days 5.881 ±1.276 kg and at the weaning 7.725 ±1.781 kg. Differences were not significant (p>0.05). Hybrid LW x L x PIC also achieved better ADG at 21 days (220.6 ±52.0) and at the weaning (223.5 ±47.6) than hybrid LW x PIC (207.7 ±62.1 and 221.7 ±60.9), but these differences were not statistically significant (p>0.05). Higher FCR at the weaning was recorded in hybrid LW x L x PIC (154.1 ±47.3 g) in comparison hybrid LW x PIC (83.0 ±40.0 g). This difference was statistically significant (p<0.01). From the above results indicate that the hybrid piglets LW x PIC receive more milk from the sow and therefore take less feed and thus achieve lower FCR in weaning.

Boars achieve a higher birth weight (1.638 ±0.177 kg) than gilts (1.494 ±0.190). Boars were castrated at the age of 5 days. Despite castrate, barrows achieve higher weight at 21 days of age (6.419 ±1.290 kg), and at the weaning (8.218 ±1.260) than gilts (6.006 ±1.291 and 7.339 ±1.825 kg). Weight differences by sex in different growth phases were not statistically significant (p>0.05). Barrows achieved ADG until weaning on the level of 234.5 ±44.3 g, which was by 31.5 g more in comparison with the gilts, but this difference was not significant (p>0.05). Barrows made use of more effectively accepted feed intake, which resulted in the lower FCR (120.0 ±54.5 g) compared to gilts (141.0 ±59.3 g). We can conclude that barrows had a higher growth potential than gilts, but not statistically significant.

From the correlation analysis of the fattening parameters it seems that birth weight was statistically significant correlated with weight at the weaning (r = 0.397; p<0.05) and was not significant correlated with weight at 21 days (r = 0.221; p>0.05). However, we have recorded several statistically significant correlation dependences between the weight at 21 days and weight at the weaning (r = 0.593; p<0.01), ADG at the weaning (r = 0.694; p<0.01), FCR at the weaning (r = -0.414; p<0.05). Based on this correlation analysis we can conclude that piglets with higher birth weight achieved a higher weaning weight. However, in the stud of pigs is important also to pay attention to weight of piglets at 21 days, which represents milk efficiency of sows. Sows with greater milk efficiency can ensure greater intensity of growth of piglets before weaning.

* This work has been created with the support of VEGA 1/0818/16 and KEGA 006SPU-4/2014

**EFFECT OF BODY WEIGHT AT BIRTH ON GROWTH RATE
AND SURVIVAL OF PIGLETS UP TO 56 DAY OF LIFE**

WPLYW MASY CIAŁA PRZY URODZENIU NA TEMPO WZROSTU
I PRZEŻYWALNOŚĆ PROSIĄT DO 56 DNIA ŻYCIA

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Decrease of the mean body weight of piglets and increase of variation of the mentioned trait occurs often in very numerous litters as well as in the malnutrition of the sows during the second trimester of gestation (Milligan et al. 2002, Rekiel et al. 2014). It affects unfavourably the utility traits of the pigs and, first of all, growth rate during rearing and fattening period and on musculature and fatness of carcass. Low body weight of piglets at birth results in lowering of dressing percentage of the carcasses, decreases their meatiness and increases fatness what was scientifically confirmed (Herpin et al. 2002, Tribout et al. 2003, Gondret et al. 2005, Bee 2007, Beaulieu et al. 2010, Rekiel et al. 2014). The aim of the studies was to determine the influence of body weight of the piglets at birth on the effects of their rearing up to 56th day of life, as expressed by the growth of rate and survivability. The studies were carried out in an individual farm in the Mazovian voivodeship. The observations covered 277 piglets, coming from 22 litters from crossbred sows F1 (Polish Large White x Polish Landrace) coming from crossbred boars (Duroc x Pietrain). On the grounds of body weight of the piglets at birth, the groups for analysis were established: group I – body weight ≤ 1.0 kg (19 piglets), group II – BW 1.01-1.50 kg (153 piglets), group III – BW of 1.51-2.0 kg (97 piglets) and group IV – BW ≥ 2.01 kg (8 piglets). The piglets were kept with mothers until 35 day of life, and after weaning, in the groups amounting to ca. 20 animals (two litters) up to the age of 56 days. All piglets were subjected to routine zoo-technical and prophylactic procedures. Since the first day of life, the piglets had an access to water (nipple drinkers). Since the 7th day of life, the piglets were additionally fed the mixture Bonni-M-Forte by Sano Company, and after weaning, they were additionally fed the own mixture (cereal meals with the additive of Piglet concentrate by Joser company) until 56 day of life. The results were statistically developed. The mean body weight (kg) in groups I – IV was, respectively, as follows: on the first day of life – 0.82, 1.28, 1.65 and 2.18; on 7 day of life – 1.64, 2.35, 2.86 and 3.72; on 21 day of life – 4.94, 5.82, 6.53 and 7.79 and on 56 day of life – 14.41, 16.65, 18.34 and 21.09. The differences between the groups were statistically significant at $P \leq 0.01$ or $P \leq 0.05$. The daily gains (g) in the groups I – IV were: since 1 – 7 day of life: 117, 153, 172, 221; since 7 – 21 day of life – 235, 248, 263 and 290 and since 21-56 day of life – 271, 309, 337 and 380 g; they differed significantly at $P \leq 0.01$ or $P \leq 0.05$. The mean daily body weight gains of the piglets since birth until the age of 8 weeks were as follows: group I – 243 g, group II – 274 g, group III – 298 g and group IV – 338 g ($P \leq 0.01$). The survivability (%) in the groups was shaped on the following level: group I – 57.89, group II – 90.85, group III – 91.75 and group IV – 100.00. The attention should be paid to the level of losses among the piglets, weighing less than 1 kg as well as to the exceptionally unfavourable slowing down of the rate of growth of the newborn animals who survived in this group. Quinien et al (2002) also showed the increase of losses up to 28%, in the case of low body weight at birth whereas in the herds, characterized by average fertility, the losses did not exceed 6-8%. Similar results were obtained in own studies. Królewska et al. (2014) showed by 10.5-16% weaker feed conversion, by 12-20% lower growth rate and by 8.7 percentage points lower survivability of light piglets (1.17 kg) as compared to the heavy animals (1.70 kg) at their rearing up to 70 day of life. Due to a negative effect of low body weight of the piglets at birth on the rearing and fattening results, what was stressed by many researchers and practitioners, including, *inter alia*, Bocian et al. (2010) and Rekiel et al. (2015), we should strive at optimization of body weight of the piglets at birth up to ca. 1.5 kg ± 0.2 and more.

**SERUM PROTEIN ELECTROPHORESIS AS A DIAGNOSTIC TOOL
IN VETERINARY MEDICINE**

ELEKTROFOREZA BIAŁEK SUROWICY KRWI W DIAGNOSTYCE CHOROÓB ZWIERZĄT

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Electrophoretic techniques, used to separate mixtures of electrically charged particles (such as nucleic acids, proteins, lipids, enzymes, and carbohydrates), are widely used in science. One of these techniques, native protein electrophoresis in an agarose gel, is applied in both human and veterinary medicine. Changes in the proportions of individual protein fractions correspond to significant changes in the physiology of the body. Although the pattern obtained by electrophoretic separation rarely indicates a specific disease, it provides valuable information for the differential diagnosis. Decades of research on the types of patterns obtained in the case of particular diseases have led to the accumulation of a substantial knowledge base.

Serum protein electrophoresis is recommended in cases of increased levels of total protein in order to reveal the nature of the process. The basic information that can be obtained from electrophoretic separation includes the immune status of the organism. Both increased antigenic stimulation and immunodeficiency are clearly visible in electropherograms. Moreover, the level of heterogeneity of the corresponding protein fractions can help to distinguish between infectious diseases and cancer – multiple myeloma – producing a homogeneous immunoglobulin fraction.

Analysis of other protein fractions helps to detect or confirm an ongoing inflammatory process, as well as providing information regarding liver function.

Even when the concentration of total protein is within the reference range, this analysis can be recommended as a basic laboratory test.

THE ROLE OF SELENIUM IN THE DIET OF HORSES

ZNACZENIE SELENU W ŻYWIENIU KONI

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The most common diseases and degenerations induced by selenium deficiency include muscle degeneration, diarrhoea, and fertility disorders. Selenium deficiency is also linked to cataracts, ischaemic heart disease, asthma and cancer. Selenium is involved in detoxification of the body, and its antioxidant activity has an antitumour effect. Selenium is best assimilated in the form of selenomethionine and selenocysteine, which are involved in numerous transformations taking place in the body of animals and humans.

Due to selenium deficiencies commonly occurring in Poland, horse breeders must supplement the animals' diet with this element. However, it is essential to know the level of selenium in the feed and in the animal tissues. The aim of the study was to determine and compare the serum content of selenium in horses in relation to the feeding season.

Ten horses were selected for the study (5 mares and 5 geldings), all kept in similar conditions. The horses were used for recreation and sport. The study was conducted in two periods: after the pasture season (end of November 2015) and at the beginning of the pasture season (end of May 2016). Blood was collected from the jugular vein into sterile test tubes without coagulant.

In the mares that did not receive selenium supplements, a very low serum level of selenium was observed. The values were far below the norms established for horses (100 µg/l-200 µg/l) and ranged from 20 µg/l to 38 µg/l. The level of selenium in the mares which received pure selenium or selenium in the form of mineral preparations ranged from 56 µg/l to 85 µg/l. However, this level is still below the reference values. The geldings that received selenium, mineral and vitamin supplements and special feed had an appropriate level of selenium in the blood. The horses that did not receive selenium as a supplement had a low level of selenium, well below the norm.

To sum up, substantial selenium deficiencies were noted in most of the horses tested. After the pasture season eight of ten horses had a selenium level under the reference value. This was all of the mares tested and three of the geldings. After the autumn-winter period, before the start of the pasture season, selenium deficiency was noted in all the mares and in one of the geldings.

**THE USE OF SERUM PROTEIN ELECTROPHORESIS
IN DIAGNOSIS OF EQUINE DISEASES**

WYKORZYSTANIE ELEKTROFOREZY BIAŁEK SUROWICY
W DIAGNOSTYCE CHORÓB KONI

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Serum electrophoresis is a common laboratory diagnostic technique. However, despite the fact that it provides useful information about protein fractions, including acute phase proteins increasing directly after inflammation, and inflammatory diseases are common in horses, the use of serum electrophoresis is not widespread in equine medicine. The serum electropherogram of healthy horses is characterized by a lack of a prealbumin zone, and 6 different bands can be observed: albumin, α_1 , α_2 , β_1 , β_2 , and γ -globulin. Numerous pathological states in horses, including liver diseases, innate or acquired immune deficiencies, enteropathies and nephropathies associated with protein loss, local or systemic infections, cancers, and parasites can cause changes in the albumin fraction and globulin concentration. The serum protein level can also change significantly in the case of equine babesiosis. Evaluation of total protein and albumin and globulin levels can provide information about horses such as their hydration state, infection status, inflammatory state, increased protein losses or decreased protein production.

The material for the study was the peripheral blood of five mares and five geldings. All of the horses were of similar age and kept in similar conditions. Blood was taken twice: after the pasture season (end of November 2015) and before the pasture season (end of May 2016). Blood in the amount of 7 ml was collected from the jugular vein into sterile test tubes with no coagulant. Immediately after collection the blood was centrifuged to isolate the serum, in which protein fractions were determined. The serum content of albumins and three globulin fractions with their subfractions were determined. The total protein concentration and the ratio of albumins to total globulins (A/G) were determined.

In six of the horses tested the serum albumin concentration was normal, in two it was elevated and in two it was below reference values. The α_1 globulin fraction was low in all horses tested. A slight upward trend in the concentration of this fraction was noted in the autumn-winter season. In just one individual the α_1 globulin level fell even more after the autumn-winter season. Despite the increase, the α_1 globulin level remained below reference values. The α_2 globulin fraction was elevated in most of the samples analysed. Normalized values were noted after the summer season in only three individuals. Most of the horses had an elevated level of β_1 globulins. A normal concentration was observed in one individual in both periods and in one after the pasture season. Normative values for the β_2 globulin fraction were noted in four blood samples collected after the autumn-winter season from four individuals. In most of the remaining samples β_2 globulins were above the norm. In two cases, there was a decrease in the concentration of this globulin fraction at the end of May. The γ globulin fraction was normal in most of the horses. A reduced concentration was noted in three individuals after the summer season and in one after the autumn-winter season. The total protein level ranged from 56 g/l to 87 g/l. The A/G ratio was between 0.76 and 1.29.

Serum protein electrophoresis in horses can be recommended as a screening test for qualitative detection of abnormalities in the major proteins and as an important supplement to detailed calculation of serum proteins.

DETERMINE THE QUALITY OF THE WATERCOURSE BOGDANKA

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The paper presents results of water quality analysis Bogdanka in the hydrological years 2011-2012. The study included both alone watercourse Bogdanka, but also reservoirs through which flows. This is one of a few bodies of flowing water, designated in the city of Poznan. Bogdanka catchment covers an area of 51.95 km², in which nearly 50% is developed by built-up areas. The rest is mainly arable land and forests. The length of the test watercourse is about 11 km. The source of Bogdanka stream is located north of Lake Strzeszyńskie, through which flows the watercourse, then flows through the lake Rusalka and Stawy Sołackie, and finally flows into the canalised section of the Warta.

To achieve the intended purpose once a month, in seven measurement and control of water samples were taken for laboratory analyzes and characterizes selected items physicochemical ie. O₂, BOD 5, COD, pH, electrolytic conductivity, N-NO₃, N-NH₄, PO₄³⁻.

Analysis of the results showed that the water quality in the upper reaches of Bogdanka was better than in its lower reaches - below the lake Rusalka and Staw Sołacki. Water quality was defined as not meeting the requirements of Class II, or a status below good.

**THE SIZE AND REASONS OF SOWS CULLING IN ONE BIG FARM
IN WEST POMERANIAN REGION**

WIELKOŚĆ I PRZYCZYNY BRAKOWANIA LOCH NA JEDNEJ Z FERM WIELKOTOWAROWYCH
WOJEWÓDZTWA ZACHODNIOPOMORSKIEGO

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The aim of the study was to characterize the most common causes of sows culling and the level of culling during the year. Analysis of the causes of sows culling were carried out at one of the biggest farm located in West Pomerania Region in Poland. The analysis included basic herd of 1606 sows. The animal material derived from the Danish company DanBred International and included following Danish breeds: Landrace, Yorkshire, Duroc and DanHybrid hybrids (Landrace × Yorkshire). Studied sows of analyzed farm born on average 13.96 of alive piglets per litter and the number of reared on average 12.22 piglets. The effectiveness of mating sows was 83%. The size of sows culling on the farm during one year was 1120 sows, which constituted 67.30% of basic herd. The most common causes of culling were: perinatal problems (28.13%), problems related with reproduction (20.27%) and lameness (16.25%). During the spring were culled the highest number of sows: 339 animals, which constituted 30.27%. The largest percentage of culling sows depending on the sows reproductive cycle included in the third lactation 43.04% and were the main cause was perinatal problems.

**THE IMPACT OF GROWTH RATE ASSESSMENT ON FATTENING
AND SLAUGHTERING VALUE OF GILTS**

OCENA WPŁYWU TEMPY WZROSTU NA WARTOŚĆ TUCZNĄ I RZEŻNĄ LOSZEK

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The growth rate of fatteners measured by the size of daily gains is one of the most important factor which determine the efficiency of the pork livestock production. It turns out that fast growing pigs are not always characterized by a good quality of carcass. In literature appears reviews about unfavorable influence of high growth rate on the slaughter value of carcass, especially in ad libitum feeding conditions. However, in pigs with genetically high ability to protein deposition, the increased daily gains do not cause excessive fatness. The aim of this study was to determine the effect of growth rate on the fattening and slaughtering traits of two polish white breeds of gilts.

The study was conducted on 120 gilts, including 60 gilts of Polish Large White (PLW) and 60 gilts of Polish Landrace (PL) breed. The experiment was performed in the Polish Pig Testing Station. The selection of experimental gilts, feeding and keeping conditions were in accordance with the methodology elaborated by SKURTC_h (Różycki and Tyra, 2010). The growth rate of gilts was controlled from 30 to 100 of their body weight. The animals were slaughtered at a weight of about 100 kg. In slaughter performance of gilts taken into account the average daily gains and feed consumption per 1 kg of gain. Slaughter value was assessed based on the following traits: the average thickness of backfat from 5 measurements, loin eye area, the ham weight, slaughter performance and percentage of meat content in carcass. Gilts were divided into III groups due to the achieved average daily gains separately for both breeds (PLW and PL). The I group constituted gilts with a gains below 850 g, group II – gilts from 850 to 1000 g of gains, and the group III – gilts with gains above 1000 g. For the all calculations were used the STATISTICA 8 PL (2008) computer program. Gilts from group with the lowest gains were found to be the oldest (184.90 days) compared to the other two groups (171.45 days for group II and 158.17 days for the group III); ($P \leq 0.01$). In gilts from group which demonstrated the daily gains more than 1000 g/day feed efficiency was very high and was 2.41 kg/kg of group II (2.58 kg), and group I (2.97 kg); ($P \leq 0.01$). At the same time gilts of that group were characterized by greater fatness expressed as the average thickness of fat from the 5th measurement (14.15 mm) with respect to the other two groups ($P \leq 0.05$). In turn, the largest loin eye area (50.17 cm²) as well as the meatiness of the carcass (60.97%) had gilts intermediate growth rates (group II). The obtained differences in this range have been confirmed as statistically significant ($P \leq 0.05$). Comparing the values as regards studied breeds, it was found that the estimated carcass musculature was very high and showed a significant differences depending on the growth rate only in gilts of Polish Landrace breed ($P \leq 0.01$), as well as the result of fat cover thickness ($P \leq 0.05$).

In conclusion, we can say that the fastest growing gilts very effectively used the feed and thus effectively processed the energy and protein feed on weight gain as well as high musculature. The obtained data shows the high standard characteristics of usability fattening and slaughtering of two maternal breeds of gilts: PLW and PL.

ESTIMATION OF GENETIC PARAMETERS AND ASSESSMENT ECONOMIC SUBINDEX FOR DESCRIPTIVE AND LINEAR FEET AND LEG TYPE TRAITS IN THE POPULATION OF POLISH SIMMENTAL CATTLE

OCENA PARAMETRÓW GENETYCZNYCH I OSZACOWANIE EKONOMICZNEGO PODINDEKSU CECH POKROJU ORAZ LINIOWYCH DLA POPULACJI POLSKICH KRÓW RASY SIMENTALSKIEJ

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Simmental dual purpose cattle is maintained mainly in South Eastern Poland. In a year 2014 the population of Simmental cattle consisted of about 10.700 milk recorded cows and represented 1.47% of whole milk recorded population. For many years Simmental cattle has been included in the national evaluation system in terms of production and conformation traits but so far selection index for this breed was not developed. The production subindex for Simmentals may be defined similarly like that for Holsteins because for both breeds yield traits are similarly defined and recorded. In case of conformation traits differences between Simmentals and Holsteins have much bigger different because of purpose of use, also heritability and correlations between traits.

The aim of the study was to estimate genetic parameters and develop economic subindex for descriptive and linear feet and leg type traits in the population of Polish Simmental cattle. Original data were provided by the Polish Federation of Cattle Breeders and Dairy Farmers and extracted from the SYMLEK National Milk Recording System. Cow records comprised conformation scores of 7422 Simmental cows classified by one specialist from year 1996 to 2013, herds, dates of cow birth, date of calving and classifier, pedigrees containing parents and grandparents. Descriptive trait feet and legs (F&L) scored on a scale from 50 to 100 and 4 linear traits scored on a scale from 1 to 9 were included in the analysis. A five-trait animal model and a Bayesian method via Gibbs sampling were applied to estimate components of variance and covariance.

Heritability of feet and legs conformation traits were small but within a range of parameters published by other authors. In a summary genetic trends in feet and legs type traits were disadvantageous for the population disadvantageous. Favourable trends were found only for foot angle (FAN) and rear legs rear view (RLR). Genetic correlations between feet and legs type traits were high significance so use of common feet&legs subindex seems to be reasonable. Average cow indexes by year of birth computed based on various sets of economic weights were not much different.

**FRESH FRUIT PRODUCTION RELATIONSHIPS IN THE REGION
OF SZABOLCS-SZATMÁR BEREG COUNTY IN HUNGARY**

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The agri-food sector is a major generator of employment and provides income for many people worldwide. In Hungary the majority of people employed in the agriculture sector work at the level of small farms within largely rural areas. The agricultural sector has been one of the most important divisions of Hungary's economy, as in 2013 8442 economic units and 485 thousand sole holders were active in this field. In addition, supply chain relationships are of vital importance within food supply chains. In recent times, this has led to the development of supplier partnership programs and vendor development as a strategic function.

Our objective was to examine the structure and the relationship of farmers dealing with mainly fresh fruit production in the region of Szabolcs-Szatmár Bereg County (located in north-eastern Hungary, bordering Slovakia, Ukraine and Romania). As we have information about the division of Hungary's economy we try to find similarities and differences in the region of Szabolcs-Szatmár Bereg County compared to Hungary. We used semi-structured interviews as a method to ask 246 farmers.

The number of economic units has remained largely unchanged, that of sole holders has been getting lower year after year, dropping from about one million in 2000 to below 500 thousand in 2013. Out of these farmers, 47 percent produced solely for own consumption, while the proportion of those producing primarily for sales was 34 percent. Sole holders rely mainly on their families to do agricultural work, but the popularity of traditional family farming has been declining, as the number of farmers older than 65 years is outweighing that of young ones. In Hungary, the number of young farmers is some 73 percent lower than those above the age of 65 years, chiefly as a consequence of migration from the countryside to urban areas. Over the past years, there has been a massive change not only in the number of sole holders but also in the structure of plant production. While the number of sole holders involved in arable land production dropped by 12 percent, some 90 percent of sole holders produce only up to three crops. (Source: Ministry for National Economy)

Supplier partnership programs and vendor developments are very important. However, not every relationship provides a mutual benefit, and in the food sector power in the chain has become a concern where the upstream feel squeezed. Generally, the most powerful entity controls the chain and dictates the operation of the chain. Thus, relationship management is also a function of the power structure of the chain. Many researches focus on improving relationships, but in our opinion the solution is to meet the requirements of the most powerful entity in the chain.

We have to make difference between the following concepts: collaboration, partnership and trust. Collaboration is a process to create integration between supply chain members for mutual benefit, resource sharing and to achieve common objectives. A partnership is a relationship between individuals or organizations which is based on mutual interdependence and the agreement to cooperate towards achieving common goals and objectives. While the need for trust between partners has been identified as an essential element of buyer-supplier relationships. It is an important lubricant of relationships and binds parties into a common objective.

Finally, we can determine that in agri-food sector business relationships among strategic partners within supply chains are framed in win-win terms, and constructed on collaborative principles that feature high levels of interdependence and inter-organizational trust. All values-based food supply chain partners have a strategic interest in the performance and well-being of other partners.

**THE EVALUATION OF ECONOMICAL EFFICIENCY
OF THE SELECTED CROP IRRIGATION**

**OCENA EFEKTYWNOŚCI EKONOMICZNEJ NAWADNIANIA
WYBRANYCH UPRAW POLOWYCH**

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Polish climate is characterized by its transience, therefore the precipitation constitutes a highly important factor in agricultural production, with particular consideration of its quantity and distribution in time. One of the atmospheric phenomena that negatively affects crops is post-drought periods. They lead to a decrease in the easily accessible water content in the soil, and this in turn results in a reduction of the size and quality of the harvest. An agrotechnic procedure allowing to minimize the adverse effects of drought is irrigation. The subject of the evaluation in this paper is the economic efficiency of irrigation of selected field crops. The data used in the analysis were taken from the Research Station of Agriculture and Biotechnology Faculty of the University of Technology and Natural Sciences in Bydgoszcz, located in Mochełek. The strict field experiment conducted in 2006-2012 concerned the impact of irrigation on the crop of edible potatoes, spring malting barley and corn cultivated for grain, the irrigation was of intervention character, typically for Poland. To evaluate the economic efficiency of irrigation, the direct surplus method was used obtained as a result of applying this measure, which was calculated by deducting the costs of irrigation and the general agricultural costs from the productivity growth. In the analysis there have been presented five variants of the irrigated area (1, 5, 10, 20 and 50 hectares) for each of the analyzed plant. For the purpose of the calculation, the irrigation system was assumed for 15-year of utilization (rate of depreciation assumed at 6.67%), interest on equity at 5%, and the costs of materials and repairs at 2% of the investment costs. The last counted factor was the surge of the agricultural costs caused by the crop increase. It was assumed that it amounted to 30% of the extra production. For comparative purposes, the estimate excluded the costs of work and of water (assuming that it comes from own surface intake). As the increase in the value of production there was adopted the product of production effects of the irrigation and the average purchase price. The amount of the obtained direct surplus depends on many factors, such as the weather conditions, and the most importantly the amount and distribution of rainfall and prices relation. The obtained results unequivocally indicate the favourable impact of irrigation on the amount and the quality of crops for each of the researched plants. The economic analysis however, controverts the irrigation of barley and drip irrigation of corn. The estimate showed, that in case of potatoes, direct surplus increased with extending the surface area. The unit costs of irrigation diminish with the surface extension.

**THE UNDERLYING FACTORS OF RURAL DEVELOPMENT: COMPARATIVE ANALYSIS
OF SERBIA AND EU COUNTRIES**

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Serbia is the country with relatively high level of rurality and significant economic position of agriculture in the overall economy and even more within the rural areas, where often presents a dominant activity for the most of population. Interest for such a research comes from the Serbian position as a candidate for the EU membership. The European integration process requires the harmonization with the European Union rural development policy. Accordingly, the aim of this paper is to define the position of rural areas of Serbia in comparison to other EU countries, with the support of the multivariate analysis: Factor Analysis and Cluster Analysis. The research results point to a multi-dimensional approach to rural development, where there are significant differences in practice, in terms of economic, social and environmental aspects of the development of rural areas. Also, the results indicate that there is a statistically significant difference between the groups of the countries analyzed in relation to the defined indicators of rurality, which allows to define the position of Serbia in comparison to other countries included in the analysis. Considering the lower level of development of rural areas in Serbia compared to other countries of the European Union, the opportunity for the development of rural areas in Serbia are IPA funds (Instrument for Pre-Accession assistance), respectively IPARD component of pre-accession assistance to candidate countries for membership in the EU, aimed at reducing development disparities.

DETECTION TECHNIQUES OF *EPICHLÖ FESTUCAE* VAR. *LOLII* THE ENDOPHYTE OF PERENNIAL RYEGRASS (*LOLIUM PERENNE* L.)

METODY DETEKCJI ENDOFITA *EPICHLÖ FESTUCAE* VAR. *LOLII* W ŻYCICY TRWAŁEJ (*LOLIUM PERENNE* L.)

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Endophytes are the microorganisms living inside of the host plant without causing any disease symptoms for at least part of their life cycle. Typical endophytes of grasses (like *E. festucae* var. *lolii*) do not cause the plant disease and show beneficial impact on the plant. Infected plants are more resistant to biotic and abiotic stresses, thereby occur more numerously in defective or damaged habitats. These endophytes play also important role in the resistance to pathogenic fungi (owing to increased synthesis of phenolic compounds and Pathogenesis-Related Proteins) or to insects (owing to synthesis of different alkaloids). Many ecotypes are also capable of synthesizing the alkaloids harmful to livestock – ergovaline and lolitrem B, which may cause animal diseases – fescue toxicosis and ryegrass staggers. These are the main reasons, why it is important to detect their presence. Its occurrence varies in different European countries from 45% to 100% (Imlach et al. 2008, Rasmussen et al. 2009, Pańka et al. 2013).

The most common ways of detection the *Epichloë* endophytes are dyeing of the leaf sheaths or seeds, immunological tests and polymerase chain reaction (PCR). The research was performed on the collection of perennial ryegrass ecotypes obtained from Polish Centre of Plant Genome Resources. Three different techniques of endophyte detection were being used. In all cases most difficulties were caused by little amount of the endophyte mycelium in the plant tissue. Dyeing of the leaf sheaths or seeds allows to detect endophyte in fresh plant material with the use of Bengal rose or aniline blue and light microscope. Effectiveness of this technique was highly dependent on the experience and skills of the researcher and on the concentration of endophyte mycelium. It can lead to false negative results. Immunological test Phytoscreen Immunoblot Kit “*Neotyphodium* Field Tiller” (AGRINOSTICS, Ltd. Co.) is a kit, designed specially for detecting endophytes in grasses. It allows to work on fresh, unprocessed plant material and the results are obtained in two days. Its greatest disadvantage is its subjectivity, which may lead to both false positive and false negative results. Detection with PCR techniques requires more equipment, reagents, isolated DNA and the presence of the species specific primers. With low endophyte concentration it can also lead to false negative results, although its sensitivity is higher than in two previous methods. The PCR reaction allowed to verify the results obtained in two others techniques. In all cases positive results were confirmed. Most of the negative results were not confirmed – PCR reaction showed the presence of the endophyte.

For the samples with low concentration of endophyte in plant tissue the PCR reaction was the most sensitive and useful method of detection.

References:

1. Imlach W.L., Finch S.C., Dunlop J., Meredith A.J., Aldrich R.W., Dalziel J.E., 2008. The Molecular Mechanism of “Ryegrass Staggers,” a Neurological Disorder of K⁺ Channels. The journal of pharmacology and experimental therapeutics 327(3): 657-664.
2. Pańka D., Piesik D., Jeske M., Baturó-Cieśniewska A., 2013. Production of phenolics and the emission of volatile organic compounds by perennial ryegrass (*Lolium perenne* L.)/ *Neotyphodium lolii* association as a response to infection by *Fusarium poae*. Journal of Plant Physiology 170: 1010-1019.
3. Rasmussen S., Parsons A.J., Newman J.A., 2009. Maetabolomics analysis of the *Lolium perenne* – *Neotyphodium lolii*: more than just alkaloids? Phytochem. Rev. 8: 535-550.

**RIPARIAN TREE AND SHRUB VEGETATION UTILIZED
BY THE EUROPEAN BEAVER (*CASTOR FIBER L.*)
IN THE POLESIE NATIONAL PARK**

WYKORZYSTANIE PRZYBRZEŻNEJ ROŚLINNOŚCI DRZEWIASTEJ I KRZEWIASTEJ
PRZEZ BOBRA EUROPEJSKIEGO (*CASTOR FIBER L.*) BYTUJĄCEGO
NA TERENIE POLESKIEGO PARKU NARODOWEGO

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European beavers have inhabited the Polesie National Park since 1992. In 2014, the beaver population in the Park was estimated at 332 animals. Beavers are herbivores eating primarily riparian vegetation, including trees and shrubs, in the fall and winter. Therefore, they significantly affect not only vegetation in riparian areas but also transformations of transition zones (ecotones).

The aim of this study was to determine and characterize the foraging preferences of European beavers inhabiting the Polesie National Park with regard to trees and shrubs in riparian zones representing different biotope types.

The experiment was conducted at eight research sites located along watercourses in the Polesie National Park, including four study areas in woodlands, two study areas in grasslands and two study areas in non-forest tree and shrub communities. Lodges, burrows and dams were found in all study areas or in their immediate vicinity, indicating the presence of active beaver families. Tree species were identified and trunk diameters were measured within a 10 m wide littoral strip. The trees growing in the study areas were divided into three classes based on the occurrence and degree of beaver damage: I – trees cut down by beavers, II – partly cut trees, 0 – undamaged trees.

A total of 2500 trees representing 17 species were identified in the study areas, including 836 (33.44%) cut down trees and 130 (5.20%) partly cut trees. The most common tree species were the downy birch (28.96%) and the black alder (28.76%). Beavers showed a clear preference for the gray willow and the white willow, 98.60% and 73.94% of which, respectively, were cut down in the study areas. Scots pines, Norway spruces, rowans and field elms remained undamaged. Trees growing in non-forest tree and shrub communities were most frequently utilized by beavers (51.03% of felled trees), whereas trees growing in woodlands were least likely to be cut down by beavers (23.02% of felled trees).

The results of this study can provide a basis for designing and establishing food plots for European beavers, and for developing supplemental winter feeding programs.

**EVALUATION OF MEAT QUALITY FROM INDIGENOUS PIG BREEDS
IN SLOVAKIA AND POLAND***

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In the last years the market of pork has been diversified on base of the use traditional and regional specialties, where is used technology such us drying, smoking and fermentation of products. The traditional products require a specific quality of meat and fat, which is specified by dry matter content, intramuscular fat content in meat and fatty acid composition with higher content of unsaturated fatty acids. Due to this fact, indigenous breeds has received attention from the aspect of high meat quality and meat products compared to pig meat breeds. The aim of the study was compared to the physical and chemical properties of *Musculus longissimus dorsi* (MLD) from Mangalitsa breed, Zlotnicka spotted, Pulawska with parameters of MLD from pig meat breed Slovak Large White. The experimental material comprised of 39 pcs of pigs, which were reared in the intensive conditions and they were fed *ad libitum* system by complete feed mixtures for fatteners. The fattening period lasted from 30 kg to 100 kg of body weight. In the presented study, it was found that the MLD from Mangalitsa had the highest drip loss, while the lowest drip loss was determined in MLD of Zlotnicka spotted ($p < 0.01$). The breed Zlotnicka spotted had significantly the darkest meat and Slovak Large White the lightest ($p < 0.01$). The other indigenous breeds had darker and redder meat compared to Slovak Large White. From the point of texture of meat, it was measured the most tender MLD in Mangalitsa and the stiffest MLD in Slovak Large White ($p < 0.01$). The Slovak Large White had the highest water content and the lowest intramuscular fat content in MLD than indigenous breeds ($p < 0.01$). The MLD of Pulawska had significantly the lowest water content and the highest intramuscular fat content ($p < 0.01$). The highest cholesterol content was found in MLD of polish indigenous breeds and Slovak Large White had the lowest values of cholesterol content in MLD ($p < 0.01$). The MLD from Mangalitsa had lower cholesterol content than polish indigenous breeds, but it had higher values of cholesterol content compared to Slovak Large White ($p < 0.01$). The results indicated that polish indigenous breeds had higher intramuscular fat content with higher cholesterol content in meat, lower water content and darker, but stiffer meat compared to Mangalitsa in the intensive conditions. It can be concluded that meat from Zlotnicka spotted and Pulawska achieve more desirable qualitative traits for special meat products compared to Mangalitsa breed and Slovak Large White in the intensive conditions.

* This study was supported by project VEGA 1/0364/15.

**THE EFFECT OF PRODUCTION FACTORS ON THE YIELD
AND CROP QUALITY OF MAIZE HYBRIDS**

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In our researches we examined the effect of the hybrid, the nutrient supply, the number of plants and the abiotic factors on the yield, crop quality and yield stability of maize.

We tested six hybrids with different genetic characteristics and growing seasons. I analysed the correlation between the nutrient supply and the yield of maize hybrids with control treatment (treatment without fertilization) and with N 80, P₂O₅ 60, K₂O 70 kg ha⁻¹ and N 160, P₂O₅ 120, K₂O 140 kg ha⁻¹ fertilizer treatments. The number of plants of the six tested hybrids was 60, 70, and 80 thousand plants/ha.

The yield of hybrids without fertilization changed between 5.28-7.13 t ha⁻¹ depending on the number of plants.

That increase in the yield is only 0.81 t ha⁻¹, but it is significant. Due to the especially draughty weather the yield increasing effect of fertilizers was moderate. In the average of the hybrids and the number of plants, increasing the N80+PK treatment to N160+PK, the yield did not increase but decreased, which is explicable by the water scarcity in the period of flowering, fertilization and grain filling.

Beside yield amount development changes in quality were studied as well and effects have been quantified. It can be stated that treatments and quality showed significant correlations, however the applied hybrid proved to be determinant.

Protein-, starch and oil content of grain yield were analysed regarding the average of NPK nutrient supply treatments and the applied plant density per hectare.

ALEUTIAN MINK DISEASE VIRUS – OLD PROBLEM AND NEW TOOLS

WIRUS CHOROBY ALEUCKIEJ NOREK – STARY PROBLEM I NOWE NARZĘDZIA

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Viral mink diseases are the cause of the significant economic losses for breeders and the serious threat for the free-living animals. Aleutian Mink Disease Virus (AMDV) is one of the most widespread pathogen infecting the minks. The infection leads to the decreased fertility as well as to the high mortality among the kits. Virus is also common in the populations of free-living animals, in which besides the minks it may also infect another mustelids and another predatory animals such as the raccoon dogs.

Despite the fact that pathogen is known from the late 50 s. even presently there does not exist an efficient treatment against Aleutian Disease (AD) and the only way to remove the disease from farms is the elimination of infected animals and the monitoring of the sanitary status of farms. There is common the flow of knowledge and technology between a research institutions and breeders in the countries that play important role on the world fur market such as Denmark, Finland or China and therefore it is possible to estimate epidemiology of AMDV and, in further perspective it may contribute to the solution of this problem.

The diagnostic has a vital meaning in case of the actions leading to the elimination of pathogen. Constant progression in the science is giving a new more specific and sensitive tools that massively enhance the capabilities of diagnostics. First method that was used to detection of AMDV was the non-specific iodine test allowing to detection of high level of antibodies which may occur not only in case of AD but also in many other pathological states. Presently Counter Immune Electrophoresis (CIE) and ELISA are considered as a standard in diagnostic. However the growing number of the researchers as well as the diagnosticians are interested in the molecular tests that allow to the directly detection of genetic material of virus. Polymerase Chain Reaction (PCR) – the basic molecular technique is commonly used to identification of many pathogenic agents but in case of AD it is not commonly used. Optimized PCR makes it possible to detect the virus occurring even in small quantities within short period of time.

Undoubtedly, molecular tools belong to the rapidly developing and innovative methods of detection of pathogens which are characterized by not only the higher sensitivity and specificity but also by the huge amount of generated information. PCR, besides the diagnostic, enable to carry out further analysis such as a sequencing – technique that reveal the nucleotide sequence of the pathogen and through the usage of bioinformatic tools it makes possible to match the genetic variants of pathogen to the particular strain. What is more the molecular methods are not limited to the analysis of tissue of infected animals but also they may be used to the analysis of environmental samples. Viruses are very persistent in environment and therefore, despite the elimination of infected animals, virus may be still present and contagious in relation to the newly introduced animals. The good solution of this problem is one of PCR modification – Real-Time PCR – technique, due to its high sensitivity, allows to detection of pathogen in the environmental samples such as the swabs.

Molecular diagnostic is innovative approach to the problem of AMDV which in further perspective may has a great impact to not only removing the virus from farms but may be also helpful in better understanding of the pathogenesis of AD. More close cooperation between the research centers and breeders allowing to the more widespread diagnostic and the regular monitoring of the sanitary status may play a crucial role in elimination of pathogen from the farms.

HUMAN-ANIMAL RELATIONS AS OBSERVED IN THE POLISH KONIK HORSES

INTERAKCJE CZŁOWIEK-ZWIERZĘ U KONIKÓW POLSKICH

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Relations with humans and the living conditions are among the factors that are essential to the welfare of horses. The Polish Konik Horses represents an indigenous breed of primitive horses which are bred both in reservations as well as in stables. This breed is characterised with all-round versatility, i.e. they are suitable for riding, harness, and equine-assisted therapy. They are more and more popular. The purpose of the research was to determine the behavioural reactivity and the heart rate during routine stable grooming activities (stage 1) and to assess the horse behaviour during breeding inspection (stage 2) of Polish Konik Horses bred in stables at the Centre for Preserving Breeding of Polish Konik Horses at the Roztocze National Park in Florianka. Stage 1 included 22 horses (12 mares, 8 stallions and 2 geldings). The horses were assessed on a scale of 5 points (affiliative behaviour) to 1 point (aversive behaviour) and telemetric measurement of heart rate during particular stages of grooming (approach to the horse, cleaning, bridling, leg raising) in the stable. Stage 2 consisted of an observation of 39 horses (14 stallions and 25 mares) during breeding inspection. Behavioural reactions observed in the horses while walking and trotting were assessed on a scale of 5 points (the horse cooperates very well) to 1 point (the pony is emotionally stimulated and won't cooperate), and the behaviour of the horses during presentation on the evaluation ground (5 points – the horse is standing calmly; 1 point – the horse is kicking, bucking and biting). Other registered markers included: the time of walk and trot, the time needed to position a pony on the paddock. During the observations of the grooming activities in the stable it was noticed that there was a significant negative correlation between the animals' behaviour and their heart rate. The mares were characterised with a higher heart rate level than the stallions. The horses with positive evaluation of their behaviour at the moment when a person was approaching also showed affiliative behaviour during bridling. The assessment performed during breeding inspection showed that the observed horses were characterised with highly balanced behaviour during presenting in movement as well as at the paddock. Positive correlation was noticed between the time of trot and the time necessary to position the animal at the evaluation ground, and a negative correlation between the time of trot and the assessment of the behaviour in motion. Compared to older mares, the younger ones were received fewer points for behaviour during presentation in motion.

The results of the preliminary tests of human-animal relations will be used in further research of a multi-directional analysis of this subject with respect to horses.

**EFFECT OF THE ADDITION OF MILK THISTLE (*SILYBUM MARIANUM*)
ON THE QUALITY OF PORK OFFAL POLISH LANDRACE BREED**

WPŁYW DODATKU OSTROPESTU PLAMISTEGO (*SILYBUM MARIANUM*)
NA JAKOŚĆ PODROBÓW POZYSKANYCH Z TUCZNIKÓW PBZ

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According to the Polish Norms (PN-65 / A-82000, PN-86 / A-82004) offal are edible internal organs and other body parts of animals for slaughter does not fall in the carcasses. Pork offal are mostly used in the production of cured meat offal. For the production of dishes with offal, is their high nutritional value, low price and the current consumer preferences.

The quality of edible by-products, as in the case of meat depends on genetic factors (such as breed utility type, sex, age) and the environment, for example – feeding.

Numerous studies indicate health promoting properties milk thistle, resulting from the high content of the biologically active components – silymarin. Milk thistle (*Silybum Marianum*) used in humans shows antioxidant effects, detoxifying and regenerating. It is assumed that supplementation of feed in fruits of milk thistle, can modify the chemical composition internal organs.

The objective of study is to determine the effect of feeding porkers feed with fruit of milk thistle (*Silybum marianum*) on quality of pork offal Polish Landrace breed.

The research was conducted on a group of 40 porkers Polish Landrace breed: 20 pcs. – Control group; 20 pcs. – Experimental group. The experimental group received furthermore of ground fruits of milk thistle (*Silybum marianum*) in the amount of 7 g per kg of feed.

For laboratory samples were collected: the heart, lungs and liver.

In the samples were determined: the hydrogen ion concentration (pH₄₅, pH₂₄), the percentage of loose water, and chemical composition (fat, protein, water, collagen).

Analyses show that the addition of milk thistle in the diet porkers Polish Landrace breed significantly shapes the technological quality of offal.

The internal organs obtained from the experimental group porkers were characterized by higher values of pH₄₅ and pH₂₄.

Significant differences between groups were observed also in relation to the content of water loose. The largest in the flow of milk thistle on the chemical composition in the case of the lungs.

**GLOBAL AND NATIONAL IRRIGATION OF PLANTS
WITH PARTICULAR REFERENCE TO SOYBEAN**

**NAWADNIANIE ROŚLIN ZE SZCZEGÓLNYM UWZGLĘDNIENIEM SOI
W UJECIU GLOBALNYM I KRAJOWYM**

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Water is necessary to life of every living organism. In agriculture it is an important factor that shapes the yield. Occurrence of unfavourable atmospheric conditions for example periods of after-droughts makes the cultivation at climate risk both globally as well as nationally. Negative aspects of drought is eradicated by plant irrigation. This process ensures proper growth of plants and influences intensification of physiological processes which results in growth of plants and stabilises it in the period of the following years. According to FAOSTAT data, attached to the Digital Global Map of Irrigation Areas in 2013, the world's total area adjusted to irrigation was 303.371.813 ha. As far as the data from the Central Statistical Office is concerned, in Poland the area of 66.097 ha has been irrigated, from which 57.850 ha included infiltration, 8.132 ha sprinkling and 68 ha flood irrigation. The main factor that restrains the process of irrigation in Poland is its economical profitability, which directly refers to too low booster of yield value in reference to the costs of investment and exploitation of devices. Irrigation in Poland has mostly interventional character. Nevertheless, the growth of modern techniques is noticeable, for example micro-irrigation which is common at vegetable raising and fruit-growing. There is a growing trend of irrigating plants that have been cultivated in different climate zones. One of those plants is soy which takes the first place in the global trade of legumes. Worth mentioning is the fact that the USA has 60% shares of global export of this raw material. As far as FAO data is concerned the area of the cultivation of the soybeans in the world in 2012 was 105.019 ha. The tycoons in this field have been countries such as the USA (30.198 ha) and Brazil (24.975 ha). In 2012 there were 240.971 thousands of tons of seeds collected. Taking into consideration the area of the cultivation of soybeans and their crops, Poland plays meagre role in the world. In 2012 from the area of 0.9 thousands of ha 1.5 thousands of tons of soybean crops were collected. Some experts predict growth in the total world production by 2.2% a year up to 371.3 millions of tons in 2030. According to FAO reports there has been steady growth of the areas of the cultivation of soybeans and the amount of crops during the last 10 years but it is still meaningless to the world's soy trade. The great role of soy in the world's agricultural production is connected with the valuable chemical composition of soybeans. However the most important use of soy is connected with animal nutrition. Soy is cultivated mostly in south-east part of Poland. In recent years, with the appearance of new varieties of soy, this plant has gained popularity in other regions of the country. Soy is not sensitive to drought, it is also able to conserve water. Well-developed root canal system allows to collect water from deeper layers of soil. Soy has the ability to position its leaves in parallel to rays of light and it has coat that decreases transpiration. In countries, which are leaders of soy trade, irrigation is used at high scale. In Brazil 12% of irrigated areas are soy fields. In Poland no research over irrigation of soy has been conducted. However, with the gradual growth of interest of farmers in the cultivation of soybeans, this field of agriculture is also developing. This will probably cause research centres to increase their interest at the topic of irrigation.

**STUDY AND ASSESSMENT OF THE IMPACT OF WIND ENERGY PROCESSORS
ON THE RURAL ENVIRONMENT**

**BADANIE I OCENA WPŁYWU INSTALACJI ENERGETYKI WIATROWEJ
NA ŚRODOWISKO ROLNICZE**

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Changes in the energy market are stimulating the development of the renewable energy sector and in particular the installation of wind energy. The best locations for wind turbines are hills in the open space, under the law, wind turbines should be situated at a minimum distance of 500 m from the buildings. The result is that wind power installations usually occur in rural areas.

Every human activity, and thus wind power, has a specific impact on the environment. The biggest problems may include the impact on the birds and their seasonal migration routes, noise or significant changes in the landscape. While locating a farm or a single wind turbine, you need to pay attention to nearby parks, national parks and nature reserves. However, the nuisance caused noise and vibrations can be eliminated only by investing in modern, quieter structures or building wind power plants away from human headquarters. Despite the high cost associated with investments, wind turbines are desirable because of the range of benefits they bring. Wind turbine can meet its own energy needs with simultaneous large reduction of pollutants emitted into the atmosphere compared to the production of energy by conventional methods. Developing sectors related to producing modern wind installations is a factor stimulating development of industry and increasing range of opportunities to create new workplaces.

Mentioned factors and adverse effects are visible and felt immediately during the operation of the wind turbine. However, the impact on the rural environment, wider natural environment should be considered not only in the operation phase, but throughout the life cycle of a wind turbine from needs identification phase to phase-out and disposal.

The paper presents the study and assessment of the impact of wind turbine on the rural environment. Research was conducted for 2 MW wind turbine with three blade rotor with using Life Cycle Assessment methods, Eco-indicator 99 and Software SimaPro. LCA model is used to quantify the environmental impact of technical objects. Inventoried are the environmental factors in relation to the process, product or machine.

This method enables the assessment of harmful emissions and quantify the consumption of materials throughout the life cycle, acting to help optimize and improve designs. LCA model can also be used in comparative assessments of the environmental impact of objects fulfilling the same function.

Analysis included eleven categories: carcinogenic compounds, organic compounds that cause respiratory diseases, inorganic compounds that cause respiratory diseases, compounds that cause climate change, radioactive compounds, compounds that cause ozone depletion, ecotoxicological compounds, compounds that cause eutrophication / acidification, land use, minerals and fossil fuels.

The highest level of harmful emissions in the various stages of the life cycle of a wind turbine was reported to the atmospheric environment for which the most significant impact was the production phase), the average – to the aquatic environment (the most significant impact stage storage landfill site), and the lowest – to the soil environment (the most significant impact stage of production).

The highest overall level of harmful effects characterized by the production stage. The use of recycling helps to reduce negative impacts of the life cycle.

**CHARACTERIZATION OF HUMIC ACIDS ISOLATED FROM PEATY-MUCK SOILS
AND ORGANIC COMPOST**

CHARAKTERYSTYKA KWAŚÓW HUMINOWYCH WYIZOLOWANYCH
Z GLEB MURSZOWYCH I KOMPOSTU

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Many studies shows that the type of soil, vegetation, climate and human activities influence the structure and properties of humic compounds. Humic substances in soils can be divided into three main fractions: humic acids, fulvic acids and humin. Humic acids are very important carbon source in nature and have many important functions in the soil. The aim of the study was to characterization of humic acids isolated from two peat-muck soils and organic compost. Humic acids were extracted according to the Schnitzer method. The tested soils and compost were analysed for the content of total and organic carbon, ash, density and for their humification degree. The humification number of investigated was obtained according to the Springer method. The humic acids samples were characterized by elemental analysis (C, H, N and O) and UV-VIS spectroscopy (E2/E6, E4/E6, $\Delta\log K$). The differences in chemical structure and functionalities suggest a higher degree of humification and higher chemical reactivity for the humic acids isolated from peat-muck soils, with respect to the humic acid extracted from organic compost.

References:

1. Kumada K., 1975. The chemistry of soil organic matter. Food and Fertilization Technology Centre. 22, 10-36.
2. Matyka-Sarzyńska D., Sokołowska Z., 2004. Usefulness of humification number in studies of the state of secondary transformation as comparison to water holding capacity of mucks (in Polish). *Acta Agrophysica*, 3(3): 553-563.
3. Niemiałkowska-Butrym I., Talarowska A., Sokołowska Z., Boguta P., 2012. Optical properties of humic acids in selected organic waste. *Acta Agrophysica* 19(4): 773-785.
4. Schlichting E., Blume H.P., Stahr K., 1986. *Bodenkundliches Praktikum*, 2 Auflage. Blackwell Wissenschafts Verlag, Berlin, Wien, p. 167.
5. Schnitzer M., Khan S.U., 1978. Soil organic matter. Elsevier. Sci. Pub. Comp., N.Y.
6. Reddy S., Nagaraja M.S., Puntith-Raj T.S., 2014. Elemental analysis E4/E6 ratio and total acidity of soil humic and fulvic acids from different land use systems. *Annals of Plant and Soil Research* 16(2): 89-92.
7. Rodriguez F.J., Schlenger P., Garcia-Valverde M., 2016. Monitoring changes in structure and properties of humic substances following ozonation using UV-Vis, FTIR and ¹H NMR techniques. *Science of the Total Environment* 541: 623-637.

**SPERM MOTILITY, ASSESSED USING TRADITIONAL METHODS AND CASA,
IN THE FOLLOWING DAYS STORAGE OF THE SEMEN DUROC BOARS**

**RUCHLIWOŚĆ PLEMNIKÓW, OCENIANA METODĄ TRADYCYJNĄ I CASA,
W KOLEJNYCH DNIACH PRZECHOWYWANIA NASIENIA KNURÓW RASY DUROC**

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Boar semen is generally stored in liquid form. In practice short and long-term diluents are used to maintain adequate sperm viability from a few to several days. In the insemination practice, the basic method of semen evaluation is the assessment of the percentage of progressively motile sperm using a microscope – this method is simple but subjective. For this reason, methods like Computer Assisted Sperm Analysis – CASA are getting more popular.

The aim of this study was to compare the sperm motility, assessed using traditional methods and CASA, in the liquid-preserved semen samples stored for 10 days.

The study was performed on 20 liquid-preserved ejaculates obtained from the boars of Duroc bred. The semen was collected manually and evaluated macro- and microscopically. The progressive motility was assessed using a traditional method with Blom table and with a SCA (Sperm Class Analyzer® Microptic S.L., Barcelona). In the CASA analysis, the following subpopulations of sperm were considered: total motile sperm, progressively motile sperm, fast motile sperm (rapid), slow motile sperm, no motile sperm (static) and VCL (curvilinear velocity), VSL (straight-line velocity), VAP (average path velocity), LIN (percentage of linearity, as the ratio between VSL and VCL), WOB (wobble of the curvilinear trajectory, as the ratio between VAP and VCL), ALH (amplitude of lateral head displacement), BCF (bead cross frequency). These indicators were evaluated every 2 days for the period of ten days. The results have shown that traditionally assessed progressive motility in the second day of the examination was 83.25%, in the 4th day – 71.5%, 6th – 55.0%, 8th – 42.0%. After ten days of semen storing, the percentage of progressively motile sperm was 34.2%. In the CASA evaluation, the number of motile sperm in the second day of the study was 84.7%, in the 4th day – 75.0%, 6th – 59.1%, 8th – 47.2% and in the 10th day 40.0%. In the case of total motility, we have shown that 96.5% of sperm were motile at the beginning of the study. At the end of the experiment this value was 87.7%. However, there was a big decrease of spermatozoa with rapid progressive motility (from 73.0 to 22.8%). Other evaluated indicators have the following values: VCL – 76.7 $\mu\text{m/s}$ in the 2nd day and 37.1 $\mu\text{m/s}$ in the 10th day, VSL – respectively 37.4 and 16.5 $\mu\text{m/s}$, VAP – 48.5 and 33.8 $\mu\text{m/s}$, LIN – 30.4 and 46.8%, WOB – 64.1 and 67.9%, ALH – 2.8 and 2.1 $\mu\text{m/s}$ and BCF – 7.9 and 7.0 Hz in the 2nd and 10th day respectively. To sum up, this study has demonstrated the positive relationship between the percentage of progressively motile sperm assessed traditionally and CASA and the steady decline in the value of this parameter in the following days maintenance. It may be noted, however, a big decline in rapid sperm motility and VLC, VSL and VAP indicating clearly disturbance in the mechanism of sperm movement with time of the semen storage.

**OMEGA-3 FATTY ACIDS FED TO SOWS INFLUENCE PIGLET INFLAMMATORY
RESPONSE AND COGNITIVE ABILITIES**

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In recent years the public has become more concerned about how animals in the food industry are treated during the production phase. In the commercial pig industry, processing and weaning are arguably the most stressful events in a young pig's life. The primary objective of this study was to document the effects of feeding a diet rich in omega-3 fatty acids during gestation and lactation on the inflammatory response during processing on the sows' litter. The secondary objective was to evaluate the cognitive and behavioral effects of maternal omega-3 fatty acids on the weaned pigs. Eight (8) large white commercial gilts (female swine with no prior pregnancy) were purchased from Texas Tech University (Lubbock, TX) and transported to the Tarleton State University's Agricultural Center after a 30 day acclimation period. The gilts were bred via artificial insemination to the same boar. After breeding, gilts were randomly assigned into one of two dietary groups; CONT (basal diet + corn oil) or N3FA (basal diet + protected n-3 fatty acid supplement). Research indicates sow diets with increased amounts of omega-3 fatty acids can increase litter size and piglet's cognitive ability as well as decrease piglet mortality via the maternal diet. It is our hypothesis that feeding a diet rich in omega-3 fatty acids will lower the inflammatory response and stress during handling and processing. If our hypothesis proves correct then pork producers would benefit by having a user friendly and feasible solution to improve welfare and increase production. Preliminary data indicates that litters that piglets from litters whose mothers were fed N3FA during gestation had birth weights on average 0.357 kg higher than piglets from CONT. Correspondingly piglets from the N3FA litter also had a weaning weight an average of 0.750 kg higher. White blood cell differentiation counts for N3FA and CONT fell within the normal hematologic reference ranges for swine. Additionally blood neutrophil: lymphocyte ratio (N:L) had no noticeable differences amongst N3FA and CONT.

**THE SAVORY'S (*SATUREJA HORTENSIS* L.) ESSENTIAL OIL COMPONENTS
AND CRUMBLER HERB DRUG YIELD FLUCTUATION UNDER DIFFERENT
FERTILIZATION SETTINGS**

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During our research we investigated the savory's (*Satureja hortensis* L.) nutrient requirements with different fertilization setting in small-plot trial. We measured SPME (Solid phase microextraction) and GC-MS (gas chromatograph-mass spectrometer) we examined the effects of the different fertilization settings for the herb's main active ingredients of essential oil's percentage. We monitored the harvested savory's drug's raw and dry mass. The harvest was done manually between 12th and 17th August 2015. We dried the drug under preumbra.

Based on the results, it was concluded, the essential oil agents' percentage breakdowns significantly depending on the crop land's ecological endowment, and cropping technologies.

It was concluded, based on the results, the N30P40K60 fertilization setting is ideal in terms of the quantity of the marigold drug. Both the raw and the dry mass' measurements of the case, this fertilization setting have the most important effect on the herb's yield. The analysis of variance didn't show significant differences between the plots with different fertilization settings. We discovered relationship between the drying loss and the increasing quantities of nutrients. We think it may be possible the nutrient requirements and the distribution data of the essential oil's agents are connected.

**ENZYMATIC ACTIVITY OF ASPARTATE AMINOTRANSFERASE
IN BOAR SEMEN AND ITS RELATION TO SEMEN QUALITY DURING THE SEASON***

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Seasonality is a considerable factor affecting reproduction in pigs because boars and swine are sensitive to seasonal changes. Therefore, control of qualitative and quantitative traits of boar semen has great economic importance for pig breeders. Aspartate aminotransferase (AspAT) is an intracellular enzyme related with sperm membrane integrity and it is a determinant of cellular damage spermatozoa. The objective of this study was to find out the seasonal changes in the enzymatic activity of AspAT in boar seminal plasma and spermatozoa and determine their relation to semen quality.

Total 139 ejaculates (sperm-rich fraction) from hybrid AI boars aged 1 to 3 years were used for this study. Ejaculates from healthy and fertile mature boars were collected with using the gloved-hand technique during four year period from AI centres in the Czech Republic. The ejaculates were divided into four groups according to season period of the year: winter (1st-3rd month), spring (4th-6th month), summer (7th-9th month) and autumn (10th-12th month). The following parameters were evaluated in fresh native boar semen: semen volume, sperm motility, sperm concentration, percentage of morphologically abnormal spermatozoa (MAS), total number of spermatozoa per ejaculate, enzymatic activity of AspAT (mU/10⁹ sp – spermatozoa) in supernatant and spermatozoa.

The AspAT activity in seminal plasma correlated positively with MAS incidence ($r = 0.76$) and negatively with sperm progressive motility ($r = -0.37$) and with the AspAT activity in spermatozoa ($r = -0.37$), $P < 0.05$. In addition, the AspAT activity in spermatozoa correlated positively with sperm progressive motility ($r = 0.38$) and negatively with MAS ($r = -0.53$), $P < 0.05$. Sperm progressive motility was significantly higher in winter (74.31 %) and spring (76.67 %) vs. summer (66.61 %) and autumn (67.64 %), $P < 0.05$. Sperm concentration was significantly lower in autumn ($339.36 \times 10^3/\text{mm}^3$) vs. winter ($401.69 \times 10^3/\text{mm}^3$) and vs. spring ($416.11 \times 10^3/\text{mm}^3$), $P < 0.05$. Enzymatic activity of AspAT in seminal plasma was significantly higher in summer (124.30 mU/10⁹ sp) and autumn (129.95 mU/10⁹ sp) in comparison with the AspAT activity in spring (101.10 mU/10⁹ sp), $P < 0.05$. Furthermore, the AspAT activity in spermatozoa was significantly higher in winter (154.95 mU/10⁹ sp) and spring (157.97 mU/10⁹ sp) vs. autumn (126.04 mU/10⁹ sp), $P < 0.05$.

In conclusion, our results demonstrated a significant relation of the enzymatic activity of AspAT in boar semen to semen quality. According to our results the boar semen quality was the best in winter and spring, particularly in sperm motility, sperm concentration, MAS incidence, AspAT activity in seminal plasma and spermatozoa.

* This study was supported by research project MZERO0714.

**COMPARATIVE ADVANTAGES OF AGRICULTURAL PRODUCTS
IN WESTERN BALKAN COUNTRIES IN THE PROCESS OF EU INTEGRATION**

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The Western Balkan countries – Serbia, Bosnia and Herzegovina, Montenegro, Macedonia, Croatia and Albania in process of integration to European Union will have opportunity to enhance a development of the agricultural sector through trade cooperation with countries in the region, as well as with the member states of European Union. Process of transition and agricultural transformation made a gap between the countries of the Western Balkans and the European Union countries, which also had effects on agricultural competitiveness. Market liberalization in Western Balkan countries, as a result of the trade agreement with the European Union, as well as trade agreement with regional countries (CEFTA – Central European Free Trade Association), has significantly affected the foreign trade of agricultural products. In order to determine level of comparative advantages of agricultural products in the Western Balkan countries, an index of revealed comparative advantages is dynamically analyzed. The results in this paper showed that majority of countries of Western Balkan have comparative advantages of agricultural products on global market: the significant comparative advantages of this sector have Serbia and Macedonia, while on the other hand these products in Albania have not comparative advantages. In relation to the main objective of this paper, which was to identify the level of comparative advantages of agricultural products in Western Balkan countries, it may be stated that process of liberalization with European Union and countries from the region, has effects on foreign trade, as well as on increase of revealed comparative advantages of agricultural products on global market. Further results in foreign trade of agricultural products will depend on the ability of agricultural sector to improve its competitiveness of products, especially to improve quality and standards, as well as health safety. So, in that context, important condition for achievement of better positions on global market will be organized appearance with products for which there are comparative advantages.

**SUB-DERMAL, 72-MG SLOW-RELEASE MELATONIN EFFECTS
ON MARE ESTROUS INDUCTION**

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Mares are seasonal breeders with their natural breeding season occurring during late spring and early summer months. However, a universal birth date of January 1 assigned by the breed associations leave commercial producers to breed horses during the late winter and early spring months during the transitional period when mares are not consistently reproductively active. Artificial lighting and pharmacologic manipulation of the estrous cycle in order to shorten the spring transition is widely accepted, however, these practices are often costly and unpractical for many producers. A once-yearly sub-dermal melatonin implant could be a much more user-friendly and cost effective alternative to estrous manipulation for breeding during the transition period. The induction of estrous in response to 72 mg of slow-release, sub-dermal melatonin was evaluated in ovary-intact, anestrous mares in order to determine if the melatonin implants could hasten the onset of estrous out of winter anestrous. Ten open mares were blocked by age and assigned to one of two experimental groups. However, one mare was removed from the study. The average age of mares in the study is 10 years old. The remaining nine mares were assigned to either treatment (n = 5) or control (n = 4). Horses in the treatment group received 72 mg of sub-dermal, slow-release melatonin implants, while control horses were maintained naturally. Blood serum was collected on all horses prior to implantation on December 1 as well as every three days at 07:00 for the duration of the study to later be evaluated for melatonin concentrations. Onset of estrous was determined as the time of first ovulation for each mare. Ovarian activity was monitored for ovulations every 6 days throughout the study via rectal ultrasound examination, while tease scores were measured in order to monitor estrous activity. Body weight and body condition score on an individual basis was measured and recorded on 6 day intervals to ensure all mares maintained an ideal body condition for a reproductively active mare. Numerically, treatment mares had a longer period to first ovulation (average 70.2 days) compared to control mares (average 68.5 days). Body condition scores did not change throughout the duration of the study, nor did they differ between groups. In conclusion, the melatonin implant treatment did not hasten the onset of estrous. The lack of difference in time to first ovulation between treatment and control groups may be due to the time that the implants were given.

**ASSESSMENT OF IMPACT OF THE MUNICIPAL LANDFILL IN BYDGOSZCZ
ON THE CONTENT OF TOTAL AND BIOAVAILABLE FORMS
OF SELECTED TRACE ELEMENT IN SOIL**

**OCENA ODDZIAŁYWANIA SKŁADOWISKA ODPADÓW KOMUNALNYCH W BYDGOSZCZY
NA ZAWARTOŚĆ FORM CAŁKOWITYCH I PRZYSWAJALNYCH
WYBRANEGO PIERWIASTKA ŚLADOWEGO W GLEBIE**

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Due to the risks which landfill may effect on the surroundings its location is very important. Improper positioning and the use of waste deposit site could influence on various components of the environment, such as soil, water, air. Such an element of anthropopressure may affect the continuous inflow of heavy metals into soil.

Material included 45 soil samples collected from 3 depths: 0-15 cm, 15-30 cm and 30-50 cm, from research points located 5, 10, 200 and 500 m from the municipal landfill (53°06'27.2 "N 18°12'57.2" E) and also from the test site (located 700 m from the landfill) toward the south- west according to wind rose.

In the research material selected physicochemical properties were determined: soil pH in the extracts: H₂O and 1M KCl, particle size distribution by laser diffraction method using a Mastersizer 2000 with the HydroµP, content of organic carbon by Tiurin method. The total content of selected trace element was measured using atomic absorption spectroscopy method on PU 9100X spectrometer (Philips) after mineralization in a mixture of HF and HClO₄ acids using Crock's and Severson's method, bioavailable forms in 1M diethylene triamine pentaacetic acid (DTPA) using Lindsay and Norvell's method. To validate the results, performed the analysis of soil samples from the test site which were processed with identical laboratory procedure as soil samples.

Pearson correlation coefficient ($p < 0.05$) were calculated between total content of selected trace element, its available forms and analysed soil properties. Correlation was performed in the Statistica 10.0.

On the basis of the analytical results it was calculated contamination factor, assessing the impact of human activities on the soil (CF). The indicator of bioavailability was also calculated, which is the percentage share of bioavailable form to the total content of selected trace element.

The studied soil samples were characterized by a moderate or significant contamination factor, in reference to the geochemical background. Low total concentrations of selected trace element suggest the lack of a direct impact of the municipal landfill in the Bydgoszcz city on soils of surrounding areas.

**ECONOMIC AND ENVIRONMENTAL ASPECTS OF REPRODUCTION
AND FUNCTIONAL TRAITS IN PIG BREEDING***

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To the sustainable pig farming well organized breeding programs are needed. The breeding goals of pigs have been focused mainly on litter size at birth and at weaning, daily gain from birth to slaughter, meat percentage and feed *conversion*. However, the traits related to higher efficiency and minimised costs are included there in view of the economic situation. The main aim of this study is to provide a comprehensive overview of the currently trends in reproduction and functional traits in pig breeding. Generally, sow longevity is considered as a key component of effective and profitable pig farming. Longevity is usually defined as the length of sow's life from birth to end date, length of productive life from first farrowing to end date, lifetime number of piglets born alive and parity number at end date. Instead of sow's longevity sow production ability through reproductive traits, e. g. litter size, oestrus symptoms and number of piglets born alive are evaluated in some papers. Regarding to the reproduction and functional traits their economic importance should be clarified/defined. For example, a higher conception rate causes less unproductive days and reduces the number of semen doses needed. The higher survival rate after weaning is related with cost-saving at farm, and vice versa. On the other side, higher age at puberty is associated with higher maintenance feed and operating costs for replacement gilt. In relation to costs it should be mentioned that economic value of mature weight of sows is related with extra capital investment required over time to accommodate the larger breeding sows. Selection of pigs focused only on economically important traits leads to increased productivity with a long-term unfavourable side-effect on welfare and health. An increase of production is therefore not always the first priority in breeding programs. Moreover, concentration of the public for welfare and health of livestock production has increased in Europe in recent years. Therefore, next to the economic also the environmental benefit of functional and reproduction traits could be taken into account. Improvement of vitality is the most common way to consider the environmental benefit of functional traits. In pig production, vitality is generally defined as the ability of a piglet to survive, based on its survival at birth and/or till weaning. The vital gilts are also expected to have less feet and leg problems and therefore lower chance of being culled. Moreover, the piglet survival is related with the lactation efficiency which can be measured as ratio of energy intake in the feed to energy used. Phenotypes related to reduce carbon footprint could be taken into consideration. Effort can be oriented to the special feeding programme and to improve digestibility of nutrients. To consider these traits (without direct revenues) a non-market value is needed to be expressed. For this reason a methods based on survey technology and on individual preferences are mostly used. Implementation of the welfare traits in breeding programs requires other prerequisites than only the genetic gain. It will be driven also by a higher price for products labelled as "animal friendly" and by social trends and expectations. The progress and redefinition of breeding goals needs to be balanced for sustainable pork production.

* The study was funded by the project QJ1310109 of the Czech Republic.

**PERFORMANCE TEST ANALYSIS OF PURE BREED GILTS PRODUCED
IN THE BYDGOSZCZ BREEDING REGION**

ANALIZA OCENY PRZYŻYCIOWEJ LOSZEK CZYSTO RASOWYCH PRODUKOWANYCH
W BYDGOSKIM OKRĘGU HODOWLANYM

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Significant progress of pigs breeding value in terms of growth and slaughter performance occurred as a result of breeding work carried out on the basis of performance test. Its results are one of the main criteria in the selection of pigs for breeding and producing herds. In Poland including The Bydgoszcz Breeding Region performance tested are gilts of following pure breeds: Polish Large White, Polish Landrace, Hampshire, Duroc and Pietrain and crossbreeds obtained from reciprocal crossing of PLW and PL breeds i.e.: PLW x PL and PL x PLW. The Bydgoszcz Breeding Region is located in Kujawy-Pomorze Province and has a leading position in pig production in the country and young boars and gilts being produced here impact on the level of usefulness of this animal species in Poland. The research covered the results of 12.966 gilts: Polish Large White (PLW), Polish Landrace (PL), Hampshire (H), Duroc (D) and Pietrain (P). Gilts were performance tested in years 2011-2014 in The Bydgoszcz Breeding Region with accordance to actual, modified methodology which in calculation of the selection index takes into account the daily gain of body weight standardized on 180th day and the percentage body meat content. The results were statistically elaborated using two-way variance analysis ANOVA. The significance of differences among analysed groups of gilts (1-5) in tested years and years (2011-2014) when performance test was done assumed as groups 1-4 were verified by Duncan test. Computer program Statistica 8.0 PL was used for calculations. Among pure breed breeding gilts performance tested in The Bydgoszcz Breeding Region in years 2011-2014 Hampshire gilts had the highest daily gain of body weight standardised on 180th day of life: 737 g (2011), 750 g (2012), 730 g (2013) and 999 g (2014). Pigs of Hampshire and Pietrain breed had the highest meat content, i.e. 61.4 and 62.0% in 2011; 62.0 and 61.8% in 2012; 61.9 and 61.4% in 2013 and 61.9% in 2014, respectively. The highest selection index value providing the highest breeding value in terms of growth and slaughter traits had Hampshire gilts (126 points – 2011, 131 points – 2012, 127 points – 2013, 130 points – 2014) and Pietrain (121 points – 2011, 122 points – 2012, 124 points – 2013, 122 points – 2014) and Polish Large White (128 points – 2013). Analysing the results from years 2011 and 2014 it was observed the increase of performance test selection index value in all tested pure breed gilts i.e. PLW, PL, Hampshire, Duroc and Pietrain by 5, 4, 4, 6 and 1 point. It proves effective improvement in terms of this trait of a pure breed gilts from The Bydgoszcz Breeding Region over the period of 2011-2014 years.

**EFFECT OF ENERGY IN DIETS ON MECHANICAL ENDURANCE
OF CORNU ASPERSUM MAXIMA SHELL AT THE FINISHING PERIOD OF FATTENING**

WPŁYW ZAWARTOŚCI ENERGII I JEJ DOSTĘPNOŚCI W PASZY
NA WYTRZYMAŁOŚĆ MECHANICZNĄ MUSZLI ŚLIMAKA Z GAT. *CORNU ASPERSUM MAXIMA*
W KOŃCOWYM ETAPIE TUCZU

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The intensification in brown snail (*Cornu aspersum*) production cause an increase in their growth rate, what leads to low mechanical endurance of its shell. Mechanical properties are especially important in processing. Insufficiently durable shells can be damaged in chemical-mechanical cleaning process. Shells are commercial product, and it effects as a financial loss for a producer (Ligaszewski 2005). Mechanical properties depend on: genetic constitution, microclimate, stocking density, nutrition and structural maturity. (Ligaszewski 2005) The objective of the current study was to determine a possibility to increase mechanical endurance of brown snail shell at the finishing period of fattening.

Studies were carried out on 125 *Cornu aspersum maxima* snails after first period of fattening. The animals were divided into five groups (A, B, C, D, E) of 25, in each. The snails were fed, according to the INRA (1990) system, the basal diet with following chemical composition: 16.7% CP, 4.5% CF, 2.5% CF, 35% ash (manufacturer's data). The daily feed ration was enhanced in the following supplements: group B had an addition of 2% of rapeseed oil; group C 4% rapeseed oil; group D had an addition of 0.5 g/kg of feed, dried herbs supplement „Superliv”; group E 0.05 g/kg of feed enzyme supplement „Rovabio”. The group A was a control group. The study lasted 30 days. At the end of the investigation shells were manually cleaned, weighted and mechanically tested. Assessment of mechanical endurance was made by uniaxial compressing using Texture Analyser TA.HD PLUS (Stable Micro Systems). After that, three mechanical parameters were determined: hardness (as the maximum force [N] observed in test), fracturability (force [N] value that caused first decrease of compressing force over 0,1 kg,) and work of fracture (work done by piston till fracturability value appears). Mean values of those parameters were compared using the Mann –Whitney U test.

The hardness obtained for A, B, C, D and E groups was respectively: 115.88 (± 40.56), 114.98 (± 35.29), 101.50 (± 31.57), 116.63 (± 26.28), 95.38 (± 32.82). Where values in brackets are standard deviations. There was no significant differences ($p \leq 0.05$) between the groups except that both mean values for B and D groups were significantly higher than mean value for E group. The fracturability mean values for shells from each group were in sequence: 37.14 (± 34.81), 37.29 (± 35.75), 41.21 (± 24.68), 45.00 (± 31.15) and 40.89 (± 25.52). In the case of fracturability there was no significant differences at all. Similarly as in the case of work of fracture, which mean values for each group were in sequence: 3.32 (± 5.12), 4.46 (± 5.57), 3.99 (± 4.63), 5.15 (± 5.83) and 3.87 (± 4.03). In the case of the mass the results are in sequence: 2.59 (± 0.41), 2.29 (± 0.52), 2.36 (± 0.34), 2.50 (± 0.54) and 2.42 (± 0.40) g. The reason of the general lack of significant differences was the high variability within groups in each parameter which is evidenced by relatively high standard deviation.

Despite a lack of statistically significant differences between groups (also in their mass), there was some tendencies of fracturability. Shells from groups B, C, E and especially D had lower level of fracturability and bigger work of fracture than in control group (A). There was differences in shells from group D, that characterized by better hardness, than those from group C and E. It could be an influence of excess energy available in feed on mechanical endurance. In general statement the most durable shells are from group D. However, the results of this study don't give the unambiguous answer that supplement Superliv had effect on mechanical endurance of shell. Small contribution of energy and dry herbs supplement effects on increase in work of fracture.

**ASSOCIATION OF SELECTED GPAT I GENE POLYMORPHISMS
WITH MEAT TEXTURE PARAMETERS IN PIGS**

ZWIĄZEK WYBRANYCH POLIMORFIZMÓW GENU GPAT I
Z PARAMETRAMI TEKSTURY MIĘSA WIEPRZOWEGO

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GPAT I (*GPAM*) gene encodes a glycerol-3-phosphate acyltransferase mitochondrial enzyme, which plays an essential role in triacylglycerol (TG) biosynthesis. The GPAT enzyme initiates the pathway of TG synthesis by catalyzing the esterification of long-chain acyl-CoAs at the sn-1 position of glycerol-3-phosphate. In this reaction the lysophosphatidic acid (LPA) is produced. It is well known that TGs are the main constituents of body fat in humans as well as in animals. The aim of present study was to analyze three selected polymorphisms of the ENSSSCT00000011627, one localized in intron 1 and two localized in 3'UTR region within porcine *GPAT I* locus and to estimate their association with meat texture parameters in pigs.

Analysis was performed on five breeds (Polish Landrace, Polish Large White, Puławska, Pietrain, Duroc), in total on 709 pigs, maintained in the Pig Performance Testing Station (SKURTCh) of National Research Institute of Animal Production. The DNA was isolated from whole blood collected into EDTA tubes with the use of Wizard Genomic Purification Kit (Promega). Searching for polymorphisms was carried out in fragments of the *GPAT I* gene that might influence the activity of produced protein (active center/functional domain) as well as in promoter and miRNA binding sites (3'UTR). Based on DNA sequence for *GPAT I* gene, which is available in ensemble.org database, primers were designed using Primer 3 software, and which were used for High Resolution Melting (HRM) analysis. Individuals that showed different pattern of melting curve were selected to DNA sequencing, to the polymorphism identification. DNA sequencing was performed using capillary sequencer CEQ8000 Genetic Analysis System (Beckman Coulter, Brea, CA, USA). The results were analyzed using CEQTM Genetic Analysis System (Beckman Coulter) and Finch TV software. Estimation of the frequency of ENSSSCT00000011627.2: c.37+55C>T; c.*116T>C; c.*186C>T genotypes were performed using PCR-RFLP method (with the use of RsaI, SfaNI and BbvI endonuclease, respectively). The meat texture parameters were determined for *longissimus dorsi* and *semimembranosus muscles* using a TA.XT PLUS Texture Analyser. The WBS analyses (Warner-Bratzler shear force) were performed for both raw and cooked meat (firmness and toughness), while texture profile parameters (TPA) were estimated only for raw meat (hardness, cohesiveness, springiness, chewiness and resilience).

The association between meat quality traits and different *GPAT I* genotypes was performed using GLM procedure (SASv. 8.02).

Our results showed that ENSSSCT00000011627.2:c.37+55C>T polymorphism affects firmness in loin and four of analyzed texture parameters in *semimembranosus muscle*. Meat from pigs with TT genotype was characterized by lower firmness parameter ($p<0.05$) measured in cooked *longissimus dorsi muscle* compare to CT genotypes. The same trend was observed regarding the analyzed texture parameters in cooked *semimembranosus muscle*. Meat of pigs with TT genotype was characterized by significantly lower hardness ($p<0.01$), and lower springiness, cohesiveness as well as resilience ($p<0.05$) compare to CT genotypes. Results obtained also showed that ENSSSCT00000011627.2:c.*116T>C polymorphism is related to cohesiveness parameter in ham muscle: homozygotes CC were characterized by lower values than heterozygotes CT ($p<0.05$). Furthermore the last one of studied polymorphisms: ENSSSCT00000011627.2:c.*186C>T was associated with hardness in loin and cohesiveness in ham muscle of pigs. Homozygotes TT showed the lowest value for hardness parameter ($p<0.05$), while opposite homozygotes CC the highest. Concerning cohesiveness, homozygotes TT were characterized by the lowest value of this parameter ($p<0.05$) and heterozygotes CT by the highest.

THE EFFECTS OF AGE AND GENDER ON SELECTED SLAUGHTER TRAITS OF COMMON PHEASANTS (*PHASIANUS COLCHICUS*) REARED UNDER EXTENSIVE CONDITIONS

WPLYW WIEKU I PŁCI NA WYBRANE CECHY WARTOŚCI RZEŻNEJ BAŻANTA ŁOWNEGO (*PHASIANUS COLCHICUS*) UTRZYMYWANEGO EKSTENSYWNIE

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Pheasant meat can be acquired from birds hunted seasonally or raised on farms. Captive-bred pheasants are intended for meat production or are reintroduced into their natural habitats for hunting purposes. The rearing cycle is completed when the birds reach the desired weight and plumage quality. The recommended slaughter weight of pheasants is approximately 1 kg, and the birds have to develop full plumage before slaughter. According to the literature, the rearing period of pheasants ends at 11 to 24 weeks of age. Captive-bred pheasants intended for release into the wild are fed extensively to boost their vitality, enhance resistance to adverse environmental conditions, and facilitate adaptation to natural habitats. Pheasants raised extensively are characterized by lower body weights than intensively-fed birds. It should be noted that in the common pheasant, sexual dimorphism is manifested in differences between the sexes in both phenotypic traits and body size. Since pheasants raised in captivity for hunting purposes can also be used for meat production, it is important to determine the age at which males and females reach their target slaughter weight.

The aim of this study was to determine the effects of age and gender on selected slaughter traits of common pheasants raised extensively in percherries.

The experimental materials comprised male and female pheasants (*Phasianus colchicus*) raised to 150 days of age in the Konopaty Game Breeding Center in the Lidzbark Forest Division, in accordance with the guidelines relating to this species. From 70 to 150 days of age, at 10-day intervals, 16 birds (sex ratio 1:1) were selected randomly for slaughter and carcass quality assessment.

From 70 to 150 days of age, the age and gender of pheasants exerted significant effects on body weight, carcass weight and meat yield ($P < 0.05$). In 70-day-old birds, the average body weight of males was approximately 130 g higher than the average body weight of females (926 g ♂ vs. 796 g ♀). At 150 days of age, the difference in body weight between the sexes reached 400 g (1393 g BW ♂, 994 g BW ♀). At 70 and 150 days of age, average carcass weight was 660 g and 963 g, respectively, in males, and 564 g and 696 g, respectively, in females ($P < 0.05$). In 70-day-old pheasants, meat weight reached 465 g in males and 401 g in females, and in 150-day-old birds the respective values were 717 g and 516 g ($P < 0.05$). The carcass dressing percentage of males and females representing different age groups was similar, reaching 71.2% and 70.9%, respectively, at 70 days of age, and 69.1% and 70.0%, respectively, at 150 days of age. No differences in lean meat content expressed as a percentage of body weight were observed between males and females slaughtered at 70 days (50.2% ♂, 50.4% ♀) and 150 days of age (51.4% ♂, 51.9% ♀).

The results of this study indicate that male and female pheasants raised extensively reach the minimum slaughter weight at 80 days (1020 g) and 150 days of age (995 g), respectively. However, males and females aged 70 and 150 days are characterized by comparable carcass dressing percentage and lean meat content expressed as a percentage of body weight.

EVALUATION OF PHOTOSYNTHETIC EFFICIENCY OF OAT-MAIZE HYBRIDS*

**OCENA SPRAWNOŚCI APARATU FOTOSYNTETYCZNEGO MIESZAŃCÓW OWSA
Z KUKURYDZĄ**

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Wide crossing is one of the methods which are used in plant breeding to obtain new cultivars. Oat (*Avena sativa* L.) doubled haploid (DH) lines are obtained by pollination with maize. Usually in this method chromosomes from pollen donor are completely eliminated in the early stage of embryogenesis, but in oat it is possible to retain one or more maize chromosomes. As a result oat forms fertile hybrids with maize, called oat – maize addition lines (OMAs). Maize is characterized by C4 type of photosynthesis, whereas oat by C3. In C4 type of photosynthesis conversion of carbon dioxide to carbohydrates is more efficient than in C3 type. Hypothesis assumes that retained fragments or whole maize chromosomes in OMA lines affects to overall performance of the photosynthetic apparatus and results in morphological changes. The measurement of chlorophyll *a* fluorescence parameters is a convenient, non-invasive, highly sensitive and rapid technique which allows for detection even subtle differences in the activity of photosynthetic apparatus in plants.

The aim of this research was to evaluate the photosynthetic efficiency of OMA lines and oat DH lines without retained maize chromosomes by determination of the chlorophyll *a* fluorescence parameters.

The experiment was performed on 17 OMA lines and 3 DH lines obtained by wide crossing with maize. Chlorophyll fluorescence measurements were carried out on the fully expanded flag leaf using a portable fluorometer (Handy Plant Efficiency Analyzer, Handy PEA; Hansatech Instruments Ltd., King's Lynn, Norfolk, UK) at ambient temperature after at least 15 min of leaf adaptation to dark conditions in leaf-clips. The following parameters were calculated per excited leaf cross-section (CS): F_v/F_m (maximum photochemical efficiency), PI (overall performance index of PSII photochemistry), ABS/CS (light energy absorption), TR_o/CS (excitation energy trapped in PSII reaction centers), DI_o/CS (energy dissipated from PSII, equal to $[ABS/CS - TR_o/CS]$) and ET_o/CS (energy used for electron transport). The measurements were performed in fifteen replicates for each DH line, in two growth stages: tillering stage and stage when the head completely emerged from the leaf boot.

The analysis of variance showed that the oat OMA and DH lines varied in values of chlorophyll *a* fluorescence parameters. All parameters showed high significance at a probability level of 0.001. Among the measured parameters, F_v/F_m and Area demonstrated the lowest variation between the lines, whereas the other parameters showed higher variation. Six OMA lines had higher values of ABS/CS , TR_o/CS , ET_o/CS and DI_o/CS parameters than other OMA and DH lines. It suggested that these six OMA lines had better photosynthetic efficiency despite the higher energy dissipation from PSII. Variation of chlorophyll *a* fluorescence parameters was higher in the tillering stage than in later growth stage.

* Research funded by Młodzi Naukowcy 2016 No. 3/2016.

EFFECT OF AMINO ACIDS BIOSTYMLATION ON THE PARAMETERS OF RAPE PHOTOSYNTHESIS (*BRASSICA NAPUS* VAR. *OLEIFERA*) IN ALLEVIATING ABIOTIC STRESS

WPLYW BIOSTYMLACJI AMINOKWASAMI NA PARAMETRY FOTOSYNTETY RZEPAKU (*BRASSICA NAPUS* VAR. *OLEIFERA*) W ŁAGODZENIU STRESU ABIOTYCZNEGO

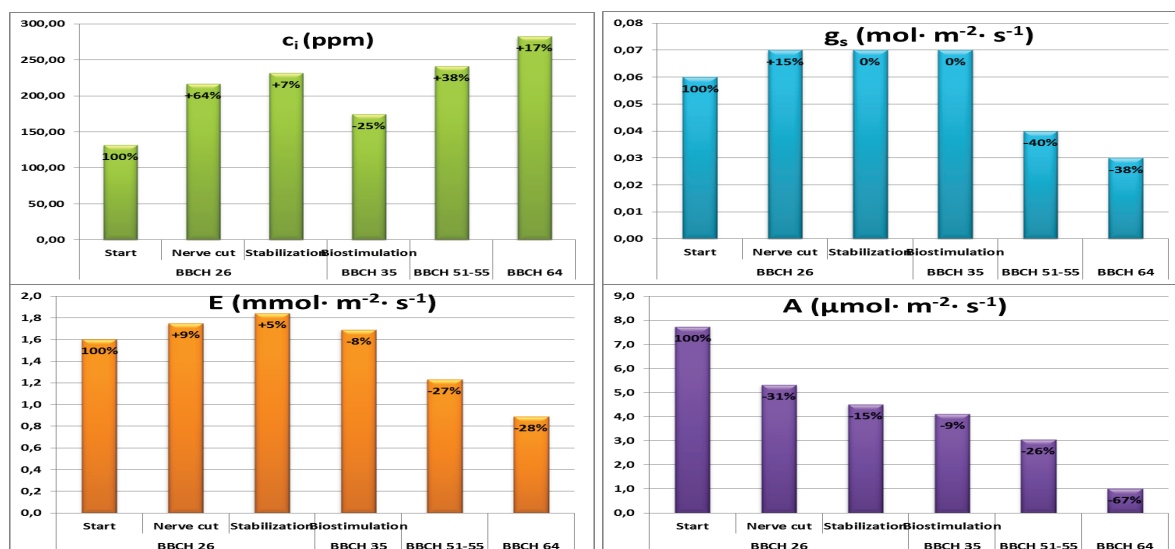
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Modern plant cropping system uses various types of biostimulants which improve the amount of yield without negative affect on its quality. This strategy allows to increase the biomass, but also induces the natural resistance of plants (Kocira 2016 Zodape et al., 2010 Złotek and Wojcik 2014). Natural products, such as extracts of aquatic species, can activate and strengthen the natural defense mechanisms of plants. It is widely recognized that these substances are safe for the environment. Fylloton as the biostimulating product enhances the metabolic processes in plants. It is produced based on natural components from *Ascophyllum nodosum*, and contains free amino acids of plant origin obtained by enzymatic hydrolysis (Kociara et al. 2015, Abad and Norouzpour 2013). It can be applied alone or together with the macro and microelements. The aim of the study was to determine the photosynthetic response of rape plants on Fylloton application in alleviating abiotic stress.

The subject of the study was oilseed rape (*Brassica napus* var. *oleifera*) cv. Californium. Plants at the stage of rosette (BBCH 26) were injured by the cut nerve root taken at the leaf base. The measurements were performed at 6 stages: before injury, immediately after the stabilization phase, one week after injury (at BBCH 35), one day and one week after the application of Fylloton (BBCH 51-55 and BBCH 64, respectively). Measurements were carried out under constant temperature (22°C), light intensity (360 $\mu\text{mol}\cdot\text{s}^{-1}\cdot\text{m}^{-2}$), and CO₂ concentration (300 ppm) by LCPro-SD system with an air-conditioned chamber. Photosynthetic assay included 4 parameters: stomatal conductance of leaves (Ci), intercellular CO₂ concentration (Gs), transpiration (E) and assimilation (A).

Mechanical stress caused by the incision main vein of the leaf rape induced an increase in intercellular CO₂ concentration, stomatal conductivity and transpiration. The use of Fylloton alleviated Gs and E, and increased intracellular concentrations of CO₂. Induced stress had a negative impact on the process of assimilation. Application of amino acids did not affect the improvement of this parameter. Oilseed rape plants growing in a crop field, during the growing season are exposed to various stresses occurring in nature. Therefore, the rapid methods to control stress and how to mitigate the consequences of stress at different stages of plant growth and development are needed.



**BEHAVIOURAL TESTS FOR THE ASSESSMENT OF MATERNAL RESPONSIVENESS
OF SOWS IN DIFFERENT HOUSING SYSTEMS**

ZASTOSOWANIE TESTÓW BEHAVIORALNYCH DO OKREŚLANIA TROSKLIWOŚCI
MACIERZYŃSKIEJ LOCH W RÓŻNYCH SYSTEMACH UTRZYMANIA

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Crushing is the main reason of piglet loss during the first few days after farrowing. Farrowing crates were developed largely to counteract the problem of high piglet mortality and since the 60's of 20th century there has been a strong worldwide trend to house the farrowing sow in crates of various designs. Recent years' animal welfare considerations have lead to increased interest in other solutions and systems for parturient and lactating sows including loose-housing. The impossibility of expression the natural maternal behaviour causes increased nervousness and higher activity level before parturition what can have an effect on the larger amount of crushing by sows or aggressive behaviour towards newborn piglets. Susceptibility of sows for the sounds of crushed piglets is the individual trait and in case of more susceptible sows there is lower number of crushed piglets. In this place it should be asked whether the construction and design of farrowing environment should limit the possibility of expressing maternal instinct, decreasing simultaneously risk of piglet being crushed (farrowing crate) or it should fully enable expression of maternal behaviour what can naturally minimize losses of piglets (farrowing pen). The aim of the study was to assess the maternal responsiveness of sows housed in two farrowing environments: 3-part farrowing crate and Danish type farrowing pen. The behaviour of 24 sows (12 in crates and 12 in pens) in the parturition day and two days after farrowing was observed. The sows were tested on the basis of two behavioural tests during first three days after farrowing. Each sow was tested once per day. Test procedure: Test 1. Previously recorded as mp3 file 15 sec. squeak of the crushed piglet was played by the speakers inside the pen or crate of the sow when the sows were laying. The wireless transmission of sound and remote video observation were used so there was no influence of staff presence in the experimental room. The reaction of the sow was observed during 30 seconds after playing the squeak. The following scale of reaction was taken: 0 – no reaction of the sow, 1 – slight movement of the sow's head, 2 – rise of the head, 3 – rise of the front legs, 4 – quick rise of the whole body and quick lying down, 5 – the rise of the whole body, the sow keeps a lookout for piglets, sniffs out. Test 2. Squeak of the crushed piglet was played when the sow was changing the body position from standing to laying. Scale used: 0 - the sows quickly lays down, 1 – the sow stops laying and stands up after a short while, 3 – the sow stands up quickly. The behavioural tests showed that sows housed in farrowing pen were more susceptible for sounds of the piglets in danger. The mean for three days of observation achieved in test 1 was 3.86 and 4.21, respectively for farrowing crate and farrowing pen. The differences were statistically significant ($p < 0.05$). Test 2 confirmed above statement – sows housed with the possibility of free movement were more careful. The average results in test two were as follows: 2.04 and 2.38, respectively for farrowing crate and pen. Differences were statistically proved ($p < 0.05$).

Tests showed higher maternal responsiveness of sows which were able to turn around, sniff and look at their offspring. The behavioural tests could help to assess the maternal responsiveness of sows after first parturition regardless of real results of rearing piglets by the sow, what could help breeders to eliminate very early sows with poor maternal abilities.

ACUTE TOXICITY OF GOSSYPOL ON NORTHERN BOBWHITES

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Gossypol is a toxic secondary plant compound found in cotton (*Gossypium* spp.). Because of gossypol's toxicity to many animals, particularly monogastric mammals, cottonseed-based feeds are currently under investigation as a possible control agent for feral swine. However, concerns have arisen regarding the effects of gossypol ingestion on non-target wild animals. A species of particular concern is northern bobwhite (*Colinus virginianus*), a species of significant economic and cultural value. We determined the oral LD₅₀ of gossypol in northern bobwhites following the EPA's OCSPP 850.2100 Guideline: Avian Acute Toxicity Test. Through a range-finding test, we estimated that the LD₅₀ was between 200 mg/kg and 1,000 mg/kg body weight [BW]. Following the range-finding test, we administered a single oral dose of refined gossypol to quail at 262 mg/kg, 342 mg/kg, 447 mg/kg, 585 mg/kg, and 765 mg/kg BW. We observed quail daily for mortality or any signs of intoxication throughout a 28-day observation period. We measured feed consumption daily and body weight intermittently. We monitored sublethal effects, including: gross appearance, behavior, gross pathology, and histopathological and physiological changes. Using probit analysis, we determined that the oral LD₅₀ of gossypol in northern bobwhites is 651 mg/kg BW (95% CI, 579 ≤ x ≤ 731). Results suggest that the level of gossypol found in cottonseed is insufficient to cause direct mortality in northern bobwhites. Further research will investigate the long-term effects of gossypol ingestion on northern bobwhite health and reproductive parameters.

**THE RELATION BETWEEN PERFORMANCE, PHYSIOLOGICAL
AND BEHAVIOURAL PARAMETERS DURING FOUR DIFFERENT BEHAVIOURAL TESTS
IN YOUNG HUCUL HORSES**

ZALEŻNOŚCI MIĘDZY WYNIKAMI TESTÓW ORAZ PARAMETRAMI FIZJOLOGICZNYMI
I BEHAWIORALNYMI MŁODYCH KONI HUCULSKICH PODCZAS CZTERECH
RÓŻNYCH TESTÓW BEHAWIORALNYCH

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It is suggested that horses' learning abilities are task-dependent. Furthermore, it is known that motivation can influence learning, but it is unknown to which extent food motivation is linked to performance in positively reinforced learning tests.

This study aimed to investigate the correlation between performance, physiological and behavioural parameters of young horses in four different behavioural tests.

Methodology: 25 naive Hucul horses were used in this experiment. Four different tests were performed on all horses. Two tests were designed to assess food motivation: 1. Lever (LT): Horses were trained to press a lever for a food reward. Required number of presses was increased by 3 every 2 trials. The number of training sessions and the highest number of presses were analyzed. 2. Jumping (JT): Horses had to cross an obstacle for a food reward. The height was raised (5 cm) after each trial (the height was scored numerically as levels 1-11). The level of an obstacle and latency to cross was measured. Furthermore, two learning tests were conducted: 3. Clicker (CT): Using clicker training, the horses were taught to take 3 steps forward and backwards following the target. The training was performed in 10 stages, the time to reach learning criterion was measured. 4. Visual discrimination (VD): Horses had to learn to recognize a bucket with food (there were two buckets that varied in shape, color, and size and only one of them contained food). The number of learning sessions and mistakes were analyzed.

In all tests, food that was familiar to horses was used (full grain oat). During all tests, the heart rate (HR) was measured with Polar heart rate monitor (RS400). Saliva samples, for salivary cortisol (SC) measurement, were collected before tests and 10 minutes after each test. The horses' behaviour assumed as nervous (NB) was recorded (running, alertness and flight responses).

Heart rate correlated positively between all tests ($r = 0.6-0.8$; all $P < 0.05$). The level of salivary cortisol correlated positively between JT and VD ($r = 0.44$, $P < 0.05$) and among CT and VD ($r = 0.49$, $P < 0.05$). There was a positive correlation between nervous behaviour and no. of training sessions in LT ($r = 0.43$, $P < 0.05$). This suggests that nervousness may decrease performance in learning tests. There were a few correlations in performance variables between tests, e.g. the highest number of presses in the LT test correlated positively to the max height of the obstacle in the JT test ($r = 0.46$, $P < 0.05$). This result suggests that both motivational tests may reflect the horses' willingness to work for food. Positive correlations were also found between training sessions for LT and the time to reach criterion in the CT ($r = 0.64$, $P < 0.05$). These parameters may reflect learning performance that involves the same acquisition mechanism. However, no correlations were found between performance in the two learning tests (CT and VD). This result is in accordance with previous studies showing that various tests may rank horses differently. In addition, no correlations were found between performance in the motivation tests and speed of learning in the learning tests, which may suggest that other factors were more important for learning in these tasks, or that the chosen criteria were inappropriate.

IDENTIFICATION OF COS MARKERS TIGHTLY LINKED WITH Rfc1 GENE THAT RESTORE MALE FERTILITY IN RYE WITH CMS-C*

IDENTYFIKACJA MARKERÓW COS ŚCIŚLE SPRZEŻONYCH Z GENEM Rfc1, KTÓRY PRZYWRACA PŁODNOŚĆ U ŻYTA Z CYTOPLAZMĄ STERYLIZUJĄCĄ CMS-C

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Winter rye (*Secale cereale* L.) is one of the most popular winter grain crop cultivated in Poland. It is commonly grown in Central and East Europe due to its excellent winter hardiness, tolerance to highly acidic soils and drought tolerance.

Significant part of rye cultivation area is occupied by hybrid cultivars, which in very efficient way exploit effect of heterosis. Almost all registered hybrids are produced with use of the Pampa cytoplasmic male sterility (CMS-P) system which was discovered by Geiger and Schnell (1970). Only a few European cultivars rely on Vavilovii type of sterility-inducing cytoplasm. Use of alternative source of CMS in practical breeding is strongly recommended. Significant aspect of hybrid plants production is constantly keeping plants with sterile phenotype. Fertility restoration (Rf) genes play important role in hybrid breeding. It is necessary to choose individuals with or without Rf genes, depending of purpose. Fast and easy way to select desired genotypes is feasible by application of molecular marker tightly linked with Rf gene.

The main purpose of this research is identification of newly developed COS (conserved orthologous markers) markers tightly linked to the Rfc1 gene. A mapping population used in this study was developed via crossing male sterile inbred line 544C with restorer inbred line Ot0-20. About 1200 individuals of this population (MOtN) were phenotyped. Two methods of male sterility assessment were applied: visual observations of pollen shedding by individuals with the use of the 9-step scale of Geiger and Morgenstern (1975) and analysis of seed setting within spikes isolated on each plant before flowering. Ninety-three individuals were genotyped using 51 COS. A set of orthologues EST markers were developed in Julius Kühn-Institute, 37 of them demonstrated polymorphism. Molecular mapping was established with the use of JoinMap4. Eighteen COS markers were used for construction one linkage group at LOD = 10. Total length of mapped fragment 4RL chromosome was 12.6 cM which gives an average density of 0.7 cM. Markers TC363404, c3116_a and c22574 was closely linked with restorer locus Rfc1. One of tested markers (c22574) demonstrated co-segregation with restorer gene. The Rfc1 was flanked by two remaining markers (TC363404 and c3116_a) and the distance between them was approximately 0,5 cM.

* This work was financially supported by Polish Ministry of Agriculture and Rural Development (Dec HORhn-801-PB- 6/16, project 20).

**ASSESSMENT OF RING-NECKED PARAKEET (*PSITTACULA KRAMERI*)
HATCHING IN PRIVATE BREEDING**

OCENA LĘGÓW ALEKSANDRETTY OBROŻNEJ (*PSITTACULA KRAMERI*)
W HODOWLI INDYWIDUALNEJ

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Ring-necked Parakeet are pleasant research materials, because they can be kept at home in a cages, as god as whole year aviaries. So we can learn their behaviour, or have a cute pet.

The study was taken in a private breeding in Masovian voivodship in 2010-2014. Breeding was carried out in the year-round outdoor aviaries. Observations were carried out on 4 pairs of ring-necked parakeet. Pairs were formed by: female 1 at the age of 4 years with a male 1 at the age of 2.5 years, female 2 at the age of 3 years with a male 2 at the age of 3 years, female 3 at the age of 3 years with a male 3 at the age of 3 years, female 4 at the age of 5 years with a male 4 at the age of 4 years (age at the beginning of observation period). After mating females laid eggs and sat them exclusively by themselves. They were laying eggs every 2 days, and pitting process started after laying the first egg. The analysis of hatching was based on the following indicators: the number of eggs laid by 4 females in the system of two clutches in one year.

Females of all pair, laid up from 1 to 6 eggs. At the first year of observation females laid 13 eggs, at the fifth 16 eggs. Indicators of ring-necked parakeet show individual variation between females. The worst results were observed in pair 3, with raised 0 chicks. The weakest results of this pair were in 2010 and 2011, when 0 eggs were laid. In 2012, 2013 and 2014 female laid only 1 egg, but all of the eggs were unfertilized. Pair 4 showed the best effectiveness of fertilization and good hatchability where 27 eggs were laid, only 1 were unfertilized and 23 chicks hatched.

Observations pairs of ring-necked parakeet presented good reproductive rates. The results of the present study may constitute the basis for making further observations of reproduction elements and incubation behaviour of the ring-necked parakeet and can be used in comparison of this kind of studies carried out in nature.

KITTENS' PROBLEM OF ADAPTATION

PROBLEMY ADAPTACYJNE KOCIĄT

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The problem of cats adaptation to the new breeding environment is a major challenge for breeders and behaviorists. Cats are territorial animals, so any change in their environment causes huge stress. It is believed that the adaptation to the new environment of a 3-month-old kitten should last no longer than one week. Very often cat adaptation takes much longer and is more difficult. Sometimes, in extreme cases, cats never adapt.

The topic of adaptation of kittens is very important, and at the same time very poorly-known aspect of cats' behavior. Many breeders avoid this topic – it is like a taboo. For years the general opinion was that the problem of adaptation applies to catteries that have a problem with kittens socialization, and do not care about their cats. Breeders are afraid of a negative opinion of others and loss of authority. No one shares his experiences in this area so the opinion that only badly socialized cats have the problems of adaptation to the new environment is being confirmed.

The main purpose of this study was to define the optimal adaptation conditions in new breeding environment based on the example of kittens. The research was based on the 50 surveys conducted among the new owners of kittens bred in selected breedings. Every survey consisted of 22 questions, related to factors present in the new environment, that could be stressful for kittens. The survey made it possible to verify the theories about certain means of adaptation acceleration generally accepted in the breeding environment. The results were analyzed using STATISTICA, rejecting extreme data not to affect the average. The surveys describe 28 males and 22 females.

The results of the survey showed that the period of adaptation depends on cat's sex. Females need 5.9 days on average to accept the new environment, while males need 7.1 days. Females exhibit better adaptability, because in the future they will be responsible for their kittens which implies necessity of fast reacting and decision making. Moreover, the time of adaptation increases with kitten's age.

Basing on the results of research, "transition areas" prolong time of adaptation. When used, time of adaptation was 14.3 days which is 3 days more than without them.. The research confirmed that newly arrived kittens need some time on their own to get used to a new home – constant presence of human forces them into possibly unwanted interactions.

Another important aspect which affects the time of adaptation is presence of children in new breeding environment. Kittens, which were not accompanied by children in the process of acclimatization, needed 7 days for effective adaptation, while the presence of children lengthened this time almost three times. Uncoordinated moves and high-frequency sounds of young children are stressful for kitten. The results of the survey showed that also presence and species of other animals in the new house has a large influence on time of adaptation. The time required for effective adaptation of kitten in the company of a dog was more than a month, while in the presence of another cat – about one week. Dogs show foreign, unknown for kitten behavior and reactions. Therefore, they need be together for more than a month to learn to read each other's needs.

The studies have shown that the problem of adaptation to the new environment is underestimated. It affects different cats, often sufficiently socialized. The time of adaptation is influenced by a huge number of factors and external stimuli. Studying the effect of only one factor on the adaptability of kittens is a mistake – we should explore all the elements as a one, related whole.

**STUDY AND IMPACT ASSESSMENT OF PHOTOVOLTAIC PROCESSORS
ON THE RURAL ENVIRONMENT**

**BADANIE I OCENA WPŁYWU PROCESORÓW FOTOWOLTAICZNYCH
NA ŚRODOWISKO ROLNICZE**

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One of the main cause of environmental degradation, including agricultural environment, is excessive consumption of energy from conventional sources. Because of the need to reduce greenhouse gas emissions and the need to increase the energy independence in countries and the progressive depletion of fossil fuels now a days, modern societies began greater usage of alternative energy sources that includes the Sun's energy. Each energy affects the quality of the environment, but not all of them to the same extent. Therefore, the essence of the present research was to implementation of environmental testing life cycle of plastics materials and components of photovoltaic power plants. Particular attention was focused on the aspects of an impact on the rural environment.

This paper consisted of proposing a methodology for analysis of ecological and energy analyzed the renewable energy source based on the method of LCA (Life Cycle Assessment). The object of research was a photovoltaic power plant with a capacity of 1 MW, situated in the north of Poland. In addition, the load placed on the agricultural environment has been characterized as a result of the life cycle of plants and the possibility of quantifying its impact. Examined and evaluated the level of impact on the rural environment of different processes of post-consumer management for selected power plant. In this paper provided identification of the dominant areas, aggravating human health, environmental quality and depletion of agricultural raw materials. Analysis was focused on every single stage of the life cycle of an object of research.

Analysis assess of the impact was made using computer software SimaPro 7.1. The program enabled the assessment of impact on agricultural environmental of photovoltaic power plant within one life cycle and through its various phases. For each phase had to be defined processes that will be applied, amount and type of materials and energy used what in a result constructed a model of lifecycles. The result of the study was an environmental factors that were expressed in environmental points (Pt), which are aggregated units that allows comparison of results of eco-balance. A thousand environmental points is equal to the impact on the environment made by average European in one year period.

The highest overall level of negative impact on the environment stood out on stage of the production resulting in 37770 Pt and development of postconsumer in the form of landfill waste: 4691 Pt. Phase of exploitation did not result in significant high impact on an agricultural environment what overall result was 32 Pt. Recycling these components after usage would make it possible to reduce the adverse impacts of the life cycle of total 23804 Pt, which would have a direct impact on improving the quality of agricultural environment. Highest harmful impact in all areas of interaction was recognized in a stage of production, which for the area of depletion of raw materials received value 21593 Pt, for human health: 13372 Pt, and the environmental quality of agricultural production: 3366 Pt. Recycling processes would allow for the minimization of significant adverse effects (Pt 11983 for material resources, about 10814 Pt human health and the Pt 934 for the quality of the agricultural environment).

Generally, however, a relatively trouble-free and long-term operation of photovoltaic brings many environmental benefits. In the interests of the people is skilful and rational use of renewable energy sources for the benefit of man and the world around him.

**POLYMORPHISM OF *IGF-1R* GENE IN RELATION TO CARCASS
AND MEAT QUALITY TRAITS IN PIGS**

POLIMORFIZM GENU *IGF-1R* W ODNIESIENIU
DO CECH JAKOŚCI TUSZY I MIĘSA U ŚWIŃ

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The aim of this study was to determine possible associations between *IGF-1R* polymorphism (1:153562561T>C) and carcass and meat quality traits in pigs.

Investigations were carried out on 369 pigs belong to five breed groups: Landrace (n = 75), Landrace x Duroc (n = 107), Landrace x Yorkshire (n = 68), (Landrace x Yorkshire) x Duroc (n = 75) and (Landrace x Yorkshire) x (Duroc x Pietrain) (n = 44). The animals were slaughtered at 100-115 kg live weight by use electric stunner after 4-5 h transport on distance about 300 km during autumn and winter months. Rearing and feeding condition were equalized for all analyzed animals. Twelve carcass quality traits and eighteen meat quality traits were measured in obtained fragments of the *Longissimus lumborum* muscle (after last rib).

Polymorphism of *IGF-1R* gene, located in the intron 9 was detected by use PCR-RFLP method with *SacII* restriction enzyme.

The data was statistically analyzed using two-way non-orthogonal analysis of variance taking into consideration influence of the genotypes, breed groups and their interactions.

In the analyzed pigs three *IGF-1R* genotypes were present – *CC*, *CT* and *TT*, which frequency differed statistically significant ($P \leq 0.01$ and $P \leq 0.05$) between breed groups. Highest heterozygosity were noticed for (Landrace x Yorkshire) x (Duroc x Pietrain), however lowest for Landrace breed.

Breed group influenced almost all of the analyzed carcass (10 of 12) and meat (15 of 18) quality traits ($P \leq 0.01$ or $P \leq 0.05$). *IGF-1R* genotypes were associated only with one trait – R_1 (IMP/ATP) ($P \leq 0.05$) with highest value for *CT* genotype and lowest for *CC* genotype. Interaction between *IGF-1R* genotypes and breed groups was also observed for this trait ($P \leq 0.01$).

TIMING OF EMBRYO DEVELOPMENT AND QUALITY OF PIG EMBRYOS RESULTED FROM IN VITRO FERTILIZED OOCYTES WITH EJACULATED OR EPIDIDIMAL BOAR SEMEN*

TEMPO ROZWOJU I JAKOŚĆ ZARODKÓW ŚWINI UZYSKANYCH PO ZAPŁODNIENIU *IN VITRO* OOCYTÓW EJAKULOWANYM LUB NAJĄDRZOWYM NASIENIEM KNURA

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In our recent study we demonstrated that the developmental competence of embryos obtained after *in vitro* fertilization (IVF) of ejaculated and epididimal boar semen is comparable. The next step of our study was to compare the timing of embryo development and quality of pig embryos resulted from IVF oocytes with ejaculated and epididimal boar semen.

The epididimal semen (experimental group) was obtained after slaughter from 4 selected boar of different breeds. The collected semen was diluted in "Biosolwens +" and assessed under the microscope. For the control group ejaculates were obtained from one, cross-breed selected boar. After collection and assessment both groups of semen (experimental and control) were capacitated in a medium based on TCM-199 for 1 hour and then semen was used for IVF. Cumulus-oocyte complexes were collected from pig's slaughterhoused ovaries and matured in the modified TCM-199 medium. Matured oocytes were assessed and used for the IVF. Presumptive zygotes were cultured in NCSU-23 medium for 8 days, up to the blastocyst stage. After culture the time of development, the number of total cell nuclei per blastocyst and number of apoptotic nuclei was checked. For statistical analyze the t-student and Chi-squared-tests were used. The results have been shown in the Table 1.

Table 1. Timing of embryo development, the number of total cell per blastocyst and number of apoptotic nuclei of pig embryos resulted from oocytes with epididimal (experimental) and ejaculated (control group) boar semen.

Group	Blastocysts (day of culture)					
	Days 7			Days 8		
	n (%)	mean number of cells nuclei	mean number of apoptotic nuclei	n (%)	mean number of cells nuclei	mean number of apoptotic nuclei
exp.	11 (61.1)	27.4	0.2	7 (38.9)	27.2	1.6
control	4 (44.4)	22.6	0.6	5 (55.6)	19.3	0.4

Timing of embryo development up to the morula stage in both experimental and control groups was identical. In the Day 7 of culture the percentage of obtained blastocysts was higher in the experimental (61.1) than in the control group (44.4), but the difference was not significant. Also there was not significant difference in the percentage of obtained blastocysts in Day 8 of culture between the control (55.6) and the experimental group (38.9). Moreover, the results shows, that there were no significant differences in the mean number of cell nuclei and mean number of apoptotic nuclei between the experimental and control groups.

In conclusion, the results demonstrated that the quality of pig embryos obtained after *in vitro* fertilization by both the epididimal and ejaculated semen was similar, but the timing of embryo development to the blastocyst stage was slightly higher for embryos resulted from IVF oocytes with epididimal than ejaculated boar semen.

* Supported in part by Fund of Own Research of IZ PIB no. 07-2.06.7 (2015-2016) and Predoctoral Research Funded by Ministry of Agriculture no. 11-0.07.1 (2015-2016)

**EFFECTS OF SOME GROWTH PROMOTING BACTERIA
ON TRITICUM AESTIVUM L. GROWTH**

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Usege of the unconscious and excessive doses of pesticides and chemical fertilizers to ensure increased efficiency in the agricultural sector along with causing the accumulation of vast amount of toxins in the plant, disrupts soil structure, causes the land to desertification and the loss of vitality. Therefore, to avoid negativity that occurs excess use of chemical pesticides and fertilizers, microorganisms can be used instead of chemicals. *Rhizobacteria* which induces plant growth, besides their stimulatory effects, they are effective in biological control of diseases.

In the study five different *Triticum aestivum* varieties were used along with six bacteria species plus negative control. Bacteria species used in the study were *Azotobacter* sp., *Bacillus subtilis* ATCC 6633, *Bacillus cereus* ATCC 11778, *Pseudomonas aeruginosa* ATCC 35032, *Enterobacter aerogenes* ATCC 13048 and *Serratia marcescens* ATCC 13880. Sterile distilled water was used as negative control. Bacterial suspensions were prepared at the concentration of 10^8 cfu/ml and injected 5 ml for each variety. Surface sterilization of the seed were made with %5 hipochlorite solution. After sterilization 100 of seeds were put in petri dishes and left at 25°C for 3 days for germination. At the end of the period germinated seed were counted. Another set of seeds, 5 seeds for each variety, will be sterilized and put in the soils in flowerpots. Flowerpots were left in climate chamber at 25°C at 13 h of light and 11 h of dark for 10 days. After ten days of growth period measurements of stem length, root length, stem radius, root radius and leaf width were measured with digital compass and recorded.

In petri dish experiments it can be seen that three bacteria (*B.subtilis*, *B.cereus*, *P.aeruginosa*) induced germination ratio. While control group has a germination ratio of 97%, experiment group's germination ratio is above 95% except *E.aerogenes* which has 88.8% germination ratio. Among these six bacteria *E.aerogenes* lowest germination ratio (88.8%). Aldane was the most effected variety among all five varieties. It's germination ratios change between 73%-100% while control group has 93% germination ratio. Pehlivan was the least effected varieties with the control group 99%, experiment group between 95%-100%.

In soil experiments three bacteria species (*B.cereus*, *Azotobacter* sp.) reduced the stem length and root length while others (*B.subtilis*, *S.mercencens*, *P.aeruginosa*, *E.aerogenes*) increased. *B.subtilis* increased all criterias most effectively while *B.cereus* reduced all selected criterias except root length most effectively. When we looked to the overall effects of the bacteria on the selected criteria we can say that bacteria decreased more than half of the selected criteria. It can be said that soil contamination can be harmful to the crops until further experiments are done.

**THE EFFECT OF PIGLETS BODY WEIGHT AT BIRTH
ON THEIR REARING AND FATTENING RESULTS**

WPŁYW MASY CIAŁA PROSIĄT PRZY URODZENIU
NA WYNIKI ICH ODCHOWU I TUCZU

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The aim of this study was to assess the influence of body weight at birth on results of rearing and fattening. 222 piglets were provided with the evaluation from birth to weaning, and further as porkers to the end of the fattening period. Piglets were acquired from 17 litters from F1 sows (pbz x wbp) after 9 ♂ pietrain and 8 ♂ hybrid P76.

The criterion of division of piglets on groups was their body weight at birth (I group – <1.2 kg, n = 59; II group – 1.2-1.7 kg, n = 101; III group – >1.7 kg, n = 62). In the period from birth to weaning there were assessed: number of piglets in 1, 21 and 28 day of life, their body weight in 1, 21 and 28 day, the sex and the mortality during rearing. The fattening period of animals was from 30 up to 120 kg body weight. Fattened features were subjected to the evaluation, i.e.: the body weight: at the beginning of the fattening, after 2 months and at the end of fattening, total increases and the rate of growth and slaughter features: weight of the warm carcass, slaughter yield and meatness. The highest losses piglets for the all period rearing from 1 to 28 day was noted in the group of highest piglets (3.60%), lowest in III group most heavy (of 0.45%), in the period of fattening in group of II any death falls was noted. Together with the increase in the birth body weight of piglets in individual group, their weight rose during rearing in 21 and 28 day of life, as well as in further stages of fattening ($P \leq 0.01$). Together with the increase of body weight at birth the piglets had increased growth rate in the period rearing of piglets ($P \leq 0.01$) and in the course of the fattening ($P \leq 0.05$), as well as greater mass of the warm carcass ($P \leq 0.05$). Obtained the high coefficients of correlation between the body weight of piglets and the body weight in 21 day ($r = 0.620^{xx}$) and into 28 day ($r = 0.606^{xx}$) they proved about the essential influence of birth body weight on their later growth and development ($P \leq 0.01$). Proven, that occurring differences in the moment of birth are held and they increase in growth of piglets and exert essential influence on their later growth rate, survivability and fattening features.

**THE EFFECT OF BIOACTIVE SUBSTANCES ON THE MICROSTRUCTURE
OF PECTORALIS SUPERFICIALIS MUSCLE OF BROILER CHICKENS**

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The ban of use of antibiotics as growth promoters has created a high demand for an alternative substances, equally effective. Bioactive substances may constitute an alternative to antibiotics. Probiotics are mixtures of microorganisms that enhance the effectiveness and yield of nutrient absorption by competing for the substrate against pathogens that may cause intestinal infections. Prebiotics are organic substances, which include complex carbohydrates (polysaccharides) and have influence on growth and activity of the desirable intestinal micro-flora. Synbiotics are a combination of the both of them. The aim of this study was to analyze the impact of probiotic and synbiotic added to commercial feed on pectoral muscle microstructure in broiler chickens.

Research material consisted of 36 Ross 308 cocks. Birds were divided into 3 groups, 12 individuals each. Group 1 (control – C) was fed a commercial diet, group SYN was fed the same diet with added synbiotic: 0.8% of prebiotic RFO extracted from lupin seeds and 1% of probiotic Lapivan (with *Lactobacillus* and yeast) and group LAP was fed with commercial diet with addition of 1% probiotic Lapivan. The additives to feed were used in the first 7 days of rearing. Birds were slaughtered at day 42. Immediately after slaughter, for histological analysis the samples of *pectoralis superficialis* muscle was taken and frozen in liquid nitrogen. Muscle tissue was cut into sections (10 µm thick) at -25°C using a cryostat. Microstructure of *pectoralis superficialis* muscle was evaluated on histological slides using H+E and Oil Red staining. The Opta-Tech microscope equipped with camera was used to record microscopic images on a computer disk. MultiScan v. 18.03 microscope imaging software was used to evaluate fiber diameter, fibre density per 1.8 mm², histopathological changes in muscle and intramuscular fatty tissue content (per 3.6 mm²). The results were subjected to one-way analysis of variance using Statistica 10.0 PL.

There was no effect of bioactive substances on body weight and weight of the pectoral muscle of chickens. The diameter of the muscle fibers ranged from 52.8 µm in group SYN to 55.8 µm in group C. The density of the fibers per 1.8 mm² was at a similar level, from 301.3 in group C to 320.9 in group SYN. Intramuscular fatty tissue content in pectoral muscle of chickens amounted from 1.5% in group C to 2% in group LAP. In case analyzed traits of muscle microstructure, there was no statistically significant differences between the groups of birds. When assessing the occurrence of pathological changes, in group LAP was observed significantly more fibre atrophy in comparison to group C and significantly more necrosis with phagocytosis than in group SYN. However, the significantly more fibre splitting was in group C compared to LAP. Positive effect of the probiotic Lapivan on the occurrence of fibre splitting was observed, but other changes in muscle occurred with greater frequency and percentage of normal fibres in this group of chickens was less.

**INFLUENCE OF ESTRUS TO CHANGES IN THE RUMINATION
AND LOCOMOTION ACTIVITY OF HEIFERS AND DAIRY COWS***

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The aim of the work is focused on the evaluation of the locomotion activity and rumination in heifers and Holstein dairy cows during estrus. We have analyzed the locomotion activity and rumination using the Heatime RuminAct device on 99 dams (68 dairy cows and 31 heifers) and we evaluated a total of 213 estrus cycles during the reference period of 3 days before estrus, 3 days after estrus and on the day of the estrus occurrence. The data was analyzed using the DataFlowTM II program. Besides of this, it evaluates the influence on age and parity (heifers, primiparous and multiparous cows) and daily milk yield (high – with daily production over 35.4 kg and low milk production cows, with daily milk production under 35.4 kg) on the locomotion activity and rumination changes.

The locomotion activity of cows was expressed in the units of locomotion activity in 24 hours (u/24 h). During the reference period, 3 days before estrus the cows showed locomotion activity 603 u/24 h., with an increase in the locomotion activity on the day of estrus of 876/24 u/24 h (+45.3%) and during the reference period 3 days after estrus the level of locomotion activity decreased to 566 u/24 h, what is the similar locomotion activity to the reference period before estrus. In term of evaluation the influence of the parity on the locomotion activity during estrus we registered the highest locomotion activity in the group of heifers and primiparous cows (929, 934 u/24 h respectively), where the multiparous cows achieved an average locomotion activity of 775 u/24h during estrus time. The daily milk production also strongly influenced the locomotion activity. During estrus time, the high production cows showed a lower locomotion activity -5.4% on average.

Ruminations of dams were expressed in minutes per 24 hours (min/24 h). The analyses of impact the rumination to estrus cycles showed that, the reference period 3 days before estrus found an average rumination of 554 min/24 h. On the day of estrus was statistically significant decrease in rumination time to 492 min/24 h (-62 min/24 h, -12.6% respectively) and in the reference period of 3 days after estrus, the averages of rumination increase on 548 min/24 h. For parity, the most significant decrease occurred in the time of rumination (from 537 to 462 min/24 h) at category of heifers (-75 min/24 h, -16.2% respectively), and at least in multiparous cows (-50 min/24 h, -9.9% respectively). In assessing the impact of milk production at the level of rumination in the categories of high producing dairy cows compared to the reference period of 3 days before estrus we recorded reduce in rumination about -64 min/24 h and low production cows by -58 min/24 h (-11.5%).

Based on the results of work and undertake statistic analysis, we can conclude that one of the characteristic behaviors of cows during estrus is to increase locomotion activity and reduce rumination time and therefore this paper presents original results of the locomotion activity and rumination time of dams using the Heatime RuminAct system on the farms.

* The work was supported by the projects VEGA 1/0724/16 and KEGA 035SPU-4/2015.

REARING WAR-HORSES IN MEDIEVAL WESTERN EUROPE

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Not long ago horses and their riders were the lords of the battlegrounds. Nowadays it is only important for heritage preservation. In the middle ages it was the matter of life and death to have a sufficient horse for the battles. In those days there were different kinds of horses for different functions, like endurance, packing and actual fighting or for tournaments.

The exact origin of medieval war-horses is unknown. According to the assumptions the Roman horse breeding methods kept by the Meroving and Karoling dynasties were determinative. Moreover the Scandinavian, the Spanish Jennet, the Burrey and Arabian blood from the Holy Land were significant. The Spanish bloodline was a keystone for the later involved races, because the Spanish convents noted the details of breeding very accurately.

Even so, purity was not the absolute condition of service. Also in races, the animal's habit, trainability, sex and individual skills were more important. Basically the stallions were used as war-horses. Moreover, the stress capacity and the unquestioning obedience were significant for the timing and troop movements. The needs changed in the different ages, triggering the change of breeding methods also.

With the continuous changing of the armours, their weight grew considerably. The horse should endure the rider with all of his weapons and armour and its own armour too. It was important to improve the carrying capacity of horses. In the 12-13. centuries with the growing weight of equipment the knights in armour used stronger, robuster, and thicker-set horses, who were sufficiently disciplined. In this time the chain and scale horse armours weighed about only 20-30 kg. These horses with their great weight were not able to maneuver swiftly, but had a great penetrating power. Contrary to popular belief these horses were not so tall. Several horse skeleton artefacts and pictures prove that the average withers were not taller than 140 cm until the 14. century. The start of the 14. century was the beginning of development of plate armours. This type of horse-armours – called by barding – weighed about 100 kg, so it also required the use of larger horses with more strength. At this time was the emergence of the "great horse" pictured by the Renaissance depictions. This type of horse was able to carry the heavier equipment and the average withers extended about to 170-180 cm. To achieve this the taller mares were crossed with lower, but high-performance stallions. Although these horses looked rather similar to dobbins, yet their price could reach a hundred times the value.

The 15. century was the beginning of the age of firearms. As the heavy armours became unnecessary – it only slowed down the horse – the increase of agility was required. The later cavalry horse archetype developed at this time, which was modest, smaller, but had excellent properties. At the same time the heavy, cold-blooded horses were only used to move artillery devices. From the 17. century the great horse began to ebb, instead more mobile, lighter races evolved and spread.

The Dextrarius once existed race was the elite and the more expensive of all war-horses. Nowadays some people tried to reproduce the dextrarius with the crossing of the athletic andalusian and the percheron dobbin horse. As a result they created the "Spanish-Norman" horse, which basically looks like the once existed Dextrarius.

The dobbin races in existence today and their predecessors – e.g. Shire, Boulonnais, Brabant, Clydesdale, Comtois, etc. – were once used to plough and haul rigs in peacetime, but for war too. The warm-blooded, half breed and full-blooded horses did not get large interest in the Western-European wars, they were used as saddlers instead.

Nowadays traditionalists use very different kinds of horses, but obviously they do not use such strong and huge animals, which were needed before.

**VARIABILITY OF PRODUCTION PARAMETERS IN OPEN CYCLE SWINE FATTENING
ACCORDING TO HOUSING SYSTEM***

ZMIENNOŚĆ WSKAŹNIKÓW PRODUKCYJNYCH TUCZU ŚWIŃ
W CYKLU OTWARTYM W ZALEŻNOŚCI OD SYSTEMU UTRZYMANIA

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Housing system is one of the most important factors affecting full exposure of genetic potential of pigs. Crucial parameters of housing system for fattening sector are ventilation system and floor type. Nowadays mechanical and computer controlled ventilation is standard, making this parameter unified. A type of floor varies among farms and potentially can influence variability of pig parameters. Opinions about the use of bedding may be extremely different. Some scientists consider bedding as a major method of animal welfare assurance. The others, however, show many disadvantages of bedding, especially straw, because of large production costs, excessively increased fiber intake resulting in slower growth, increased ammonia emission, and rapid rise of mycotoxicosis risk. The aim of the study was to define differences in main fattening and slaughter parameters of pigs in open cycle fattening, according to the type of floor in buildings. The study was conducted as analysis of daily gains, feed conversion rate, slaughter value, meatiness and mortality rate of 637 583 starter pigs introduced into open cycle production in 954 stages during 6 years (2009-2014). Four types of farms were included according to floor type: fully slatted floor, mixed slatted-solid floor, solid floor with shallow straw bedding and solid floor with deep straw bedding. No significant differences were observed in daily gains among pigs housed in four types of buildings. Numerically the lowest result was found in pigs housed on shallow bedding, and the difference was probably relevant from economical point of view. Feed conversion rate was significantly worse in pigs housed on shallow bedding, without significant differences among the other types of buildings. Slaughter value was similar among pigs housed in all types of buildings, however, similarly to FCR, lean meat content was also the lowest in pigs housed on shallow bedding. Surprisingly, mortality rate was significantly higher in pigs housed on deep bedding, and did not differ significantly among pigs housed in the other types of buildings (tab. 1).

Table 1. Main production parameters of pigs housed in different housing system

Parameter	Slatted floor	Slatted-solid floor	Shallow bedding	Deep bedding
Daily gain	942±142	951±95	925±118	955±110
FCR	2.76±0.17 ^{ABa}	2.79±0.18 ^{ABab}	2.82±0.17 ^{Ab}	2.74±0.14 ^{Ba}
Slaughter value	78.25±1.16	78.06±1.02	78.21±1.01	78.23±0.73
Meat content	57.38±1.29 ^{Aab}	57.74±0.78 ^{Aa}	56.84±1.18 ^{Bc}	57.27±0.91 ^{ABb}
Mortality rate	2.25±1.35 ^a	2.16±1.18 ^a	2.11±1.30 ^a	2.64±1.94 ^b

^{AB} means inside row denoted different letter superscripts differ significantly (P<0.01)

^{ab} means inside row denoted different letter superscripts differ significantly (P<0.05)

To conclude, the weakest fattening performance was observed in pigs housed on shallow bedding except for mortality rate, which was the highest in pigs housed on deep bedding. Possible cause of such results could be worse quality of air in shallow bedding buildings, and thus impairment of animal health and physiological potential of production. Our results did not support an idea of lower growth rate as a result of excessive fiber intake by pigs housed in straw bedding buildings, because fatteners housed on deep bedding had numerically higher growth rates in comparison to the other types of buildings.

* Financial source: DS 3242/WHiBZ/ZHTChiDI

CHARACTERIZATION OF A REGION WITHIN BOVINE CHROMOSOME 6 ASSOCIATED WITH GRAY COAT COLOR IN A NELLORE-ANGUS CROSS

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Breeds of cattle native to hot and humid climates often have light, gray, or white coats. Although the hide of Nellore cattle is generally black, the coat ranges from white to dark gray. This variation in hair color is likely due to irregular deposition of pigment within individual hairs. In other species, gray is caused by mutations affecting formation of dendritic cells, resulting in malformed dendritic cells depositing melanin in clumps rather than uniformly along the hair shaft. The objective of this study was to identify the locus that causes gray in a Nellore-Angus F₂ cross population. There were 779 cattle available for this study, each with 34,957 SNP genotypes. Each individual was scored for gray, and through genome-wide association analysis, gray was mapped to the same region of bovine chromosome 6 that has previously been associated with reddening and spotting phenotypes. We subsequently imputed this region to sequence scale and characterized haplotypes from recombinant individuals to define the critical interval for gray. We will also present evidence for epistatic interactions across this region that may contribute to misclassification of the gray phenotype in this cross.

**VARIATION OF BACTERIAL COMMUNITIES WITHIN
A CONSOCIATION SOIL MAP UNIT**

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Soil microorganisms drive biogeochemical cycling. These soil microbial communities differ based on pH, soil moisture, texture, organic carbon, and available nutrients. Furthermore, soil microbial diversity and abundance decrease with depth in a soil profile. The objective was to determine whether soil microbial communities differ across a soil map unit. We hypothesized that soil microbial communities will be similar within a soil map unit. We sampled at 10 randomly located sites in a field mapped as Windthorst consociation that was used as a dairy effluent waste application field. At each site, we dug a pit to parent material and sampled by horizon, and 4 satellite surface samples were also collected. We characterized soils by pH, texture, calcium carbonate equivalence, total nitrogen, and total carbon. Microbial communities were analyzed using massively parallel DNA sequencing, and separated into Operation Taxonomic Units (OTUs) based on 97% sequence similarity. We analyzed results through Qiime using PERMANOVA, Mann-Whitney U, and Spearman's rank correlations. Results showed relatively homogenous soil properties across the field. There were no differences in microbial communities within each site. When the ten sites were compared against one another, differences in 4 phyla were observed. Four OTUs also varied by site. Microbial communities were also dependent on phosphorus. 3 phyla and 21 OTUs varied with phosphorus concentrations. We suggest soil microbial communities have very little variation over short distances (<5 m), but have greater changes over greater distances. Bacterial communities likely change in response to changes in soil properties such as nutrients.

CONSUMER INTEREST IN WINE AMONG RESIDENTS OF KROSNO DISTRICT

KONSUMENCKIE ZAINTERESOWANIE WINEM WŚRÓD MIESZKAŃCÓW POWIATU KROŚNIEŃSKIEGO

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One of the most popular alcoholic beverage in the world (apart from beer) is wine. In many countries drinking wine is a very important part of the culture. Taste, quality and benefits of drinking wine are often appreciated by Poles who has their own preferences and some specific taste expectations. All substances in wine that are biologically active, mainly polyphenals and natural antioxidants provides health benefits. Mainly red wine is full of polyphenals.

The aim of the research was to precise the extent of the interest in wine among residents of Krosno district.

These empirical research were conducted using the original interview method in May 2014.

The number of surveyed people was 254. All the respondents were wine consumers who drinks wine at least twice a month. According to the evaluation of respondents' attitude towards wine, it is seen that about 7% of respondents consider wine as the life passion and about 14.70% of them take wine as their favourite beverage. The respondents were asked about reasons of drinking wine. The answers were: wine has health benefits (46.85%), wine is a good light alcoholic drink (41.73%), wine has a good taste (28.35%), wine makes the meal more attractive (16.54%), wine is up-to-date (12.29%), wine is a part of the family tradition (5.91%), interest in wine tourism (3.94%).

The research has shown that two points were taken into account when buying wine: the taste (for 51.18% of respondents) and the price (35.43%). Around 30% of the survived people buy wine recommended by sales assistant and around 20% of them buy wine recommended by their friends. Taking types of occasions for drinking wine into account we can see that 37.80% of respondents drink wine when they get together and 29.13% of them drink it having no occasion.

According to 47.24% of survived people, the amount of wine that is most often consumed is from 2 to 3 glass of wine. For about 34.00% of respondents it is just one glass of wine. According to 90.16% of respondents Red wine is the most popular. There were also pointed: wine grapes (75.59%), wine with 10-14% of alcohol level (76.38%), European wine (64.96%).

In podkarpackie voivodship there have been several professional vineyards built recently. And on account of that there were all respondents asked if they knew that regional wine. Only 7% of survived people affirmed that information.

**APPLICATION OF DARtseq TECHNOLOGY MARKERS FOR MAPPING
THE MALE FERTILITY RESTORER GENES IN TRITICALE
WITH CYTOPLASMIC MALE STERILITY OF *TRITICUM TIMOPHEEVI****

ZASTOSOWANIE TECHNOLOGII MARKERÓW DARtseq
DO MAPOWANIA GENÓW PRZYWRACAJĄCYCH MĘSKĄ PŁODNOŚĆ U PSZENŻYTA
Z SYSTEMEM CYTOPLAZMATYCZNEJ MĘSKIEJ STERYLNOŚCI *TRITICUM TIMOPHEEVI*

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Currently there are no registered hybrids variety of triticale in Poland. Nevertheless ongoing intensive research are intended to cultivate such a cultivar. Triticale is one of the most significant cereal in Poland. Due to high amount of protein it is used as feed.

Sterility-inducing cytoplasm are based on cytoplasmic male sterility (CMS) systems which are commonly used in seed production of hybrid cultivars in numerous crops. In triticale there are available different sterilizing cytoplasm, and that originated from *Triticum timopheevi* is considered as the most promising in commercial plant breeding. Unfortunately, there is still very limited information about number and localization of nuclear genes involved in restoration of male fertility in this CMS system. DARtseq is positioned in the area of high resolution mapping and detailed genetic dissection of traits. This technology is a generic and cost-effective genotyping technology detecting all types of DNA variation. This study is aimed at application of DARtseq technology for construction of linkage groups of newly developed mapping population and localization on these groups genes restoring male fertility to triticale plants. Presented results are of preliminary character.

Mapping population was developed by crossing of male sterile line CMS-19T containing *Triticum timopheevi* cytoplasm with restorer line Bolero 14/1. Plants of F1 generation were male fertile and after self-fertilization produced seeds of F2 mapping population. For genotyping the DARtseq technology based on Genotyping by Sequencing method was applied. Mapping population was phenotyped using two methods: visual observations of pollen shedding of each individual done in field conditions and assessment of seed setting within spikes isolated on each plant before flowering.

At the beginning 5967 SNP markers was obtained from DARtseq platform, however only 2148 were polymorphic. All SNP markers were co-dominant. They were used for construction of linkage groups (LG) in the JoinMap4 software. Twelve groups of linked markers containing at least 50 loci were obtained at LOD = 20. Most numerous LG contain 182 and 185 markers. Developed linkage maps and phenotype data were used for interval mapping in order to location of restorer genes.

* This work was financially supported by Polish Ministry of Agriculture and Rural Development (Dec HORhn-801-PB-6/16, project 83).

**THE INFLUENCE OF CULTIVATION SYSTEMS ON THE QUALITY
OF BREAD WINTER WHEAT**

WPŁYW SYSTEMÓW UPRAWY NA JAKOŚĆ PIECZYWA Z PSZENICY OZIMEJ

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The most important cereals in Poland include winter wheat. Wheat is one of the three major food sources in the world next rice and maize, which has the necessary nutrients in the human diet. It is a grain which is used for fodder, for flour and bread. The grain, which is intended for consumption should be of high value baking and milling (the value of the technology). Unfortunately, wheat is one of the major allergens which causes downward trend in the consumption of wheat bread for the other types.

Production of bread is also dependent on the region and culture in the country. Bread of good quality should be healthy food with high taste and nutrients. It contains fat, carbohydrates, protein, minerals, vitamins and fiber, which are necessary for the proper functioning of the body. Flour, which is characterized by normal quality parameters, allows you to get bread plump, well-grown, a uniform crumb structure, and obtained from the baking has features that are friendly to a potential customer.

The aim of the study was to determine what degree the choice of cultivation system, influences the quality the obtained bread.

The winter wheat grain from 2009, came from the National Research Center of Mecklenburg and Western Pomerania (LFA) in Gülzow. The experiment was set up as a two – factor: 1 factor – varieties of winter wheat, 2 factor – cultivation systems (conventional, ecological). The baking was conducted, where properties such as: dough yield , furnace loss, bread yield, baking total loss, weight of bread after 30 min were evaluated. Also an analysis was made of texture profile and rheological properties of bread (hardness, springiness, cohesiveness, gumminess, chewiness). Moreover, produced bread was evaluated with organoleptic test. In addition the protein content was determined in grain from different cultivation systems.

Bread produced from flour from conventional farming system had higher scores of organoleptic evaluation in comparison with the flour from an ecological farming system. So for a potential consumer the flour from conventional farming is the product of better quality. Analyzing the results of the study) it can be said, that the cultivar from elite class was characterized by the best quality of bread and cultivar from feed class – the worst. The bread from ecological cultivation (11-12%) has a lower protein content than conventional (14-15%) and the protein content is the influence on the loaf volume.

**GENETIC BACKGROUND ANALYSIS OF HEIGHT REDUCTION
IN RYE PLANTS (*SECALE CEREALE* L.)**

ANALIZA GENETYCZNEGO PODŁOŻA
REDUKCJI WYSOKOŚCI ROŚLIN ŻYTA (*SECALE CEREALE* L.)

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One of the most important tasks in rye breeding is to improve plant resistance to lodging. The way to obtain it is to introduce genes responsible for the shortening of straw to cultivars. Plant breeding towards resistance to lodging is difficult because this quantitative trait is controlled by multiple genes, which expression is vulnerable to environmental influence. Significant height reduction in cereals is caused by dwarfing genes, which are divided into two groups: gibberellin (GA) sensitive and insensitive (unresponsive to exogenously applied GA). Currently there are 17 known dwarfism genes, three of which are described as dominant and the rest as recessive genes.

The aim of this study is to establish the impact on morphological features of the recessive mutation reducing the height of rye plants. In addition, it is planned to identify markers linked to gene conditioning the reduction of growth, and subsequently determining the chromosomal location.

Experimental material consists of: near-isogenic pair of lines (NILs) where M112-NIL_w is a typical height plant, M112-NIL_n which is a dwarf line, interline hybrid M112-NIL_w × M112-NIL_n (F₁, F₂ and F₃), interline hybrid 541 (tall line) × M112-NIL_n (F₂ and F₃), interline hybrid CMS879 × M112-NIL_w (F₁), interline hybrid CMS879 × M112-NIL_n (F₁), parental inbred lines for mapping populations of rye available in Department of Plant Genetics, Breeding and Biotechnology and selected mapping populations.

NILs and their F₁ population plants were characterized in terms of: plant height, number of internodes, length of the second internode, length of the peduncle, number of spikes per plant, main spike length, number of spikelets per spike, number of grains per spike and kernel weight. The gibberellic test was carried out under of hydroponics conditions. Two molecular techniques, RAPD and DArT-Seq (DArT-Silico, DART-SNP) were used. Primers were designed based on the homologous sequences from NCBI database. After sequencing new allele-specific primers were also designed using PRIMER 3 program. Genetic mapping was done using JoinMap program.

In case of the number of spikes, number of grains and kernel weight there were significant differences between NILs. It has been shown in the study that a reduction of height in dwarf plants results from shortening of the internodes and that the analyzed allele causes a reduction in plant height also in the heterozygous state. The gibberellic test showed sensitivity to GA of both dwarf and tall forms of NILs. Molecular analysis (RAPD and DART-Seq) indicated high genetic similarity (over 99%). Three markers were mapped: Sil3910110 (homologous sequence to *Zea mays* putative leucine-rich repeat receptor-like serine/threonine-protein kinase) and GA3Ox2-2 (homologous sequence to *Triticum aestivum* gibberellin 3-oxidase 2-2) on 5R chromosome and the GAR-GID1 (homologous sequence to *Triticum aestivum* putative gibberellin receptor GID1) on 1R, which were not linked to the tested gene.

CONSUMERS' PREFERENCES REGARDING WINE CHOICE

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Wine is one of the most popular alcoholic beverages in Europe, which complements culinary experiences and contributes to socializing, relaxation and learning. Not surprisingly, then, wine has received considerable attention among researchers across disciplines such as hospitality, tourism, food science, enology, marketing, and consumer behavior.

The objective of this study was to present one methodology namely choice experiment approach that is able to measure the making purchase decisions of consumers and based on the literature we showed the most important traits how influence the consumers' preferences regarding wine choice.

Wine is a difficult product for consumers to choose because of the large range of wines available in the market. There are a large number of attributes that differentiates wine: extrinsic cues such as type, country of origin, brand name, price, awards, packaging, labels and several intrinsic cues such as quality, taste, grape variety or varieties, alcohol content, vintage. It would assume that taste is the most important factor in wine purchase. However, consumers cannot usually taste the wine before purchase, so the choice is more complex process.

The complexity of the wine category has forced researchers to try different means to understand how consumers choose wines. One method of examination is the choice experiment (CE) approach that is able to model the decision rules consumers use when making product choices using multiple attributes. The method is relatively well known and offer insights into how consumers use tradeoffs among product attributes. The CE belongs to the stated preference type of methods and is based on the creation of a hypothetical market for the analyzed goods and services. Individuals are asked which product they would buy from a set of competitive products at different prices. The application of the CE implies the presentation to "subjects" of an array of "choice sets" representing different possible states of the good of interest. Subjects are asked to choose the "alternative" that they consider the best within each choice set.

The most results confirm that origin, vintner, vintage, and brand reputation significantly affect consumers' preferences and their perception of the product (Angulo et al., 2000; Lecocq & Visser, 2006; Noeva, 2006; Orth & Krška, 2002), among them country and region of origin has a major impact on wine purchase (Dean, 2002). Price also is an overriding criterion in making the purchase decision, especially when there are few other cues available, when the product cannot be tasted before purchase, and when there is some degree of risk of making a wrong choice. Lockshin et al., (2006) examined the impact of brand, region, price, and award was showed that gold medal increased the choice probability the most, but mainly at the lower and middle price products, and a well-known region amplified the desirability of small brands more than large brands. Because of the most wine purchases are made using extrinsic cues, several papers seeked to assess the impact of information and advertisement on consumers' preference. The information on the label and bottle as an indications of what lies inside the bottle provide very important traits for the consumers to the making decision. For example, Stasi et al., (2014) was showed that alcohol content of wine positively influences consumers' preferences and the dealcoholization wine generated aversion. In another perspective, consumers assigned greater utility to health warnings, followed by nutritional information on the label (Annunziata et al., 2016).

Our plan in the future is to use CE methods for the examination of Hungarian wine consumers. The aims are to identify which attributes consumers actually rely on and how they perceive and weight them in order to reach the final decision In addition, we would like to measure the willingness to pay in case of different wine attributes.

**CARCASS COMPOSITION AND MEAT QUALITY OF NATIVE BREEDS
OF LAYING HENS AFTER ONE YEAR OF REARING**

**SKŁAD TUSZKI I JAKOŚĆ MIĘSA KUR RAS RODZIMYCH
PO ROCZNYM UŻYTKOWANIU NIEŚNYM**

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Organic hens that are kept for eggs production are also most commonly used as carcasses after the completion of the laying cycle. For consumers of the organic products the quality of those products, especially their nutritional and technological values are more important than the volume of production itself. Important factors affecting the quality of poultry meat is the genotype and type of feeding, as well as age of hens and housing system. Thus, the aim of this research was to assess the technological usefulness and the composition of carcass from three native breeds of laying hens after one year of rearing.

The experiment was based on 354 hens of the Greenleg Partridge, Rhode Island Red and Sussex breeds (age of 64 weeks) intended for the production of organic eggs. Laying hens were reared under the organic breeding conditions in a certified poultry farm. All birds were fed on compound feeds of organic type. After 64 weeks of rearing, 20 birds from each group were selected, according to their weight, that was close to weight mean for each group for slaughter analysis. The pH of the breast and leg muscles was measured within 15 minutes after slaughtering, and than 24 hours after carcass chilling. There was determined the chilling loss, water holding capacity (WHC) and colour of breast and leg muscles. The carcasses of Greenleg Partridge birds were characterized by the highest content of breast muscles and giblets; especially liver and heart and also lowest fat deposition. The highest level of muscle pH 15 minutes postmortem was found in Rhode Island Red hens, while the highest level of final pH was observed in Greenleg Partridge hens. There were observed no differences in the level of WHC between the groups, but the leg muscles in Greenleg Partridge hens were characterized by the highest chilling loss. Breast and legs muscles of Sussex hens breed were characterized by the highest level of colour parameter L*. In the muscles of the legs of this hens were also found the highest saturation of colour in the direction of b* and a*.

The study showed that the Greenleg Partridge hens breed were characterized by the best composition of the carcasses, the highest level of final pH and chilling loss. The highest parameters of colour in the direction of L*, a* and b* were characterized by muscles layers Sussex.

**THE EFFECTS OF REARING SYSTEMS ON WELFARE STATUS
OF LAYING HENS**

WPŁYW SYSTEMU UTRZYMANIA NA DOBROSTAN KUR
W UŻYTKOWANIU NIEŚNYM

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The objective of this study was to determine the effects of rearing hens to the welfare status of laying hens. Hy-Line Brown hens (n = 450) were divided into three groups designated as 1, 2, and 3. Group 1, was maintained in the furnished cages (750 cm² of floor space per hen); in group 2 nd, the birds were kept on litter with outdoor access; and group for number 3, the birds kept on litter without outdoor access. Throughout the study, all birds were fed *ad libitum* a standard laying diets. Eggs production were recorded daily. Level of welfare was evaluated by following parameters: footpad dermatitis (FPD), claws hypertrophy and feather condition (FCS) on a scale of 0-5 points with division into parts of the body. As a result of this study, there was shown that body weight did not differ significantly between the three groups. Furthermore, in this research there were not found any differences in FPD in particular treatments. The incidences of claws hypertrophy were significantly higher (P<0.05) in furnished cage comparing to other housing systems. In the case of condition of the feathers, the most plumage was represented in this group of hens, which were kept on litter with outdoor access.

When taking into account the obtained results, it can be said that the highest welfare status was defined for hens that were kept one litter, with outdoor access. Whereas, comparing it to the two others rearing systems: furnish cage vs. noncage system (without outdoor access), we cannot determine which rearing system affects them the most, in the negative way on the welfare of laying. Hens kept in furnished cages were characterized by correct plumage, however some incidences of claws hypertrophy appeared. On the other hand, hens reared on litter without outdoor access had some feathers deficiencies, but did not have problems with legs. To sum up, in order to understand this subject better, some further researches are necessary.

**ASSESSMENT OF PIG FEEDING THE MIXTURE WITH LEGUMES
ON CARCASS AND MEAT QUALITY**

OCENA WPŁYWU ŻYWIENIA ŚWIŃ MIESZANKĄ Z UDZIAŁEM ROŚLIN STRĄCZKOWYCH
NA JAKOŚĆ TUSZY I MIĘSA

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The aim of this study was to estimate the effect of feeding with a mixture containing legumes on the quality of carcass and meat in pigs. This evaluation comprised 30 porkers, hybrids F₁(wbp x pbz). Animals were fed with a mixture based on soybean meal (group K) and with a mixture containing leguminous plants (group D). Animals were slaughtered at the weight of 105-120 kg.

There were analyzed the slaughter carcass traits and meat quality traits. Acidification of *longissimus lumborum* muscle was measured pH₄₈, also the visual colour intensity, marbling, firmness and technological properties of meat, i.e.: water holding capacity, drip loss and thermal drip were determined. The color of meat was measured by using a colorimeter Minolta CR 310: the meat tenderness and chemical composition of meat were also measured.

No significant differences were indicated in slaughter traits of the evaluated carcasses between the groups D and K. Nevertheless, significant differences were indicated in the meat acidity pH_k (P≤0.05) and the technological yield of salted meat RTN (P≤0.01) in favor of experimental group. No significant differences were indicated in the sensory analysis of raw meat. Meat of group K (P≤0.05) was characterized by a significantly higher collagen content. The quality of meat was as follows: in group D there were found 1 meat with the PSE defect, whereas in group K there were 2 meats with the PSE defect and 1 meat with the DFD type defect.

The study did not prove a negative effect of feeding the pigs with mixtures containing local leguminous plants on the quality of carcasses and meat quality. The soybean protein in mixtures for pigs can be successfully replaced with protein from legumes.

**EFFECT OF SOIL TILLAGE SYSTEM AND STRAW RETENTION
ON SOIL PROPERTIES IN SPRING BARLEY**

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In Experimental station of Aleksandras Stulginskis University, Kaunas district, Lithuania, a long-term field experiment has been established since 1999. The soil was sandy loam (*Endohypogleyi-Eutric Planosol*), horizon humus layer – 25 cm, slightly alkaline – pH – 7.6, average humus content – 2.86% mg kg⁻¹, average potassium content – 134 mg kg⁻¹ and high phosphorus content – 266 mg kg⁻¹.

A short crop rotation was introduced: winter wheat, spring barley, spring rape. The results were obtained in 2015 when spring barley was grown. According to two factor field experiment, the straw (factor A) was removed (R) from one part of the experimental field and on the other part of the field all straw yield was chopped and spread (S) at harvesting. As a subplot 6 different tillage systems (factor B) were investigated: conventional ploughing (CP) at 23-25 cm depth in autumn, shallow ploughing (SP) at 10-12 cm depth in autumn, shallow loosening (SL) with sweep cultivator and disc harrow at 8-10 cm depth in autumn, shallow rotovating (SR) at 5-6 cm depth before next crop sowing, catch cropping for green manure and rotovating (GMR) at 5-6 cm depth before next crop sowing, no-tillage direct drilling (NT). Catch crop white mustard (*Sinapis alba* L.) for green manure was undersown on stubble only in GMR plots just after winter wheat and spring barley harvest. The experiment was performed by split plot design, 4 replications, totally 48 plots. Size of the plots: plot area – 102 m² (6 m x 17 m), net area – 30 m² (2 m x 15 m). The aim of our investigation was to find out long-term impact of reduced intensity tillage systems with straw and green manure combinations on soil aggregation and stability, soil temperature, water content and shear strength.

It was found that straw incorporation to compare without straw have no significant effect on soil water content and temperature. Shallow tillage systems (SR, GMR, NT), compared with a deep ploughing (CP), significantly reduced soil water content and temperature.

Straw incorporation improved soil aggregation at 10-25 cm depth. Amount of macro aggregates increased by 15.5% and micro aggregates decreased by 24%. Shallow rotovating (SR) at 5-6 cm depth improved soil structure by 22.3% due to the increased macro aggregates and decreased amount mega aggregates by 34.7%, compared with a deep ploughing (CP).

Straw incorporation had no significant influence on aggregate stability but effect of soil tillage intensity was significant. Shallow rotovating (SR), catch cropping for green manure and rotovating (GMR) and no-tillage direct drilling (NT) increased stability of aggregates from 74.4% till 90.4% in upper soil layer (0-10 cm), and from 32.8% till 38.3% in lower soil layer (10-25 cm), compared with a deep ploughing (CP).

Straw incorporation had no influence on soil shear strength. Shallow tillage systems (SR, GMR, NT) comparing with deep ploughing (CP) increased shear strength from 11.4 % till 14.1%.

**YIELDS OF WINTER TRITICALE DEPENDING ON THE CROP ROTATION SYSTEM,
CHEMICAL PLANT PROTECTION LEVEL AND CULTIVAR**

PLONOWANIE PSZENŻYTA OZIMEGO W ZALEŻNOŚCI OD SYSTEMU NASTĘPSTWA ROŚLIN,
POZIOMU OCHRONY CHEMICZNEJ I ODMIANY

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The paper presents results of a 5-year-long study (2011-2015) conducted as a static field experiment in the Research Station in Bałcyny, on grey-brown podzolic soil classified as very good rye complex, in which yields of two winter triticale cultivars (Pigmej, Cyrkon) grown in 6-field rotation and 19-23-year-long monoculture were compared, depending on different chemical protection of fields: 0 – no chemical protection, H – herbicides, HF – herbicides and fungicides.

In both crop systems, cv. Cyrkon produced significantly higher yields: 15.3% higher in rotation and 21.2% higher in monoculture. At the same time, cv. Cyrkon responded more weakly to being cultivated in monoculture, as its yield decreased by 21.1% on average, compared to the average yield decline of 26.6% noted for cv. Pigmej. More intensive chemical protection practice resulted in increased yielding of winter triticale grain, and higher yield gains were achieved in monoculture (H – 40.2 and HF – 49.1%) than in crop rotation (H – 5.5 and 12.6%). The cultivar Cyrkon responded better, by producing higher yields, to the chemical protection of a field in both crop systems and to weed eradication only in the crop rotation system.

**EFFECTS OF RESVERATROL AND α -KETOGLUTARATE
ON FOOD INTAKE FACTORS IN RATS FED A HIGH-FAT DIET**

WPLYW RESWERATROLU ORAZ α -KETOGLUTARANU NA CZYNNIKI REGULUJĄCE
POBÓR POKARMU U SZCZURÓW KARMIONYCH DIETĄ WYSOKOTŁUSZCZOWĄ

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The dietary habits of westernized societies together with low physical activity contribute to metabolic disorders, including obesity. Global obesity has reached a staggering total of 2.1 billion, leading to a numerous of health complications including cardiovascular disease, cancer, inflammatory disorders and increased mortality. Energy balance and food intake are regulated by a complex network of interacting feedback mechanisms occurring between the gastrointestinal tract and the nervous system. Caloric restriction (CR) is the most robust way to induce metabolic shift, retard endocrine disturbances and prevent age-related diseases. The physiological effects of CR are attributed mostly to proteins called sirtuins having anorectic effect, which regulate glucose and insulin production, fat metabolism and cell survival. Several compounds have been identified that mimic CR effects, while resveratrol (RESV) emerged as the most potent. In mammalian cells, RESV produces sirtuins-dependent effects improving cellular function and organismal health, unfortunately its bioavailability is very low. Additionally, α -ketoglutarate (AKG), Krebs cycle metabolite, can also mimic the action of CR by reducing the ATP production, and what is more, there are evidences it can prevent many metabolic diseases. We hypothesized that RESV and AKG might shift the physiology and provide the associated health benefits without reduced calorie intake. Thus, the aim of this study was to examine the impact of RESV protected in lipid matrix and AKG on health parameters of rats fed high-fat diet.

The experiment was conducted on 24 male Wistar rats provided with either a standard diet (control group), high-fat diet (HF, 60% calories from fat), HF supplemented with AKG (12.8 g/kg of feed) or HF supplemented with RESV (660 mg/kg of feed). Animals were fed *ad libitum*. During the experiment measurements of body weight, feed intake and blood glucose level (glucose meter Roche Accu-Chek Active) were performed weekly. After six weeks the animals were euthanized, blood samples were collected into heparin tubes (Equimed, Poland) and immediately centrifuged (2.500 rpm, 20 min). Plasma was frozen at -80°C. Plasma glucose and triglycerides levels were determined spectrophotometrically (Beckman UV-VIS DU 640, CA, USA) using commercially available enzymatic kits (Cormay, Poland). The analyses of insulin, ghrelin, leptin, NPY and thyroid hormones were performed by RIA and read outs were processed using manual miniature γ -ray detector Mini Gamma. Statistical analysis was performed using one-way ANOVA and Tukey's test. Differences were considered significant if $p < 0.05$.

HF diet, alone or in combination with AKG or protected RESV did not significantly affect body weight and feed intake of rats throughout the study. During the first week of the experiment, the concentration of blood glucose was the same in all groups. In the following periods the glucose level was significantly higher in groups fed the HF diet as compared to the control. Similarly, plasma insulin concentration was significantly higher in all groups fed the HF diet in comparison with the group fed a standard diet (2.43, 2.52, 2.52 vs. 1.56 ng/ml, respectively, $p = 0.0001$). In the case of thyroid hormones, a significantly higher concentration was observed only for thyroxine in group supplemented with RESV as compared to the control (72.05, 73.01, 79.03 vs. 56.32 nmol/l, respectively, $p = 0.0095$). There was a tendency to higher triglycerides level in groups fed the HF diet comparing with control group. The remaining measured parameters such as leptin, ghrelin, NPY showed no statically significant differences between the groups.

Summarizing, rats fed the HF diet showed symptoms of insulin resistance and metabolic disorders leading to obesity. Supplementation with AKG or RESV in applied doses did not contribute to health benefits and showed no anorectic effect in rats fed the HF diet.

HS-SPME FOR QUALITY CONTROL OF PLANTS

HS-SPME W KONTROLI JAKOŚCI SUROWCÓW ROŚLINNYCH

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Solid phase micro-extraction (SPME) in headspace (HS) analysis of plant volatiles, like EO components, is considered as one of the most efficient, quickest and environmentally friendly sample preparation method. However, the main limitation of HS-SPME are significant differences in the quantitative relations of EO components estimated by the HS-SPME procedure and by the direct analysis of EO obtained from the plant by steam distillation (SD), which is sample preparation method recommended by pharmacopoeias for controlling the value of plant materials as essential oil sources.

The presented results of plants analysis prove that the replacement of the plant material by its oil suspension in the oil of the same physicochemical character as the coating of the used SPME fiber in HS-SPME procedure allows to get similar quantitative relations of EO components to those in EO/SD. In optimal HS-SPME conditions, the replacement of the plant material by its suspension in oil makes the distribution constants for any given EO component between plant/HS-phase and SPME-fiber coating/HS-phase similar. The proposed modification of performing the HS-SPME procedure substantially shortens the evaluation time of plant value as the EO source, thus increasing the efficiency of analytical laboratories.

References:

1. Kovacevic M., Kac M., 2001. Solid-phase microextraction of hop volatiles Potential use for determination and verification of hop varieties, *J. Chromatogr. A*, 159-167.
2. Dawidowicz A.L., Szewczyk J., Dybowski M.P., 2016. Modified application of S-SPME evaluation of plants materials, *Talanta*, 195-202.

**THE EFFECT OF DIFFERENT FEEDING REGIME ON THE MINERAL STATUS
OF CHAROLAIS CATLE BASED ON HAIR ANALYSES**

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Nutrient intake plays the most important role in animal production. In order to minimize the feeding cost it is important to feed the animals according to their age, production and health status. Macro and trace minerals has important role in the body. Proper supply is essential since most of them cannot be found in sufficient amount in forages and grains. As actual feed intake can considerable vary in grazing and group housed animals, the mineral status needs to be evaluated. One possibility is to analyse the mineral content of hair, of which is easy to collect and can provide information over a period. However, literature results are contradictionary. Therefore, the aim of our study was to determine the mineral status of Charolais cows kept on different feeding regime. We selected two times 10 Charolais cows from two farms. Farm A animals were fed with meadow hay and TMR (haylage and concentrate), while farm B cows received meadow hay only. Hair samples were collected with bended scissors from the withers. Samples were cleaned with ethanol from organic contamination, than nitric acid was added and the mixture was evaporated in ultrasonic bath. After being cooled down, hydrogen peroxide has been added to the solution and the mineral concentration was analysed with ICP – OES (Perkin-Elmer, Optima 3300 DV). Level of Ca, Mg, Na, Cu, Se and Zn were determined. The statistical analysis has been carried out with SAS (SAS Institute Inc., Cary, NC) GLM method. The difference between the groups has been evaluated with Tukey test. Calcium content of cattle's hair from the two farms was similar (1722 vs. 1552 mg/g). Magnesium, copper, selenium and zinc level in hair was significantly higher ($P<0.05$) in farm B (651 vs. 987; 7.6 vs. 10.9; 7.0 vs. 15.1, 81 vs. 184 mg/g, respectively). Sodium content of farm A cow's hair was significantly higher ($P<0.05$) (4916 vs. 2846 mg/g). These results indicate that the different feeding regime reflects in hair mineral content. It can be hypothesised that hair mineral content can be a good indicator of mineral status once proper standards are established.

**CYTOGENETIC ANALYSIS ON PREVALENCE OF CHROMOSOMAL FRAGILE SITES
IN CHROMOSOMES OF BLACK-HEADED SHEEP**

**CYTOGENETYCZNA ANALIZA WYSTĘPOWANIA MIEJSC ŁAMLIWYCH CHROMOSOMU
NA CHROMOSOMACH OWIEC RASY CZARNOGŁÓWKA**

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Fragile sites (FRA) are regions of chromosome that are prone to forming chromatid gaps and breaks. They are sensitive to breakage under special cell culture conditions, after induction with chemical agents. In rare instances, DNA damages could also occur spontaneously. According to their frequency in the population, FRA are classified as rare and common fragile sites. They are unstable regions of the genome and can play important role in processes of formation genetic and chromosomal defects.

The purpose of these study was to determine presence of fragile sites in chromosomes of Polish Black-Headed Sheeps.

Black-headed sheeps are a breed covered by the gene pool protection program. They are one of the native Polish meat sheep breeds. In the study, were used 10 lambs of the Black-headed breed. The research material consisted of the peripheral blood of young animals about 4 months of age.

Mitotic chromosomes were obtained from an in vitro culture of peripheral blood lymphocytes. The chromosome preparations were stained according to the RBG staining technique by PERRY & WOLFF (1974). Next, RBG-banded metaphases were microscope analysed, computer processed and statistical analysed to determine presence of fragile sites.

20 metaphases per animal were analysed. Altogether, 592 fragile sites in total of 200 metaphase plates were observed. The mean value of breaks per metaphase plate in all analysed sheeps was 2.96 with a standard deviation (SD) of 0.86. Between individuals the lowest value of fragile sites in chromosomes was 2.45 sites per metaphase, the next were: 2.6; 2.7; 2.95 and 3 site, three lambs got 3.05 sites and the highest rates of observed breakpoints was 3.35 and 3.4. Breakages were found in each analysed metaphase.

RBG-banding did confirm presence of fragile sites. Fragile sites are subject of cytogenic studies due to diagnose genetic disorders. They could be valuable selection tool in an health assessment and be helpful in evaluation genetic resistance in individuals.

**SISTER CHROMATID EXCHANGE TEST AS AN ASSAY
TO CHROMOSOME INSTABILITY IDENTIFICATION
IN CHROMOSOMES OF BLACK-HEADED SHEEP**

TEST WYMIANY CHROMATYD SIOSTRZANYCH
JAKO METODA IDENTYFIKACJI NIESTABILNOŚCI CHROMOSOMOWYCH
W CHROMOSOMACH OWIEC RASY CZARNOGŁÓWKA

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Sister chromatid exchange (SCE) test is a highly sensitive and valuable method to assessing the genotoxicity of chemical and physical agents which can have mutagenic and carcinogenic effect on the structure of the chromosome. It identifies DNA damages caused by incorrectly setting replication and repair mechanisms (e.g. HR and NHEJ). The aim of study was to analyse the frequency of spontaneous sister chromatid exchanges in Polish BLACK-HEADED SHEEP.

Black-headed sheeps are one of the native Polish meat breeds and are covered by the gene pool protection program. The study covered 10 lambs about 4 months of age of the Black-headed breed.

The experimental material was constituted by mitotic chromosomes obtained from an in vitro culture of peripheral blood lymphocytes collected from the analysed sheep breed. The chromosome preparations were stained according to the FPG method by Kihlman and Kronborg (1975). They were subsequently subjected to microscope analyses, computer processing and statistical analyses to determine the incidence of sister chromatid exchanges in the chromosomes.

20 metaphases were scored for SCE in each lamb. Altogether, 1240 exchanges in 200 metaphases were observed. The mean value of SCE per cell was 6.2 with a standard deviation (SD) of 1.08. Between individuals the lowest frequency of SCE which was observed in three lambs was 5.95 SCE per cell, next five lambs had it between 6 to 6.15 SCE/cell, one individual had 6.45 SCE/cell when the highest observed SCE's frequency was 7.3 SCE/cell.

Observed in the study incidence of sister chromatid exchanges in the chromosomes of analysed sheeps was on average rate as for the normal value of sister chromatid exchanges spontaneously occurring in healthy animals. It means that analysed animals are probably healthy but are likely to be more sensitive to adverse environmental factors and are less genetic resistant.

**FACTORS THAT DEFINE SURVIVABILITY OF PIGLETS BEFORE WEANING
IN GERMAN PIG FARM**

CZYNNIKI KSZTAŁTUJĄCE PRZEŻYWALNOŚĆ PROSIĄT
W OKRESIE PRZED ODSADZENIOWYM W NIEMIECKIEJ CHLEWNI

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The mortality rate of piglets before weaning is an important element that has influence on economics of pigs production. It is a stage in which knowledge, experience and correctness of measures made by the breeder influence the number of piglets as well as their productive results in future. It is estimated that deaths of piglets amount to from 5% to 35% and half of them happens during three first days after delivering.

The sow cripples the seed with her body what is considered to be the main reason of piglets deaths. However, a problem is complex and it involves numerous interactions between the piglet, the sow and the environment.

A significant and widely discussed interaction is hypothermia of starvation, which is connected with the act of crippling. Piglets that did not incept the appropriate amount of immunoglobulins and energy during 36 hours may die of starvation. Moreover, the lack of brown adipose tissue causes increased susceptibility of piglets to the cold. It leads to hypothermia and attempts to warm up beside the sow. In result, the risk of crippling increases.

According to multitudinous authors, the low birth weight of piglets increases the risk of the mortality rate. It is indicated by the fact that the mortality rate of piglets that weigh under 1kg is more than 55%, whereas piglets that weigh 1kg to 1,2 kg is about 20%. A crucial matter to consider is also vitality of piglets, because by having it they are able to find the teat of the sow quickly and incept an appropriate amount of balanced nourishment. Another important aspect is the health of the sow and her behaviour as it influences the mortality rate of piglets.

The research carried out in one of the German pig farm located in Hesse shows factors that define survivability of piglets before weaning. All of piglets involved in the research were the seed of Danhybrid LY sows artificially inseminated by sperm of Pietrain boars. The purpose of the experiment was to analyse the mortality rate of piglets aged up to the third week of life as well as to scrutinise its grounds.

**THE CHARACTERISTICS OF REPRODUCTIVE PERFORMANCE FEATURES
OF DANHYBRID LY HYBRID SOWS**

CHARAKTERYSTYKA CECH ROZPŁODOWYCH LOCH HYBRYDOWYCH DANHYBRYD LY

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High reproductive performance is the main feature of hybrid sows. It is crucial when it comes to reducing the cost of piglet production by increasing economic prolificacy. The main funds paid by pigs producers are costs of the sow's livelihood regardless its fertility. That is the reason why the effectivity of production should be improved. It is possible by increasing reproductive performance of sows, because it leads to reducing the unit production cost of one piglet. The mortality rate, the fertility, the frequency of farrowing and other features have influence on the number of weaned piglets. Nevertheless, actual output values differ in various pig farms and there are numerous reasons for this matter, for example disparate genetics.

In this paper, the value of reproductive performance features of Danhybrid LY hybrid sows in 2010-2015 was tested. The research was carried out in one of the German pig farm located in Hesse that specialises in piglet production. Danhybrid LY sows from the DanAvl Danish system that were impregnated by Pietrain boars were involved in the research. The data that applies to reproductive performance features was gathered based on the breeding documentation from 2010-2015.

THE EFFECT OF DIETARY VITAMIN D₃ AND 25-HYDROXYVITAMIN D₃ ON PIGS FATTENING RESULTS AND CARCASS QUALITY

WPLYW WITAMINY D₃ ORAZ 25-HYDROKSYWITAMINY D₃
NA WYNIKI TUCZU ŚWIŃ I JAKOŚĆ TUSZY

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Farm animals are characterized by a very high requirement for vitamins due to their intensive productivity, stressful environmental conditions and limited access to sunlight. Unfortunately, the content of vitamin D is not available in the tables of feed ingredients' composition. A significant increase of hypovitaminosis D in pigs, kept under farm conditions without access to sunlight, forced scientists to determine the proper requirement for vitamin D in these animals. Presently, widely-used cholecalciferol is often replaced by 25-hydroxycholecalciferol, especially for poultry. Research shows that this form is more bioavailable, more rapidly promotes intestinal calcium transport and mobilizes bone materials, and that its use is more economically justified. The activity of the different metabolites is still a matter of discussion and it has been suggested that the activity of 25(OH)D₃ is 1.4-2 (up to 5) times higher than that of vitamin D₃ in the maintenance of serum calcium level and growth stimulation.

The aim of this study was to determine the effect of level and form of vitamin D₃ (cholecalciferol vs. 25-hydroxycholecalciferol) in feed on the results of fattening pigs. The experiment was performed on 64 finishers (32 gilts and 32 barrows) which were divided into 4 groups and fed isoprotein and isoenergy feed mixtures, differing only in the level and form of vitamin D₃. Scheme of experiment was as follows: Group I (control) – grower 2000 IU and finisher 1500 IU vitamin D₃/kg feed; Group II – grower 3000 IU and finisher 2500 IU vitamin D₃/kg feed; Group III – grower 3000 IU vitamin D [including 2000 IU vitamin D₃ + 1000 IU 25(OH)D₃] and finisher 2500 IU vitamin D [including 1500 IU vitamin D₃ + 1000 IU 25(OH)D₃]; Group IV – grower 2000 IU 25(OH)D₃ and finisher 1500 IU 25(OH)D₃. The animals were kept individually and fed relevant amounts of feed, depending on body weight, which were examined every two weeks. The fattening experiment was carried out from 30 to 110 kg body weight. After ending of fattening all animals were slaughtered. After 24-hours cooling carcasses at +4°C the quality assessment of right carcasses was carried out. Statistical analysis of the results was performed using ANOVA, and significance of differences between the means of each group was determined using the Duncan test (Statistica, v. 12).

It was found that the average daily weight gain throughout the fattening period, from 30 to 110 kg body weight, were higher in the group receiving more vitamin D₃, especially in the groups receiving 25-hydroxyvitamin D₃ as compared to the control group, respectively 2.5% and 4.6%. Statistically significant differences were observed only in the first period of fattening (30-60 kg body weight), wherein the weight gain in all treatment groups were higher than in the control group by 6-10% (P≤0.05). Fattening pigs in experimental groups also better utilized feed. In the first period of fattening the differences ranged from 5.8 to 8.6% when compared to a control group and were statistically significant (P≤0.05). In the whole period of fattening the average feed utilization per 1kg of body weight gain in all animals groups remained at a level of 2.8-2.9 kg. There was a tendency to shorten the growing period in the experimental groups, especially in the groups receiving 25-hydroxyvitamin D₃, as compared to the control group by about 4 days. In the present experiment there was no significant impact of vitamin D₃ forms or its level in feed on the results of evaluation of carcass quality. Meatiness of pigs, carcass fatness, weight of primary cuts and loin eye area were similar in all groups, although numerically slightly better results were noted in the experimental groups.

Summing up the obtained results it can be concluded that higher, than a standard used, amount of vitamin D₃ in the feed and the use of 25-hydroxyvitamin D₃ had a positive effect on the growth performance of young fattened pigs.

IMPACT OF SULFUR FERTILIZATION ON THE CONTENT AND SAMPLING SELECTED MINERALS COMPONENTS WITH YIELD OF SPRING BARLEY

ODDZIAŁYWANIE NAWOŻENIA SIARKĄ NA ZAWARTOŚĆ I POBRANIE WYBRANYCH SKŁADNIKÓW MINERALNYCH Z PLONEM JĘCZMIENIA JAREGO

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In connection with the deepening in Poland since the 90 s. the deficit of sulfur in plant production and the need to maintain a high crop yield, must incorporate this component in fertilization not only plants with the highest demand for sulfur. As a result of this situation, it is necessary to conduct research on the effects of sulfur on the chemical composition of crops, including mineral component content. In the three years of strict field experiment on spring barley varieties Stratus was assessed the impact of sulfur application method (soil, foliar), its form (ion, elementary) and doses (0, 20, 40 and 60 kg S ha⁻¹) on the content and sampling of macronutrients (N, P, K, Mg, Ca, S, and Na) with the yield of grain and straw of this species. The field trial was conducted on a typical fawn soil, class IIIb, good rye complex. The soil was acidic, the average abundance of available forms of phosphorus and potassium and low - sulfur.

The study showed that the content and sampling of elements with the yield of grain and straw of spring barley to the greatest extent determined the dose of sulfur. In relation to the control application of the fertilizer component generally it resulted in a significant increase of nitrogen, potassium, sodium and total sulfur and reducing phosphorus. The soil application sulfur influenced favorable than the foliar application on the content of magnesium, sulfur and sodium in grain, and in the case of potassium and sulfate (VI) was favorable a soil method of application. Form and method sulfur application generally was not affect the size of the sampling macronutrient with the yield of spring barley, however a dose of this element significantly determined the sampling of nitrogen and sulfur.

THE INFLUENCE OF TRANSPORT CONDITIONS ON THE WELFARE OF FATTENERS AND MEAT QUALITY

WARUNKI TRANSPORTU DO UBOJU I ICH WPŁYW NA DOBROSTAN I JAKOŚĆ MIĘSA TUCZNIKÓW

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Transportation of fatteners from the place of production to slaughter belongs to particularly difficult logistic operations conducted in agribusiness. Results of long-term research show that in the course of pre-slaughter transport animals are exposed to numerous threats, which may significantly decrease the welfare and the quality of slaughter products, closely connected with the state of animals before slaughter. The factors which may decrease the welfare of fatteners during transport comprise: methods of loading and unloading, transport conditions, among which the distance and duration of transport are particularly significant, the technical condition, equipment and construction of the vehicles, floor surface, and availability of litter.

It was the aim of the study to evaluate the influence of selected conditions of transport to slaughter on the welfare of fatteners and meat quality. The material for the analysis comprised data describing 120 transport operations, during which 3300 fatteners were transported to slaughter. Fatteners were transported to three slaughter houses located in the Subcarpathian Voivodeship. To evaluate the conditions of transport of the animals the following factors were studied: loading method (lift, ramp), distance and duration of transport, type of vehicle (single-deck, multi-deck), technical condition (specialist, adapted), suspension type (stiff, sprung), floor type (wooden, metal, plastic), maintenance system (litter-free, litter – type of litter: hay, sawdust, straw). The welfare of fatteners was evaluated based on: animal fall rate, floor surface per animal rate, body injury surface measurement, respiratory rate and heart rate measurement. The measurement of respiratory rate and heart rate was conducted using telemetric sets. After slaughter the parameters of slaughter quality were estimated: slaughter capacity, weight loss, meat content, fat thickness. Meat quality parameters were also estimated: T1, T24 temperature, pH1, pH24 value, PE90, PE24 electric conductance, meat colour. The measurements were performed in loin (longest chest muscle) and in ham (semi-membranous muscle). The measurements were performed using Mathaus equipment. Muscle samples were later extracted from neck muscles, from the oblique internal abdomen muscle and the diaphragm muscle, in which the level of post-slaughter exsanguination was estimated using the hemoglobin diffusion test. Basic chemical composition of loin and ham meat was also determined. The results were statistically evaluated.

The study showed that fatteners are mainly transported to slaughter by means of specialized vehicles, designed for transporting livestock. It was only in short-distance transports of below 50 km that adapted vehicles were used, mainly farming units (tractor with a trailer), delivery trucks and car trailers. Most often ramps were used for loading fatteners (above 70%). It was observed that the floor surface of the containers was made of metal and covered with litter (90%). Most often sawdust and straw were used as litter. No cases of fatteners' falls were recorded in the studied transports. However, body injuries proved common, and were the most frequent among animals transported by specialized multi-deck vehicles at the distances of above 300 km. The study proved cases in which the norm of stocking density during transport was exceeded. The percentage of animals transported in the stock of below 0,5 m²/fattener was around 8%. The study showed that the distance and stocking density are the main factors determining the welfare of the fatteners during transport and the quality of the meat.

DETERMINATION OF TRANSPOSON FREQUENCIES OF *BOTRYTIS CINERA* POPULATIONS ON STRAWBERRIES FROM UMURLU AND KÖŞK DISTRICTS IN AYDIN, TURKEY

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Botrytis cinera is a widely distributed plant pathogen with the capability of infecting more than 220 plant species. It infects not only fruits but leaves, root, petals and stem also. It is easy for a pathogen to tolerate fungicides that has high genetic variability. Transposon variability is one of the ways for determination of genetic variability. *Botrytis cinera* has two transposons; *Boty* and *Flipper*. Presence or absence of these transposons determines the transposon group; *transposa* which has two transposons, *Boty* or *Flipper* which has only one transposon and *vacuma* which has neither transposons.

Samples were collected from strawberry fields located in Umurlu and Köşk districts in Aydın, Turkey during April 2015. They were isolated from infected strawberries. Single spore isolates were prepared from each strawberry sample and fostered on Potato Dextrose Agar (PDA) at 20°C for 5 days. After incubation period mycelia from each sample were collected in a tube and lyophilized for 24 hours. DNA isolation was realized according to Doyle and Doyle (1987). To detect the transposon presence PCR approach was followed. Primers F300 (5'-GCA CAA AAC CTA CAG AAG A-3') and F1550 (5'-ATT CGT TTC TTG GAC TGT A-3') was used for detection of Flipper and BotyF4 (5'-CAG CTG CAG TAT ACT GGG GGA-3') and BotyR4 (5'-GGT GCT CAA AGT GTT ACG GGA G-3') was used for detection of Boty. PCRs were carried out using 2X Mastermix (Fermentas) at 95°C 3 min for initial denaturation, 40 cycles of 94°C 40 sec denaturation, 60-68°C 40 sec annealing, 72°C 1 min extension ve 72°C 10 min final extension. PCR products were size controlled on 1.5% agarose gel at 90 V 30 min. PCR products were sequenced (Macrogen, Holland) and controlled with BLASTn software.

We tested for the presence or absence of the two transposons in 70 *Botrytis cinera* samples. Majority of the isolates belongs to *Boty* transposon group (77%) while the rest belongs to *Transposa* transposon group (33%). Since *vacuma* transposon group hasn't seen in both populations all samples are carrying one or both of the transposons. In *transposa* transposon group both transposable elements are present; meaning all 70 samples carries *Boty* transposon and only 17 samples carries *Flipper* transposon but not without *Boty*.

The PCR-RFLP method will be applied to distinguish group I and group II strains based on *Bc-hch* locus. With this we will be able to see transposon distribution among two RFLP groups.

**REPRODUCTIVE AND PRODUCTIVE PERFORMANCE
OF PRESTICE BLACK-PIED PIG FROM TWO DIFFERENT FARMS***

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The aim of the study was to evaluate productive and reproductive performance of Prestice Black-Pied sows (original Czech breed included in animal genetic resources) in conditions of two farms. The experiment involved one hundred sows from the 1st to the 7th parity. Both observed farms have breeding farm status. Farm A: Sows are stabled in individual farrowing pens in farrowing house. Feed is administered manually. Air ventilation is solved with ventilation flaps. The floor in stable for inseminated and pregnant sows is solid and the sows are stabled in groups of 6-10 animals. Farm B: Sows in farrowing house are stabled in farrowing cages. Feed administration and air ventilation is solved automatically. The floor is partially slatted and the animals are stabled in groups of 10-12 animals.

Performance control in gilts was in accordance with the methodology CSN 466164. The data were analysed using software QCExpert (TriloByte Statistical Software Ltd.).

The evaluation of productive parameters (performance test) in gilts shows that the difference in the percentage of lean meat is very highly significant ($P \leq 0.001$) between gilts from the observed farms ($60.20 \pm 1.74\%$ vs. $58.07 \pm 2.76\%$). The backfat thickness was 0.19 mm lower in gilts from the farm A ($P \leq 0.001$).

Table 1. Basic statistical characteristics of reproductive parameters in sows by the farm

Parameter	Farm	Mean	S _x	Min	Max	Significance
Age at 1 st mating	A	306.74	56.67	242.00	435.00	*
	B	266.94	44.96	216.00	358.00	
Total number of piglets/litter	A	9.20	2.35	4.00	14.00	NS
	B	9.52	2.17	3.00	14.00	
Number of live-born piglets/litter	A	8.16	2.38	3.00	12.00	NS
	B	8.70	2.14	3.00	13.00	
Number of stillborn piglets/litter	A	1.76	2.02	0.00	7.00	**
	B	0.82	0.87	0.00	3.00	
Number of reared piglets/litter	A	7.90	2.40	3.00	12.00	NS
	B	8.14	1.91	3.00	12.00	
Farrowing interval (days)	A	172.53	23.74	151.00	241.00	*
	B	158.24	21.55	145.00	245.00	
Loss of piglets/litter	A	0.26	0.60	0.00	3.00	*
	B	0.56	0.73	0.00	2.00	

NS $P \geq 0.05$; * $P \leq 0.05$; ** $P \leq 0.01$

The analysis of reproductive performance revealed that the age at the time of the first insemination was statistically significantly higher ($P \leq 0.05$) in gilts from the farm A compared to gilts from the farm B by 39 days on average. The performed analysis also shows that there was no significant difference between observed farms in the total number of piglets and the numbers of live-born and reared piglets. The length of interval was significantly longer ($P \leq 0.05$) in sows from the farm A by 14.29 days. In the losses of piglets, a significant difference was recorded between the farms in favor of the farm A. In conclusion, there are significant differences between the farms in the performance of Prestice Black-Pied sows.

* The study was supported by the project NAZV QJ1210253 of the Ministry of Agriculture of the Czech Republic.

**ANALYSIS OF MITOCHONDRIAL DNA HYPERVARIABLE D-LOOP REGION
OF BIALA KOLUDZKA GOOSE**

ANALIZA REGIONU HIPERZMIENNEGO D-LOOP MITOCHONDRIALNEGO DNA
GĘSI BIAŁEJ KOŁUDZKIEJ

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Mitochondrial DNA is a very useful molecular tool due to its high polymorphic control region and lack of recombinations. Frequency of mutations in mtDNA is higher than in nuclear DNA, moreover degree of differentiation in mitogenome is a characteristic for population. A mitochondrial control region also known as D-loop hypervariable region is a non-coding sequence including fragments responsible of initiation of replication and transcription, additionally its variability is the highest in whole mtDNA. Mitochondrial DNA polymorphism could be use as a molecular tool for variability in geese population research. Biala Koludzka goose is the most widespread and common breed occurring on the Polish geese fattening farms and it is represented by 90% of the national population of geese. Biala Koludzka goose was bred in Koluda Wielka and nowadays is leading in two parental lines: maternal W11 and paternal W33. This breeding material is foundation to genetic population research.

The aim of the present study was searching for variability in mtDNA D-loop hypervariable region of Biala Koludzka goose. Analysis was performed on seven goose individuals from W11 and W33 lines. The whole DNA was isolated from plumage with the use of DNA Isolation Kit Sherlock AX (A&A Biotechnology). Based on DNA sequence for control region of *Anser anser* (GeneBank accession number NC_011196.1) primers were designed using the Primer 3 software. The expected fragment of 695 bp length was amplified and sequenced. DNA sequencing products were separated using the 3130xl Genetic Analyser (Applied Biosystems) and analyzed in BioEdit software.

Average length of DNA sequencing products was 638 bp and occur identical comparing to reference sequence of *Anser anser* (NC_011196.1). Results of analysis indicate a lack of genetic variability in the tested group of individuals of Biala Koludzka goose. This preliminary results of hypervariable region study of Biala Koludzka goose. In the next step of our research we are going to compare the sequence of Biala Koludzka goose to other species from the *Anatidae* family, such as ducks and swans.

SPERM QUALITY CHARACTERISTICS IN EXTENDED BOAR SEMEN HELD AT DIFFERENT TEMPERATURES PRIOR TO CRYOPRESERVATION

WŁAŚCIWOŚCI BIOLOGICZNE PLEMNIKÓW Z ROZRZEDZONEGO NASIENIA KNURA PRZECHOWYWANYCH W RÓŻNYCH TEMPERATURACH PRZED KRIOKONSERWACJĄ

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Cryopreservation causes extreme damage to the functional and structural integrity of spermatozoa, thereby impairing their fertilizing ability. Moreover, different methods of semen treatment prior to freezing have been used to increase the sperm susceptibility to cryo-induced damage. This study investigated the effects of 2 h and 24 h holding time (HT) periods of extended boar semen at temperatures, prior to freezing, on the post-thaw sperm quality characteristics. Sperm rich fractions were diluted in Androhep® Plus (AHP), Androstar® Plus, ASP (Minitübe, Germany), Safecell® Plus (SCP) and TRIxcell® Plus, TCP (IMV Technologies) extenders and held for 2 h and 24 h at 17°C (HT 1) and 10°C (HT 2), respectively. Total motility (TMOT), progressive motility (PMOT) and speed velocity distributions, such as rapid (RAP), medium (MED), slow (SLOW) and static (STAT), were analyzed with the computer-assisted sperm analysis (CASA) system (HTR-IVOS 12.3, Hamilton Thorne Biosciences). The CASA – analyzed sperm parameters, in combination with assessment of the sperm mitochondrial membrane potential (MMP), normal apical ridge (NAR) acrosome integrity, and viability and plasma membrane apoptotic-like changes (Vybrant Apoptosis Assay Kit), were performed in HT1 and HT 2 of the pre-freeze and frozen-thawed semen. ANOVA results showed that most of the analyzed sperm parameters were affected by the main effects of boar, extender type and HT of the pre-freeze semen or frozen-thawed semen. Furthermore, boar × extender and boar × HT interactions significantly affected PMOT ($P < 0.044$ and $P < 0.019$, respectively) and NAR acrosome integrity ($P < 0.012$ and $P < 0.004$, respectively) of the pre-freeze semen. Also, boar × extender and boar × HT interactions were significant sources of variations in post-thaw RAP movement and NAR acrosome integrity ($P < 0.047$ and $P < 0.014$, respectively). Significantly higher ($P < 0.05$) sperm PMOT and RAP movement were detected in HT 2 of the pre-freeze semen in all the extenders, except for the TCP extender. It was found that AHP-, AHS- and SCP-extended semen of HT 2 exhibited higher ($P < 0.05$) post-thaw PMOT and TMOT. Significantly higher ($P < 0.05$) percentages of spermatozoa with RAP movement in HT 2 were concomitant with greater proportions of spermatozoa with STAT movement in HT 1 after freezing-thawing, irrespective of the extender type. No marked changes in the percentages of frozen-thawed spermatozoa with MED and SLOW movement were observed among the extenders or between the HTs. In all the extenders higher ($P < 0.05$) post-thaw sperm MMP and viability (YO-Pro-1-/PI-) were detected in HT 2. There were wide variations in the percentages of dead spermatozoa (YO-Pro-1+/PI+) between the HTs following freezing-thawing, being significantly higher ($P < 0.05$) in the TCP extender of HT 1. No marked changes ($P > 0.05$) in either the percentages of sperm NAR acrosome integrity or plasma membrane apoptotic-like changes in spermatozoa (YO-Pro-1+/PI-) were observed following freezing-thawing. The results of this reaffirm that different extenders and holding time periods, used prior to freezing, exert protective effects on the sperm quality characteristics following freezing-thawing. In addition, the findings of this study confirm that holding of boar semen in different long-term extenders at 10°C after a 24 h HT reduces the sperm susceptibility to cryo-induced damage. Such findings will be useful for the improvement in the cryopreservation technology of boar semen. (Supported by funds from UWM in Olsztyn (No.11.610.003.300;11.620.025.300).

**ANALYSIS OF BULL (*BOS TAURUS*) SEMINAL VESICLES FLUID PROTEOME
IN RELATION TO SEMINAL PLASMA PROTEOME***

ANALIZA PROTEOMU PŁYNU GRUCZOŁÓW PĘCHERZYKOWYCH BUHAJA
W RELACJI DO PROTEOMU PLAZMY NASIENIA BUHAJA (*BOS TAURUS*)

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Current proteomic knowledge concerning the relationship of bull seminal plasma and its major constituent, the seminal vesicles secretion, is limited. This knowledge is crucial to better understanding of the variability of seminal plasma, which in turn affects the quality of semen. Therefore the objective of this study was to compare the proteomes of bull seminal plasma and seminal vesicles fluid, in order to better understand participation of seminal vesicles fluid in seminal plasma, and the relationship between these fluids.

Ejaculates and seminal vesicles fluid obtained post-mortem were collected from six mature Holstein Friesian bulls. After clean-up procedure of collected samples, we analysed and identified proteins utilizing 2-dimensional electrophoresis coupled with matrix-assisted laser desorption/ionization mass spectrometry. In total, 88 proteins from seminal plasma and 105 proteins from seminal vesicles fluid were identified. Analysis of seminal plasma proteome allowed for indication of six major protein groups. Two of them were related to protective functions towards spermatozoa and other tissues of reproductive system, two groups were related to correct morphology and physiology of spermatozoa, one reflected sperm maturation in epididymis, and one was connected to glycolytic pathway. Analysis of seminal vesicles proteome distinguished two protein groups, both of which mirrored the functionalities of similar protein groups in seminal plasma – the groups related to protective functions and groups related to correct spermatozoa functioning. Comparison of seminal plasma proteins and seminal vesicles proteins suggested that some seminal vesicles proteome proteins might adsorb on the surface of spermatozoa. Additionally, the data strongly suggested that ampullary gland is probably the major source of osteopontin, which can be potential biomarker of this gland.

Our data allowed for the description and analysis of bull seminal vesicles fluid proteome for the first time, and significantly expanded current knowledge on bull seminal plasma proteome. Our analysis indicated multiple potential connections between particular proteins and protein groups of seminal plasma and seminal vesicles fluid. These connections could be specifically targeted in future research in order to better understand the molecular basis of seminal plasma functioning.

* This work was supported by grants 2013/09/N/NZ9/01655 and 2013/09/B/NZ9/01752 from the National Science Center and funds appropriated to Institute of Animal Reproduction and Food Research.

**COMPARISON OF STRUCTURAL PROPERTIES
AND TENDERNESS OF M. SEMIMEMBRANOSUS OF DIFFERENT PIG BREEDS***

PORÓWNANIE PARAMETRÓW STRUKTURALNYCH
I KRUCHOŚCI M. SEMIMEMBRANOSUS ŚWIŃ RÓŻNYCH RAS

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One of the most important meat traits for consumer satisfaction is meat tenderness. Meat tenderness depends on several factors such as muscle fibre composition, sarcomere length, pH, intramuscular fat content and rate of tenderization. An important role in shaping meat tenderness is also played by connective tissue, which has been shown to be a critical factor in meat tenderness. For many years, pigs were selected for improved fattening and slaughter traits, in particular for increased meatiness. This has increased the incidence of meat quality defects in the most desirable part of the pig carcass, namely the *longissimus dorsi* muscle, and in one of most representative pork cuts, namely the ham, of which *m. semimembranosus* is analysed the most often. Much hope is placed on the investigations of muscle microstructure to explain the increasing meat content and the deteriorating quality of pig meat. Animal breed is one of the major factors affecting the physicochemical parameters of meat. Accordingly, one way to improve pork quality is to increase the interest in native pig breeds, including the Złotnicka Spotted which represents a valuable genetic resource and is characterized by high resistance to infectious agents, low feed requirements, and very good quality of meat. Therefore, the objective of the study was to analyse the effect of breed on characteristics of muscle fibres, parameters of intramuscular connective tissue, collagen content, intramuscular fat content and tenderness of *semimembranosus* muscle in pigs.

The study was conducted with 16 Złotnicka Spotted (ZS) and 23 Polish Landrace (PL) fattening pigs slaughtered at 210 days of age.

The results obtained show that the *m. semimembranosus* of ZS pigs was characterized by a significantly greater percentage of type I fibres and a smaller percentage of type IIB fibres compared to the muscles of PL pigs. In addition, ZS pigs had significantly smaller diameters of all the three muscle fibre types compared to PL pigs. In the case of intramuscular connective tissue, the microstructural analysis performed by light and scanning electron microscopy showed every muscle fibre to be surrounded by a thin sheath of wavelike collagen fibres, arranged concentrically around muscle fibres and forming the endomysium. ZS pigs were characterized by a more delicate arrangement of collagen fibres. In the skeletal muscle, muscle fibres are grouped into bundles, which are surrounded by a connective tissue sheath, the perimysium. In the present study, the perimysium of *m. semimembranosus* from ZS pigs is formed by numerous bundles of collagen fibres, which run concentrically and diagonally around muscle bundles and criss-cross to form a relatively loose network. In PL pigs, however, the collagen fibres which form the perimysium are arranged in thick, parallel bundles that adhere tightly together and run concentrically around the muscle bundles. Furthermore, the morphometric analysis showed that both the endomysium and the perimysium were significantly thicker in the *m. semimembranosus* of ZS compared to PL pigs. In turn, the muscles of PL pigs were characterized by a significantly smaller percentage of immunohistochemically detected collagen in the muscle structure, by lower levels of total and soluble collagen, and by lower IMF content compared to the muscles of ZS pigs. As regards shear force, this parameter was significantly lower for the muscles of ZS compared to PL pigs.

* This research was supported by DS-3253.

CAN CANINE OOCYTES UNDERGO A SUCCESSFUL MEIOTIC MATURATION UNDER SEQUENTIAL *IN VITRO* CULTURE CONDITIONS THAT WERE ANALOGOUS TO THOSE PREVAILING DURING THE MATURATION OF PORCINE OOCYTES?

CZY DOJRZEWANIE MEJOTYCZNE OOCYTÓW PSA DOMOWEGO MOŻE BYĆ EFEKTYWNE W WARUNKACH SEKWENCYJNEJ HODOWLI *IN VITRO*, KTÓRE BYŁY ANALOGICZNE DO WARUNKÓW PANUJĄCYCH PODCZAS DOJRZEWANIA OOCYTÓW ŚWINI DOMOWEJ?

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The efficiency of *in vitro* oocyte maturation (IVM) in domestic dog (*Canis lupus familiaris*) persists at the disappointingly low levels that range from 0% to approximately 25%. Imminently, these disadvantageous circumstances and failures have given rise to chronic scarcity of canine female gametes that turn out to be meiotically competent *ex vivo*. On the one hand, high incidence of impairments in the acquisition by bitch oocytes of competence to mature extracorporeally is reflected in their extremely low ability to resume the first meiotic division by onset of germinal vesicle breakdown (GVBD) and the subsequent release from prophase I dictyotene-related block. On the other hand, drastically diminished meiotic competence of *in vitro* cultured canine female germ cells has been found to be correlated with abundance of oocytes that are incapable of completing the second meiotic division immediately after their exit from metaphase II (MII) arrest, which is triggered through intraooplasmic spermatozoon penetration-mediated process of ovum activation. For these reasons, either development of the effective strategies used for IVM in this member of the *Canidae* family or optimisation of the procedures adapted from IVM in other mammalian species seem to be inevitable to successfully generate canine embryos by applying such assisted reproductive technologies (ARTs) and experimental embryology techniques as standard *in vitro* fertilization (IVF), microsurgical IVF by intracytoplasmic sperm injection (ICSI) and intra-species or inter-species cloning by somatic cell nuclear transfer (SCNT). The objective of the current study was to compare the rates of canine (Group A) and porcine (Group B) oocytes reaching the MII stage under similar biochemical and biophysical conditions of sequential (two-step) IVM. The medium intended for the first step of IVM was comprised of Tissue Culture Medium 199 (TCM 199) and enriched with 10% foetal bovine serum (FBS), 10% porcine follicular fluid (pFF), 5 ng/mL recombinant human basic fibroblast growth factor (rh-bFGF), 10 ng/mL recombinant human epidermal growth factor (rhEGF), 1.2 mM *L*-cysteine (*L*-Cys), 0.1 IU/mL human menopausal gonadotropin (hMG), 5 mIU/mL porcine follicle-stimulating hormone (pFSH) and 1 mM dibutyryl cyclic adenosine monophosphate (bucladesine; db-cAMP). In the second step of IVM, cumulus-oocyte complexes (COCs) were cultured in the medium depleted of hMG, pFSH and db-cAMP. In Group A, canine COCs were matured *in vitro* for 22 h in the hMG-, pFSH-, and db-cAMP-supplemented TC 199 medium. They were then incubated for an additional 50 h in the medium deprived of hMG, pFSH and db-cAMP. In Group B, porcine COCs that had been classified for IVM were cultured for 22 h in the hMG-, pFSH-, and db-cAMP-enriched TCM 199, followed by 22 h incubation in the medium lacking hMG, pFSH, and db-cAMP. The meiotic (nuclear) maturity status of canine and porcine cumulus-free oocytes was identified according to both morphological assessment (the presence of the first polar bodies fully expelled into their perivitelline spaces) and bisbenzimidazole fluorochrome-dependent cytochemical analysis. The sequential IVM has brought about achieving the complete meiotic maturity at the MII stage by 0/97 (0%)^A bitch oocytes as compared to 115/126 (91.3%)^B gilt/sow oocytes (^{A,B} $P < 0.001$; χ^2 test). Collectively, canine oocytes did not exhibit capacity to both acquire the meiotic competence, and to attain the nuclear maturity status under analogous conditions of two-step IVM that were used for *in vitro* culture of porcine oocytes. Therefore, future studies are indispensable in order to develop and/or adapt efficient and more cytochemically or cytophysiologically relevant approaches to *ex vivo* meiotic maturation of oocytes originating from domestic dog bitches.

**RATING SPECIES DIVERSITY OF WEEDS IN OATS ORDINARY GROWN
ON FARMS WITH DIFFERENT FARMING SYSTEM**

OCENA RÓŻNORODNOŚCI GATUNKOWEJ CHWASTÓW W OWSIE ZWYCZAJNYM
UPRAWIANYM W GOSPODARSTWACH RÓŻNIĄCYCH SIĘ SYSTEMEM GOSPODAROWANIA

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Organic farming in Poland and around the world is growing rapidly, taking into account the number of producers, acreage and production volume. The growing demand of the consumer market for organic food products and also their insufficient availability and higher price translates into interest in conventional farmers change the current method of management. Conventional farmers making decisions on the transformation of the traditional way of farming in ecological generally have a number of concerns related to production methods and end up with a result of the financial holdings. One of the problems requiring explanation is the increased risk of ecological field crops by pests, mainly by weeds segetal. The potential danger of severe infestation of organic farming due to, among others, with the principles of organic farming, limiting the use of synthetic inputs (fertilizers and pesticides). The effects of increased competition weeds from crops reduce the quantity and quality of the harvested plants. Therefore, there is a need to find adequate ways to cultivate organic crops, which could reduce potential yield loss resulting from the restrictions on chemical weed control of field crops.

The aim of the study was to determine the status and degree of infestation of oats grown in farms with different farming system (conventional and organic).

Field tests of ordinary oats were carried out in 2011 in two farms (organic and conventional), located in the Municipality Szczecinek. Based on interviews conducted with landowners and shared documents made characteristics of each farm. In the experiment the analysis of weed infestation oats – three times during the growing season (1 – phase of tillering, heading 2 and 3 before harvest plants). The measurements were made using botanical – using a frame size of 1 m² in four randomly selected locations specified floristic composition and abundance of individual species. The results are presented as the mean per 1 m².

Test results showed that the weed oats grown on an organic farm was significantly higher than in oats grown in a conventional farm. The hinds oats grown on an organic farm, in each successive period of study increased species diversity of weeds (from 6 to 14 species) and their size (from 191.8 to 243.5 pcs·m⁻²). The most dominated: *Chenopodium album*, *Tripleurospermum inodorum*, *Galeopsis tetrahit*, *Avena fatua*, *Lapsana communis*. The use of herbicides in the care of oats grown on the farm conventional helped to reduce the infestation. For each test period reduces the variety of weed species (from 6 to 11 species) and their size (from 44.7 to 126.3 pcs·m⁻²). Dominated: *Thlaspi arvense*, *Chenopodium album*, *Matricaria chamomilla*, *Polygonum convolvulus*, *Vicia hirsuta*. In summary way of growing on an organic farm promotes the development of vegetation segetal, their biodiversity and their high rate of coverage.

EFFECTS OF SOME GROWTH INDUCING BACTERIA ON *ORYZA SATIVA* L. GROWTH

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Usege of the unconscious and excessive doses of pesticides and chemical fertilizers to ensure increased efficiency in the agricultural sector along with causing the accumulation of vast amount of toxins in the plant, disrupts soil structure, causes the land to desertification and the loss of vitality. Therefore, to avoid negativity that occurs excess use of chemical pesticides and fertilizers, microorganisms can be used instead of chemicals. *Rhizobacteria* which induces plant growth, besides their stimulatory effects, they are effective in biological control of diseases.

In the study five different *Oryza sativa* varieties were used along with six bacteria species plus negative control. Bacteria species used in the study were *Azotobacter* sp., *Bacillus subtilis* ATCC 6633, *Bacillus cereus* ATCC 11778, *Pseudomonas aeruginosa* ATCC 35032, *Enterobacter aerogenes* ATCC 13048 and *Serratia marcescens* ATCC 13880. Sterile distilled water was used as negative control. Bacterial suspensions were prepared at the concentration of 10^8 cfu/ml and injected 5 ml for each variety. Surface sterilization of the seed were made with 5% hipochlorite solution. After sterilization 100 of seeds were put in petri dishes and left at 25°C for 3 days for germination. At the end of the period germinated seed were counted. Another set of seeds, 5 seeds for each variety, will be sterilized and put in the soils in flowerpots. Flowerpots were left in climate chamber at 25°C at 13 h of light and 11 h of dark for 10 days. After ten days of growth period measurements of stem length, root length, stem radius, root radius and leaf width were measured with digital compass and recorded.

In petri dish experiments it can be seen that all bacteria induced germination ratio. While control group has a germination ratio of 40%, experiment group's germination ratio is above 85%. Among these six bacteria *Pseudomonas aeruginosa* has highest inducement ratio (96.8%) while *B.subtilis* has lowest inducement ratio (92.4%). Yatkın was the most effected variety among all five varieties. It's germination ratios change between 88%-99% while control group has 13% germination ratio. Edirne and Efe varieties were the least effected varieties with the control group 72%, experiment group between 90%-98%.

In soil experiments all bacteria reduced the stem length but increased root length while all other criterias varied depending on the bacteria. *B.cereus* increased all criterias except stem length while *P.aeruginosa* reduced stem length, stem radius and root radius and increased root length and leaf width. When we looked to the overall effects of the bacteria on the selected criteria we can say that bacteria decreased more than half of the selected criteria. Although further experiments must be done it can be said that soil contamination can be harmful to the crops.

**THE EFFECTS OF COTTON OIL ADDITIVES TO DIETS BASED
ON DIFFERENT FORAGES (ALFALFA, CORN SILAGES)
ON GREENHOUSE GAS EMISSIONS FROM SLURRIES IN AWASSI EWES**

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The purpose of the study was to investigate the effect of combining plant oil to diets with different forage sources to concentrate on methane, carbon dioxide and nitrous oxide (CH₄, CO₂, and N₂O) emission of slurries in *Awassi* ewes. The experiment was carried out by 2 * 2 factorial designs with four groups and each group contained four sheep (total 16 sheep). The main factor was different forage based ratios (alfalfa hay and silage) with similar energy and protein content and sub factor was fat addition to these ratios. Cotton seed oil was preferred as fat source in order to evaluate cotton produced on this region. Changes in body weight of sheep were affected by forage source and live weight gain and feed conversion ratio developed positively in silage-consuming group at the end of first trial. Slurry components were not affected by the group's ratio. The contents of CH₄, CO₂ and N₂O gases located as ppm/ml in slurries were similar. But daily CO₂ emissions were increased significantly by the addition of cottonseed oil. The amounts of slurries and gases based origin of slurry were higher in the groups of alfalfa hay and the potential of gas production in these groups were higher. There was no effect of adding the oil on content of the slurries. Non-fat diets tended to contain lower NDF in the slurries especially in non-fats with silage based diets. As a result of this study, the using of alfalfa hay as forage source caused to more slurries and slurry gas production. The temperature and amount of humidity in slurries was the main factors in the rise of the proliferation of fungi and the amount of carbon dioxide.

THE INFLUENCE OF NUTRITIONAL PREPARATIONS ON QUALITY CHARACTERISTICS OF CUT ROSES

WPLYW WYBRANYCH PREPARATÓW ODŻYWCZYCH NA CECHY JAKOŚCIOWE RÓŻ CIĘTYCH

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Cut flowers available in the market are characterized by a relatively short life time and particular sensitivity to the conditions of storage, transport and distribution. These conditions make that, for long-term preservation, there are sought the methods for extending the period of trade. Optimizing conditions mainly include the improvement of storage methods through the use of innovative technologies to monitor the microclimate conditions and modifications of the atmosphere. Nutritional preparations, which are also used as aqueous solutions, are of great importance in extending the durability of cut flowers.

The aim of this study was to evaluate the effect of selected mineral-nutrient for life postharvest and qualitative characteristics of varieties of Grande Amore roses.

The research material consisted of Grande Amore roses varieties acquired in Podkarpackie Centrum Hurtowe Agrohurt SA. The purchased flowers were transported to the Laboratory Safety and Quality Rzeszów University of Technology. After a preliminary qualitative assessment which included an assessment of the mass of flowers, measuring the diameter and height of buds and their visual features, the flowers were divided into five experimental groups and were maintained: in distilled water (control) at 4% solution formulation Agrecol (group I), 4% sodium Chrysal Clear formulation (group II), 4% solution FloraLife formulation (group III) and 4% sucrose solution (group IV). Additionally, in each experimental group there were used two types of pruning stems – cut perpendicular and cut at an angle of 45°. The rated flowers were stored in the refrigerator at 4°C and 70% relative humidity. During the experiment lasting 20 days in the cycle of 48 hours the parameters such as changes in the mass of flowers, the volume loss solutions, the level of development of buds and visual features defining turgor flowers and buds color, color of flowers, the color of the leaves and stems of color were determined.

An important indicator of changes in the quality of cut flowers in the storage process is to achieve their maximum mass, which is an indicator of beginning of the aging process.

The maximum weight reached the latest flowers of Group I (the eighth day of storage) and Group II (the tenth day of storage), and significantly advance the maximum weight gained flowers stored in the solution preparation FloraLife (the fourth day observation). The study showed a significant contribution of the preparation on the mass loss of flowers during the experience. The smallest weight losses were recorded in the group of flowers stored in 4% sucrose, and 4% solution formulation FloraLife, and were significantly lower compared to the weight losses of flowers held in a 4% solution of the preparation Agrecol. Weight losses of flowers stored in the solution amounted to 30%.

The research showed that in the period of the most intense experiences (rate of change in the diameter of the flower) developed the flowers stored in a 4% solution of preparation Chrysal Clear. It was also demonstrated the impact of the test solutions for measuring the pace of flower development and its diameter on the last day of the experiment, the largest diameter in this period reached flowers stored in 4% sucrose solution and the solution of the Chrysal Clear. It was shown that the diameter of the flowers stored in these solutions during the experiment doubled. In contrast, the smallest change in the diameter of flowers was observed in Group I.

Based on organoleptic evaluation one demonstrated that until the second day of observation in all the experimental groups there were assessed the flowers with retention of high quality names. The earliest (the fourth day of experience) adverse changes in the form of visual discoloration of leaves appeared on the flowers of Group IV, stored in 4% sucrose solution. In turn, the visible changes of turgor loss for the first time were observed at the eighth day in the group roses stored in 4% solution of preparation FloraLife.

**THE INFLUENCE OF CASTRATION AND AGE ON THE INCIDENCE
OF HISTOPATHOLOGICAL CHANGES IN THE LIVERS OF ROOSTRES AND CAPONS**

WPŁYW KASTRACJI I WIEKU NA WYSTĘPOWANIE ZMIAN HISTOPATOLOGICZNYCH
W WĄTROBIE KOGUTÓW I KAPŁONÓW

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Results of studies performed on different breeds of domesticated chicken do not unequivocally confirm the beneficial effects of castration on weight gain and slaughter value of birds. Removal of the gonads significantly reduces the production of steroid hormones which affect the metabolic processes in the bodies of treated birds. Most of the studies confirm a greater body fat deposition, occurring both in the form of subcutaneous fat, intermuscular, intramuscular, and extramuscular fat, in the bodies of capons compared with cocks. The main processes of lipid to fatty acid synthesis, and their elongation and destruction as well as triacylglycerol synthesis occur in the liver. The already mentioned increased fat deposition in the bodies of capons may indicate disturbances between the influx of fatty acids and hepatic lipid synthesis and the process of beta-oxidation. Such disorders may result in the increased deposition of fatty compounds within hepatocytes (Kargulewicz, 2010). Therefore, the aim of this study was to determine the effects of surgical castration and age of the birds on histological picture of liver of cocks and capons.

The experimental materials comprised 200 Zk roosters supplied by the National Research Institute of Animal production in Chorzełów. At 8 weeks of age, 100 birds were subjected to surgical castration. Caponized and uncastrated males were raised to 28 weeks of age, and fed ad libitum commercial diets. Starting from 12 weeks of age, at 4 – week intervals, 10 birds were randomly selected from each group for the analysis. After the slaughter the samples of the liver (by 6 randomly selected cockerels and capons from each group in different time of fattening) were fixed in 10% neutralized formalin and embedded in paraffin blocks. The paraffin sections of the liver (5 µm) were stained with haematoxylin and eosin (HE). Additionally the liver samples were put into 30% saccharose solution with sodium azide addition, then frozen samples were cut into 8 µm sections and were stained with Oil Red O to detect lipids. Obtained preparations were subjected to microscopic evaluation.

Morphological evaluation of liver of cocks and capons showed most frequently parenchymal degeneration and fat degeneration of hepatocytes. Parenchymatous degeneration was observed from 12 weeks of age with low intensity, but at 28 weeks it was demonstrated in all subject birds. Fatty degeneration was evidenced at 12 weeks of age in one capon, then it increased in its intensity and at 28 weeks it was demonstrated in all subject birds – in 5 capons with moderate intensity, in one case with low intensity, whereas in the case of cocks at 28 weeks – 5 birds evidenced low intensity and 1 example showed moderate intensity. Oil Red staining showed the presence of small drops of fat that appeared red in the cytoplasm of hepatocytes. The morphological evaluation also showed infiltration of lymphoid cells, found both around vessels and around the biliary tracts. Starting from 12 weeks of age, infiltration of these cells was shown more often in capons than in cocks.

**THE SIGNIFICANCE AND INFLUENCE OF GRASSLANDS
ON THE NATURAL ENVIRONMENT AND LANDSCAPE FORMATION**

**ZNACZENIE ZBIOROWISK TRAWIASTYCH
W KSZTAŁTOWANIU ŚRODOWISKA PRZYRODNICZEGO I KRAJOBRAZU**

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The aim of this paper was to show the significance and influence of grasslands on the natural environment and landscape formation according on the literature reports.

Areas where grasslands are the dominating group are covering 1/3 of the earth lands, including: steppes, savannas, prairies, pampas, natural meadows and pastures. Grasslands are such ecosystems in which the majority of species include the *Poaceae*, *Cyperaceae* and *Fabaceae*. Grasses consist a wide range of species with a specific morphology and anatomy. This class also possess many biological features like: ability to fast regeneration of biomass after mowing, large biomass production in short time, fast adaptation to habitat conditions and the ability to appear in parallel with wide range of other plant species.

The role of grassland communities are determined by the main areas of their influence for example: development of fodder base of farms and food systems for herbivorous animals, development of raw materials for various industries and economic life and shaping the natural environment and landscape.

The impact of the meadows on the development of the natural environment manifests itself in soil protection against water erosion and wind, increasing soil fertility and the sequestration of organic carbon in the soil, reducing the migration of nutrients, shaping the climate, providing better water retention, preservation of floristic diversity and genetic resources, and shaping the diversity of the animal world.

With the influence of the meadows on the natural environment is inseparable like their function in landscape forming. They occupy a permanent place in the landscape, by determining its colors and the type of vegetation, sward structure and topography of the area.

In summary grasslands perform many functions like: production, climatic, protective, hydrological, biocenotic, landscape shaping, culture and recreation.