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CURRENT CONCEPTS ON MECHANISMS REGULATING EMBRYO-MATERNAL DIALOGUE DURING EARLY PREGNANCY IN THE PIG

MECHANIZMY REGULUJĄCE INTERAKCJE POMIĘDZY ZARODKAMI A ORGANIZMEM MATCZYNYM PODCZAS WCZESNEJ CIĄŻY U ŚWINI

Agnieszka Blitek

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In the pig production, litter size is affected by the ovulation and fertilization rates, embryonic mortality, uterine capacity, and placenta efficiency. Among these factors, early embryonic death occurring on days 10 to 30 seems to be predominant and can reach 30%. Days 10 to 30 after fertilization are crucial for pregnancy establishment and subsequent fetus development because of maternal recognition of pregnancy and implantation that take place at this time. Implantation is a highly orchestrated process which can occur only if developmental synchrony exists between the conceptus (embryo with extra-embryonic membranes) and uterine endometrium. Understanding of mechanisms involved in embryo-maternal dialogue is essential to enhance fertility and reproductive health of pigs and other domestic species.

The endometrium undergoes morphological and physiological changes during each estrous cycle in order to prepare this tissue for implantation. These changes are regulated by ovarian steroids. The action of progesterone (P4) is essential to attain uterine receptivity for implantation. Under the influence of P4, the endometrium is transformed into a secretory tissue to create the environment permissive to conceptus development and implantation. Sustained P4 action on the endometrium affects the synthesis and/or secretion of cytokines, growth factors, prostaglandins (PGs), and integrins, but supports also vascular development. Interestingly, down-regulation of P4 receptors in endometrial epithelial cells after day 10 of gestation is essential for initiation of implantation and depends on P4 itself.

In mammals, embryos/conceptuses developing in the uterine lumen signal their presence to the mother in order to sustain functional corpus luteum which produce P4, the hormone of pregnancy. Between days 10 and 12 after fertilization, porcine conceptuses undergo morphological transition from large spheres (10 to 15 mm diameter) to filamentous forms (up to 100-200 mm). During this period of rapid elongation, the trophectoderm produces significant amounts of estrogens for pregnancy recognition. Estrogens stimulate P4 secretion from corpus luteum directly, and also increase the concentration of luteinizing hormone receptors. Effects of conceptus estrogens on the endometrium include regulation of PGs synthesis to favor luteoprotective PGE2, increased uterine blood flow, and enhanced secretion of proteins that contribute to histotroph within the uterine lumen. Besides estrogens, peri-implantation porcine conceptuses secrete interferons (IFNδ and IFNγ), PGE, and interleukin 1β. All these factors regulate the expression of several genes responsible for endometrial remodeling for implantation and conceptus development between days 13 and 25 of pregnancy.

Rapid elongation of porcine conceptuses allows maximum surface area of contact between trophectoderm and uterine epithelium. Our latest results revealed a dramatic increase in the expression of genes encoding peroxisome proliferator-activated receptors (PPAR) β/δ and γ isoforms in filamentous porcine conceptuses compared with spherical ones. PPARs belong to the nuclear receptor super-family and function as transcription regulators. The process of conceptus elongation involves exponential increases in length and weight of the trophectoderm and PPARs are well known regulators of energy and glucose homeostasis, lipid metabolism, and cell proliferation. Therefore, conceptus transformation may be under the control of PPARs. Moreover, PPARβ/δ and γ expression in porcine trophectoderm cells is stimulated by estradiol.

In the pig, the conceptus and endometrium synthesize and secrete substantial amounts of PGs, including PGE2 and PGI2 during early pregnancy. Blocking of PGs synthesis results in pregnancy failure. PGE2 and PGI2 synthesis in the endometrium is affected by conceptus products. PGE2 is involved in protecting the corpus luteum against luteolytic effect of PGF2α. Both PGE2 and PGI2 stimulate the attachment of trophectoderm cells, while PGI2 increases also their proliferation. In the endometrium, PGI2 may be involved in the function of vascular system, because it acts as a potent vasodilator. Increased uterine

blood flow is necessary for continued endometrial cell function and for sufficient embryo/fetus nutrition. Moreover, we found that the expression of PGI2 receptors in non-vascular endometrial cells increases in response to conceptus signals. Activation of these receptors by PGI2, results in a greater expression of pro-angiogenic factors: FGF-2 and VEGF164. Thus, PGI2 receptor signaling is an important component of embryo-maternal communication in the pig.

Implantation involves a complex series of sequential interactions between the embryo and the uterus. Initial attachment of porcine conceptus trophectoderm to the endometrial epithelium starts at approximately day 13 of gestation, followed by a more stable adhesion on day 16 and ending with the formation of the placenta. The pig is the only species demonstrating a true epitheliochorial placenta in which there is no displacement or invasion of the maternal tissue. Both conceptus trophectoderm and uterine epithelium express a number of integrin subunits that may dimerize to form integrin receptors. Binding of integrin receptors to extracellular matrix molecules results in cytoplasmic reorganization, induction of focal adhesion, and "bridging" cells of two genetically different organisms for successful pregnancy establishment. In summary, in response to ovarian P4 and conceptus signals, the uterus secretes large amounts of a wide variety of biological factors, and this secretions establish a unique embryotrophic environment that plays an important role in the survival of embryos, implantation and placenta formation. Identification of specific downstream genes/proteins/signaling pathways regulated by components of the histotroph might be helpful in better understanding of embryo-maternal dialogue. Moreover, determination of genetic markers of conceptus signaling and endometrial receptivity would be of great benefit for increasing reproductive efficiency, and also for optimizing transgenesis, cloning, and other biotechniques.

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INVASIVE FERAL SWINE IN NORTH AMERICA: HISTORY, IMPACTS AND MANAGEMENT

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Wild hogs have secured a respectable reputation in history across the world. They have been hunted by Romans, are portrayed in the stories of King Author and are held responsible for the death of the demi-god Adonis. The goddess of grain and agriculture, Demeter, is often seen in artwork with a hog. Regardless of the origin of the legend, the hog is almost always depicted as fierce animal that is a formidable opponent in a hunt. Of all of the livestock animals, the hog seems to hold reverence as it has been, and often still is on special occasions presented in its recognizable form when presented for meals.

Despite the long history of the hog in European countries, the hog is fairly new to North America. There are three types of feral hogs found in the U.S. now: domesticated feral hogs, Eurasian wild pigs, and hybrids of the two. Each has distinctive characteristics, but all are classified as *sus scrofa*. Before transport regulations of pigs in the U.S. were implemented, it is assumed that hybridization of these animals was facilitated by relocations to various sport hunting ranches as well as habitat invasion. There is still debate as to the exact time of the introduction of swine to the new world. One common theory is that Columbus brought the first domestic swine during his second voyage to the new world. Some maintain that DeSoto and DeLeon were the first to introduce the animal to the continental US in the early 1500's. Naturally, descendants of those hogs escaped confinement, allowing them to reproduce in the wild. Early settlers also facilitated the distribution of hogs across the continent while traveling with the animals to the west. In the 1920's, fifteen, mixed-sex wild boars from the Germany Hartz Mountains were released into a ranch in North Carolina for sport hunting. This group was left unadulterated for 8 to 10 years to multiply and establish a population able to support the sport. Animals from this population were also relocated to another sport hunting facility in California. Pure wild boar populations are still found in National Parks in California and North Carolina.

Feral hogs are omnivorous and are able to sustain themselves on a wide variety of forage of both plant and animal sources. They are opportunistic consumers and diet selection varies with season and availability. Problems with feral hogs occur primarily when they forage for food in unwanted areas. Discussion of feral hogs rarely goes without comment as to how effective they are at destruction of their environment. Foraging hogs are often the cause of soil erosion, altered plant succession, disruptive natural water flow, mineral imbalance, wildlife displacement and destruction of crops. Hogs are known to keenly compete for habitat (food, water, shelter) with native wildlife such as deer, turkey, waterfowl, squirrel, raccoon, opossum, foxes, bobcat, collared peccary, bears, snakes, and quail. They are known to take a predatory role among birds, reptiles, and small mammals in certain conditions. They are partial to agricultural crops such as peanuts, corn, milo, oats, wheat and soybeans and rooting in softer soils can reach up to 3 feet in depth.

Preventing movement of feral hogs either in or out of an area can be difficult. Fencing typically has to be both buried and electrified to be effective. This type of fence is not only expensive, but can often limit the movement of native wildlife. The use of toxicants to maintain hog population is not legal in the US. Hunting and trapping are currently the most popular ways of controlling feral hog populations in a given area. However hogs prove to be intelligent and almost always adapt their behavior to avoid being caught. Many feel that a more effective method to control and reduce feral swine populations is a critical component of addressing feral swine depredations.

Our study is investigating the possibility of using cottonseed-based feedstuffs as a method of reducing feral hog populations, by reducing reproduction, thus improving the effectiveness of other control methods such as trapping, hunting. Cottonseed is a candidate for such control because of the presence of the secondary plant compound gossypol and it's availability in the US. Gossypol is a compound found in the pigment glands of cotton plant. There is a variety of published reports regarding the physiological ef-

fects of cottonseed products in livestock. Animals with a functioning rumen seem to have much higher tolerance to gossypol toxicity as the free gossypol is chemically bound during ruminant fermentation. Pigs fed cottonseed meal containing free gossypol content of 80, 244, or 400 mg/kg in the diet reported that the pigs on the lower dose showed no ill effects while pigs fed the higher concentrations suffered from weight loss, poor appetite and mortality. Consumption of cottonseed products has been linked to many reports in reproductive dysfunction; however the intensity and effects are variable depending on source of the product, type and age of the animal. Dairy cows fed diets containing 717 or 951 mg/kg BW had a lower conception rate and increased fetal loss. Inclusion of cottonseed to diets (0, 15, or 30%) fed to kid buck goats had no effect on intake or daily weight gain; however at the higher dose, scrotal circumference, sperm motility and semen concentrations decreased. Reports of lowered reproductive efficiency of pigs do exist, but are not conclusive. It was reported that sows consuming 24.2% of their diet from cottonseed meal for 94 days prior to farrowing had smaller litters and increased stillbirths. But in another study with 0.01% free gossypol, could not repeat those results. Another study found decreased testosterone concentrations in boars, but diet had no influence on the birth weight or vitality of piglets. Our study is evaluating dose rate responses in fertility and mortality rate, as well as identifying compounds that will make a cottonseed product more appealing to hogs and less appealing to non-target animals.

THE IMPORTANCE OF BEEKEEPING, PRODUCTION AND BEEKEEPING ORGANIZATIONS IN TURKEY

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Turkey is a gen pool due to its own geographical richness with different ecotypes holding many plant and animals such as bees. It comes from especially it's location in temperature zone of the earth. The Turkish flora includes more than 9000 plants species. About 3000 of them are endemic and 1000 of them are used as medicine and spice in Turkey. Turkish people are interested in wild plants. Some of these plants are used as flavoring agents, spices, natural dyestuff, perfumes, cosmetics, and pharmaceutical and biological agents Turkey has also 75% honeyed plant species. In terms of honey production, Turkey has been ranked 2[th] in the World after China with 94.694 tone honey and ranked 3[th] in the World after India and China with the 6.641.348 colonies according data by FAO in 2014.

Under this condition, about 60.000 of families experince in beekeeping and most of beekeepers are professional. They keep between 100-200 honeybee colonies and usually use *A. m. anatolica* and *A. m. caucasica* genotypes in production.

There is one Beekeeping Research Institute located in Ordu city, two beekeeping departments connected to Agriculture Ministry (Aegean Agriculture Research Institue in İzmir and Alaata Research Institue in Mersin), one Beekeeping Production Station located in Ardahan and about 21 Agriculture Faculties have beekeeping department or programme.

With this structure Mustafa Kemal University has a cryopreservation Project that keeps honey bee semen in liquid nitrojen for a long time. The aim of this study is evaluating the effects of drone semen that was frozen in liquid nitrogen with cryoprotectant on queen bee insemination and brood patterns. The result of this study showed that it is possible to protect bee genotype and ecoytpes by using frozen and thawed semen.

SOWING SEEDS FOR GLOBALIZING ACADEMIC COLLABORATIONS

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The United States Department of Agriculture's Office of International Research at its Agricultural Research Service lists around two hundred active projects funded. The Agricultural Research Service is a United States Federal service, but commercial, private, and academic active projects are far more numerous.

Ever increasing human population and technological advances, especially in communications, have increased international integration: globalization. While interdependence of economies are increasing, it also appears that cultural activities are becoming more interdependent.

Trade and international transactions are more integrated, capital investments move more freely, and knowledge is transferred more readily, and more widely. Additionally, individuals move more freely now than ever before.

Still challenges remain. Agricultural problems do not end at country boarders. Animal health, food safety, and environment impacts can seem more menacing, and more threatening despite the individual mobility and increased ease of information dissemination.

The agricultural and environmental challenges are perhaps among the most complex. Owing to their complexity, protectionism and isolation remain as tools employed by Nations to combat threats.

Given the complexity of the agricultural and environmental challenges of today, and those on the horizon, it is reasonable to promote and embrace international mobility amongst academics. Academics are well suited to grapple with difficult and complex issues requiring lengthily and complex data for decision making and solution generation.

Since people are now moving more freely than ever, it is perhaps unsurprising that, for the student component of academic individuals, the Organization for European Economic Co-operation (OEEC) documents an impressive growth in exchanges between 1965 and 2011 (250.000 to 3.7 million).

It is these exchanges, and particularly the exposures to unfamiliar surroundings, that fosters patience, and more importantly, cultural tolerance among participants. This tolerance elevates the individual in a globally connected discipline. Without the immersion experience of being in the host country, virtual exchanges that are now becoming possible through ever more robust communication mediums using the Internet, likely would produce less culturally tolerant academics.

Academic exchange students who live and learn abroad experience globalization first hand. These students thrive when they have excellent mentors. Excellent mentors in a globalized

market need to demonstrate the collaborations effectiveness to the learner in a live and dynamic fashion. These global collaborations in agricultural and environmental academic circles could be enriched by even greater support for mentor-and-student to mentor-and-student collaborations. Research or investigations that are collaborative in nature model for the learner real world skills necessary for today's „connected" problems.

Exchange programs have a successful track record. The Institute for the International Education of Students reports that students who participate in academic programs abroad are employed more readily (97% vs 49%) upon graduation. The United Kingdom's Go International has findings that show a 17% hiring salary for learners who participated in study abroad. Other studies highlight that learners cite benefits such as greater job satisfaction, increased adaptability, and transferable skills learned while studying internationally.

The success of international exchange can be enhanced. Modeling mentor-ship in international exchange settings is the highest form of apprenticeship a learner can receive.

HEALTHY PLANT – HEALTHY PEOPLE

ZDROWA ROŚLINA – ZDROWI LUDZIE

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Since the widespread use of pesticides in plant protection from the middle of last century it has been searching for principles capable of responding to the need of high level crop production, high requirements for food and feed safety and the need to protect natural environments. Common use of pesticides rapidly revealed their limitations. Intensive chemical control increases the risk of the presence the residue of pesticides in agricultural products and environment contamination. Thus, alternative solutions to pest management problems have been recommended for last decades. A new strategy named 'integrated control' was developed. Actions taken have resulted in new legal regulations in European Union: DIRECTIVE 2009/128/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides; REGULATION (EC) No 1107/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC, and DIRECTIVE 2009/128/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 amending Directive 2006/42/EC with regard to machinery for pesticide application. The statement contained in the first chapter, art. 1 (subject matter) of Directive 2009/128/EEC, perfectly describes aims: „*This Directive establishes a framework to achieve a sustainable use of pesticides by reducing the risks and impacts of pesticide use on human health and the environment and promoting the use of integrated pest management and of alternative approaches or techniques such as non-chemical alternatives to pesticides*". One of the key regulations implemented in each EU Member State starting from 1 January 2014 is obligation of use of integrated pest management by all professional users.

Apart from pesticide residues plants can be also contaminated by mycotoxins, e.g. aflatoxins, trichotecenes, zearalenon, fumonisins, ochratoxin, patuline, ergot alkaloids. Those chemicals are produced by wide range of microbial fungi, pathogens, developing on plants during the vegetation period, e.g. *Fusarium* spp., *Penicillium* spp., *Aspergillus* spp, *Claviceps*. Mycotoxins are well known for their toxicity to humans and many other organisms e.g. invertebrates, plants, microorganisms. To ensure the high level of safety of plant products for consumers the wide range of integrated pest management practices are applied. The following solutions are usually used:

- Control methods that exclude the pathogen from the host (e.g. quarantines and inspection),
- Control methods that eradicate or reduce pathogen inoculums (e.g. crop rotation, sanitation, physical factors, induced resistance, transgenic plants),
- Direct protection of plants from pathogens by biological control (e.g. antagonists, parasites),
- Direct protection by chemicals (spraying with pesticides).

ASPECTS FOR MANAGEMENT OF LITTERS FROM HIGH PERFORMANCE SOWS

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In the past 6 years the number of weaned piglets per sow and year has been increased in the average 1 piglet per year. This strong progress is the result of breeding, nutrition and husband-dry management. The genetic and phenotypic trend for litter size is still increasing, also in next time (Tab. 1). But a few signs of slowing this development suggests itself in present time.

Table 1. Special references about development in reproduction performance in sows

Autor	Alive born piglets/litter	Weaned piglets / litter
HOFMANN, 1960	11.0	9.7
SCHREMMER publisher (1975)	11.0	10.6
WÄHNER, 1975	11.3	8.6
SCHLEGEL, 1979	10.5	9.9
ZDS (1987)	10.3	8.8
ZDS (2000)	10.6	9.1
SUS 5/2014	16.7	14.5
KÜHLEWIND, 2015	16.7	14.6

Often sows have born more piglets than teats at their udder. In the average more than 16 alive born piglets per litter can be observed in nearly all good working farms with high perfor-mance sows.

HORTMANN-SCHOLTEN (2014) warns, the breeding success in reproduction performance is necessary for economical situation in farms. If there is a better littersize, an economies of scale is acting. If there are 32 sold piglets per sow and year, author realized lower costs by 20% /piglet compared only 24 sold piglets. The genetic condition for fertility in sows is met.

Breeding organisations and companies are active for better vitality of piglets. That is impor-tant for sustainability in farms and in animals. The aims of activities are sows with high qua-lity udder and high level in uniform litters with stable reproduction performance. Generally, with increased littersize the input of man power, technical systems, feed quality, financial expenses a.s.e., is increasing too. That is necessary to keep piglet losses in low level in future. That is ethically justified. Different management measures are used (Tab. 2).

Table 2. Management measures in piglet production

Before and during parturition	**After parturition and others:**
– Synchronization of parturitions in group of sows after timed AI	– Litter balance /cross forstering
– Birth care	– Supplementation of additional milk
– Split Nursing	– In time and enough feeding of piglets (prestarter for suckling piglets)
– Desinfection of udder	
– Replacement of colostrum	– System of nurses: natural nurses artificial nurses
	– Housing system in farrowing barn
	– Box for early weaned piglets
– Climate	– Climate
– Hygiene	– Hygiene

Everywhere a lot of farm-special activities to reduce piglet losses you can observe. One important goal is to keep the costs. No all management measures are sustainable enough. No all management measures are teste by scientific researches. Often you can find special experiences of colleagues for animal welfare. Often effectiveness and success vary between farms. The perceived success is not equal to a measured success generally. Following some approaches for scientific investigation are called:

- Promotion a rapid birth for limited exposure situation for sow and piglets. That is important for vitality of piglets and an immediate colostrum intake by piglets.
- A manual birth control over 24 hours has proved positive in all tests.
- Timely and accurate obstetrics.
- Realization of good care for neonates with everything necessary. Piglets have to get power-paste for energy in first hours p.p.
- Frequency of feeding of sows per day. More than two times are minimum necessary.
- Administration of additionaly milk and prestarter for piglets
- Sows with high level of maternal behavior are necessary. In Swizerland breeding association (SUISAG) looks for it because sows are housed in freewheel box.
- Udder quality has to be a breeding goal (number and distribution of teats) for high performance sows. "Norsvin", the breeding company in Norway measures numbers of teats and the distance between teats in all boars for AI when they are tested in CT.
- It is necessary to find simple methods for calculation the milk yield in sows to use it for breeding selection.
- Early weaning of litters with well developed piglets at day 5 – 6 p.p. Piglets go into early weaning box with good climate and hygiene. Here you can realize a motherless rearing. The free sow should be use as nurse for underweighted piglets from other sows.
- Using of technical (artificial) nurses for supernumerary piglets. There is a special benefit for good observation of animals.
- Using of multi-level nursing-system with natural nurses like Danish pattern.
- For success of all activities a high qualification in the people is necessary.

The pig production has moved increasingly into the focus of public interest in recent years. The proper management of large litters with the aim to reduce the suckling piglet losses, to improve the breeding results is one of the aspects in the context of cross-industry initiative animal welfare. The interest of farmers to actively participate here is great.

In different regions of Germany you can observe a sustained progress in reproduction performance but with constant animal losses (Fig. 1).

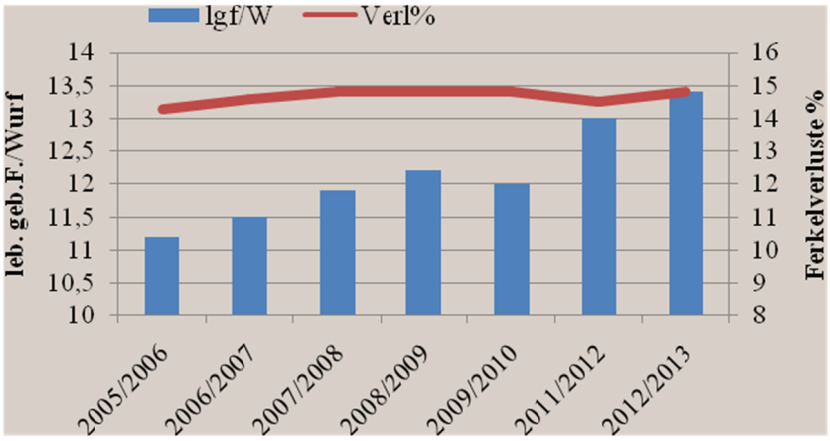

Fig. 1. Progress in littersize and piglet losses from 2005/6 to 2013 (ZDS)

The bibliography is available from the author.

ABSTRACTS

REMEDIATING AND REVEGETATING AND INDUSTRIAL DOLOMITE WASTE USING PEAT

REMEDIACJA I REWEGETACJA PRZEMYSŁOWEGO ODPADU DOLOMITOWEGO ZA POMOCĄ TORFU

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Dolomite is a mineral belonging to the group of carbonates. Its properties are widely considered in the global economic market. In agriculture, it is used for the production of calcium-magnesium fertilizers for regulating soil pH and supplying with calcium as well as magnesium. Peat originates mainly from plant materials subjected to specific geogenic processes regulated by water, air and microbiological effects. Remediation is a process of restoring a given medium (for instance soil), whereas revegetation proceeds *via* establishing a vegetation cover. All these practices are controlled by creating optimal conditions (humidity, organic matter, nutrients availability) for the growth and development of plant. Furthermore, the increase of organic and mineral colloids as a mean for stimulating the activity of microflora and microfauna in the environment appears to be the target, especially in mineral wastes.

The aim of the research was to evaluate the capacity of commercial peat (CP) for the regeneration of industrial dolomite waste (IDW) and the restoration of the flora and fauna. Specifically, the purpose was to regevetate the mineral waste (heap) by establishing a grass cover. In particular, attention is directed to the use of commercial peat properties for regulating water/air relationships and rising the pool of organic colloids.

The trial consisted of incorporating commercial peat (CP) into the industrial dolomite waste (IDW) collected in the surroundings of Katowice. Moreover, the IDW was highly contaminated by heavy metals such as Pb and Cd. The commercial peat was added at various rates, i.e., 0, 1, 2, 4, 8 and 12% (dry weight basis). The whole medium (CP + IDW) was thoroughly mixed, wet and subjected to incubation for 4 weeks at 21-23^{o}C and, then a grass mixture was sown. The experiment of revegetation ran through a period of 8 weeks, when grasses were cut, dried, ground and analysed for heavy metals. Particular treatments (CP + IDW) were also collected and analysed for total (in 6.0 mol HCl dm^{-3}) and reactive (in 0.11 mol CH_3COOH dm^{-3}) heavy metal contents.

Data revealed, that the increase of CP has decidedly reduced the concentrations of the reactive forms of Cu, Pb and Cd in the CP + IDW treatments and simultaneously increased grass biomass. This implies, that the addition of commercial peat significantly reduced the bioavailability of Cu, Pb and Cd. This resulted in the marked decrease in the amounts of these metals taken up by the grass biomass.

ANTIOXIDATIVE ENZYME ACTIVITY ALTERATIONS OF SMALL REDDISH BEAN INDUCED BY HEAT STRESS

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This study was conducted to investigate the effects of heat stress on small reddish bean (*Phaseolus vulgaris* L.) *cv.* Keklik leaves. For this purpose, the leaves obtained from small reddish bean seedlings were collected into pyrex tubes with caps closed and placed into water bath. After a 30 minutes habituation of the sample containing tubes in water bath adjusted to 30°C, the water temperature was inclined to 35°C in half an hour. The leaves were subjected to heat stress treatments in water bath at 35, 40, 45, 50, 55 and 60°C with gradual increments every half an hour. Samples that were obtained at each treatment temperature were analyzed for cell membrane injury and catalase (CAT), ascorbate peroxidase (APX), soluble peroxidase (S-POX) and cell wall-bound peroxidase (CWB-POX) activities. In general, effects of heat stress on the variables studied were significant. The results revealed that cell membrane injury increased with elevated temperatures, especially after 50°C. Besides, CAT activity increased with high temperatures while APX activity decreased with rising temperatures up to 55°C and increased at 60°C. Considering the POX activities, the S-POX activity reduced until 45°C and then enhanced parallel to increasing temperatures. Moreover, the CWB-POX activity increased with heat stress and was notable at 60°C. Data also indicated that, generally S-POX activity was higher than CWB-POX activity in the leaves in response to heat stress treatments. In conclusion, leaf tissues of small reddish bean *cv.* Keklik bring CAT and CWB-POX enzyme activities together with increased temperature and S-POX after 45°C up to speed under heat stress conditions hence show tolerance up to 50°C.

THE APPLICATION OF NANOMETAL SOLUTIONS IN THE SEED DISINFECTION IN *IN VITRO* CULTURE

ZASTOSOWANIE ROZTWORÓW NANOMETALI W PROCESIE DEZYNFEKCJI NASION W ROŚLINNYCH KULTURACH *IN VITRO*

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In vitro technique is one of the biotechnological methods by which one is enabled to create new valuable cultivation materials and improve a variety of plants. The essential element of conducting plant in vitro culture is explant disinfection. It is undoubtedly indispensable when it comes to preserving sterile breeding conditions. Granting sterility guarantees proper plant growth and development. It is very crucial to ensure a correct way of plant material disinfection. The first stage in seed sterilization is rinsing them in running water, which allows to remove dust and other smaller pollution. Subsequent stage is pre-sterilization with the usage of 70% ethanol that increases the effectiveness of final disinfectant through degreasing the surface and eliminating the air The proper sterilization is conducted with the usage of active substances that in their construction contain active groups, which act with various speed and effectiveness. In plant in vitro cultures the most frequently used disinfectants are ethanol, sodium or calcium hypochlorite, hydrogen peroxide, chloramine T and mercury (II) chloride. Moreover, commercial chemicals composed of some of the above-mentioned substances are commonly used, e.g. ACE containing disinfectant – NaClO.

The drawback of well-known ways is using chemicals that can damage seed or embryo hindering germination. It is very frequent that some ways of sterilization are devoted for seeds of merely one species. The problem seems to be also complexity and multistage of treatments, e.g. seed disinfection and detoxification. Furthermore, using multistage seed sterilization and particularly rinsing the seed may trigger secondary infection. Due to its specific structure and differences from metallic silver, nanosilver can be characterized by the whole array of interesting features. It manifests very strong antibacterial and antifungal properties. It turned out that even in low concentration (5 ppm) one can see a bacteriostatic effect. In 10 ppm concentration, nanosilver virtually hinders growth and development of Gram(+), Gram(-) bacteria and fungi of Trichocomecaceae such as Aspergillus fumigatus or Aspergillus niger. The conducted experiments involved water solutions of spherial nanosilver and nanocopper in concentration: mix of Ag Cu 10 ppm and 20 ppm, Ag 10 and 20 ppm, Cu 10 and 20 ppm. Preliminary sterilization with the use of 70% ethanol (1 min) was carried out as well as the proper sterilization with nanometal solutions (8 min). The sterile seeds were inoculated onto the medium excluding the phase of numerous rinsing them in redistilled water. Lack of infected seeds in subsequent repetitions gives evidence of strong antibacterial and antifungal properties of nanometals. When it comes to seed sterilization, silver nanoparticles in concentration 10 ppm and 20 ppm proved their 100% effectiveness, which is higher than in case of sodium hypochlorite. The seedlings obtained owing to such modern method of sterilization can be characterized by normal type, green color and typical for this species growth ratio. Described method is protected by patent law, as well as patent application P.406575 [WIPO ST 10/PL406575].

THE FATTENING RESULTS OF PIGS IN RELATION TO THE AGE OF SLAUGHTER

WYNIKI TUCZU ŚWIŃ W ZALEŻNOŚCI OD WIEKU UBOJU

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The aim of the study was to carry out an experiment concerning the effectiveness of breeding pigs in relation to the age of slaughter. The study included 99 F_1 crossbreed pigs (Danish Landrace x Yorkshire x Duroc) deriving from Denmark. The animals were divided in two groups basing on the age at slaughter. The first group was formed by porkers of 159 days age at slaughter, the second group – porkers of 169 days age at slaughter. The study takes account of characteristics of fattening traits (i.e. body weight at day of the beginning the fattening, fattening days, average daily and total gain, total fattening feed intake) and slaughter traits (i.e. hot carcass weight, dressing percentage, fat thickness and loin muscle height). The study includes simplified economic analysis of fattening porkers covering piglet buying costs, feeding costs and other costs.

The study proved that crossbreed pigs of first group were characterized by higher growth rate, having been fattened shorter than the pigs of second group ($P \leq 0.01$). Dressing percentage of both pig study groups was very good, as all carcasses of examined porkers were qualified to most magnitude class S, E and U. The analysis demonstrated profit from second group crossbreed pigs production. It was revealed that the profitability and the volume of profits are significantly affected by the age of animals at slaughter and self-production of feed. The decrease of profit was caused by unfavourable relation between purchase price of piglets and sale price of pigs. The used pig rearing system in the deep straw bedding restrain the human cost labor and in consequence it arises the profit of pig production.

REPRODUCTIVE PERFORMANCE OF POLISH LANDRACE SOWS MATED WITH HYBRID BOARS

PRODUKCYJNOŚĆ ROZPŁODOWA LOCH POLSKIEJ BIAŁEJ ZWISŁOUCHEJ KRYTYCH KNURAMI MIESZAŃCOWYMI

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The purpose of the study was to estimate the reproductive performance of Polish Landrace (PL) sows in family farm in the Kuyavian-Pomeranian. Two sow groups, each of 20 animals, were mated with different sires. Group I was mated with crossbred sires F_1(Duroc x Pietrain) and group II was mated with hybrid PIC 410 sires. Sow's reproductive performance was contained records the number piglets at birth, at 21 day and at weaning (28 days), mortality of piglets during rearing, total piglet growth weight and piglet growth rate. There was stated that PL sows mated with F_1(Duroc x Pietrain) sires have born the heavier piglets than sows mated with PIC 410 sires ($P \leq 0.05$). However, at 21 days and 28 days the piglet weight was higher in second group sows ($P \leq 0.01$). Also, the higher total growth weight and higher growth rate of piglets form group II sows mated with PIC 410 sires were stated. The obtained results in this study indicate the proper assortment of parents to obtain the good piglet material to further rearing.

THE RELATIONSHIP BETWEEN THE POLYMORPHIC FORMS OF BETA-LACTOGLOBULIN AND THE SYNTHESIS OF BIOACTIVE COMPONENTS OF LIPID AND PROTEIN FRACTION OF BOVINE MILK

ZALEŻNOŚĆ MIĘDZY POLIMORFICZNYMI FORMAMI BETA-LAKTOGLOBULINY A SYNTEZĄ BIOAKTYWNYCH SKŁADNIKÓW FRAKCJI BIAŁKOWEJ I LIPIDOWEJ MLEKA KROWIEGO

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The aim of this study was to determine the effect of polymorphic forms of β-lactoglobulin on the synthesis of bioactive substances and the formation of the antioxidant capacity of milk from Polish Holstein-Friesian cows.

Representative milk samples were collected from 30 cows during milking by means of a milk meter in the milking parlor. Milk samples were taken individually from each cow ten times during the experiment at monthly intervals (10 collecting from each cow). Gross milk composition, i.e. fat, protein, and urea content, were determined by automated infrared analysis (FTIR) with a Milkoscan FT-120 instrument (FOSS Electric, Hillerød, Denmark). Concentrations of whey proteins, i.e. α-lactalbumin (α-LA), ß-lactoglobulin (ß-LG_{AA}, ß-LG_{BB} and ß-LG_{AB}), lactoferrin (Lf) and lysozyme (Lz), were established using an Agilent 1100 Series reverse phase high-performance liquid chromatograph (Agilent Technologies, Waldbronn, Germany) according to the methodology described by Puppel *et al.* 2014. Fatty acid methylation was performed according to the trans esterification method EN ISO 5509. Identification of individual fatty acids in crude fat was conducted using an Agilent 7890A GC (Agilent, Waldbronn, Germany) with flame-ionization detector, HP Chem software and Varian Select FAME column (100 m length, 0.25 mm diameter, 0.25 μm film thickness; Varian/Agilent Technologies, Waldbronn, Germany). Analysis of the fat soluble vitamins: β-carotene, α-retinol, α-tocopherol were established using an Agilent 1100 Series reverse phase high-performance liquid chromatograph (Agilent Technologies, Waldbronn, Germany) and Zorbax Eclipse XDB C8 column (4.6 x 150 mm, 5 μm film thickness) according to the method described by Puppel et al.

Polymorphic variant of β-BLG_{AA} determined the lowest content of SFA in comparison with other variants (β-BLG_{AB}, β-BLG_{BB}). The highest level of TAS and vitamins A and E was associated with a variant β-BLG_{AA}. BB-LG_{AA} variant was also associated with the highest content of bioactive components of the protein fraction: lactoferrin and lysozyme.

SUMMARY AND CONCLUSIONS:

1. Polymorphic variant β-LG_{AA} variant was associated with a lowest concentration of fatty acids synthesized *de novo*, which means that the energy required for the synthesis of these fatty acids was transferred towards the synthesis of lactose and protein.
2. Polymorphic variant β-LG_{AA} variant was associated with the highest antioxidant capacity of cow's milk.
3. Polymorphic variants of β-LG are not only an indicators of the technological quality of milk, but are also a factors affecting the level of bioactive components of the protein and lipid fractions.

THE EFFECT OF CONTROLLED INTERNAL DRUG-RELEASING (CIDR) APPLICATION TO SYNCHRONIZE ESTRUS IN HERDS OF DAIRY COWS

WPŁYW ZASTOSOWANIA WKŁADEK CIDR DO SYNCHRONIZACJI RUI W STADACH KRÓW MLECZNYCH

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Many dairy producers are interested in improving the reproductive management of their cows and heifers. Heifers are the most fertile animals in the herd. The effectiveness of dairy cattle production largely depends on detecting estrus and the timing of insemination. The objective of this study was to examine the effects of using a controlled internal drug-releasing insert (CIDR; 1.38 g progesterone) on the dynamics and synchrony of estrus. The experiment was conducted at three dairy farms (A, B, C) in Malopolska Province between 2009 and 2012. Forty-two Polish Holstein-Friesian (HF) cows (16 cows from farm A, 26 cows from farm B) with conception problems were used to evaluate the effects of CIDR insert on the concentration of progesterone after CIDR removal. All cows were healthy, being in the 5th or later lactations. Thirty-six HF heifers (all from farm C) were selected by weight and birth date and treated as a control group. Body condition score (BCS) was assigned to every heifer and cow before the synchronization protocol and in each case BCS was between 2.5 and 3.5. Cows and heifers were fed a mixed ration of forage and had *ad libitum* access to fresh water.

Heifers received the CIDR insert on day 1. On day 6, every heifer in the group was injected with $PGF_{2\alpha}$ – prostaglandin F2-alpha (25 mg). On day 7, the CIDR insert was removed and estrus cycles occurred between 8 d and 11 d. Then the heifers were inseminated. Cows received the CIDR insert also on day 1. After 7 days the CIDR was removed and cows were treated with one injection of $PGF_{2\alpha}$. Then they were observed until estrus was detected (at 8 to 11 d on average) and artificially inseminated (AI). Pregnancy diagnosis was done on day 60 after AI using transrectal ultrasonography.

The obtained pregnancy rates were 41.2% for heifers and 81.4% and 53% for cows at farms A and B respectively. The difference in pregnancy rate between heifers and lactating cows was large. As compared with heifers, the CIDR insert substantially increased the synchronization rate (SR) (± 50% in 4 d) and overall estrus detection in cows, especially in farm A. For heifers the use of CIDR insert was not so important; it only slightly reduced their pregnancy rate.

AUGMENTED REALITY IN ECOLOGICAL PRODUCT PROMOTION

WYKORZYSTANIE RZECZYWISTOŚCI ROZSZERZONEJ W PROMOCJI MLECZNYCH PRODUKTÓW EKOLOGICZNYCH

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Augmented reality is a technology which is very often used in marketing campaigns of companies in various industries. The availability of mobile devices that are now the most popular tools for interacting with augmented reality has become an additional stimulus inducing business owners to use this tool in communicating with customers. Augmented reality has a very wide range of possibilities that can be used for presenting marketing information to the end user and its implementation is relatively easy and inexpensive. In Poland, the use of augmented reality is still not very popular particularly in the field of food products. The aim of the project was to prepare the mobile application to promote the values of ecological product lines produced by a dairy processing companies from the areas of Podkarpacie.

At the application development stage special emphasis was placed on showing the client information that includes: presentation of environmental values in which the raw material is produced, with particular emphasis on high welfare of Simmental cows from which milk is produced, acquisition system and milk processing methods, the presentation of nutritional values and health range of finished products, included in the line of organic products produced by the Regional Dairy Cooperatives (OSM) in Jasienica Rosielna. The application includes the presentation qualities of the following products: organic milk, curd rural ecological, organic butter and organic "osełkowe" butter. In application special algorithm was used that allow to recognize images. Analyzed image is compared with pattern image stored in database and next multimedia content (as image, text or video) that is linked to the image is displayed on the user screen. Using this application is simplified to three simple steps that user need to make in order to run application (installing plugin that allow image recognition, run application, pointing the lens of device toward the label of selected product). Next user will have some options that allow him to select what information about product he want to watch. Those information are grouped in three categories as follows: product information, methods of processing organic milk information and quality of finished products).

In the development process a lot of practical and technical solutions that ensure the correct functioning and proper content display were used. In this stage of development application meets all assumptions that consider technical and factual aspects. Application works in real time, showing all multimedia content without any errors. One limitation of this application consider user device, because at this stage application runs only on Android platform devices.

The dynamic development of techniques related to the use of augmented reality makes them attractive for the modern manufacturer tools to promote products and services. In order to promote and showcase to consumers the full advantages of organic product lines produced by OSM Jasienica Rosielna mobile applications that allows the use of augmented reality technology was developed. Create application gives a lot of possibilities for both the manufacturer in the context of the promotion of products as well as consumers in terms of better understanding of the product by consulting with the natural environment from which is extracted, the raw material for the production of organic products, processing methods and values its quality of finished products.

RETAINED FOETAL MEMBRANES IN CATTLE: TREATMENT OPTIONS

ZATRZYMANIE BŁON PŁODOWYCH U BYDŁA – METODY LECZENIA

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Although there are many treatment options for retained foetal membranes in cattle, none of these are considered in the available literature as a reliable method of solving the above problem and its consequences. The basic classification includes radical and conservative methods as well as combinations of both. The objective of the study was to analyse the advantages and disadvantages of individual methods, which may help practitioners to answer the crucial question: "to extract or not to extract".

The presented experiment involved HF dairy cows (n = 30) with diagnosed retention of foetal membranes (from 12-48 h following the evacuation of a calf foetus). The animals were divided into two groups: n_1 = 15 and n_2 = 15; in the first group, the cows were treated with a radical method (manual extraction of the foetal membranes) whereas in the second group conservative procedures were applied (administration of bacterial collagenase, antibacterial products and ecobolics). It was decided that if any effects of treatment were found in the n_2 group (after up to 4 days following parturition), conservative methods would be replaced with a radical procedure.

The analysis of available clinical cases does not allow for a definite assessment of which method is best. A wide spectrum of side effects was noted with the manual extraction of the foetal membranes at a similar or lower efficacy in comparison with the other methods.

There is some hope linked to a method with bacterial collagenase and an option based on parenteral administration of antibiotics in feverish cows. However, economic factors and the lack of acceptance by producers is a major obstacle to making the conservative methods widespread. It is even more difficult to predict whether the manual technique will lose its importance in the future. The opportunities for changes in the forthcoming years are rather limited because the method of manual extraction of the foetal membranes, which is deeply rooted in traditional veterinary management, has (except for a few scientific divagations) relatively few competitors in the field.

COMPARISON OF NUTRITIONAL VALUE AND FUNCTIONAL PROPERTIES OF MEAT OBTAINED FROM POLISH NATIVE BREEDS OF PIGS AND OF HIGH PRODUCTION CROSSBREEDS

PORÓWNANIE WARTOŚCI ODŻYWCZEJ I WŁAŚCIWOŚCI FUNKCJONALNYCH MIĘSA ŚWIŃ POLSKICH RAS RODZIMYCH I TUCZNIKÓW WYSOKOPRODUKCYJNYCH

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Today, consumers pay more attention to the quality of products and also, due to the increasing occurrence of so-called „civilization diseases" – cardiovascular and heart, the interest of healthy food increases. The healthy foods include functional products, which positively effect on the vital functions of the body and through their action may prevent the occurrence of some diseases (Diplock et al., 1999).

The meat, including pork, is characterized by high nutritional value and further, although it is not classified as functional food, it posses the functional traits. Among these traits are the contents of: macro- and microelements, saturated and unsaturated fatty acids and vitamins. It is believed that in the case of pork requirements regarding functionality will meet better the meat of native breeds of pigs compared with the high production crossbreeds. These animals weren't subjected to intensive breeding so they kept in the large extent the advantages of earlier period of using. This allowed to preserve the unique traits of meat quality and sensory properties – mainly better flavor and texture of meat.

Literature data and own studies show that meat of native breeds of pigs has higher protein content than the meat of pigs from mass breeding (Szulc et al., 2012). At the same time, in the case of Złotnicka Spotted pigs is noted relatively low content of fat which effect on increasing its nitritional value. Moreover, there is stated high ash concentration indicates a high content of minerals. Own researches show, that native breeds of pigs exceed the crossbreeds fatteners in content of macroelements especially sodium, potassium, magnesium and calcium. A similar situation concerns microelements and there is noted the high content of easily absorbed iron. In fat extract from meat of native breeds and the high production crossbreeds is noted aligned level of saturated fatty acids. A higher concentration of monounsaturated fatty acids was stated in meat of Puławska pigs (own studies). The large effect on increasing the healthy value of the product has right proportion of fatty acids n-6 to n-3. Today, in pig meat, also in meat of mass breeding pigs this ratio achieve lower values showing favorable share of these two groups of acids (Alonso et al., 2009; Mieńkowska-Stępniewska et al., 2006; Blicharski, 2013). There is also noted the presence of essential unsaturated fatty acids. The pork isn't principal place of their occurrence but is their important source. Moreover, it is rich in vitamins maliny from group B and contais also vitamin E. The higher content of healthy components is noted also in meat of pigs kept in out-door conditions and they are also appropriate for native breeds of pigs. (Szyndler-Nędza et al., 2012).

It is known that pigs of Polish native breeds can not be competitive for the mass production of fatteners. But they can, because of possesion of functional properties, contribute to restore more favourable, than prevailing, opinion about pork in the diet.

ASSESSMENT OF SELECTED HEALTH AND NUTRITIONAL PARAMETERS OF SHREDDED CURED MEATS PRODUCED IN PODKARPACIE

OCENA WYBRANYCH PARAMETRÓW ZDROWOTNYCH I ODŻYWCZYCH WĘDLIN ROZDROBNIONYCH PRODUKOWANYCH NA PODKARPACIU

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Production of traditional cured meats is especially prevalent in Podkarpackie province. Local entrepreneurs have registered total of 190 products, including 62 meat products with fixation of smoking, which places this region in a group of the national leaders. The latest studies show that meat fixed with method of smoking may be source of carcinogenic compounds. In this group of compounds especially dangerous for health are polycyclic aromatic hydrocarbons (PAHs).

The purpose of this study was to evaluate of selected health and nutritional parameters of shredded cured meats produced in Podkarpacie.

The studied material consisted of two types of traditional sausages ("kiełbasa pieczona wiejska", "kiełbasa gruba pieczona z Górna") produced in one of the local manufacturer. The following nutritional parameters of cured meats have been analyzed: total water content, protein content, fat content, salt content and the accumulation of dangerous compounds in form of PAHs (benoza(a)pyrene - b(a)p, and the sum of the four heavy PAHs - chrysene, benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluornaten).

The results of the study and statistical evaluation are shown in Table 1 and Table 2.

Table 1. Selected chemical parameters of studied shredded cured meats

Parameter	In Polish: „Kiełbasa wiejska pieczona"	In Polish: „Kiełbasa gruba z Górna"
water [%]	$\bar{x} = 53{,}50^{a} \pm 0{,}08$	$\bar{x} = 64{,}20^{b} \pm 0{,}08$
salt [%]	$\bar{x} = 2{,}30 \pm 0{,}1$	$\bar{x} = 2{,}37 \pm 0{,}1$
fat [%]	$\bar{x} = 21{,}70^{a} \pm 0{,}05$	$\bar{x} = 8{,}63^{b} \pm 0{,}05$
protein [%]	$\bar{x} = 19{,}71^{a} \pm 0{,}05$	$\bar{x} = 23{,}50^{b} \pm 0{,}05$

a,b ≤ 0.05

Table 2. PAHs content in studied shredded cured meats

Evaluated parameters	In Polish: „Kiełbasa wiejska pieczona"	In Polish: „Kiełbasa gruba z Górna"
benzo(a)pyrene [µg/ kg]	$\bar{x} = 1{,}87^{a} \pm 0{,}03$	$\bar{x} = 0{,}12^{b} \pm 0{,}03$
the sum of the four heavy PAHs [µg/ kg]	$\bar{x} = 23{,}90^{a} \pm 0{,}03$	$\bar{x} = 3{,}42^{b} \pm 0{,}03$

a,b ≤ 0.05

The evaluation of two shredded cured meats shown significant differences in nutritional value, expressed mainly in water, fat and protein content. Evaluated products also differed in content of benzo(a)pyren and the sum of the four heavy PAHs. Differences of carcinogenic compounds content can be related to an absorbent surface exposed to direct influence of smoke of both evaluated indexes.

EFFECT OF MARINE ALGAE BIOMASS ADDITION TO FEED MIXTURE ON THE CHEMICAL COMPOSITION AND SENSORY QUALITY OF RABBIT MEAT

WPŁYW DODATKU DO PASZY BIOMASY ALG MORSKICH NA SKŁAD CHEMICZNY I WŁAŚCIWOŚCI SENSORYCZNE MIĘSA KRÓLICZEGO

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The analysis of chemical composition and sensory evaluation are very important aspects of rabbit meat quality. The sensory parameters are at a sufficient-to-good level in meat from animals fed with a traditional diet, or good-to-very good in meat from animals on a complete diet. Monogastric animal nutrition may alternatively use single-cell marine algae and phytoplankton, which are a rich source of bioactive compounds improving the functional properties of meat. Therefore, the aim of the study was to analyse the chemical composition and sensory properties of thigh muscles from rabbits fed with a diet supplemented with 20 and 40 g/kg of marine algae biomass.

The experimental material comprised 150 Thermond White rabbits divided into 3 analogous feeding groups, 50 rabbits each. Animals (75♀ and 75♂) were fattened the Experimental Station (ZDIZ PIB) in Chorzelów. From weaning to 60 days of life rabbits were fed with a standard complete feed mixture (I-control group). For the last 30 days of fattening, rabbits in two groups (II and III) were given feed supplemented with 20 and 40 g/kg of marine algae biomass *(Schizochytrium sp.)*. Slaughter and post-slaughter processing were carried out in accordance with relevant procedures (EC) No. 1099/2009. Rabbit carcasses were chilled at 4±1°C for 24 h. After boning, the thigh muscles were analysed for the content of dry matter, total protein, fat, and crude ash in accordance with standards (PN and ISO), subjected to heat treatment, and then evaluated for the parameters of sensory quality using a 5-point hedonic scale (PN-ISO 4121:1998).

The analysis of the chemical composition demonstrated higher dry matter content (24.81%) and fat (2.19%) in thigh muscles from rabbits fed with the addition of 20 g of marine algae biomass per kg of feed, and the differences were statistically significant ($p \leq 0.05$). The mean content of total protein in the experimental groups was comparable, but the highest (21.98%) was found in the muscles from rabbits who received the standard control feed during the fattened period. The content of mineral compounds expressed as ash was at a relatively high level. Ash content was similar in muscle samples from animals receiving the control and feed with the addition of 20 g of marine algae biomass per kg (1.13 vs 1.12%, respectively).

The obtained results demonstrated that the scores for aroma (intensity and desirability) and taste (intensity) were the highest for thigh muscles from rabbits fed with feed containing 20 g of marine algae per kg, and the lowest for those receiving feed with 40 g of marine algae per kg. The differences were statistically significant. Higher scores for juiciness and tenderness were given to rabbit muscles from the experimental groups (I and II). The addition of 20 g per kg of marine algae biomass to complete granulated feed mixtures allows the production of rabbit meat with the best sensory characteristics, and thus meat of good or very good quality.

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EFFECTS OF BIRTH TYPE AND SEX ON THE GROWTH PERFORMANCE IN PUREBRED DORPER LAMBS UNDER HUNGARIAN REARING CONDITIONS

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Sheep production has always been of great importance to the economy and in the nutrition of the people. In intensive systems of sheep meat production, profitability is the most important element as part of the economy.

South-African Dorper is a synthetic breed, a cross between Dorset Horn and Persian Blackheaded. As a single purpose, wool – shedding meat sheep it is selected for lamb production. This hair sheep breed combining the hardiness of the fat rump Blackhead Persian and carcass conformation of the Dorset Horn. Dorper ewes have an outstanding good mothering ability and are also regarded as early maturing. A high lambing percentage can frequently be achieved with a low preweaning mortality rate. Dorper rams are used as terminal sires in order to produce lambs, with intensive growth rates, good post weaning feed efficiency and carcass traits.

The aim of this study was to evaluate effects of sex and birth type on growth performance in purebred Dorper lambs. It is well documented that low BWT negatively affects lambs survival and morbidity. In this manner we examined the influence of sex (ram, ewe) and birth type (1 or 2) on growth parameters, using the birth weight (BW), weaning weight (WW) and weight of 120 days ($BWT_{(120)}$), and also determining average daily gain (ADG) estimated between birth and weaning (80 days) and from the age of weaning to 120 days.

The study was carried out at the RIFS Farm of University of Debrecen between January and May 2015. In 2014 after a 2 weeks flushing period a mixed group Dorper ewes (25ewe/group) were assigned into single ram mating groups. This period lasted for six weeks from mid August. During gestation the ewes were group penned in a straw bedded shed and feed bunk management was used. Lambing occurred from 1th of January till the 15th March. Till weaning the lambs were kept together with their dams and were group penned without getting any feed supplementation. Ewes were fed with ad libitum hay and cereal based loose mix concentrate (whole corn, oat, barley in a 50:25:25 ratio), water from wall mounted drinkers and mineral licks were consistently available.

Data were analyzed using repeated measure mixed effect models in R program. Multiple comparison tests were done with the Duncan's new multiple range test. To account for the repeated measures per lamb (across time: period), the individual was nested within treatments (sex and birth type) and treated as random effect in the analysis. The model included fixed effects of treatments, time and treatment×time. For all analyses, significance was considered to be $P < 0.05$.

There were significant differences in weight development between the different sex and birth types: ewe – birth type 2 was the lowest by contrast ram – birth type 1 was the highest in each period.

We concluded that proper nutrition should be used for ewes having twins and lambs are able to express their full genetic potential.

THE EFFECT OF SELECTED STAINING TECHNIQUES ON BULL SPERM MORPHOMETRY

WPŁYW WYBRANYCH TECHNIK BARWIENIA NA MORFOMETRIĘ PLEMNIKÓW BUHAJA

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Sperm morphology continues to be an important parameter in predicting fertility in both humans and animals. The concept of morphology is closely linked to sperm cell dimensions falling within the norms for a given species. Hence many authors have observed relationships between sperm morphometry and male fertility. The aim of this study was to determine the effect of staining of semen using four different techniques on the morphometry of the bull sperm cell.

The material for the study consisted of semen collected from test bulls of the Black-and-White variety of Holstein-Friesians. A total of 20 individuals at the age of one and a half years were selected for the study. In each ejaculate, morphometric measurements were made of the heads of 100 randomly selected sperm that were clearly visible in the field of view of the microscope. A total of 4000 sperm heads were evaluated. The length, width, circumference and surface area of the sperm head. The sperm cells were evaluated with an Olympus BX50 fluorescence microscope and the MultiScan image analysis system and measurement software from Computer Scanning system.

The staining method affects the dimensions of the bull sperm heads. The smallest sperm head dimensions were observed in the case of the Papanicolaou staining. The heads of sperm cells stained with Papanicolaou stain were 0.50-0.72 μm shorter and 0.19-0.43 μm narrower than in the case of sperm stained by other techniques ($P \leq 0.05$). These dimensions also resulted in a smaller circumference and surface area for the heads of these sperm cells. The largest sperm head dimensions by far were noted in the case of silver nitrate staining. The morphometric dimensions of the sperm cells stained with eosin + gentian violet complex, recommended for bull semen, were closest to those of the cells stained with SpermBlue®, and in most cases the standard deviation was lower than in the sperm stained using other methods. Statistically significant differences at $P \leq 0.05$ were found between all of the dimensions of sperm stained using the four techniques.

The results obtained in the study indicate differences in the dimensions of bull sperm heads when different slide staining techniques were used. The most similar results for sperm head dimensions were obtained in the case of SpermBlue® and eosin + gentian violet complex, although statistically significant differences were found between all the staining techniques. Extreme values were noted for the other staining techniques – lowest for the Papanicolaou and highest for silver nitrate, which may indicate more interference in the cell by the reagents used in the staining process. However, silver nitrate staining was best at identifying the structures of the sperm cell. Hence it is difficult to determine which of the staining methods most faithfully reveals the dimensions and shape of the bull sperm. These observations suggest that it is crucial to determine the natural size of the sperm head for each staining technique so that accurate assessment and classification can be made in the diagnosis of male fertility. It is also essential to select an appropriate staining technique for a given animal species, as research by many authors indicates that some methods that work well for one species are not suitable for analysis of another species.

PRECISE SHOT ONE OF THE BASIC CONDITIONS OF ETHICAL HUNTING

PRECYZYJNY STRZAŁ JEDNYM Z PODSTAWOWYCH WARUNKÓW ETYCZNEGO POLOWANIA

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In Poland, the wild life is owned by the State Treasury, while after shotting is owned by hunting team, in which teritory it was obtained. The whole area of country is divided into hunting circuits (except for areas covered by a different form of protection) administered by provincial government authorities and forestry management. Hunting associations lease the circuits from institutions mentioned above, in which commit themselves to conduct the wider game management. In order to maintain the reasonable management, each year is determined the population size (cataloguing) and plans of acquisition game. The acquisition is determined in terms of age and gender. Hunters are also responsible for conducting selection in order to improve the quality of the population, and finally, in a certain extent for preserving the health of the game through cooperation with county veterinarians, observations, and finally, if necessary, to perform the sanitary shooting.

During hunting for big game is mainly used firearms with rifled barrels. Polish Hunting Association, which brings together all the hunters in Poland recommends the hunters to take shooting trainings and requires them to perform once a year a technical review of weapons by persons authorized and execution of the practical testing of accuracy. The aim of this activities is to preserve the full technical efficiency of using weapons. Practical testing of accuracy customarily takes place at a distance of 100 m. Terms of Polish Hunting Association allow taking a shot to the animals under certain conditions to a distance of 200 m. The shooting at closer distances than 100 m comes to the so-called exceedance shot, and at longer distance the bullet trajectory further reduced characteristic for each caliber. Exemplary bullet track deviation from the line of sight is shown in Fig. 1.

The hunter shooting game must have great skill for determining the distance as well as to know the trajectory of the bullet caliber of the shoots, which gives the opportunity to bring amendments to aim for putting a precise shot. Each ethical hunter should try to put a shot so effective that the goal should stay in downing place.

For the example of the one hunting team of the Bydgoszcz district hunting weapon using by hunters was performer – Tab. 1.

Table 1. The weapon which hunters from the example hunting team have

Members of the hunting team	Number	Weapon with rifled barrels		Calibres of used weapons			
		Rifle (n)	Mobile weapon (n)	7x64	.30-06	8x57 JS	Others
	42	29	7	10	12	7	3

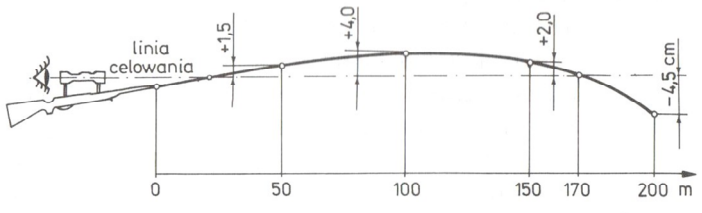

Fig. 1. Bullet track deviation from the line of sight (for a cartridge of caliber 7.62x63 with a mass of 11.6 g) (Szyrkowiec, 2001)

NEXT ALLELES DESCRIBE IN TETRANUCLEOTIDE STR MARKERS IN THE CZECH GENETIC RESOURCE PRESTICE BLACK-PIED PIG

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The study focuses on genotyping Prestice Black-Pied pig in comparison to commercial breeds. The Prestice Black-Pied pig as a Czech native breed – genetic resource is investigated as a part of wide project aimed to small populations of pigs and their conservation. We analysed genotypes of 550 individuals of Prestice Black-Pied pig (PC), 159 Czech Large White (CLW), 105 Czech Landrase (CLA), 60 Duroc (D) and 23 Pietrain (PN) by tetranucleotide microsatellite markers. We used a commercial multiplex PCR kit Animaltype Pig (Biotype Diagnostic Gmbh) specifically developed for the genotyping of breeding livestock. The test kit is recommended for proof of origin according the EU-Directive, kinship testing in context with control of breeding, status of inbreeding for herd book populations. We found further alleles in PC outside declared range in six markers (387A12F, S0655, SBH2, SBH10, SBH18, SBH19) out of eleven. In two markers we detected three further alleles, in one case two new alleles and in three markers one allele which didn´t find in other investigated breeds. These findings provide evidence about differences in genetic structure of PC and will implement to programme of traceability of PC meat products.

The research was supported by project MZe ČR QJ1210253.

THE EFFECT OF THE USE OF YELLOW LUPINE AND CORN DDGS DIETS SUPPLEMENTED WITH PHYTOBIOTIC ON CHEMICAL COMPOSITION, PHYSICOCHEMICAL AND SENSORY PROPERTIES OF PIGS MEAT

WPŁYW ZASTOSOWANIA ŁUBINU ŻÓŁTEGO I DDGS KUKURYDZIANEGO Z DODATKIEM FITOBIOTYKU NA SKŁAD CHEMICZNY I WŁAŚCIWOŚCI FIZYKOCHEMICZNE ORAZ SENSORYCZNE MIĘSA ŚWIŃ

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The objective of this study was to determine the effect of the use of yellow lupine *cv. Taper* and corn DDGS with or without phytobiotic on meat quality of growing-finishing pigs.

At the end of a feeding trial 24 pigs were slaughtered at the ”Warmia” Meat Processing Plant in Biskupiec near Olsztyn (NE Poland). The carcasses were chilled at 2-4°C for 24 hours. Samples were collected from the longissimus dorsi muscle (*m. longissimus dorsi*) and divided into the following groups:

Table 1. Experimental design

Specifications	Groups			
	Ł	Ł+F	D	D+F
Vegetable protein source	yellow lupine *cv. Taper*	yellow lupine *cv. Taper*	corn DDGS	corn DDGS
Phytobiotic	-	+	-	+

In meat samples were determined: chemical composition, physicochemical and sensory properties.

The results were processed in the Statistica 10 PL application by two-way analysis of variance (ANOVA) and Duncan's multiple range test.

The vegetable protein source, that is yellow lupine *cv. Taper* and corn DDGS, did not significantly affect the content of dry matter, crude protein, crude ash and intramuscular fat. There were no statically significant impact when phytobiotic was used. However there was a trend for the interaction in the content of dry matter between protein source and phytobiotic. There was no significant effect of vegetable protein sources on physicochemical properties, i.e. water-holding capacity, shear force, meat color and acidity. Sensory analysis showed that the intensity of the smell of meat samples from animals receiving feed with phytobiotic were significantly lower (4.71 points) compared to meat samples from animals receiving feed without phytobiotic (4.92 points). Similar relation was observed for the intensity of flavor. Meat obtained from pigs receiving feed with phytobiotic had a lower value of this indicator (4.67 points) compared to pigs fed a diet without phytobiotic. There was also a tendency to reduce the tenderness of meat when phytobiotic was used. The values of this indicator for diets supplemented and not supplemented with phytobiotic were 4.46 and 4.79 points respectively. The vegetable protein source did not significant impact on the meat sensory properties.

It can be concluded that the use fed diets with both yellow lupine *cv. Taper* and corn DDGS, does not negatively affect the meat quality. There were also no significant negative effects phytobiotic on the chemical composition and physicochemical and sensory properties of growing-finishing pigs meat.

POLISH LEGAL REGULATIONS IN THE WILD PIGS BREEDING

POLSKIE REGULACJE PRAWNE W HODOWLI ŚWINIODZIKÓW

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Crossing the wild boar with sows of contemporary used breed of pigs allows to gain an average number of piglets in litters which are distinguished by increased vitality, less susceptibility to diseases and minor environmental requirements. Unfortunately, these hybrids are characterized by slower growth rate and greater carcass fatness. However, better quality and flavor of meat obtained from these animals completely compensate these undesirable traits.

Wild pigs breeding can be very dangerous for native nature. In the case of escape that animal to the forest it can be crossed with a wild boar, what may change the population of wild boar in Poland. Domesticated animals are much more resistant than those living in the wild, that is why wild boar crossed with wild pigs will be characterized by lower resistance to adverse environmental conditions which could threaten the extinction of their population.

Breeding wild pigs is regulated Nature Conservation Act of 16 April 2004. According with 119a article of this Act, it is prohibited to multiply animals obtained by crossing animals under strict or partial protection (article 49 paragraph 1 letters a and b), or animals with alien species (article 120 paragraph 1). In addition, wild animals with animals of other species, as well as with animals from different forms and varieties, without the permission of the General Director of Environmental Protection. Such permission may be obtained by submitting a application to the Ministry of Environment. The application should contain the following information: basic data of the applicant, the purpose of activities, the name of the species, number of individuals, time and place of action, the certificate of animals origin and the opinion of the Polish Hunting Association. Moreover you should obtain a ruling of the District Veterinary Officer which state that applicant meets proper conditions of animal housing which correspond with their to their biological needs and not permitting to animal escape. In addition to the application should be attached a letter in which the applicant describes why he wants to take care of the activities described in the application. Such prepared documents must be sent to the Ministry of Environment, which has 30 days to issue a positive or negative decision on the permission of actions.

General Director of Environmental Protection obligatory refuses to issue a permit if the applicant has been convicted with legally binding verdict for a crime related to transporting across the state borders, keeping, conducting the breeding and selling of species mentioned in article 49 and 120 and hunting animals within 3 years from the date the judgment became final. It may also refuse to issue a permission if the applicant in any way with his actions poses a threat to native species.

After obtaining permission, the General and Regional Director of Environmental Protection may require verification of the conditions specified in the issued permits. If during the inspection it comes to disclose irregularities the permission may be taken back. One must be aware that if someone is breeding wild pigs without the permission of the General Director of Environmental Protection is subject to arrest and fines, which are governed by the Code of Conduct in the cases of offense.

THE EVALUATION OF PIGS WELFARE IN SELECTED FARM IN KUYAVIAN-POMERANIAN REGION

OCENA DOBROSTANU ŚWIŃ W WYBRANYM GOSPODARSTWIE WOJEWÓDZTWA KUJAWSKO-POMORSKIEGO

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The aim of the study was to evaluate of pigs welfare from birth to their sale. The study was conducted from 10th July 2013 till 31th May 2014 in individual farm in Złotniki Kujawskie in Kuyavian-Pomeranian Region. Evaluated 213 piglets, 86 weaners and 66 fatteners of Polish Landrace breed which derived from 20 litters. Sows with piglets were kept in the same conditions on shallow litter in individual pens with separate place for piglets. All sows were feed with the same fodder. The piglets were kept with their mother for a period of 42 days. The evaluation of the litters was made based on the following traits: body weight of piglets (at 1st, 7th, 14th, 21th, 28th, 42th day of life), sex of piglets, mortality up to the 42th day of live and growth rate in following days of measuring. Obtained results were statistically calculated using computer program STATISTICA 8.0 (2008).

The average litter size was 11.10 piglets, including 10.65 piglets that were born alive in a litter. The mortality in a period of being piglets with their mother was on average 6.31% in litter. The body weight of piglets in the day of birth was 1.64 kg, and in the weaning day was 11.28 kg. There hasn't been demonstrated any differences in growth rate of piglets due to gender. Body weight of weaners at the beginning of rearing was 23.15 kg, while on the end of rearing and the same time day of the start of fattening amounted 43.04 kg. Body weight of fatteners which were slaughtered in about 27-28 weeks of life was 108 kg. During the observation each technological group noted only a few aggressive events associated with setting up the hierarchy in the new groups.

Obtained production results of individual groups of pigs in the analyzed farm indicate the appropriate and in accordance with the requirements of animal welfare conducting pig production.

THE INFLUENCE OF LINSEED OIL ON THE QUALITY OF PORK MEAT

WPŁYW OLEJU LNIANEGO NA JAKOŚĆ MIĘSA WIEPRZOWEGO

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Pork meat is a complete protein of animal origin which includes i.a. B vitamins, oxidant_vitamins, minerals (eg. zinc, selenium, copper, easily absorbable iron) and nutrients. Therefore it plays an important role in human nutrition.

Pork is the most consumed meat in Poland (38.5 kg person/year, the Central Statistical Office, 2014). Despite the relatively high consumption of pork, for several years there has been a downward trend in the consumption of meat and meat products. The main cause is believed to be the view prevailing among consumers that pork may have a negative impact on health and lead to many diseases of modern civilization, such as: diseases of the cardiovascular system, coronary heart disease, thrombotic and embolic disorders and obesity. Currently different solutions and modifications are sought in animal nutrition. Not only should we provide the optimum level of energy and nutrients in animals' feed rations, but we should also introduce some additives that both have a positive effect on animal health and improve the quality of the meat products, which is of utmost importance to consumers.

The preferred solution is the use of linseed oil, whose health benefits are widely known. Linseed oil contains: 73% of polyunsaturated fatty acids (PUFA), 18% monounsaturated fatty acids (MUFA), 9% saturated fatty acids (SFA). One of the major linseed oil fatty acids is α-linolenic acid (ALA), which is 53.3%. The addition of the linseed oil in the last phase of fattening pigs is a relatively inexpensive way to improve the fatty acid profile in the muscle tissue. Pig body is not able to synthesize fatty acids of the PUFA family, therefore an effective solution is to enrich the diet with this additive. Through the introduction of a few percent (3-5%) linseed oil to the animal feed, the PUFA acids content can be greatly increased, so you can get an increased proportion of omega 6 to omega 3, as recommended by WHO/FAO (World Health Organization / Food and Agriculture Organization).

The use of the linseed oil additive in the diet of pigs has a positive effect on the increase of the content of polyunsaturated fatty acids thereby causing that meat and its products might be considered as a functional food. Improving the nutritional value of pork could gain consumer recognition and contribute to the increased demand for pork and its products.

IMPACT OF ANAEROBIC DIGESTION ON THE CONTENT OF NITROGEN IN PIG SLURRY AND BIOMASS USED AS A SUBSTRATES IN AGRICULTURAL BIOGAS PLANTS

WPŁYW FERMENTACJI METANOWEJ NA ZAWARTOŚĆ AZOTU W GNOJOWICY ŚWIŃSKIEJ I BIOMASIE UŻYTYCH JAKO SUBSTRATY W BIOGAZOWNIACH ROLNICZYCH

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Intensive pig farming industry causes production of large amounts of manure – pig slurry. According to Polish Law of 10 July 2007 about fertilizers and fertilization pig slurry is valuable natural organic fertilizer, but it should be managed in suitable way because it is a potential threat for environment due to high content of chemical compounds, which can cause pollution of water and soil.

The aim of this research was to determine the changes caused by anaerobic digestion in the content of nitrogen forms in pig slurry from different production groups, and in fermented biomass, especially in the aspect of fertilization importance.

In the study dry matter (DM), content of total nitrogen (TN), content of ammonium nitrogen (N_{NH4}), and the content of nitrate nitrogen (N_{NO3}) was determined in 6 samples collected from two agricultural biogas plants localized in West Pomerania, Poland. One biogas plant, in Giżyno uses pig slurry from breeding farm, and the other, in Świelino, uses slurry from a fattening farm. Two samples were raw slurry (RS) from each biogas plant. Next two samples were prefermented biomass (PB) consisting of pig slurry, the feedstock of maize silage, and small amount of fermented biomass as a recirculate. Another two samples were fermented biomass, after all stages of biogas production. Total nitrogen and nitrate nitrogen levels were determined by photometric analysis with mineralization and tube testing (*NANOCOLOR*®). The level of ammonium nitrogen was determined by distillation with separation of ammonia nitrogen from the digestate, and titration of the ammonia with a standard solution of 0.1 M hydrochloric acid in the presence of mixed indicator. The level of organic nitrogen (ON) with nitrite nitrogen ($ON+N_{NO2}$) was calculated from the formula: $TN = ON + N_{NO2} + N_{NO3} + N_{NH4}$.

The results showed that RS from breeding farm had 2.2 g/L TN, 76.4% of which was N_{NH4}, 10.5% was N_{NO3}, and 13.2% was $ON+N_{NO2}$. Dry matter was on the level of 1.54%. After addition of maize silage TN content increased to 3.8 g/L, 57.9% of which was N_{NH4}, 10.3% was N_{NO3}, and 31.8% was $ON+N_{NO2}$, DM = 6.12%. After anaerobic digestion TN of FB increased to 4.0 g/L, 56.8% of which was N_{NH4} , 10.0% was N_{NO3}, and 33.3% was $ON+N_{NO2}$, DM = 3.93%. RS from the fattening farm had 3.3 g/L TN, 82.7% of which was N_{NH4}, 10.3% was N_{NO3}, and 7% was $ON+N_{NO2}$. Dry mass was on the level of 3.25%. After addition of maize silage TN content was 4.2 g/L, 61.7% of which was N_{NH4}, 10.2% was N_{NO3}, and 28.1% was $ON+N_{NO2}$, DM = 9.88%. After anaerobic digestion TN of FB increased to 5.1 g/L, 63.1% of which was N_{NH4}, 10.2% was N_{NO3}, and 26.7% was $ON+N_{NO2}$, DM = 4.86%.

In conclusion, TN content in pig slurry depends on the manure production group. Slurry from fattening farm has higher level of TN. Addition of maize silage, and microbiological activity in fermentation increased the amount of organic forms of nitrogen, which is not profitable for fertilization because of limited bioavailability of organic nitrogen. Also fermentation decreased the amount of ammonium nitrogen. That is undesired because of efficient absorption of this form by crops. Biomass after fermentation in agricultural biogas plant has higher level of TN than raw pig slurry, but pig slurry contains more bioavailable forms of nitrogen, which makes it better fertilizer.

STRESS RESPONSE IN CONTACT WITH BOAR IN RELATION TO ESTRADIOL AND LH LEVEL IN WEANED SOWS

REAKCJA STRESOWA NA KONTAKT Z KNUREM U LOCH ODSADZONYCH, W ZALEŻNOŚCI OD KONCENTRACJI ESTRADIOLU I LH

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The aim of the study was to evaluate cortisol secretion in sows during weaning to estrus period, as reaction to contact with teaser boar, according to the day after weaning and thus associated concentrations of estradiol and LH. The experiment was conducted on 10 primiparous sows, F1 crossbreed of polish landrace and polish large white, from weaning time to ovulation. From the 2nd day after weaning, at 12:00 a.m. and 8 p.m. mature boar was introduced to mating sector where sows were housed. Animals have had nose to nose contact for 15 minutes. During boar contact blood samples were collected 10 minutes after male introducing. The rest of samples were collected every 4 hours each day (6 samples per day). Mean daily secretion and whole period profiles of hormonal secretion were analyzed. ANOVA and Duncan test were used to evaluate differences in daily secretion of every analyzed hormones. Spearman correlation coefficients were estimated between estradiol and cortisol, and LH and cortisol secretion.

Results shown large fluctuations of cortisol secretion between the 2nd and 5th day with evident peaks during contact with boar. The reaction was significantly ($P < 0.01$) increased during estrus, in days 4th and 5th, when cortisol level was comparable even with the day 1, when weaning stress occurred (tab. 1). Increased cortisol secretion in days 4 and 5 was related to gradually decreasing estradiol level and rapidly increasing concentration of LH preovulatory surge. Spearman correlation coefficient between estradiol and cortisol secretion was negative and amounted to -0.72, while correlation between LH and cortisol secretion was positive and amounted to 0.49.

Table 1. Mean daily concentrations of E2, LH and cortisol between weaning and ovulation

After weaning	Estradiol	LH	Cortisol
Day 1	7.6 ± 2.6^{A}	2.7 ± 3.7^{Aa}	22.5 ± 16.3^{Aa}
Day 2	16.6 ± 8.9^{Ba}	1.9 ± 2.2^{ABb}	12.9 ± 8.9^{BCc}
Day 3	26.2 ± 5.4^{C}	1.2 ± 1.1^{Bc}	12.0 ± 8.1^{C}
Day 4 (proestrus)	18.8 ± 5.2^{Bb}	0.9 ± 1.5^{Bc}	17.5 ± 9.1^{Ab}
Day 5 (estrus)	16.4 ± 5.9^{Ba}	6.0 ± 4.6^{C}	19.7 ± 10.3^{Aa}
Day 6 (ovulation)	13.0 ± 3.1^{D}	2.8 ± 3.3^{A}	15.0 ± 11.3^{Bd}

^{abcd} – means in columns denoted with different superscripts differ significantly ($P < 0.05$)

^{ABCD} – means in columns denoted with different superscripts differ significantly ($P < 0.01$)

To conclude, contact with boar seemed to be strong emotional stress for sows, however, the level of stress response was dependent on day after weaning. The main physiological factor of stress response modulation seem to be the relation between estradiol and LH, but the results must be confirmed and expounded in further, more detailed analyses.

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SOME REPRODUCTIVE AND GROWTH TRAITS OF AKKARAMAN SHEEP IN TURKEY

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This study was conducted to investigate the reproductive and growth traits of Akkaraman sheep. Akkaraman is a native breed of Turkey. It is raised in Central Anatolia, in where steppe climate condition prevails. The data were collected from 1527 ewes and 843 lambs during 2013-2014 years. The means were 84.3 and 83.0% for lambing rates, 1.61 and 1.42, for litter size, in the first and second years, respectively. Least squares means of lambs were 5.09 and 4.90 kg for birth weight, 14.66 and 12.62 kg for 30-day weight, and 30.99 and 27.87 kg for 90-day weight in the first and second years, respectively. In conclusion, the litter size of Akkaraman ewes and growth of lambs were better than before published literature. So, Akkaraman seems to be a suitable breed for lamb production.

AIR MYCOLOGICAL RATE IN THE ENCLOSURE FOR CALVES AND THE DAIRY COWS STABLE

OCENA MIKOLOGICZNA POWIETRZA W CIELĘTNIKU I OBORZE KRÓW MLECZNYCH

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Ensuring the welfare of farm animals is not only important for humanitarian reasons but it also has a significant impact on the volume of production and quality of products.

The important part of the environment of livestock buildings is the air quality in terms of microclimate parameters and microbiological quality. Air can be a potential source of bacterial, fungal and viral diseases. The air microbiological condition in livestock buildings is thus important both for animal health and biosecurity of certain products.

The aim of these thesis was to determine the content of fungi in the air of the enclosure for calves and the dairy cows stable, taking into account the microclimate conditions prevailing in the tested areas. Tests were carried out from June 2009 to March 2010 in an enclosure for calves and a dairy cows stable in the county of Bydgoszcz. A sampling was performed once a month (excluding August) in the mornings.

During microbiological tests there was indicated the number of yeast-like and mould fungi in the tested air. Stands for sampling were determined in three places at the distance of approximately 10m apart, at the height of 0.5 m. Microbiological material was collected by the collision method (the camera SAS SUPER 90) and the sedimentation method on the substrate of Sabouraud Dextrose 2% and Glukos Agar. Cultures were incubated at 25°C for 72, 120 and 240 hours and then determined the number of fungi. Temperature and humidity measurements were made with the help of the hytherograph and pollination with a conimeter.

The lowest temperature, both for the enclosure for calves and the stable, was recorded in January and the highest one in June. The temperature in the enclosure for calves varied between -0.7°C and 26.6°C in the stall it is held in the values of -1.7°C to 28.4°C. It was noticed that in the winter months the temperature and humidity were the lowest in the tested rooms. However, the highest values of these parameters were recorded in the summer.

The winter months favored the growth rate of pollination while in the autumn there was its fall. Comparing the results of the number of fungi tests measured with a collision method on

a substrate of Sabouraud Dextrose 2% Glucose Agar in 6 studies, the average number of mould fungi in the air of the enclosure for calves was higher in the comparison with the results of the research in the stable. In case of yeast-like fungi, results were developing differently. Their 5 times higher number was seen in the stable than in the enclosure for calves. At the same time, the research was conducted in the livestock buildings, using the support of Czapek Dox Agar (with a collision method). In the stable the lowest value was obtained in January (89 cfu / m^3) and in the enclosure for calves in November and February (311 cfu / m^3). The tested number of mould fungi in the enclosure for calves in September (3722 cfu / m^3) exceeded almost a thousand cfu / m^3 number of fungi measured in barn (2778 cfu / m^3). For the above method has also been found 6 times bigger number of yeast - like fungi in the stable than in the enclosure for calves.

By using the sedimentation method there were detected more microorganisms than with the collision method. The research has shown that the air in the tested livestock buildings was much polluted mycologically and microclimate parameters often differed from the zoohygenic standards. To sum up, it can be said that in the stable and in the enclosure for calves occurred periodically deterioration of animal welfare.

„KINDERGARTEN" KEEPING-SYSTEM IN FARROWING HOUSE: EFFECT ON WEIGHT PERFORMANCES OF PIGLET'S AFTER-WEANING

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The process of weaning is a multifactorial stressor, in which nutritional, social, physical and psychologic stressors are combined. It takes a long time while the piglets from different litters used to each other in the rearing crates and hierarchy formed, meanwhile the weight development fall back.

The aim of this study was to examine the effect of litter's let-together system ("kindergarten") in the farrowing house before weaning on after-weaning weight development.

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 (20^{th}-21^{st} 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. The piglets from different litters had different color of number on their back. The sow had a colored number fit to their piglets, so we could check the cross-suckling too. After weaning the piglets from experimental groups were housed to the same rearing crates (4 groups to 4 different crates, n = 46; 41; 48; 44 piglets/group).

Control groups: the piglets stayed in their own farrowing pen till weaning. After weaning 123 piglets were put to 3 different rearing crates (n = 41 piglets/group).

The piglet's body weights were measured at birth and every week till 7^{th} life-week.

Data were analyzed using repeated measure mixed effect models in R program. Multiple comparison tests were done with the Duncan's new multiple range test. To account for the repeated measures per piglet (across time: period), the individual was nested within treatments (sex, keeping-system) and treated as random effect in the analysis. The model included fixed effects of treatments, time and treatment×time. For all analyses, significance was considered to be $P < 0.05$.

There were no significant differences in weight development between the control and experimental groups. We found the female's body weight in experimental groups on 7^{th} week was slightly higher than males and females' groups were more homogeneous in weight than males', respectively.

However, there were no significant differences in weight gain between the control and experimental groups, further investigations are going on and we would like to support the beneficial effect of "kindergarten" system in the farrowing house in animal welfare aspects.

UNCONVENTIONAL UTILIZATION OF PIGS

NIEKONWENCJONALNE UŻYTKOWANIE ŚWIŃ

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Since the moment of generating the miniature pigs in the fifties of the XX century, they have been utilized in the studies. The increase of the application of the mentioned animal species in biomedical experiments was significantly affected by the pressure of the societies which demanded reduction of the number of apes and dogs which were universally employed for scientific purposes in the seventies and the eighties of the 20[th] century (Bollen et al. 2000). The pigs became also an alternative to rodents, being the research model for decades. It was connected with the development of xenotransplantation and with toxicological and immunological studies (Bollen and Ellegaard, 1997). For research purposes, farm pigs of various breeds are currently used (Landrace, Yorkshire, Duroc, Hampshire, hybrids) (Bollen et al. 2000). From among miniature breeds, we distinguish Göettingen, Yucatan and Sinclair (micro-group) and Hanford and Yucatan (mini group) and Vietnamese potbellied pigs. The quick growth rate and high body weight constitute defects of farm pigs. It limits their utilization; therefore, they are employed in short-term projects which require killing the animals. The miniature pigs are used in long-term experiments. They are characterized by small dimensions, low body weight and slow growth rate what lowers costs of maintenance and is advantageous. The body weight of the miniature pigs at birth is equal to ca. 0.5 kg and at the age of 4 months, it is 12-45 kg (Fitko, 1993; Swindle et al. 1994). They reach sexual maturity at the age of 4-5 months; they are utilized for reproduction from 6-7 month of life at the body weight of 20-25 kg; they are born in the litter consisting of 5-8 piglets. Their biology, anatomy, physiology and haematological and biochemical parameters have been recognized and their similarities with human organism constitute the background for utilization in the studies (Pond and Mersmann, 2001). The suitability of the pigs for biological experiments is determined by many factors, which may be precisely specified by the teams of specialists who conduct the mentioned studies. They include breed and the resulting defined genetic predispositions of the animals. For example, the structure and functions of the pig's brain are the subject of various experiments as the cortex functions of the mentioned organ are weakly recognized (Lind et al. 2007). Jelsing et al. (2006) conducted neurological tests which, aiming at determination of the number of neurons in cerebral cortex of the pigs. It is an area responsible for aware behaviour. The evaluation included microscopic preparations of brain tissue of farm and miniature pigs. The number of neurons at birth of the pigs of the both discussed breeds was assessed and then, the quantity of neurons in the brain of adult animals was calculated. The number of neurons in the brain of farm pig was not changed and that one of the miniature pig was increased by 28%. In the case of humans and farm pigs, the cortex neurons are not developing after birth, therefore the miniature pigs are not the most suitable model for examination of development of human brain. As it was given by Klocek and Kalinowska (2003) in the studies on the level of pig intelligence, a simplified form of computer games was employed for IQ testing of the Primates. It was demonstrated that the pigs associated facts quicker than chimpanzees and revealed the ability of abstractive thinking and the acquired skills remembered for a long time, even up to three years (Internet, McLaughlin). In ranking of the increasing level of intelligence of various animals species, Hally (2008) mentions as follows: squirrel, squid, raven, dog, pig, parrot, elephant, dolphin and ape. Reassuming, it may be stated that the miniature and breeding pigs may, or may not constitute a model for biological studies in practice.

A COMPARISON OF METHODS FOR EVALUATING SOIL ORGANIC CARBON AS IT IMPACTS THE ACCURACY OF SOIL PHOSPHORUS DETERMINATION

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Accurate determination of a soil's P content is essential for sound environmental management, especially in agricultural settings, due to negative water quality impacts from excess P entering aquatic systems. The ascorbic acid method is a convenient and inexpensive quantification of P from soil extracts; however, soil organic matter interferes with accuracy. Therefore, soil organic matter measurement method becomes important. Loss on ignition method determination of soil organic carbon is less involved and uses no chemicals, but mineralogy may impact values. Soil samples collected in depth increments from a dairy waste effluent application field in Texas, USA are the sample set for comparing the dry combustion total carbon method less inorganic carbon method (calcium carbonate equivalence) verses the loss-on-ignition method for determining soil organic carbon. Correlations between P distributions with depth and soil organic matter distributions with depth will be presented.

POLYMORPHISM OF MICRORNAS – MIR156B AND MIR168 IN REGARD TO GENOME PLASTICITY OF *LINUM USITATISSIMUM* (L.)

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MicroRNA as endogenous non-coding RNAs have recently emerged as important regulators of gene expression mechanisms at the post-transcription level in support of plant developmental plasticity and environment adaptability. The miRNAs activity may result in an increased or decreased activity based on environment conditions. In terms of analyzing the genome plasticity, the flax genome has certain characteristics that make it an interesting research object. The aim of our study was to analyze the polymorphism of selected miRNAs in flax linseed (3) and fibre (4) genotypes as well as in two landraces by newly developed type of molecular markers based on microRNA. For the study were selected two types of miRNA, miR156b and miR168. Both types of miRNAs belong to conserved microRNA families. Based on the literature, the highest expression of miR156 was declared in the flax leaves while the expression of miR168 was low. However, the miR168 belongs to the group of potential biomarkers of plant stress response. DNA was extracted from 14-days old seedlings by modified CTAB extraction method and quantified by nanophotometer. The primers for the miRNA-based markers were designed according to the mature miRNAs sequences, which are part of the miRNA precursors (pre-miRNA) originated from the miRNA database (http://www.mirbase.org/). A total of 3 miRNA-based forward primers and two universal miRNA reverse primers were used. The single primers were randomly combined together to perform a marker assay. Consequently, the touchdown PCR amplification has been established. The PCR products were separated on 15% TBE-Urea gels. By the primer combinations miR156b/universal reverse miRNA primer was possible, based on miR156b polymorphism, distinguish the linseed genotypes from fibre genotypes and landraces. Even, one of the linseed and one of the fibre genotypes was separated from the others within the group. The amplified length of PCR products ranged from 25 bp up to more than 330 bp (linseed genotypes) respectively up to 100 bp (fibre genotypes). On the other side, although the primer combination miR168/universal reverse miRNA primer produced clear bands, these were monomorphic for all analyzed genotypes. The amplified length of PCR products ranged from 30 bp up to 220 bp. Whereas the diversity of genetic background of analyzed genotypes was not sufficiently strong incentive for registration of polymorphism, the monomorphic loci pattern of miR168 may support its role as a biomarker of plant stress response. Interestingly, the combination of primers of both analyzed miRNAs provided similar loci pattern as in the case of miR156b polymorphism. The stability of miR156b polymorphic pattern reflects its level of expression in flax leaves as well as its expression stability in general such as is declared in the literature. MicroRNA DNA sequences are sufficiently sensitive for the mapping of polymorphism in regard of plants genome plasticity.

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INFLUENCE OF DEFICIENCY OF SELECTED 4 MACRONUTRIENT (CA, N, P AND K) DEFICIENCY ON CO_2 BALANCE OF MISCANTHUS (MISCANTHUS X GIGANTHEUS ANDERSS) CULTIVATED IN CENTRAL POLAND

WPŁYW NIEDOBORU 4 OKREŚLONYCH MAKROSKŁADNIKÓW(CA, N, P I K) NA BILANS CO_2 MISKANTA (MISCANTHUS X GIGANTHEUS ANDERSS) UPRAWIANEGO W CENTRALNEJ POLSCE

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The Aim of research was estimating influence of deficiency of selected macronutrients (Ca, N, P and K)on CO_2 balance of Miscanthus plants cultivated in Central Poland including four important elements (absorption, biological emission, retention brutto and emission from means of production).

The evaluation of changes of parameters of CO_2 balance (in CO_2 equivalent) balance (absorption, emission and retention) was performed on Miscanthus x gigantheus in three continues years (2008, 2009 and 2010), cultivated since 2003 in the frames of long-term static fertilizer experiment design (Mercik and Stępień 2005, Łabętowicz and Stępień 2010, Lebioda et al. 2010) in the field of the Prof. Marian Górski Skierniewice Experimental Station, WULS-SGGW Faculty of Agriculture and Biology. It was done on a IVa class field, not fertilized with NPK since 1923. Scheme of experimentsite shows below Table 1.

Table 1. The fertilization treatments used in the experiment with Miscanthus

Treatment	Ca	CaNPK	NPK	CaPK	CaPN	CaKN	Ca	CaNPK	NPK
Field no.	1	2	3	4	5	6	7	8	9
Treatment	CaPK	CaPN	CaKN	Ca	CaNPK	NPK	CaPK	CaPN	CaKN
Field no.	10	11	12	13	14	15	16	17	18

Source: Pietkiewicz et al. 2014

Table 2. and 3 show main parameters of CO_2 balance.

Table 2. Main elements of CO_2 balance

Year	Treatment	Absorption [t CO_2 ha^{-1}]	Biological emisis-sion [t CO_2 ha^{-1}]	Retenion brutto [t CO_2 ha^{-1}]
2008	Ca	54,14	52,23	1,91
2009		49,02	46,95	2,07
2010		49,45	47,21	2,23
Mean		50,87	48,80	2,07
2008	CaNPK	62,25	59,71	2,54
2009		53,93	51,23	2,70
2010		56,49	53,63	2,86
Mean		57,55	54,86	2,70
2008	NPK	58,83	56,69	2,15
2009		50,13	47,83	2,31
2010		50,77	48,31	2,47
Mean		53,25	50,94	2,31
2008	CaPK	39,21	37,06	2,15
2009		36,65	20,26	2,31
2010		22,57	34,18	2,47
Mean		32,81	30,50	2,31
2008	CaPN	52,86	50,47	2,39
2009		44,11	41,56	2,55
2010		47,10	44,39	2,71
Mean		48,03	45,47	2,55
2008	CaKN	58,83	56,38	2,46
2009		52,27	49,65	2,62
2010		54,78	52,01	2,78
Mean		55,29	52,68	2,62

Table 3. Emission tCO_2 ha-1 a-1 from production means of production used for cultivation

Treatment	Ca	CaNPK	NPK	CaPK	CaPN	CaKN
Emisission	0,393	1,019	0,626	0,628	0,872	0,936

Conclusions

1. The yield of biomass of Miscanthus was determined by nutrient availabity.
2. Deficiency of nitrogen have the highest influence on rate of absortion and biological emisson of CO_2.
3. Lack of three out of four macronutrients(N, P and K) decreases level of retention brutto significantly.
4. The level of emission of CO_2 from means of producion varied from 0.393 to 1.019 tCO_2 ha-1 a-1.

CALVING EASE AND PERINATAL MORTALITY IN POLISH HOLSTEIN FRIESIANS

PRZEBIEG PORODU I OKOŁOPORODOWA ŚMIERTELNOŚĆ CIELĄT W POPULACJI KRÓW RASY PHF

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The aim of the study was to examine the relationship between calving ease and perinatal calf mortality by year of calving, season of calving, and parity, in Black-and-White Polish Holstein-Friesian cows.

Data consisted of 2,538,673 calving ease and perinatal mortality records from the SYMLEK database. Cows calved between 2010 and 2014. Calving ease was classified into unassisted and five categories of assisted (easy pull, difficult, hard pull, abortion and caesarean section) calving. Calves were classified live-born or dead (calves born dead or dying within 24 hours of parturition). Twin calvings and abortions were discarded. Calving category records occurred with the following frequencies: unassisted – 37.32%, easy pull – 59.96%, difficult, hard pull and caesarean section – 2.73%. In general, 5.16% of all calvings ended in calf death. Increased calving difficulty was linked to higher perinatal mortality. Stillbirth rates were low among unassisted (4.12%) and easy pull (4.87%) calvings. The perinatal mortality rate was highest for the hard pull calving category (45.34%).

In the period examined, the share of unassisted calvings increased from 35.05% to 40.30%. Among the assisted calving categories, difficult, hard pull and caesarean section calvings, taken together, increased from 2.54% to 2.86%. No such trend was noted for easy calvings. For caesarean section calvings, calf mortality increased from 36.03% to 43.52%.

In the studied population, the percentage of difficult calvings was highest for primiparous cows (4.58%), more than double the percentage for multiparous cows (1.87%). In terms of cow age, unassisted calving increased from 26.74% for primiparous cows to 43.08% for cows in the fifth and subsequent calvings. The stillbirth rate was highest in primiparous cows (7.33%), decreased with successive calvings, and was twice as high time in the first-calf cows as in older cows.

The share of assisted calvings was higher in winter (2.94%) than in summer (2.52%), and the percentage of unassisted calvings was higher in summer. The stillbirth rate was 5.42% in winter, higher than in summer (4.92%).

Generally, perinatal calf mortality increased with the increase of assisted calvings. The rates of assisted calving and stillbirth decreased with successive years, and were highest in primiparous cows.

SOIL ORGANISMS IN A BIODEGRADATION OF FILM BASED ON STARCH

BIODEGRADACJA FOLII NA OSNOWIE SKROBI W OBECNOŚCI CZYNNIKÓW BIOTYCZNYCH

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The starch based film biodegradation possibilities with various soil organisms: bacteria, fungi, and nematodes was examined. Film composed of 66% starch is completely biodegradable protective material designed for early spring horticultural and field cultivation. Presented film is a relatively easily accessible source of carbon for many soil microorganisms, what contributes to fast degradation. This process has economic benefits because after the time required for use on the surface of the soil, the material is completely decomposed without taking away. In addition, previous phytotoxicity studies, showed no negative effect of films on oats and radishes plants.

An assessment of the growth of PGPR bacteria - *Plant Growth Promoting Rhizobacteria* (*Bacillus* sp., *Pseudomonas* sp., *Serratia* sp.) of actinomycetes (*Streptomyces cyaneus*), fungi (*Aspergillus ochraceus, Fusarium culmorum*) and nematodes (*Caenorhabditis elegans*) on starch films was made. For bacteria, actinomycetes and fungi used minimal medium having the composition set out in the PN-EN ISO 846:2002 standard. The nematodes were grown on NGM media in the presence of *Escherichia coli.* Due to the additional benefits that may accrue from the use of PGPR bacteria, involving these microorganisms were conducted also examination of weight loss after 4 weeks of incubation (based on PN-EN ISO 846: 2002), and was determined biodegradability by measuring the evolved carbon dioxide (in based on the PN-EN ISO 14855-1).

All of the microorganisms very rapidly overgrown the samples, and caused significant changes in the structure what brought to their defragment. After 4 weeks of experiment 60% mass loss, and biodegradation of 30% were Nematodes inhabitation of the did not affect its degradation.

Starch film is a material easily biodegradable in soil. After one month there was a significant change in degradation under the influence of the used microorganisms. Combining the use of starch based film and PGPR bacteria may in the future bring significant benefits in the cultivation of early spring plants, which requires further research.

MEAT QUALITY OF FATTENERS DEPENDING ON INTRAMUSCULAR FAT CONTENT

JAKOŚĆ MIĘSA TUCZNIKÓW W ZALEŻNOŚCI OD ZAWARTOŚCI TŁUSZCZU ŚRÓDMIĘŚNIOWEGO

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The aim of the study was to evaluate the relationship between the level of intramuscular fat content and meat quality traits of pigs. The study included 110 fatteners, three-breed hybrids [F1 (PLW x PL) x Pietrain]. Experimental animals were fattened from 27 kg to 104 kg body weight. Fattening performed under unified traditional keeping conditions, care and nutrition. The evaluation of meat quality after slaughter was made by analyzing such traits as: degree of muscle tissue acidification (pH_1 and pH_K), water holding capacity, drip loss, meat color and chemical composition of meat (water, dry matter, protein, intramuscular fat, ash). Fatteners were divided into tree groups according to the level of intramuscular fat (IMF – intramuscular fat): less than 1% (group I), from 1% to 1.5% (group II), above the 1.5% (group III). The obtained results were statistically analyzed using the computer program STATISTICA 8.0 PL (2008).

The most numerous group was group I (56 individuals), the least numerous was group III (16 individuals), while in group II were 38 fatteners. All animals were slaughtered at similar final body weight of about 104 kg and similar age ranging from 169 days (group I) to 172 days (group II, and III). Significant differences were found between intramuscular fat content and the degree of muscle tissue acidification in 45 minutes after slaughter. Higher values of pH_1 was characterized by pigs with the highest content of intramuscular fat (group III) relative to the group with the lowest content of IMF (group I) (respectively: 6.46 vs 6.21); $P \leq 0.05$. Furthermore, it was found high significant differences in the basic chemical composition of the meat. The higher content of dry matter and intramuscular fat characterized by the meat obtained from the III group of fatteners (26.44% and 1.79%) compared to the group II (25.68% and 1.15%) and group I (25.37% and 0.72%).

The quality of meat obtained from examined fatteners generally was at a good level. Simultaneously it has been shown that the level of intramuscular fat affect on some traits of meat quality.

CHARACTERISTIC OF THE FAMILY *SUIDAE* REPRESENTATIVE

CHARAKTERYSTYKA PRZEDSTAWICIELA Z RODZINY ŚWINIOWATYCH

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Due to characteristic coat traits the Red River Hog (*Potamochoerus porcus*) is considered to be the most beautiful representative of the *Suidae* family. It occurs in central and West Africa and the islands of Zanzibar, Mafia, Lake Victoria island and Madagascar, where it is the only species of mammal occurring both on the island and on the African continent. It lives in the environment of persistent vegetation throughout the year. Always occurs near rivers, hence the origin of the name of this species.

Potamochoerus porcus distinguished by unusual for *Suidae*, and even for the *Artiodactyla* order the garish coloration. Particular subspecies of river pigs differ from each other of coat. Individuals living in the West African bush are usually red, while those who live in the Southern and Eastern parts of their occurrence, the most common coat color takes shades of red, brown and black. Most subspecies connects a characteristic trait which is the white "mask" on his head. Furthermore has elongated ears ended with long wisps of white bristles so called "brushes", white sideburns, white mane extending along the entire back and tail ending white bristles. Additionally male individuals have a papillary protuberances under their eyes.

As the whole *Suidae* family Red River Hog is an omnivorous animal. Diet is quite varied: rootlets, fruits, seeds, water plants, grass, mushrooms, insects, bird eggs, snails, small reptiles, and even carrion. Their delicacy are the seeds of *Balonites wilsoniana* tree, which are found in undigested form in the elephants feces. In search of food approaches to settlements inhabited by people. Very often appears on the peanuts plantations, which are also their favorite food. By burrowing ground intensively during feeding Red River Hog sometimes totally destroys plantations. Furthermore causes damage in crops of cereals, corn, pineapple, grapes and papaya *Carica papaya* L. The pig is known for its harmfulness particularly in Uganda, where it occurs the most numerous. The population of trying to protect their farms cultivation fences, however *Suidae* they are known for their intelligence. To get food pigs easily cope with obstacles by tunnel under the fences. In addition that pig attacks domesticated, diseased and young animals of sheep, goats and even the domestic pig. Most often these attacks as well as feeding on plantations occur at night when they are most active. During the day pig rests and seeks shelter from intense sun in plant thicknets or digged burrows.

The Red River Hog is a species numerously occurring in Africa, and therefore may be a potential source of food for people. It is even suggested that it would be possible to domesticate that pig. However, one should keep in mind the fact that the pig is a carrier of infectious diseases such as ASF (*African Swine Fever*) which can result in large losses of domestic animals.

THE SIZE OF FATTENERS AND SLURRY PRODUCTION IN INDIVIDUAL FARM

WIELKOŚĆ PRODUKCJI TUCZNIKÓW I GNOJOWICY W GOSPODARSTWIE INDYWIDUALNYM

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The aim of the study was to analyze animal production and by-products obtained from these animals. The study was conducted from January to December 2014 in one of the farm placed in the commune of Gostycyn in Kuyavian and Pomeranian Region. Basic herd had a population of 10 sows Polish Large White breed (PLW), which were mated boar of the same breed. Keeping sows with piglets was in accordance with the requirements of welfare, in individual pens with shallow litter and with a constant access to water. Piglets stayed with their mother up to 35 days of age. Weaners were reared for 60 days while fattening lasted for on average 98 days. Both weaners and fatteners were kept in group pens with a designated part of a slurry, with slotted floor. All production groups were fed in accordance with the Polish Standards of Pigs Nutrition (1993), and the feed mixture were prepared on own farm.

In the analysed farm the number of piglets born during the year was 207 while the reared was 190 individuals. The mortality of piglets during rearing was in the normal limits and amounted 8.33%. The mortality in the group of weaners was slightly above 2% (2.23%), which affected on obtainable number of weaners per year, giving 188 individuals. While in the group of weaners demonstrated the mortality at the level of 1.16%, and therefore throughout the year in the analyzed farm obtained 186 fatteners with average body weight of 111.5 kg. Fatteners during the 98 days of fattening were growing on average 801 g per day. During the year from weaners and fatteners obtained on average 182.5 m^3 of slurry. For storage such amount of feces on the farm was built 61 m^3 size container, which allows the storage of slurry over a period of 122 days without negative consequences for the natural environment. In the analyzed farm obtained slurry is used as natural fertilizer and applied on 3.65 hectares of land. Fertilization takes place each time before the agrotechnic procedure (deep plowing) performed to a depth of approx. 20 cm.

THE SIZE OF PIG PRODUCTION AND MANAGEMENT OF WASTE OBTAINED FROM KOWAL COMMUNE FARMS

WIELKOŚĆ PRODUKCJI TRZODY CHLEWNEJ I ZAGOSPODAROWANIE POWSTAŁYCH ODPADÓW Z GOSPODARSTW ROLNYCH GMINY KOWAL

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The Kowal Commune is located in the south-eastern part of the Kuyavian-Pomeranian Region. The vast majority of the area is used for agriculture and tourism. The commune covers an area of about 11.000 hectares, of which 6.119 hectares are arable land and 2.584 hectares are forests. In addition, Gostynińsko-Włocławski Landscape Park, occupying an area of 4.000 hectares, is situated in the Kowal Commune. Appropriate handling, storage and utilization of waste products in such areas is particularly important for environmental protection. The aim of this study was therefore the analysis of pig production scale and the method of storing waste products in the Kowal Commune.

The study was conducted on 54 randomly selected pig producers. The analysis was based on a questionnaire consisting of 15 questions (open and closed), which concerned i.a. the farm size, the sowing structure, the animal welfare system, the quantity of the fattening pigs sold within a year, the method and the storage period of the resulting waste.

Farms with an area of 5 ha accounted for 51.85% of all surveyed households in the Kowal Commune and farms with an area of over 20 hectares – only 5.56%. In 45 farms (83.33%) the basic herd size amounted to 5 sows and in 9 farms from 6 to 10 sows (16.67%) were maintained. Most holdings in the Kowal Commune annually produced up to 120 fattening pigs (43 farms, which accounted for 79.63% of all). 10 farms produced from 132 to 240 fattening pigs (18.52%) and 1 farm was characterized by a higher annual production scale of fattening pigs – from 252 to 360 (1.85%). Pigs in the Kowal Commune were kept on straw bedding, where the main solution applied by the farmers was shallow straw bedding system, which accounted for 96% of all. In other cases pigs were kept on deep bedding (4%). Thus, the main by-product of pig production in the Kowal Commune was manure. Most often the manure was stored on a manure board together with a tank for liquid manure (24 farms, i.e. 44.44%), then on a manure board without a tank (21 farms, i.e. 38.89%) and in 9 farms the manure heaps were stored directly on the field (16.67%). The storage period of manure in the analyzed farms was between 4 and 6 months (33 farms, which accounted for 61.11% of all) and over 6 months in 21 farms (38.89%). The resulting organic fertilizer was entirely used to fertilize fields and its amount did not exceed the permissible dose per 1 ha of arable land.

Based on the information that has been obtained it can be concluded that the Kowal Community is characterized by a small scale of pig production and that it does not pose a risk to the environment of this region of Poland.

AGRICULTURE AND WATER MANAGEMENT – CECESSARY TO MUTUAL COOPERATION

ROLNICTWO A GOSPODAROWANIE WODĄ – POTRZEBA WZAJEMNEGO WSPÓŁDZIAŁANIA

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Water is an essential component of environment, having priority for economy, industry and development. Resources and water quality are also determining factors for possibility of its use for agricultural purposes.

Water quality has large importance for the protection of soils and agricultural land. Improving the physico-chemical state causes an increase in quantity and quality of crops.

Analysis of water management for agricultural purposes is essential to stimulate development processes to protection of environment.

In order to improve water quality, Poland introduced a number of regulations. The most important for objectives of the water management strategy was adopt the European Union water policy. The implementation of the Water Framework Directive in country was tied to the implementation of tasks in order to improve water quality based on changes in agriculture and wastewater treatment.

The paper presents long term studies on water quality of the Główna river in Poznan in the years 1996-2009. The state of the river was characterized by biogenic substances: ammonia nitrogen, Kjeldahl nitrogen, nitrate nitrogen, total nitrogen, phosphates and total phosphorus. The results were analyzed with respect the changes in local climate, water and wastewater management, land use and use of chemical fertilizers.

Due to high concentrations of Kjeldahl nitrogen and phosphates, physicochemical state of the Główna river was less than good. The results of the analysis proved that concentration of total phosphorus in analyzed years was gradually decreased.

Obtained results shows that changes in agricultural policy should continue to support good solutions for protection water resources in agriculture. Organization of water and wastewater management in the catchment of Główna river has not significantly impact to improvment physicochemical state of water in the years 1996-2009.

RETROSPECTIVE STUDY ON THE EFFECTIVENESS OF EMBRYO TRANSFER (ET) METHOD IN HOLSTEIN-FRIESIAN DAIRY CATTLE IN SELECTED HERDS IN POLAND IN THE YEARS 2013-2014

OCENA RETROSPEKTYWNA EFEKTYWNOŚCI POZYSKIWANIA ZARODKÓW METODĄ EMBRIOTRANSFERU (ET) U KRÓW MLECZNYCH RASY HOLSZTYŃSKO-FRYZYJSKIEJ W WYBRANYCH STADACH W POLSCE W LATACH 2013-2014

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Embryo Transfer (ET) is an advanced reproductive technology that can help to produce more offspring from an elite cow and can extend the impact of outstanding cattle genetics. ET is one option that can increase a cow's reproductive efficiency, allowing to have numerous calves per year. In the average one cow can produce six to seven calves in the lifetime, while ET can increase reproductive efficiency to numerous calves per year – allowing breeders to multiply the success of their superior pedigrees. ET is a very accessible technology and produces the option to have embryos transferred fresh into synchronized recipients, or to have the embryos safely frozen to be transferred at a later date.

Objectives were to analyze the embryo transfer (ET) effectiveness in Holstein – Friesian dairy cattle in the years 2013-2014 in one selected herd in Poland.

This study was conducted on commercial dairy farm in the center of Poland (850 dairy cows), the average milk production was at level of 11 212 kg milk of 305 day lactation. Data were obtained from every ET program on the farm. Consisted of two full years (2013 and 2014), to subsequent specify the cold and warm season, and to investigate the influence of heat stress on the effectiveness of ET.

Table 1. The statistical summary of years 2013-2014

	Average number of embryos	Protocol	Number of transferable embryos	Pregnancies with ET program	Percentage of pregnant recipient heifers
Average in 2013/2014	7.15	Total embryos	207	122	68.38
		Fresh embryos	64	35	54.69
		Frozen embryos	137	87	63.5
Average in 2013	9	Total embryos	90	42	46.67
		Fresh embryos	23	10	43.48
		Frozen embryos	67	32	47.76
Average in 2014	5.11	Total embryos	117	80	68.38
		Fresh embryos	41	25	60.98
		Frozen embryos	76	55	72.37

The ET with frozen embryos was more effective than with fresh ones (Tab. 1). The effectiveness of ET is shown by percentage of pregnant recipient heifers – in year 2013 was 46.6% and 68.3% in year 2014 (Tab. 1). It also suggest that success in ET program depends on recipient heifers welfare and feeding program (information from farm's host).

IMPORTANCE OF PATHOGENESIS KNOWLEDGE OF SCLEROTINIA ROT OF CARROT

ZNACZENIE ZNAJOMOŚCI PATOGENEZY ZGNILIZNY TWARDZIKOWEJ MARCHWI

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One of the most dangerous pathogen threatening the carrot is the polyphagous soil-borne fungus – *Sclerotinia sclerotiorum* (Lib.) de Bary, considered as the most widespread non-specific plant pathogen for which occurrence of disease is difficult to predict. This species is an agent of sclerotinia rot, a disease that causes both pre-harvest and post-harvest losses. *S. sclerotiorum* is responsible for diseases in more than 450 plant species across the world, including many economically important ones like carrot, parsley, celery, lettuce, *Brassicacae* (e. g. rapeseed), tomatoes, peppers or beans.

Sclerotinia rot currently causes the greatest economic loss of stored carrots, reaching up to 50% of yield. This is caused by the rapid development of the disease in storage conditions – even one infected root can be a source of serious damage to adjacent carrot roots. In addition, the infected roots are susceptible to infections by other pathogens, which further increases losses of stored carrots. For these reasons much scientific efforts is directed toward improvement of storage conditions, cultivation methods and control. There are no established methods that guarantee 100% protection against Sclerotinia rot of carrot (SRC). The reason for this may be that the pathogen infects many commonly cultivated plants and field rotation has no impact on reducing infection by *S. sclerotiorum*. The pathogen has developed an additional ability to survive as sclerotia on the residues of harvested carrots. Sclerotia can persist in soil for around 8 to 15 years. Furthermore, it increases a resource of the inoculum in soil and *Sclerotinia* pathogenic potential. *S. sclerotiorum* has also adapted to the carrot lifecycle in the production process through the generation of infectious synchronized with the periods of carrots susceptibility. Its infectious mechanism is closely linked with the development of new leaves and their ageing in later stages of the growing season. The stage when carrots are susceptible to infection is relatively long during the growing season and starts from senescing of the first leaves and last until harvest time. The source of infection can be ascospores released from apothecia germinated from sclerotia. However, the most important and the most common source of infection are hyphae. Although direct infection of carrot roots by *S. sclerotiorum* is rare, roots became infected after petiole infection has spread down from the crown. Field-infected roots are the principal source of postharvest inoculum. The disease is introduced into storage by carrot roots initially infected in the field. The fungus has the ability to grow in very low temperatures. Therefore, conditions during storage i. e. 95-98% humidity, at a temperature of 0-1°C, limit losses caused by root respiration and evaporation (root drying), but does not fully protect carrot roots against SRC.

Root infection of carrot affects their quality from the very early developmental stages. Thus precise detection of the pathogen from the beginning of the growing season, seems to be a particularly important step in protection of this vegetable. It enables a timely application of fungicides, biological control agents and compounds based on metal ions, which prevents the disease developing and reduce subsequent losses. Disease monitoring should be an essential element in reducing SRC development.

IDENTIFICATION OF BACTERIA CAPABLE OF DEGRADATION OF PETROLEUM PRODUCTS

IDENTYFIKACJA BAKTERII ZDOLNYCH DO DEGRADACJI PRODUKTÓW ROPOPOCHODNYCH

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The future rehabilitation of degraded land through uncontrolled leakage of petroleum products lies in the development of Automatic remediation. The validity of the application of the inoculum with consortia of bacteria native confirmed in the literature concerns not only petroleum compounds, polycyclic aromatic hydrocarbons, but also other pollutants of organic origin. An important aspect of the automatic cleaning process is the action of microorganisms, as none of the species is not in a position to independently distribute individual hydrocarbons.

The aim of this study was to identify microorganisms with potential for degradation of biodiesel, gas oil, fuel oil and lead-free petroleum 98. The research material was clay loam with a pH of 6.0. Before beginning the experiment the soil material was not fertilized micro and macronutrients. Samples of a 100 g air-dried soil were placed in glass beakers, in triplicate. After mixing the soil with petroleum products in an amount of 0 and 16 g kg^{-1} dm soil were placed in an incubator at 25°C. During the incubation, the samples kept constant soil moisture at 50% of capillary water capacity using distilled water. After 180 days of incubation attempt isolation of microbial involving the completion of several cycles of the microbial growth on solid medium for breeding organotrofic bacteria by Bunta and Roviry of basic and modified composition. The next step was the passage several times most characteristic colonies of microorganisms in order to obtain pure cultures of bacteria. Isolated microorganisms were subjected to sequence analysis of 16S rRNA. Application of the 16S rRNA has enabled identification of microorganisms from 99-100% accuracy of a result of NCBI database. The following bacterial groups were isolated potentially capable of degrading petroleum products:

- uncontaminated soil samples: *Arthrobacter* sp. KF314190.1 and *Arthrobacter* sp. KC236871.1;
- soil contaminated with biodiesel: *Rhizobium* sp. AB552864.1, *Rhizobium alamii* GU552885.1, *Luteibacter rhizovicinus* NR_042197.1;
- soil contaminated with gas oil: *Kocuria* sp. KM886128.1, *Streptomyces atratus* EU593683.1, *Rhodococcus erythropolis* KJ000875.1, *Bacillus aryabhattai* KM817253.1;
- soil contaminated with fuel oil: *Caulobacter* sp. DQ337549.1, *Bacillus* sp. EU374155.1, *Gordonia amicalis* KM113029.1.;
- soil contaminated with lead-free petroleum 98: *Bacillus* sp. AY660700.1, *Cellulomonas* sp. AB733539.1, *Microbacterium* sp. JX566652.1.

Using Mega 6 isolated 3 monophyletic groups (clades). The first group was formed mainly by bacteria isolated from uncontaminated soil samples and samples contaminated with gas oil and lead-free petroleum 98. The second group of bacteria was isolated from samples of contaminated fuel oil and biodiesel. Of the 15 identified strains of bacteria only *Luteibacter rhizovicinus* NR_042197.1 did not qualify for any of the above clades.

IMPACT OF THE USE OF BIO-STIMULATORS FOR THE RELEASE OF VOLATILE ORGANIC COMPOUNDS IN THE CULTIVATION OF OILSEED RAPE

WPŁYW ZASTOSOWANIA BIOSTYMULATORÓW NA WYDZIELANIE LOTNYCH ZWIĄZKÓW ORGANICZNYCH W UPRAWIE RZEPAKU OZIMEGO

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Volatile organic compounds (VOCs) are products emitted into the atmosphere from many living organisms. In fact, over 90% of natural emission of VOCs is related to plants species like forests all over the world. The primary functions of airborne VOCs are to defend plants against herbivores and pathogens. There are two types of induced plant defense may be distinguished: 1) direct defense that affects the performance or behavior of its attacker directly, 2) indirect defense that enhances the effectiveness of natural enemies of herbivores through the production of induced volatiles.

The aim of this study was to determine the effect of the application of bio-stimulators for emissions of volatile organic compounds. Detailed studies have included the impact of the use of two biostimulators („Algaren" and „Drin") to induce the release of volatile organic compounds at 24 and 72 h in two development stages of rape (BBCH 19 and BBCH 52).

All of the tested cultivars of oilseed rapes („Granat", „Müller", „Kadore", „Alizeo") released quantitatively the same bouquet of VOCs at a certain stage of development. Plants at BBCH 19 following the application of biostimulators („Algaren", „Drin") released 13 VOCs. „Algaren" induced stronger emission of VOCs to compare to „Drin". The largest emission of VOCs was related to „Granat". Other tested cultivars („Müller" i „Kadore") released lower amounts of components. „Alizeo" appeared to be less active. Green Leaf Volatiles (GLVs) were emitted by plants at both stages (BBCH 19 and 52) in larger amounts after 24 h. Most of the rest of the components were released in larger amounts after 72 h. Control plants emitted only small amounts of VOCs. Adult insects of the pollen beetle (both females and males) were attracted to control plants at BBCH 52, but tested cultivars 'Granat' i 'Alizeo' (after biostymulator applying) repelled insects.

It proved that the use of certain biostimulators can boost the defense mechanisms of plants, thus prepare the plants to attack by insects. They can lay the foundations for the realization of the phenomenon of „priming" in practice.

EFFECT OF DIFFERENT COMPOST DOSES ON THE YIELD AND QUALITY CHARACTERISTICS OF ALFALFA UNDER SULUOVA-AMASYA ECOLOGICAL CONDITIONS IN TURKEY

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This research was carried out to determine of effect of different compost doses on the yield and quality characteristics of alfalfa under Suluova-Amasya Ecological Conditions in Turkey during 2009 and 2010 years. Victoria alfalfa cultivar obtained from Fito Seed Company was used as plant material. Field experiments started on 23[th] of October, 2010 and was designed in a randomized complete block with three replications. Plot size was 5 x 1.8 m. Sowing rates of alfalfa was 30 kg/ha. Four different compost doses (0, 20, 40 and 60 ton/ha) were uniformly applied by mixing to the soil before sowing. The data were anlyzed with MSTAT statistical program. Green forage yield (63082-70559 kg/ha), dry matter yield (20978-23015 kg/ha), crude protein content (20.67-21.21%) crude ash content (11.03-11.59%), ADF content (30.90-33.63%), NDF content (39.67-41.80%) were ranged based on two years production.

ASSESSMENT OF GENETIC VARIABILITY AMONG CENTRAL EUROPEAN CATTLE BREEDS BASED ON POLYMORPHISM OF PROLACTIN (PRL) AND LEPTIN (LEP) GENES

OCENA ZMIENNOŚCI GENETYCZNEJ ŚRODKOWOEUROPEJSKICH RAS BYDŁA NA PODSTAWIE POLIMORFIZMU GENÓW PROLAKTYNY (PRL) ORAZ LEPTYNY (LEP)

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In recent times, molecular genetics has become more significant in animal breeding. Molecular techniques and methods are useful not only in showing relationships between genes polymorphism and production traits in cattle but also in assessment of genetic variability between and within animals. This type of analysis can be provide based on polymorphism in many loci of candidate genes, for example: prolactin (PRL) or leptin (LEP) genes. Prolactin belongs to the family of protein hormones with growth hormone (GH) and placental lactogen (PL) [Bonavera et al., 1994]. The functions of prolactin in the organisms are extensive and far outside the scope of reproduction. This hormone plays an important role in the metabolism, growth, development, behaviour, and in homeostasis maintaining [Freeman i wsp. 2000]. So far, has been documented more than 300 types of interactions of prolactin hormone on a specific biological functions in mammals organisms. The important role of prolactin also corespondents with metabolism by affecting on: appetite stimulating and metabolism of lipids, carbohydrates and steroid in mammals organisms. Prolactin is often described as a hormone which plays an important role in the control of animal behavior and their adaptation to the environment conditions [Sotowska-Brochocka, 2001]. Whereas, leptin is a hormone, that is involved in the regulation of food intake, long-term energy balance, body weight, reproductive and immune system. Its role in meat and milk production makes it a candidate for the search of molecular markers related to meat production and meat quality. Recently, polymorphisms have been reported for this gene suggesting, that it is a candidate affecting the milk production and its components [Buchanan et al., 2002, Buchanan et al., 2003].

The aim of this study was to determin the genetic variability based on polymorphism in the prolactin (PRL) and leptin (LEP) genes loci. The study included the following breeds of cattle: Red Polish (RP), Red Lithuanian (RL), Polish Whiteback (WBP), Lithuanian Whiteback (WBL), Grey Ukrainian (GU), Brown Carpathian (BC) and Pinzgauer (PG). Analysis conducted on 10 individuals in each breed. Biological material comprised hair roots. DNA isolation was performed using Sherlock AX kit (A&A Biotechnology) according to the manufacturer's protocol. Polymorphism in the prolactin (PRL) and leptin (LEP) genes loci was determined by PCR – RFLP method – according to the method specified by Lewin et al. [1992] – for prolactin gene and by Javanmard et al. [2005] for leptin gene with own modifications. The PCR products was digested with restriction enzymes respectively: PRL – *RsaI*, LEP – *Sau3AI.* Digested DNA was separated on a 2% agarose gel.

The analyzes allowed to identify three genotypes within leptin and prolactin genes. Based on the obtained results estimated frequencies of the alleles and genotypes, expected (H_E) and observed heterozygosity (H_O), polymorphism information content (PIC) and genetic distance. The results allowed for preliminary assessment of genetic variation between and within seven Central European cattle breeds based on polymorphism in prolactin and leptin genes loci.

RESTRICTIVE FACTORS IN THE GAME MEAT CONSUMPTION

CZYNNIKI OGRANICZAJĄCE KONSUMPCJĘ DZICZYZNY

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All the wild animals live in many ecotype of natural environments. A huge existence area of wild animals makes them go and they can take the advantage of a very rich plant life. A specific lifestyle of these animals has an effect on the nutritional values of the game meat, pro-health environmental benefits and on the taste of the game meat.

Although this kind of the game meat has an irreplaceable role in the diet and it is the most natural food product, it is seldom consumed by the Poles.

The aim of these researches was to determine the restrictive factors in the game meat consumption. The researches were conducted from September to December in 2013, using the original interview method. The number of surveyed people was 1030. The majority of the respondents were females (59.13%). Taking age into account, we can see that 20.39% of the respondents were from 18 to 25 years old, – 20.10% of respondents were from 26 to 35 years old, – 22.23% of surveyed people were from 36 to 45 years old, – 23.88% of respondents were from 46 to 55 years old, and – 13.40% of the surveyed were older than 55 years.

The biggest number of respondents (63.78%) were people from the villages. Also the biggest number of survived people had only secondary education. Considering the number of people belonging to one household – 44.95% of respondents came from four-person or five-person household. 49.13% of respondents had a good material status and 43.88% of respondents had just average material status.

The researches have shown that in 2013 – out of all the surveyed people only 338 respondents consumed the game meat.

38.50% of all surveyed people declared that they ate the game meat once a year, – 16.57% of respondents ate the game meat once a month, – 35.50% of respondents ate this kind of meat once a month, and 9.47% of respondents ate the game meat once a week.

In respondents' opinion (84.32% of respondents) the game meat is very safe and healthy. The rest of the respondents were afraid of the infection of trichinosis.

From the researches that have been carried, it is shown that about 66.47% of respondents never ate the game meat as they had no chance to try it.

Both – the game meat consumers and those who did not eat this kind of meat, had an opinion that the main factors which limited the game meat consumption on the market were the availability and the price. According to 90.84% of the game meat consumers, the access to this kind of meat on the market is very difficult.

A quite big group of the game meat consumers (72.48%) bought this kind of meat on the black market. For 79.30% of the game meat consumers and for 61.85% of non-consumers of this kind of meat – the biggest problem was the price.

HUNTING DAMAGES CAUSED BY WILD BOARS, AS ANALYZED ON THE EXAMPLE OF HUNTING CIRCLES SITUATED IN DIFFERENT PARTS OF POLAND

SZKODY ŁOWIECKIE SPOWODOWANE PRZEZ DZIKI NA PRZYKŁADZIE KÓŁ ŁOWIECKICH ZLOKALIZOWANYCH W RÓŻNYCH REGIONACH POLSKI

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The increase in the number of game animals, and in particular, the rise of domestic population of the European wild boar (*Sus scrofa scrofa*) affects the quantity and distribution of haunting damages (Flis, 2009; Kniżewska and Rekiel, 2013). Dynamics of growth and evolution of population results from the reproduction changes of the discussed species (Fernandez-Llario et al., 1999; Servanty et al., 2009; Zawadzki et al., 2011; Kniżewska and Rekiel, 2013) and from global climatic changes (Bieber and Ruf, 2005). The direct causes of the rise of frequency of the damages include the changes, occurring in the environment, resulting from its utilization by man and, first of all, from intensification of agriculture ad urbanization (Flis et al., 2001). Wild boars want to be found in the new environmental conditions and they change their behaviour, habits and nutrition preferences what brings about to the hunting damages (Flis, 2008; Kniżewska, 2014).

The size of damaged area and the number of wild boar population in Poland and the rate of the changes in the size of hunting damages in all voivodeships was determined, employing data for 2000-2013, being available from the Research Station of Polish Hunting Association in Czempiń. On the mentioned background, two hunting circles were selected for further analysis. In circle A (Mazovian voivodeship; moderate level of hunting damages) and circle B (West-Pomeranian voivodeship; high level of hunting changes), the size of damages and the relating types of cultivations were compared during the seasons 2005/2006 (I) and 2012/2013 (II). In season I, in the region of circle A, the highest degree of damage concerned potatoes, then – grasslands, maize and cereals. After eight seasons, the greatest damages were found in grasslands, and then, in maize, cereals and potatoes. The hunting damages occurred from March until November. In season I, in the region of circle B, the sequence and size of damages was different; the greatest damages concerned maize, then cereals, potatoes and grasslands; the smaller ones referred to grasslands; the damages of potatoes were not recorded. An access to highly energetic feed has directly affected the dynamic growth of population and influenced indirectly the quantity and size of the resulting damages (Bombik et al., 2007; Flis, 2011b; Kniżewska, 2013, 2014) which are and still remain the unsolved and deepening problem (Węgorek, 2002). Incidence of hunting damages in the particular types of cultivations was connected with the period of vegetation season and with sowing, what was mentioned in the earlier papers (Flis et al., 2011; Kniżewska, 2014). In circles A and B, the differences in the time of occurrence of damages in agricultural cultivations and and on the meadows and pastures were found.

Since 2000 up to 2013, the rise in the number of the European wild boar population was recorded in Poland, in global as well as in the regional scale. It affected unfavourably the size of the hunting damages in the analyzed regions, subjected to A and B circles in seasons II (2012/2013) as compared to season I (2005/2006).

EFFECT OF DIFFERENT COMPOSITION OF MILK REPLACERS (MAT) ON THE REARING PERFORMANCE OF CALVES AND ON SUBSEQUENT MILK YIELD

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There a ring performance of female calves intensity in milk production is crucial for milk yield, health and age at first calving. In the present investigation, animals were analyzed, which were very differentiated milk replacers (MAT) supplied in the suckling period. The milk replacer used differed in origin, and the proportions of crude protein but keeping the same levels of crude nutrients. The MAT were tested in 3 farms, each farm has 2 MAT tested. In the period from 8 to 42 days of age 140 g MAT was added per liter of water, and from the 43[rd] to 70[th] day of life 120 gper liter of water. Statistical analysis was performed with SPSS (version 22.0). For the actual analysis were 142 calves and 102 cows in the first lactation for statistical calculation.

The live weight of calves at 70 days of age showed depending on the used MAT significant differences. In this time (70 days), the calves took an average daily gain of 631 g/d, which were significant differences between the 3 MAT (Table 1).

Table 1. Live weight and live weight gain of calves in the first 70 days (n = 142)

		liveweight (kg)		live weight gain (g/d)	
MAT	N	MW s	Min – Max	MW ±s	Min – Max
1	58	89[a]±8	72 – 110	686[a]±100	491 – 894
2	47	83[bc]±10	61 – 107	638[a]±138	315 – 964
3	37	78[bd]±9	61 – 94	536[b]±101	373 – 750

The milk yield of cows in the1[st] lactation does not differ statistically between groups of MAT used and averaged 9.544±1.010 kg ECM. However, it was very clear, however, that the calves with the highest live weight at day 70 of life with an average of 9.709 kg the highest ECM-performance in the first lactation (Fig. 1). However, significant differences could not be determined.

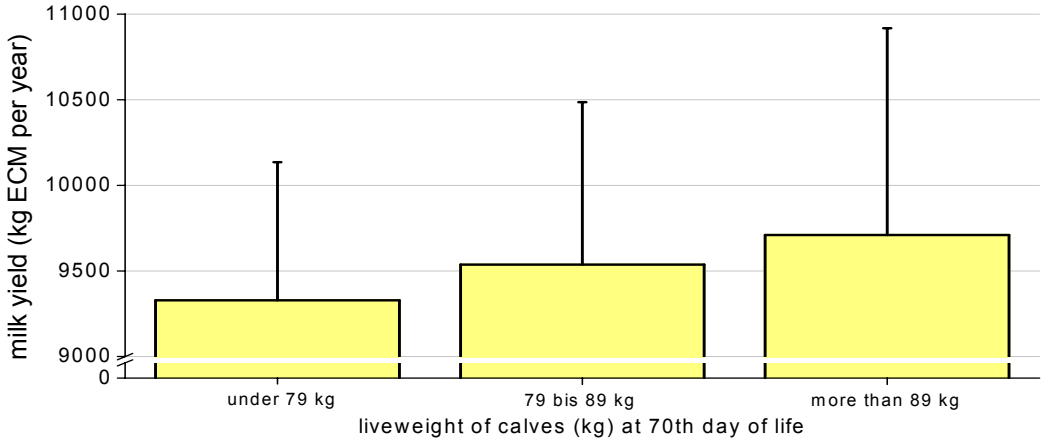

Fig. 1. Milk yield (ECM) of cows in the first lactation, depending on the group of live weight of the calves at day 70 of life (n =102)

ANTIFUNGAL ACTIVITY OF *NEOTYPHODIUM LOLII* ENDOPHYTE

AKTYWNOŚĆ PRZECIWGRZYBOWA ENDOFITA *NEOTYPHODIUM LOLII*

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Neotyphodium lolii is an endophyte naturally inhabiting perennial ryegrass (*Lolium perenne* L.), the grass of great importance in polish farming. The presence of the endophyte makes the plant more resistant to both biotic and abiotic stresses. One of the most common stresses in plant life is the one connected with fungal infection. *Fusarium poae*, *Rhizoctonia solani*, *Bipolaris sorokiniana* and *Drechslera* spp. are common fungal pathogens, known to cause diseases on grasses. The goal of the research was to analyse the impact of N. *lolii* on those pathogens *in vitro*.

The antifungal activity of endophytes was measured with the use of laboratory tests based on the method of Pańka and Jeske (2009). Dual-culture assays were performed in Petri plates with PDA medium. Three-week-old mycelial disks of *N. lolii* were placed on the surface of PDA medium in Petri plates about 3 cm from the edge of the plate and incubated for three – four weeks at 22°C in darkness. Then 14-day-old mycelial discs of test fungi (5 mm of diameter) were placed in the Petri plates with *N. lolii* colony, keeping 2 cm distance between the fungal discs. In control plates, only discs of the test fungi were placed centrally on PDA plate. Plates were incubated at 25°C in darkness up to 28 days, depending on growth rate of the test fungi. Measurements and observations were taken when colonies in control combinations reached the edge of the Petri plates.

Width of growth inhibition zone between fungal cultures on a plate and individual biotic effect for each assay were estimated. The impact of *N. lolii* was observed on all of the test fungi. The range of inhibition was dependent both on *N. lolii* ecotype as well as on the species of pathogenic fungi. The results confirmed the impact of different *N. lolii* strains on pathogenic fungi *in vitro*.

CONCENTRATION OF TESTOSTERONE BETWEEN INDIVIDUAL NEUROREFLEXIVE TYPES OF BARROWS AND GILTS IN RELATION TO SELECTED VARIABLES SLAUGHTER

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Testosterone is involved in the growth of slaughter body. Its changes can point us to the ability of an individual to produce in the future slaughter products within neuroreflexive types of pigs. The aim of our experiment was to compare concentration of testosterone for each neuroreflexive types of barrows and gilts in relation to percentage of valuable meaty part (VMP). We realized the experiment in Experimental center of animal, which belongs to the Department of Animal Production at Slovak University of Agriculture in Nitra. The experiment involved 77 pieces of pigs breeds white stainless. When the pigs reached 30-35 kg of weight, we collected saliva at rest phase. The testosterone level was determined by imunoenzymatic method ELISA. Statistical significance in concentration of testosterone within neuroreflexive types of barrows and gilts we compared by T-Test. We found out, that the neuroreflexive types EhB+ and EhB° of barrows had higher levels of testosterone compared with EhB+ and EhB° of gilts. But in EhB- of barrows we recorded lower concentration of testosterone compared with EhB- of gilts. We didn´t notice statistical significance in concentration of testosterone within neuroreflexive types of barrows and gilts. We investigated that the individual animals with higher concentration of testosterone have better adaptability. At the evaluating phase, we didn´t record statistical significance of percentage of VMP within neuroreflexive types EhB+ and EhB° between barrows and gilts. But we noticed statistical significance in the change in EhB- ($p \leq 0.001$) between barrows and gilts. We investigated, that the gilts had higher percentage of VMP compared with barrows within neuroreflexive types. From the result obtained from this research we determined an increase of muscle mass in barrows and gilts with higher concentration of testosterone.

GENOMIC SELECTION AS AN INNOVATIVE METHOD OF ASSESSMENT OF THE BREEDING VALUE

SELEKCJA GENOMOWA JAKO INNOWACYJNA METODA OCENY WARTOŚCI HODOWLANEJ

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The aim of the study was to present as an innovative selection of genomic breeding value assessment methods. On the basis of the available literature was characterized by genomic selection presenting its advantages and disadvantages. The genomic breeding value is the estimated value of the animal to its progeny, calculated by knowing its genome, which differs only slightly between animals. This innovative method must gain the trust and confidence that's what will decide about the use by farmers the achievements of a new genetic technology and expanding the participation of the bulls "genomic" semen market. Something similar happened in the early years after the introduction of artificial insemination, about the legitimacy of which there may be no objections today breeder cows. Ultimately, it is always the owner of the flock decides to make use of this or that news, however, it must have access to read the different possibilities.

On the basis of the information collected, it should be said that the selection of the genomic bulls became an innovative method for the evaluation thereof. The bovine genome is known, in 2004, which contributed to the creation of a new breeding techniques based on genomic selection. This method was applied mainly for dairy cattle. Genomic selection in Poland was launched in 2009 with the creation of the MASinBull Consortium. The advantages of this method include: breeding more progress, the growth impact of female progress, identifying new genetic lines and earlier information on functional qualities. The disadvantages of this method include: the price of the semen and sperm flow with lower content caused by the need to transport.

ADVANTAGES	
A larger breeding progress. Fathers are the next generation of young bulls animals. Reducing the gap between the generations will increase the breeding progress.	New genetic lines. Fast and precise method of evaluating animals, to probe the genome of many individuals which may result in to find in the cattle population of new value line.
Influence of female progress. With information coming from the genome can be precision select cows and heifers on the mother of the next generation. Increasing their importance in breeding programs.	Functional features. With genomic selection, the farmer obtains much earlier information. On functional characteristics, with greater reproducibility than the conventional evaluation.
DISADVANTAGES	
Less repetitive assessment. Credibility based on valuation bulls of the genome is lower than the valuation for posterity. This means that the results of the evaluation as the number of bulls daughters, are subject to change.	The very high position with the measurement of genomic bull can cause high demand for its seed. Young sires usually produce less sperm than the adult, therefore, the semen is more expensive.

GASTROINTESTINAL TRACT RESPONSE OF YOUNG TURKEYS TO DIFFERENT DIETARY INCLUSION LEVELS OF YELLOW LUPINE SEEDS

REAKCJA PRZEWODU POKARMOWEGO MŁODYCH INDYKÓW NA ZRÓŻNICOWANĄ ZAWARTOŚĆ NASION ŁUBINU ŻÓŁTEGO W DIECIE

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The European Union's ban on the use of meat and bone meals in animal feeds, accompanied by high prices of soybean meal, have contributed to a growing interest in alternative sources of vegetable protein in poultry diets, including lupine seeds. Yellow lupine seeds are characterized by a high protein content and relatively high protein digestibility in turkeys. The factor that limits wide use of lupine seeds in poultry nutrition is their high content of dietary fiber, including non-starch polysaccharides (NSPs) and α-galactosides (RFOs), which are poorly digested in the small intestine and therefore may stimulate the proliferation and activity of gut microbiota. The objective of this study was to determine the effect of different dietary levels of yellow lupine seeds on the development and function of the gastrointestinal tract (GIT) in 8-week-old turkeys.

The experiment was performed with 8-week-old Hybrid turkeys, which were fed 4 different diets for 2 months: L0 – a control diet without lupine seeds, L8 – a diet containing 8% of yellow lupine seeds, L16 – a diet containing 16% of yellow lupine seeds, L24 – a diet containing 24% of yellow lupine seeds. Yellow lupine cv. Baryt was used. On day 56, 7 turkeys that represented an average body weight of each group were selected from each dietary treatment and sacrificed. Immediately after slaughter, samples of small intestinal and cecal digesta and walls were collected for physiological analyses.

The inclusion of yellow lupine seeds at 240 g/kg increased the concentrations of NSPs and RFOs in the diet by 36% and 42%, respectively. Lupine seeds (groups L8 – L24) led to a linear increase in the viscosity of small intestinal digesta (linear contrast, $P < 0.001$) and a decrease in the activity of all analyzed enzymes (α- and β-glucosidase, α- and β-galactosidase, β-glucuronidase, α-arabinopiranosidase, β-xylosidase), relative to the control group. The concentrations of volatile fatty acids (VFAs) in the small intestinal contents were low (3.99 μmol/g in group L0 and 2.05 – 2.30 μmol/g in groups fed lupine-based diets). Lupine seeds contained in diets led to a desirable decrease in the pH of cecal digesta ($P = 0.003$) and ammonia concentrations ($P = 0.002$). A significant increase was noted in microbial glycolytic activity in the cecal digesta, confirmed by a linear increase in the concentrations of VFAs in groups L16 and L24, compared with groups L0 and L8 ($P = 0.053$).

The changes in GIT function observed in turkeys resulted from their normal response to increased dietary fiber intake. Our findings point to the desired course and a higher rate of fermentation processes in the ceca of birds fed diets containing yellow lupine seeds.

THE INFLUENCE OF SYSTEM OF KEEPING PULAWY BREED FATTENERS ON CHEMICAL PROFILE OF THE SELECTED INTERNAL ORGANS

WPŁYW SYSTEMU UTRZYMANIA TUCZNIKÓW RASY PUŁAWSKIEJ NA SKŁAD CHEMICZNY WYBRANYCH NARZĄDÓW WEWNĘTRZNYCH

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The internal organs are the main elements in slaughter animals subjected to veterinary clinical observations post mortem. The results of the observations are simple and valuable method for assessing the health of pigs. Enable you to find a correlation between nutrition and animal keeping system and health problems identified in herd.

Selected internal organs of pigs evaluated positively can be released for consumption.

In food technology, they are classified as a group of edible Carcass by-products and called offal. Pork offal are used for offal cold meats production (liver sausages, pate, black pudding, headcheese). Offal are a valuable alternative to high-grade meat Because of their nutritional value and lower price. The quality of offal depends on the and genetic environmental factors, e.g. system of keeping fatteners.

The objective of the research study was to determine floor management and litter systems on some chemical parameters of the selected offal: tongue, lungs and liver.

The analyses were conducted on a group of 40 Pulawska breed fatteners (20 fatteners keeping in floor management and 20 fatteners keeping in litter system Polish Landrace). For laboratory analyses samples were collected with tongue, lungs, and liver. In the offal, the following was determined basic chemical components (ash, fat, protein, water).

System of keeping fatteners was not observed to affect content of protein in individual internal organs. All the internal organs obtained from fattening pigs kept on litter characterized by a lower fat content, including a highly significant statistical difference was observed in tongue.

EFFICACY OF XYLANASE AND GLUCANASE ADDITION IN TURKEYS FEED

EFEKTYWNOŚĆ STOSOWANIA KSYLANAZY I GLUKANAZY JAKO DODATKU DO PASZY DLA INDYKÓW

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The water-soluble non-starch polysaccharides (NSP) of the endosperm cell walls of wheat, barley, rye and oats have anti-nutritive properties in poultry. It has been clearly demonstrated that the presence of soluble β-glucans in barley and soluble arabinoxylans in wheat are the major cause of growth depression and poor feed conversion in poultry. The primary mechanism of the anti-nutritional effects of the soluble NSP activity is related to their viscous properties, which consequently affect the viscosity of the aqueous fraction in the small intestine contents. The addition of exogenous enzymes (xylanase and/or β-glucanase) to wheat and barley-based diets can overcome the anti-nutritive effect of water soluble NSP.

This study evaluated the efficacy of addition of exogenous enzymes (xylanase and β-glucanase) in turkeys (84-days duration). One-day-old turkeys (n = 945) were divided into 4 treatments with 7 replicates (pens) each. There were 33-34 birds in each replicate. T1 was the control group, T2-T4 with increasing content of the enzyme preparation (mix of xylanase and β-glucanase at 100, 200, 300 g/T, respectively). The following parameters were recorded: body weight and gain, feed consumption, mortality and feed conversion ratio (FCR). The birds from all treatment groups performed well and exhibited good health, with the lowest mortality of 0.42% observed in T4 and the highest of 2.94% in the control group (T1).

The addition of xylanase and β-glucanase achieved improvements in body weight by 14 days of age in all experimental groups, but this improvement was not statistically significant. During the next feeding periods the same tendency was observed, however only in T3 and T4 groups. At the end of experiment the birds from those groups (T3 and T4) were 0.54 and 0.02% heavier, respectively than T1 controls. From the start of experiment the addition of xylanase and β-glucanase positively and significantly affected feed efficiency. For the whole experimental period feed efficiency values in treatment groups 3 and 4 were significantly better compared to control group (improvements of 3.25 and 2.46%, respectively). The birds from all treatment groups performed well and exhibited good health, with the lowest mortality of 0.42% observed in T4 and the highest of 2.94% in the control group (T1). After 28 days of age the birds in all experimental groups consumed a lower amount of feed than T1 controls, and significantly differences for the period 0-56 days in groups T2 and T3 were observed. From the start of experiment the addition of xylanase and β-glucanase positively and significantly affected feed efficiency.

In conclusion, the addition of xylanase and β-glucanase to the feed diet improved the growth performance of turkeys.

RELATIONSHIPS BETWEEN MILK β-CAROTENE CONCENTRATIONS AND THE CYTOLOGICAL QUALITY OF COW'S MILK

ZALEŻNOŚĆ MIĘDZY ZAWARTOŚCIĄ β-KAROTENU A JAKOŚCIĄ CYTOLOGICZNĄ MLEKA

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The objective of the study was to describe the relationship between milk β-carotene concentration and the cytological quality of milk of high yielding cows.

The experiment was carried out at the research dairy farm of the Warsaw University of Life Sciences (WULS). From a herd of 320 Polish Holstein Friesian cows maintained in a free–stall dairy shed 58 cows were selected taking into consideration the stage of lactation (15±14 days). Cows were fed a total mixed ration (TMR) diet provided *ad libitum.* Four groups of cows taking into consideration concentration of β-carotene in milk has been created: 1) < 150 mg L^{-1}; 2) 151-250 mg L^{-1}; 3) 251-450 mg L^{-1}; 4) > 450 mg L^{-1}. Analysis of β-carotene was established using an Agilent 1100 Series reverse phase high–performance liquid chromatograph (Agilent Technologies, Waldbronn, Germany) and Zorbax Eclipse XDB C8 column (4.6 x 150 mm, 5 μm film thickness) according to the method described by Puppel et al. (2012).

The content of β-carotene and SCC amounted at the herd level: 192 tys ml^{-1} and 0.312 mgL^{-1} respectively. The β-carotene content ranged from 0.150 to 0.451 mgL^{-1}. The highest content of β-carotene, 0.451 mgL^{-1}, was found in milk of cows with the lowest level of somatic cells count (SCC). The lowest level, 0.150 mgL^{-1}, was found in milk of cows with the highest level of SCC.

Milk SCC varies significantly with the concentration of β-carotene in cow's milk. Researchers should consider monitoring for this variable as potential cofounder when exploring the relationship between mastitis, intramammary infection and nutritional management.

Researches was supported by National Science Center and realized within the project NN 311 55 8840 entitled "Relationship between concentration of bioactive substances in milk during standard lactation and blood biochemical parameters of high yielding Polish Holstein-Friesian cow's" .

THE IMPACT OF MEDIA, TEMPERATURE AND PHOTOPERIOD ON GROWTH OF SELECTED ISOLATES OF *VALDENSINIA HETERODOXA* FUNGUS

WPŁYW SZTUCZNYCH PODŁOŻY, TEMPERATURY I NAŚWIETLENIA NA WZROST WYBRANYCH IZOLATÓW GRZYBA *VALDENSINIA HETERODOXA*

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Valdensinia heterodoxa is a polyphagus. Pathogen occurred on a few common plants in North America, Asia and Europe. In Poland for the first time it was identify on highbush blueberry (*Vaccinium corymbosum* L.) in 2011. Characteristic symptoms of the valdensinia leaf spots were observed on bilberry (*V. myrtillus* L.) as well. From lives with visible symptoms 40 isolates were obtained. Then, they were characterized based on molecular methods – PCR with ITS1F and ITS 4A primers. Amplicons were sequenced and analysed using BLAST and CLUSTAL W2Ebi. All nucleotide sequences exhibited 100% similarity. One of them was deposited in GeneBank (KT121733). Based on morphological features isolates were divided into two groups on PDA (potato dextrose agar) medium.

The aim of this study was to characterize growth dynamic on media and the impact of temperature and photoperiod on growth of selected isolates of *Valdensinia heterodoxa* fungus.

The isolates representative for two groups (VH/J/1 and VH/J/2 respectively) were chosen to measure growth dynamic. They were transferred on PDA and WOA (weak oatmeal agar) and the same media with addition of an extract from: a) fresh leaves of highbush blueberry, b) dried leaves of bilberry, c) dried leaves of lilly of the valley and d) dried leaves of polygonatum. The growth of these cultures was estimated in different temperatures (about 20°C constantly and 19°C day/13°C night) and photoperiods (24, 12 and 0 hours). In this study natural daylight or artificial light (white, red or blue) were used. Experiments were done with two replications. For each medium-temperature-photoperiod combination 10 Petri dishes (10 cm diameter) were allocated. The mycelial growth was measured every seven days starting from cultures incubation.

On PDA medium with extract of blended fresh highbush blueberry leaves the mycelium was thick and leathery. The best growth of cultures were observed in daylight at 20°C. Culture keep increasing 4.76 mm per day. Regardless of the type of media and temperature conditions the blue and red light, in 24 or 12 h photoperiod, inhibited the cultures growth strongly even than darkness (0 h photoperiod). After 21 days cultures were about 7 mm approximately. On WOA medium, mycelium was soft, built from a single hyphae. On this medium the sclerotia were very well developed. The first ones were observed after six weeks since the start of cultures incubation.

VARIABILITY AND POSSIBLE INFLUENCES ON THE LENGTH OF TAILS IN NEWLY BORN PIGLETS TAKING INTO ACCOUNT THE FREQUENCY AND THE LEVEL OF VERTEBRAL ANOMALIES

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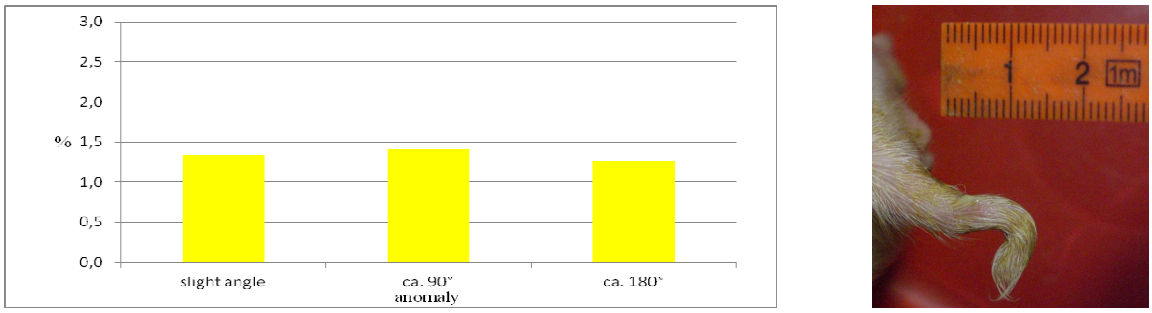
The tail of the pigs is not topic of breeding work up to now. Certainly it will gain importance soon. Because of cannibalism in pigs the tail is docked for 79% of all piglets which are held in Europe. In Germany there is a debate to give up docking tails in pigs. But to pass up docking the tails in piglets it is important get knowledge about the basics in anatomy of tails and the reasons for tail biting.

The investigation was conducted in April in 2015 in three pig farming enterprises in Saxony, Saxony-Anhalt and Thuringia, one in each federal state in Germany. In total 1.273 piglets from 100 sows got examined during the first 2 to 3 days after birth. The number of piglets differs between the farms. In the first farm 752 piglets respectively 60 litters were examined, in farm two it has been 258 piglets respectively 20 litters and in farm three there were 263 respectively 20 litters. The genetic situation differed between the three pig farming enterprises. Some sows are DanBred, some are PIC and some are a product of the criss crossing of German Large White and German Landrace. The boars had the genetic of Duroc, Piétrain, German Large White or TOPIGS. The following data were known: the number of the litter, the size of the litter of the sow and the sex of the piglets. In addition to that the following parameters got studied and calculated. The weight of piglets was recorded with digital or hanging scales. The body length of the piglets was measured with a tape measure, and the tail lengths as well as the diameter of the tail were examined with a folding rule. The anomalies of the tails were observed and the rations between the parameters were calculated.

The mean tail length in piglets is 8.50 cm ± 0.94 cm with a range of 8 cm. The genetics of the mother, the breed of the boar, the number of the litter of the sow and the weight of the piglets have a significant influence on the length of the tails in piglets. In case of the length of the tails of the piglets differences could be found between the litters as well as within the litters.



Picture 1. Occurance of different levels of anomalies (left) and a level of a ca. 90° angle (right)

There are correlations between the presence of anomalies (e.g. kind of angle), the genetics of sow and boar and the length of a tail of a piglet. With an increasing level of tail anomalies the mean tail length of the piglets decreases in a significant way. Tails with a 180° angle anomaly have only an average length of 6.90 cm ± 1.44 cm.

ENVIRONMENTAL TECHNOLOGIES DEACTIVATION, UTILIZATION AND RECYCLING OF SOLID AND LIQUID WASTE PRODUCTION WALLPAPERS

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Purpose of the work is to develop effective economic technologies wallpaper manufacture highly concentrated industrial wastewater treatment with recycling of the products. The possibility of using purified water to prepare working solutions paints of a business enterprise for the production of wallpaper. It was established that when diluted 1:2 and 1:3 with tap water color painting compositions deviation does not exceed normal. The schemes using obtained in the processing of waste products in an easy and construction industry. Proposed to use colloidal silver for biological wastewater treatment. Were synthesized resistant compositions based on natural polymers and colloidal silver to be used for decontamination of industrial effluents. A method for determining the concentration of colloidal silver in solution by chemical analysis methods.

Colloidal silver is a suspension of submicroscopic metallic silver particles in a colloidal base. Conventional fine silver particle colloidal dispersions are those in which fine particles of a noble metal such as silver have been dispersed in a low concentration of 10% by weight at most and usually received by the electro-spark physical method in aqueous solution. Thus the development of chemical methods for obtaining of colloidal silver has practical interest.Method based on chemical interaction of complex silver with reducing agent (e.g. glucose):

$$2Ag+ + 2OH– \rightarrow 2AgOH\downarrow \quad (1)$$

$$2AgOH\downarrow \rightarrow Ag2O\downarrow + H2O \quad (2)$$

$$Ag_2O\downarrow + 4NH_4OH \rightarrow 2[Ag(NH_3)_2]+ + 2OH– + 3H_2O \quad (3)$$

$$2[Ag(NH_3)_2]OH + RHO \rightarrow 2Ag\downarrow + 3NH_3\uparrow + H_2O + ROONH_4 \quad (4)$$

Technology of recycling waste paper including polymer coated wallpaper developed. Technology of recycling waste paper including polymer coated wallpaper includes the first stage of shredding waste paper with chopper-disk and milling of second stage using the threshing disintegrator with separation of cellulose fiber of paper. The third stage, separation 2 fractions: polymer and cellulose fiber in the air flow through the cyclone and fabric filter. As a result of this process polymer coated waste paper we can get 50-95% of pure cellulose and 5-50% solid polymer waste, while cellulose can be used to re-obtain technical paper, packaging carton, as a structural filler in the construction industry, for the production of asbestos-free slate for production of fuel briquettes and pallets and polymer wastes can be used as filler for construction and polymer composite materials.

BIODIVERSITY RESPONSE TO DEFORESTATION AND DESERTIFICATION IN THE SAHEL: ARTHROPOD DIVERSITY WITHIN FOREST FRAGMENTS AND THE SURROUNDING AGRICULTURAL MATRIX

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Drylands cover nearly half the terrestrial surface and are highly vulnerable to desertification. Desertification results from poor land use practices such as deforestation and overgrazing which contribute to biodiversity loss. Many people throughout the world depend on dryland ecosystem services for their livelihoods, and, in the Sahel, desertification is compounded by a high demand for water, farmland, grazing land, fuelwood and construction. Arthropods represent most of the animal diversity; in this study, they are examined in three of Senegal's remaining forest fragments (Beersheba, Bandia and Ngazobil) as well as the agricultural matrix suffering from desertification that surround these fragments. To examine the impacts of desertification and deforestation on arthropod diversity in the Sahelian region of Senegal, I collected arthropods with pitfall traps during the rainy season and the dry season so that I might (1) identify whether spatial distribution of arthropods differs between forest fragments and the surrounding agricultural matrix, (2) determine if arthropod diversity is hierarchically partitioned differently in forest fragments than the surrounding agricultural matrix, (3) associate vegetative and other environmental factors to various aspects and dimensions of arthropod diversity, (4) investigate if and how arthropod diversity differs between wet and dry seasons and (5) examine arthropod diversity at multiple (order, family and genus) taxonomic levels. I counted a total of 123.512 arthropods in this study and collected 36 different taxonomic orders. I further identified beetles (Coleoptera) to family and ants (Formicidae) to genus. I counted 9.991 beetles in 30 families and counted 55.793 ants in 17 genera. Preliminary results suggest that (1) arthropod communities are spatially structured and hierarchically partitioned differently between forest fragments and their surrounding agricultural matrix, (2) arthropod richness and diversity increases in the rainy season, and (3) taxonomic groups respond differently to environmental change.

EFFECT OF SEASON ON SPERM QUALITY IN FRESH AND CRYOPRESERVED BOAR SPERM

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The objective of this study was to evaluate routine parameters of sperm quality across season in both fresh and cryopreserved boar semen.

Ejaculates from 59 fertile boars of the different breed were collected during 2 years. The ejaculates were divided into 4 groups according to season period of the year. Semen volume, sperm motility, sperm concentration, percentage of morphologically abnormal spermatozoa, total number of spermatozoa per ejaculate, sperm motility after 24 h storage time and the aspartate aminotransferase (AST) activity before cryopreservation and after thawing in supernatant was assessed. Samples of diluted sperm in a semen-dilution rate of 1+1.5 in Androhep extender were stored at 17°C until the next day. Sperm was cryopreserved using the straw freezing procedure. Straws were thawed in a water bath at 38°C for 40 sec. Post-thaw sperm motility was evaluated immediately after thawing.

High variability in freezability of boar semen was noted in this study. It was recorded that only about 49% of all processed ejaculates were suitable for cryopreservation. Their motility was higher than 30% after thawing which may be considered as tolerable for AI. Post-thaw sperm motility was significantly the lowest ($P < 0.001$) in autumn. Season affected the semen volume, fresh sperm motility, percentage of morphologically abnormal spermatozoa, sperm motility after 24 h storage time, AST activity in supernatant, AST activity after thawing and post-thaw sperm motility which was the highest in spring. A significant negative correlation coefficient was noted between sperm motility and AST activity. There was no significant effect of season on sperm concentration and total number of spermatozoa per ejaculate.

In conclusion, the results of this study show how is important the influence of the season and the initial quality of boar semen for cryopreservation. These data support the view that the cryopreservation of boar semen in spring may yield sperm with greater post-thaw sperm motility. Freezability prediction of boar semen according seasonal has considerable importance for artificial insemination and also in the area of genetic resources.

The study was supported by project MZE RO0714

AGROPYRON ELONGATUM AS A NEW ENERGY PLANT

AGROPYRON ELONGATUM JAKO NOWA ROŚLINA ENERGETYCZNA

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The increasing demand for energy, forces us to explore new ways of meeting the energy needs both in the country and the world. This resulted in an increase in interest in all walks of life searching for alternatives in the form of renewable energy sources (OZE). One of them is the use of biomass to produce electricity. In September 2012 have been approved for sale *Agropyron elongatum* seeds which can be used for energy purposes. Therefore, a review of research literature on the characteristics of *Agropyron elongatum* and the possibility of using it in bioenergetics.

This species is a perennial plant. Stability plantation, multidirectional use and high adaptability to different climate and soil conditions indicate the possibility of introducing this species to grow on a large scale. Plant biomass *Agropyron elongatum* in relation to other energy plants is characterized by high calorific value. Incineration of the dry mass of the plant contains little ash that can be used to fertilize soil as a fertilizer with a high content of potassium and other minerals. Research of the energy of the biomass or dry straw briquettes showed the high value (approx. 18 MJ). Green biomass can be used in the fermentation process for silage and biogas production, as biodiesel high calorific value (18-24 $MJ \cdot m^{-3}$). At the same time the product digestate from biogas can be used for the recultivation of the weak and the poor and contaminated soils.

Time will tell whether the new plant will be able to replace such well-known in the energy sector plants, such as. *Salix viminalis* L. and *Miscanthus giganteus*.

INFLUENCE OF SELECTED STIMULANTS AND FOLIAR FERTILIZERS ON SPAD, ROOT MASS AND GRAIN YIELD OF WINTER RAPE

WPŁYW WYBRANYCH STYMULATORÓW I NAWOZÓW DOLISTNYCH NA SPAD, MASĘ KORZENIOWĄ ORAZ WIELKOŚĆ PLONU ZIARNA RZEPAKU OZIMEGO

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Plant efficiency and quality of yields depends on habitants conditions, mostly on the climate and precipitation, production technology also is important. One of the method increasing plant adaptation to variables habitants conditions are stimulants and foliar fertilizers. Using them in plant cultivation are natural method for better use of growth conditions, especially use of nutrients what have significant influence on yield and quality of yield. In connection with the above were conducted researches in order to determine how stimulants (Asahi, Kelpak) and foliar fertilizers (Tytanit, Terra Sorb Foliar) affect on: Leaf greenness index (SPAD), root mass and quantity of winter rape yield.

The experiment was conducted at the Experimental Stiation in Mochołek in the Kyuiavian-Pomeranian region in the 2010/2011 growing season. The experiment was established in the randomized complete block design with 4 replications (Tab. 1). The area of experiment fields was 15 m^2. Winter rape variety 'Galileo' was sown in late August 2010 in the amount of 4 $kg \cdot ha^{-1}$. Agrotechnology was used in accordance with the requirements of this species.

Test results were statistically analyzed by analysis of variance. To verify the significance of differences between the assessed average Tukey test at significance level $p = 0.05$ were used.

Table 1. Diagram of experiment

Treatmnent (commercial product name)	The does and term of preparatioms applications (BBCH)
Control object	Without spraying
Asahi	0.6 $l \cdot ha^{-1}$ (BBCH 22) 0.6 $l \cdot ha^{-1}$ (BBCH 22) + 0.6 $l \cdot ha^{-1}$ (BBCH 51)
Kelpak	2.0 $l \cdot ha^{-1}$ (BBCH 22)
Tytanit	0.2 $l \cdot ha^{-1}$ (BBCH 22) 0.2 $l \cdot ha^{-1}$ (BBCH 22) + 0.2 $l \cdot ha^{-1}$ (BBCH 51) 0.2 $l \cdot ha^{-1}$ (BBCH 22) + 0.2 $l \cdot ha^{-1}$ (BBCH 51) + 0.2 $l \cdot ha^{-1}$ (BBCH 69)
Terra Sorb Foliar	2.5 $l \cdot ha^{-1}$ (BBCH 22)

It was found, that amount of SPAD in rape leafs was significantly determined by used stimulants and foliar fertilizers independently from used dose. Winter root mass also depend significantly from used stimulants both in first and further applications. In both cases third

application of Tytanit caused a reduction of tested factors relative to second dose. Significantly higher yield of rape relative to controlled object after first dose of the stimulants and foliar fertilizers was obtained only after using Tytanit. This growth was almost 6% however the use of subsequent doses resulted in decreased yield.

In conclusion stimulants and foliar fertilizers have positive influence on winter rape, however not every applications are economically justified. It is recommended to conduct further studies in this field.

EFFECT OF PARITY ON VAGINA CERVIX LENGTH (VCL) AND NUMBER OF PIGLETS

DŁUGOŚĆ POCHWY I SZYJKI MACICY LOCH ORAZ LICZBA PROSIĄT URODZONYCH OKREŚLANA W KOLEJNYCH MIOTACH

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The proper development of reproduction tracts is necessary to obtain successful reproduction performers. The important factor determining the productivity of sows is litter size which is mostly limited by uterine capacity (Vallet 2000). Uterine capacity is defined as the maximum number of foetuses that the uterus can successfully maintain until farrowing. According to Rillo et al. (1998) each centimetre of vaginal length results with an increase of 8-9 cm of uterine horn length. Moreover, the uterine size in sows increases progressively with age, body weight and parities (Rillo et al. 1998). It is suggested that an increase of uterine size is results in increase litter size. Reproductive traits especially those related with fertility, litter size and pre-weaning viability has poorly heritability and consequently rather difficult to improve trough selection.

The aims of this study was to: compare reproductive performance and vagina-cervix catheter penetration length between sows parity; show differences between vagina-cervix length in subsequent parities.

This study was conducted in commercial small-scale farm located in south Poland. The study involved 60 sows. All sows were bred by artificial insemination, in the case of gilts it was at least their second oestrus. The pregnancy was confirmed in 58 female and this one were analyzed in this study. The significance of differences between traits was estimated by Duncan's test.

According to Domiquez et al. (2007) the length growth between the vagina and cervix of sows reaches a plateau after first parity. While the results showed in this study are not confirmed this theory (Table 1). The gilts and sows had a wide range of vagina-cervix penetration length from 18.5 to 37 cm. So in each subsequent parity the vagina-cervix length was constantly increasing as well as number of piglets born alive. Dybała et al. (2008) showed differences between reproductive tract and litter size in sows mated in first or second estrus. The group in second estrus had a longer cervix (17.41 cm) than female in first estrus (15.08 cm). This is also support theory that development of reproductive system is influenced by age. The research conducted by Hoving et al. (2011) showed correlation between litter size in 1[st] and 2[nd] with subsequent parities. Thus, the sows with the high litter size in 1[st] and 2[nd] parity had a highest production in 3[rd] and up parities.

Table 1. Effect of parity on vagina-cervix catheter penetration length and piglets born alive

Index	**Parity**			
	1	**2-4**	**5-6**	**7-8**
N	13	17	13	15
VCL ($\bar{x}$)	23.04 ± 3.26^{Aa}	25.85 ± 5.01^{ABab}	27.53 ± 3.23^{Bbc}	29.77 ± 4.79^{Bc}
Piglets born alive ($\bar{x}$)	10.62 ± 2.02^{a}	12.94 ± 3.32^{b}	12.62 ± 3.48^{ab}	12.60 ± 2.75^{b}

Values in the same rows with the same letters differ statistically: [AB] – highly significantly ($P \leq 0.01$), [ab] – significantly ($P \leq 0.05$)

In conclusion, the vagina-cervix length is growing with sows age. Moreover, this simple measurement of the VCL could be important in predicting the litter size and future profitability.

THE IMPACT OF USING MODERN PRODUCTION TECHNOLOGY IN THE MONDI PACKAGING PAPER ŚWIECIE ON THE CONDITION OF SOIL ENVIRONMENT

WPŁYW STOSOWANIA NOWOCZESNEJ TECHNOLOGII PRODUKCJI W ZAKŁADZIE CELULOZOWO-PAPIERNICZYM W ŚWIECIU (MONDI S.A.) NA STAN ŚRODOWISKA GLEBOWEGO

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Technologies using in the paper and pulp industry significantly changed in the XXth and XXIth century. The increasing emphasis on reducing emissions of pollutants, contributed to the use of new and better processes. Currently, the dominant method of production in this industry is the sulfate method. In the Mondi Packaging Paper Świecie this method is used. In addition, in the Department are introduced production systems consistent with the "pure technologies". They rely on the use of methods of production in following which comes to eliminating as much as possible the creation of waste.

In the second half of XXth century has been made tremendous process in bleaching of pulp. Until then dominated chlorine bleaching agents: chlorine Cl_2 and hypochlorite $(Ca(OCl)_2$. Several studies have shown that chlorination of pulp, toxic substances were emitted called dioxin. Accordingly, the bleach method completely free of chlorine are implemented. They are based on measures oxygen bleach: oxygen, hydrogen peroxide and ozone.

The scientific aim of the research is to demonstrate the impact of the Mondi Packaging Paper Świecie on the state of the soil environment. The study will be subjected soil samples (20 samples of surface and subsurface), which will be taken in accordance with the direction of the windrose. The analyzes will be also performed on soil samples from checkpoints. The basic properties of soils will be identified (including grain composition, pH, organic carbon content, $CaCO_3$, electrolytic conductivity) and a more detailed properties (eg. the content of selected macro- and micronutrients).

The impact assessment of the Mondi Packaging Paper Świecie on the soil environment will be conducted based on the determination of indicators of pollution (CF), the enrichment factor (EF) and geoaccumulation index (I_{geo}). Statistical analysis results will be made by using the software *Statistica* 10.0.

The working hypothesis assumes that the Mondi Packaging Paper Świecie does not adversely affect the condition of the soil environment and is not a potential environmental threat to the surrounding area.

THE EFFECT OF *GH*/*Msp*I GENE POLYMORPHISM ON LITTER SIZE IN POLISH LANDRACE SOWS

WPŁYW POLIMORFIZMU GENU *GH*/*Msp*I NA WIELKOŚĆ MIOTU LOCH RASY POLSKA BIAŁA ZWISŁOUCHA

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GH gene consist of five exons and four introns. Transcribed total length is 1700 base pairs. Polymorphism of somatotropin gene is mainly related with slaughter traits. Many authors reports that the polymorphism of growth hormone gene is associated with reproduction as well. This gene is encoding pituitary hormone, somatotropin. Growth hormone, acting through specific membrane receptors (GHR) stimulates the activity of subordinate other hormone, produced mainly in the muscle tissues. Somatotropin mainly stimulates proliferation and differentiation of cells. It was also found that the growth hormone may be directly involved in the production of gametes. The aim of this study was to analyse *GH/Msp*I gene polymorphism and estimate its impact on number of piglets born alive in two subsequent litters in Polish Landrace sows.

The group under study consisted of 75 sows of Polish Landrace (PL) breed. The animals came from the herd located in Kuyavian and Pomeranian Region approved by the Polish Pig Breeders and Producers Association „POLSUS". The polymorphism of growth hormone gene was determined by PCR - RFLP (by Pierzchała et al. 2004). The PCR product with a length of 506 base pairs was digested with the restriction enzyme M*sp*I. The digested products were visualized on 2.5% agarose gels with the presence of Midori Green Advanced in UV lights. Genotypes were identified against molecular marker pUC19 DNA/*Msp*I (*Hpa*II) Marker.

In the tested group of sows two alleles and two genotypes of *GH* gene were observed. The frequency for allele GH^B was 0.88 and 0.12 for allele GH^B was observed. Within the examined group of animals genotype *GH/BB* was the most frequently observed (0.76), the lowest frequency was found in sows *GH/AB* (0.12). In Polish Landrace sows, covered by the research, genotype *GH/AA* was not detected. Based on Chi^2 test it was found that the study population in growth hormone gene *locus* was in genetic equilibrium. By analyzing the number of piglets born alive in first litter it has been established that the highest values of the investigated trait characterized sows of *GH/BB* genotypes on average 12.03 comparing with sows of *GH/AB* genotype (11.77). Considering the second litter, differences between means of genotypes *GH/BB* and *GH/AB* were slight 11.72 and 11.89 respectively.

ANALYSIS OF STALLION EPIDIDYMAL SPERM PHOSPHOPROTEOME

ANALIZA FOSFOPROTEOMU PLEMNIKÓW NAJĄDRZOWYCH OGIERA

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The aim of this study was to isolate phosphoproteins from stallion epididymal spermatozoa and analyze epididymal sperm phosphoproteome during sperm maturation in epididymis.

The epididymis were collected from warm blood stallions aged 3-4 years after castration surgery carried out during the breading season. Immediately after the procedure of castration epididymis were placed in sterile packs and transported in thermobox (temp. +5ºC) to the laboratory.

Epididymis were divided into caput, corpus and cauda. Each part was washed in 0.85% NaCl (1x1 ratio) and 3 x centrifuged (2 000 x g 10 min. at temp. +10ºC). The supernatant containing spermatozoa was collected in new tubes and centrifuged at 10 000 x g for 5 min at temp. +10ºC. The achieved pellets of spermatozoa were diluted in RIPA buffer (Radio Immunoprecipitation Assay Buffer, 50 mM TRIS-HCl, 150 mM NaCl, 1% Triton X-100, 0.5% sodium deoxycholate, 0.1% SDS, pH 8.0) and frozen to further analysis. Phosphoproteins were isolated using affinity chromatography on PhosSelect Iron Affinity gel (Sigma-Aldrich, USA). Isolated fractions were electrophoresed on 12% SDS-PAGE gel using the MiniProtean III apparatus (BioRad, Hercules, CA, USA) and stained with Coomassie Brilliant Blue R-250 (Sigma-Aldrich, MO, USA) for visualizing proteins. Analysis of electrophoregrams were developed with MultiAnalyst Software (Bio-Rad, USA).

It has been shown the change of phosphorylation degree of epididymal spermatozoa proteins in various stages of sperm maturation. There are a characteristic phosphoproteins in the epididymal sperm extracts from selected parts of the epididymis. In all the segments it was demonstrated the presence of four phosphoproteins with molecular weight 82, 27, 21 and 6 kDa. Phosphoproteins with molecular weight 64 and 11 kDa were present in sperm extracts from corpus and cauda epididymis. The phosphoprotein with molecular weight 37 kDa was present only in the sperm extracts from cauda epididymis.

Research will be continued.

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ASSOCIATION OF MTTP GENE POLYMORPHISM WITH PORK QUALITY

ZWIĄZEK POLIMORFIZMU GENU MTTP Z JAKOŚCIĄ MIĘSA WIEPRZOWEGO

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Microsomal triglyceride transfer protein, coded by *MTTP* gene, has a multiple functions including participation in formation of chylomicrons, low-density lipoproteins (LDL) and very low-density lipoproteins (VLDL). The MTP protein plays a key role in the transport of fats and cholesterol between membrane vesicle, which can be associated with lipid metabolism. The aim of present research was to analyze the ENSSSCT00000010052.2:c.2518C > T missense polymorphism (Leu > Phe) within porcine *MTTP locus* and to estimate its association with meat quality traits in pigs.

Analysis was performed on three breeds (Landrace – 391, Large White – 319 and Pulawska – 97 pigs) in total of 807 pigs, for which the frequency of ENSSSCT00000010052.2:c.2518C > T genotypes was identified by PCR–RFLP method (with the use of MluCIendonuclease). The DNA was isolated from whole blood collected into EDTA tubes with the use of Wizard Genomic Purification Kit (Promega).The meat texture parameters were determined for *longissimusdorsi* and *semimembranosus* muscles using by Texture Analyser TA-XT*plus*. 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 *MTTP* genotypes was performed using GLM procedure (SASv. 8.02).

Our results showed that analyzed ENSSSCT00000010052.2:c.2518C > T polymorphism affects all analyzed texture parameters in loin, and springinessas well as chewiness in *semimembranosus* muscle. In both Pulawska and Large White breeds, meat of pigs with CC genotype was characterized by the lowest hardness, cohesiveness and chewiness parameters ($p < 0.05$) and the highest springiness ($p < 0.05$) measured in cooked*longissimusdorsi* muscle compare to opposite homozygotes TT. The opposite trend was observed in cooked *semimembranosus* muscle: homozygotes CC were characterized by the highest value of chewiness and the lowest of springiness ($p < 0.05$). In Pulawska pigs, raw and cooked loin muscle of both homozygotespigs was characterized by the highest firmness and toughness parameters, while in Lange White pigs the highest values were obtained for CT and TT genotypes ($p < 0.05$). The presented results showed that investigated polymorphism in *MTTP* gene maybe considered as a candidate gene responsible for pork quality traits.

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INFLUENCE OF SELECTED STIMULANTS AND FOLIAR FERTILIZERS ON SPAD, ROOT MASS AND GRAIN YIELD OF WINTER WHEAT

WPŁYW WYBRANYCH STYMULATORÓW I NAWOZÓW DOLISTNYCH NA SPAD, MASĘ KORZENIOWĄ ORAZ WIELKOŚĆ PLONU ZIARNA PSZENICY OZIMEJ

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Yield and its quality significantly depend mainly on: climate, percipitation and the applied agrotechnology. In the field crops (including wheat cultivation) are increasingly being used growth stimulants and foliar fertilizers. In connection with the above were conducted experiment, the aim of which was to determine whether and to what extent used preparations: stimulants (ASAHI, KELPAK SL) and foliar fertilizers (Tytanit, Terra Sorb Foliar) affects on: SPAD (leaf greenness index), root mass and yield of winter wheat.

The experiment was conducted at the Experimental Station in Mochełek, in the Kuyavian-Pomeranian region in the 2010/2011 growing season. The experiment was established in the randomized complete block design with 4 replications. The area of plots for harvest amounted to 15 m^2. Winter wheat cultivar 'Muszelka' was sown in the second half of September 2010, in the amount of 280 $kg \cdot ha^{-1}$. Agrotechnology was used in accordance with the requirements of this species. The basis of one-factorial experiment was stimulants and foliar fertilizers applied according to the scheme in table 1. Leaf greenness index (SPAD) was determined two weeks after spraying using Minolta SPAD-502 (Soil and Plant Analysis Development) on 5 randomly selected, leaf blades of wheat in each of the experimental small plots. Furthermore, in each plot, two weeks after the harvest in 5 randomly selected plants was estimated the root mass. Yield was estimated adjusted to the constant moisture 15%. The results were statistically analyzed by analysis of variance. To verify the significance of differences between the assessed average Tukey test at significance level P = 0.05 were used.

Table 1. The doses and term of preparations application

Treatment (commercial product name)	The doses and term of preparations application (BBCH)
Control object	• without spraying
ASAHI	• 0.6 $l \cdot ha^{-1}$, BBCH 28 • 0.6 $l \cdot ha^{-1}$, BBCH 28 + 0.6 $l \cdot ha^{-1}$, BBCH 32
KELPAK SL	• 2 $l \cdot ha^{-1}$, BBCH 28
Tytanit	• 0.2 $l \cdot ha^{-1}$, BBCH 28 • 0.2 $l \cdot ha^{-1}$, BBCH 28 + 0.2 $l \cdot ha^{-1}$, BBCH 32 • 0.2 $l \cdot ha^{-1}$ BBCH 28 + 0.2 $l \cdot ha^{-1}$, BBCH 32 + 0.2 $l \cdot ha^{-1}$, BBCH 69
Terra Sorb Foliar	• 1.5 $l \cdot ha^{-1}$, BBCH 28

• *Doses of tested preparations*

The SPAD in leaves of winter wheat did not depend significantly on the first dose of used preparations. Significant lower value of this parameter in relation to control object was obtained on treatments with more than one spraying. The highest significant value of root mass (after first spraying of preparations) obtained on KELPAK treatment and it was higher to control object around 157%. After applied stimulants and foliar fertilizers was obtained higher yield, however significant higher only after KELPAK applied (the yield was higher around 10% in comparison to control object). More than one spraying using stimulants or foliar fertilizers do not affected on increase of the yield or improvement another parameters.

NANOTECHNOLOGY IN AGRICULTURE

NANOTECHNOLOGIA W ROLNICTWIE

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Nanotechnology is and interdisciplinary field which used nano particles. It has got many applications in: medicine, animal science, food industry, engineering and also agriculture. Nano particles are structures which are less than 100 nanometers and having only one dimension. They have unique properties due to the large surface of the weight, which increases their reactivity and make them more efficient. Their solubility, strength, chemical activity and the time of entry into the plant are significantly better compared to larger particles of the same substance. Nanotechnology has enabled the introduction to a crop of new, potentially more effective pesticides, plant growth regulators and fertilizers. It is a new trend to save fertilizer, pesticides and herbicides consumption and also to minimize environmental pollution. Nanotechnology in agriculture is associated with the desire to improve the quality and efficiency of plant production. The aim of this thesis is to discuss the rule of nanotechnology in modern agriculture.

THE EFFECT OF UV-C AND H_2O_2 ON THE INACTIVATION TIME OF THE MICROORGANISMS INHABITING THE PIG SLURRY

WPŁYW PROMIENIOWANIA UV-C ORAZ H_2O_2 NA CZAS INAKTYWACJI MIKROORGANIZMÓW OBECNYCH W GNOJOWICY ŚWIŃSKIEJ

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The manure is a valuable fertilizer that contains micro- and macroelements. Agricultural use of slurry may pose danger for the environment. Because of the presence of intestinal bacteria, there is a high risk and a possibility of soil and water contamination. Some of the most frequently isolated microorganisms are *Escherichia coli*, *Salmonella* Senftenberg and bacteria of *Enterococcaceae* family. Therefore, it is important to process manure before using it for agricultural purposes [1-3].

The aim of the study was to test the suitability of UV-C radiation, addition of hydrogen peroxide and combined use of both techniques for pig slurry hygienisation. The differences between the rates of inactivation for each of the pathogens were also examined.

The experiments were conducted in laboratory scale. Fresh slurry samples were homogenized, placed in the containers and inoculated with 5 mL of a suspension of pathogenic bacteria. The density of microorganisms varied from 10^6 to 10^7 c.f.u./mL.

For inactivation of the bacteria a solution of hydrogen peroxide (1.5%) and UV-C radiation (doses: 15 $J \times m^{-2}$ and 40 $J \times m^{-2}$) were used. The number of microorganisms was determined by the MPN method according to standard procedures [4].

Studies have shown that UV-C radiation combined with hydrogen peroxide solution was more effective than using the described techniques separately. The methods were most effective in relation to *E. coli*. Bacteria of *Enterococcaceae* family were more resistant to the applied methods. The results showed that the developed method can be used on a large scale, however, it requires further research.

INTRODUCTION OF RECESSIVE DWARFING GENE *DW8* INTO A NORMAL HEIGHT RYE CULTIVAR

WPROWADZANIE RECESYWNEGO GENU KARŁOWATOŚCI *DW8* DO ODMIANY UPRAWNEJ ŻYTA

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Lodging in cereals causes severe adverse effects such as: problems during harvest, reduction of yield quantity as well as its quality, due to fungal diseases. Factors which promote lodging are: strong wind and rain, thick sowing and over-fertilization with nitrogen. Resistance to lodging is strongly correlated with plants' height – the length and diameter of individual internodes. For that reason it is vital to obtain cereals with reduced blade and high yield of grains. One of the methods for achieving this goal is using growth retardants. Another way is to cross short-straw plants carrying dwarfing gene with a normal height cultivar. In this way dwarf triticale with *Dw1* dominant dwarfing gene was obtained. Trials to produce short-straw rye have been futile mainly due to the fact that reduction of height affected pleiotropically yield, causing its decrease. All of the seventeen dwarfing genes identified in rye had already been assigned to individual chromosomes. There are four dwarfing genes identified on chromosome 5R: dominant gene *Dw1* (EM-1 mutant) and recessive genes: *dw6* (I-G-type), *ct2* (Moskowskij Karlik) and *dw8* (found in RXL10 inbred line). There are no data about the exact location of the *dw8* gene as well as about its influence on yield-forming characteristics.

The aims of this study were: to introduce *dw8* gene from RXL10 inbred line into rye cultivar, to assess the influence of the gene on the plants' phenotype and to identify markers closely correlated with the gene.

RXL10 dwarfing inbred line was crossed with cultivar Dańkowskie Amber. In F_2 population segregation was observed – there were long- and short-straw plants. Biometric measurements of F_1 and F_2 plants were performed. Genetic markers were tested on extreme groups consisting of high and short RILs derived from crossing of a normal height inbred line 541 with RXL10. Bidirectional selective genotyping (BSG) method allowed to identify markers highly correlated with the studied trait.

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THE PROFILE AND CONTENT OF BUFADIENOLIDES IN THE ROOTS OF *KALANCHOE DAIGREMONTIANA*

PROFIL I ZAWARTOŚĆ BUFADIENOLIDÓW W KORZENIU *KALANCHOE DAIGREMONTIANA*

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Today in the agricultural market is hard to find something innovative and be content with the production of raw materials is not enough. It is important to incorporate as much as possible also in the processing. Such a situation we can see in the cultivation of herbs, where farmer produces all kinds of herbal preparations like extracts, herbal tea and sells them in addition to the row material. For the production of juice from *Kalanchoe* farmer uses aerial parts and roots are not used. We decided to examine the roots of their potential uses in the future.

Kalanchoe daigremontiana (*Bryophyllum daigremontianum*), comon name Mother of Thousands from *Crassulaceae* family is a succulent plant native to Madagascar. Some species of *Kalanchoe* have been used in folk medicine for a long time in treatment many diseases, like infections, rheumatism and inflammation. The biological activity of *Kalanchoe* extracts includes antioxidant, anti-inflammatory and antiproliferative effects.

The existing literature data relate to the aerial parts of *Kalanchoe*. However, there is no data from the literature about the metabolic profile of the roots, that are also used in traditional medicine. Preliminary research on the roots showed the presence of phenolic compounds and a considerable amount of bufadienolides, with structures probably different from those found in the aerial parts. The aim of this work is the isolation of individual compounds from the roots of *Kalanchoe daigremontiana* and determination of their content.

The aqueous extract (34.75 g) from 500 g of dry, ground roots of *K. daigremontiana* was suspended in water and applied to a vacuum liquid chromatography (100 × 60 mm, LiChroprep C18, 40-63 μm). Sugars and phenolics were removed with water and 20% methanol and bufadienolides (5.55 g) were eluted from the column with 80% MeOH. Next, bufadienolides fraction was fractionated by column chromatography (Sephadex LH-20, 22 x 850 mm, 25-100 μm, Sigma-Aldrich) with methanol. This separation gave five distinctive subfractions. Individual compounds were separated from the subfractions by semi-preparative high-pressure chromatography Gilson equipped with PrepELS II detector using Kromasil C18 column (10 × 250 mm, 5 μm; Eka Chemicals AB). Single compounds and their contents were analyzed using a Waters ACQUITY UPLC™ system coupled to Waters TQ and PDA Detector (Waters Corp.) in full scan mode (*m/z* = 200-2000) on a BEH C18 (2.1 x 100 mm, 1.8 μm) column. Total content of the bufadienolides was 5.3 mg per 1 g of dry weight of root.

In the roots of *K. daigremontiana* have been identified known bufadienolides and those that seems to be new. In this context is a need to determine their structures using NMR spectrometer and test biological activity.

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ANATOMICAL ADAPTATION OF THE HORSE TO WORK UNDER SADDLE

PRZYSTOSOWANIE ANATOMICZNE KONIA DO PRACY POD SIODŁEM

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When you use the most are loaded with saddle horses limbs including hooves, and the muscles of the back and tail. The body of the horse over a number of years has adapted the construction of musculo-skeletal to jumping and other disciplines in which the starting horses.

Large accumulation of joints in a limb, as in the case of the joint of the wrist and the tarsus, contributes to the elimination of shocks arising when contact limb with hard ground. This is especially important while jumping and racing.

Unique horse is the presence of the femoral head ligament, also called round ligament that forms part of the fibers of the rectus abdominis. The result of the presence of this structure. the horse's ability to perform the movements of kicking. So complicated construction of movable engine also generates the appropriate power to meet the needs of comprehensive use of saddle.

One of the items under load during movement on horses hooves. At the time pressure of the body of the horse on the hoof, the blood produces a type of pillow in the weaves. So running depreciation mechanism protects the hoof and limb injuries related to bumps on the ground during landings after jumps or plaything.

Another important structure is the mechanics of the spine. Muscle, which is responsible rider called muscle longest Ridge is very efficient, but a misfit to the perpendicular. Its natural function is the generation of traffic, and not keeping the weight of the rider. To properly train these muscle parts and adapt to the weight ofthe rider should strive to leave a horse's head and neck during a workout, as the launch of the outward actions of ligaments. This makes the horse can relax the muscles of the back and lay freely. Relaxation of the muscles is the only way to correct them. When the blood reaches to the back in the right way, this is a guarantee of its proper development and motor skills. Bad coaching a horse and swamping during workouts can cause motor motility disorders and lead to injuries. What happens to the back of the horse during workouts and competitions will always find their reflection in the work of the limbs. The tension in the back should be irregular in gaits, and this can lead to injury. The only way to avoid injury to the horse sports is the focus on natural calling, passive and active motion mechanisms and systematic accustoming a horse to workloads. Overtraining and overuse can cause serious health consequences overload in terms of locomotive, which can lead to the permanent elimination of a horse with the sport.

AGE-RELATED CHANGES IN THE GROWTH RATE AND BLOOD TESTOSTERONE CONCENTRATIONS IN RHODE ISLAND RED AND LEGHORN ROOSTERS

ZMIANY WRAZ Z WIEKIEM TEMPA WZROSTU MASY CIAŁA I STĘŻENIA TESTOSTERONU U KOGUTÓW RHODE ISLAND RED I LEGHORN

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In poultry production, both male and female broilers are raised for meat, whereas only females lay eggs. Thus, male chicks of the layer-type, which constitute half the population of birds hatched, are considered "waste products" in the egg industry, and the same often applies to male dual-purpose chicks. The slaughter value of the latter is relatively high, but producers are not interested in raising them for meat. As a result, unwanted male chicks are usually euthanized soon after they hatch (Martin, 2003; Nandi et al., 2003). Meat-type chickens are characterized by a fast growth rate and achieve high body weight at a young age. Chickens of different types differ also with regard to their temperament. The aim of this study was to compare the growth rate and blood testosterone levels in roosters of dual-purpose (Rhode Island Red - RIR) and egg-laying (Leghorn) breeds.

The experimental materials comprised 200 RIR roosters and 200 LE roosters. All birds were raised to 28 weeks of age, and were fed *ad libitum* commercial diets. The body weights of chickens were recorded throughout the experiment. Starting from 4 weeks of age, at 4-week intervals, blood samples were collected from randomly selected birds (10 RIR roosters and 10 LE roosters). Blood testosterone levels were determined by radioimmunoassay (RIA) using the DIAsource TESTO–RIA– CT kit (DIAsource ImmunoAssays S.A., Belgium). The data were analyzed statistically.

Between 4 and 8 weeks of age, the growth rate of LE roosters was faster compared with RIR roosters (81.7% vs. 77.1%, $P < 0.05$), but it showed a falling tendency. The growth rate of RIR roosters increased to 80.1% between 8 and 12 weeks of age, and then it decreased, which was reflected in body weight. Until 8 weeks of age, the body weights of RIR and LE roosters were similar (week 8, RIR – 584 g, LE – 608 g), but in successive weeks RIR roosters achieved significantly higher average body weight (week 28, RIR – 2906 g, LE – 2378 g; $P < 0.05$). In birds of both types, plasma testosterone concentrations were found to increase until 20 weeks of age, and from week 8 until the end of the rearing period they were higher in RIR roosters than in LE roosters (RIR and LE, respectively: 0.153 ng/ml and 0.137 ng/ml at 4 weeks of age, 0.222 ng/ml and 0.175 ng/ml at 8 weeks of age, 1.857 ng/ml and 1.760 ng/ml at 20 weeks of age; $P < 0.05$).

EFFECT OF IRON NANOPARTICLES IN *IN VITRO* MEDIUM ON THE GROWTH AND ROOT DEVELOPMENT OF RAPE *EX* PLANTS (*BRASSICA NAPUS* VAR. *OLEIFERA*)

WPŁYW NANOCZĄSTECZEK ŻELAZA W ŚRODOWISKU IN VITRO NA WZROST I ROZWÓJ KORZENI EKSPLANTATÓW RZEPAKU (*BRASSICA NAPUS* VAR. *OLEIFERA*)

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The roots form a bridge between the ground and above-ground parts of plants. Through them, the plant is supplied with water and minerals taken from the ground and keeps a horizontal position. The study root systems belong to the elementary methods of assessing the growth of plants. Root length and their volume and the biomass is calculated based on the volume are the most commonly used parameters. Previous studies carried out with iron nanoparticles were aimed to seed germination, root elongation and leaf growth. In vitro cultures are a very good way of reproduction of many species, also help to meet the nutritional requirements and environmental, as well as the specific biology of plants.

The aim of the study was to determine the effect of the iron nanoparticles (two doses 10 and 25 ppm) in in vitro culture on the growth and development of root of rape explants.

The trial was conducted on spring rape variety population 'Margo'. The explants were kept in a chamber, where maintained constant conditions: temperature (day 18-20^{o}C, night 16^{o}C), photoperiod D: N 14:10, the light intensity of 200-280 $\mu mol \cdot s^{-1} \cdot m^{-2}$, humidity 70%. The measurements were made at BBCH 13 (transfer of plants from the medium into the ground perlite). After rinsing and purification from the medium the roots were scanned by Delta-T scanner. The program Win Rhizo was used to measure the following parameters: RgnArea- Area of the analysed Region (cm^2), Len- root Total Length (cm), Total SA Surface area (cm^2), PA- Total projected area (cm^2), Vol- Total Volume (cm^3), AvgD- Average Diameter (mm), Ntips- Number of Tips, NForks- Number of Forks, NCross- Number of Crossings.

Characteristics of root growth and development.

Treat-ment	RgnArea (cm^2)	Len (cm)	SA (cm^2)	PA (cm^2)	Vol (cm^3)	AvgD (mm)	N tips	N Forks	N Cross
Contr.	42.16 ± 5.08	24.34 ± 3.12	10.06 ± 1.66	3.20 ± 0.53	0.40 ± 0.08	1.40 ± 0.20	37.40 ± 10.58	60.30 ± 15.72	3.30 ± 1.01
Fe10	27.22 ± 5.12	13.44 ± 2.22	9.11 ± 1.63	2.90 ± 0.52	0.50 ± 0.10	2.16 ± 0.10	12.90 ± 3.24	15.80 ± 4.30	0.70 ± 0.33
Fe25	35.77 ± 6.17	28.69 ± 5.45	18.85 ± 3.24	6.00 ± 1.03	0.99 ± 0.16	2.12 ± 0.06	13.80 ± 2.37	51.80 ± 9.06	1.30 ± 0.45

Two opposite trends turned out between the treatments; with the greater intensity of root features in the control *versus* nano-treatments and conversely with the greater intensity at nano – treatment *versus* control. RGN area displayed the significant variation between treatments ($F = 3.51$, $p = 0.04$), with the greatest value at control – 42.16 and the smallest at Fe10 – 27.22. The same trends were traced in the case of characteristics: Vol, number of tips, number of forks and number of cross as follow. Opposite trend was found in case of root's characteristics: PA, SA, Avd D, Vol and LEN where the significant variation between treatments was followed by the greatest value at Fe25 and smallest and similar with control and Fe10.

PHOTOSYNTHETIC ACTIVITY OF RAPE *EX* PLANTS (*BRASSICA NAPUS* VAR. *OLEIFERA*) CULTURED *IN VITRO* ON MEDIA ENRICHED WITH IRON NANOPARTICLES

AKTYWNOŚĆ FOTOSYNTETYCZNA EKSPLANTATÓW RZEPAKU (*BRASSICA NAPUS* VAR. *OLEIFERA*) HODOWANYCH IN VITRO NA POŻYWKACH WZBOGACONYCH NANOCZĄSTECZKAMI ŻELAZA

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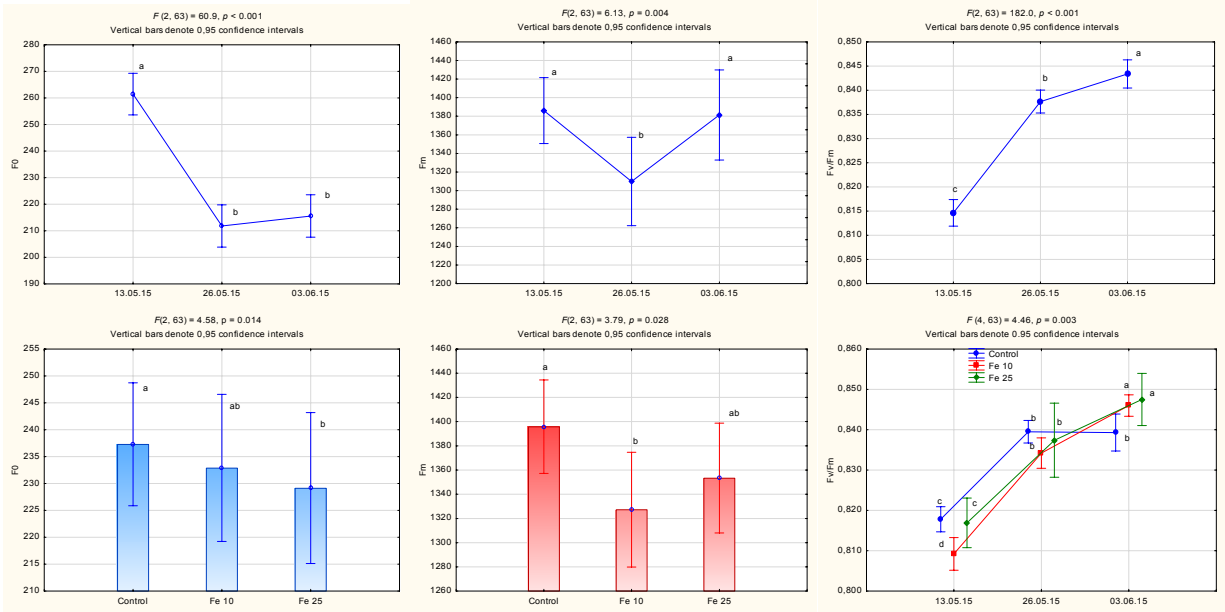
Adequate nutrition of iron (Fe) significantly affect the quantity and quality of yield. This particle creates difficulties because of the transition in the mold much more difficult absorbed by plants. Application of nanotechnology enables among other things, the introduction of the cultivation of new, potentially effective pesticides, plant growth regulators and chemical fertilizers. Performing the measurement of chlorophyll fluorescence is an important non-invasive technique for determining the operation of the photosynthesis in plants. The study of leaves allow you to determine various parameters characterizing the various stages of photosynthesis.

The aim of this study was to determine the photosynthetic response of rape explants cultured in vitro in a culture medium enriched with iron nanoparticles at two doses 10 and 25 ppm.

The research was conducted on explants of spring rape cultivar 'Margo'. Detection of stress reactions were measured by OS5p modulated fluorometer. Using chlorophyll fluorescence the parameters were measured: Fo, Fm, Fv / Fm, that is the initial fluorescence respectively, the maximum and photochemical efficiency of PSII ratio. Explants were kept in the control chamber under constant temperature (day 18-20^{o}C, night 16^{o}C), photoperiod D: N 14:10, light intensity of 200-280 µmol·s^{-1}·m^{-2}, humidity 70%. The measurements were made three times on each plant: before planting and twice up to phase BBCH 15. The results of the measurement of chlorophyll fluorescence displayed the significant improvement of the photochemical efficiency of PSII in explants cultured on medium enriched with nano Fe at 10 and 25 ppm.



THE INFLUENCE OF VISUAL AND OLFACTORY CUES ON THE LEARNING ABILITIES IN PIGS

ROLA BODŹCÓW WZROKOWYCH I ZAPACHOWYCH NA ZDOLNOŚCI UCZENIA SIĘ ŚWIŃ

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It is recognized that pigs do not have a particularly well developed sense of sight. This suggests that pigs do not rely solely on visual cues when evaluating and adapting to the environment. There is no question, that olfaction helps the pig to adapt to their way of life. Pigs need this sense when foraging and it is crucial for social contacts. But there have been very little researches which showed the importance of particular senses in learning abilities in pigs. It was the reason why it was decided to examine how the senses of vision and olfaction play the role in learning and memory in pigs and which is more important for these processes. The experiment consisted of three parts. Four different pigs were tested in each stage. First part of the experiment was performed to determine the importance of vision in learning and remembering. In the second part the sense of smell was tested alone and in the third stage the action of vision and olfaction together in learning and memory processes was investigated. At each stage two qualified persons entered the pen and one of them held in hand one B5 board with: one printed shape – vision stage, white board with glued aroma gauze – olfaction stage and printed shape with aroma – vision + olfaction stage) The second person hanged two laminated A4 sheets of paper with the printed BW shapes (stage 1), white A4 papers with aromas (stage 2) and A4 sheets of paper with the printed BW shapes and glued gauze with aromas (stage 3). Next all of these objects were installed into the pen wall (opposite corners). The task of the animal was to remember the shape, aroma, and shape with aroma, according to the stage of experiment from the first B5 board and then go to the wall, recognize, choose and touch with the nose the right remembered object. The experiment was considered as successful when the tested pig touched with the nose the appropriate shape, white board with aroma and shape with aroma which were previously displayed on the first B5 board. After the job was done correctly, the tested animal was rewarded with the tidbit (piece of apple). During the one hour visit in pen the test was repeated 10 times for each animal with different combinations of shapes, odours and shapes with odours, as well. There were 10 evaluating visits in subsequent days of the experiment. The average number of successful indications for the full time of the experiment (10 days x 10 trials) was 4.06 for the first stage (shapes only), 4.2 for the second stage (aromas only) (table 1). The highest average of successful indications was observed in the third group (shapes with aromas) – 6.9. The difference between the mean value for this group and the results achieved by two other groups were statistically significant ($P < 0.01$).

Table 1. Mean number of successful indication of adequate shapes (V), aromas (O), or shapes and aromas (V+O)

Stage	Mean of successful indications
V (N = 4)	4.06±1.80 A
O (N = 4)	4.20±2.33 A
V+O (N = 4)	6.90±2.42 B

It should be concluded that pigs have strong ability to learn and remember geometrical shapes what was proved by the improved successful indications of the shapes in subsequent sessions. Olfaction cues only may make learning equally efficient as visual stimulation. But the olfactory cues working together with visual stimulation seem to make the learning and memory processes most efficient.

WILL YOUR HORSE WORK FOR FOOD? – METHODOLOGY TO ASSES FOOD MOTIVATION IN HORSES

CZY TWÓJ KOŃ BĘDZIE PRACOWAŁ DLA POKARMU? – METODYKA OCENY MOTYWACJI POKARMOWEJ U KONI

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Clearly food is a biological need and its incentive value is well known. However, there is no accepted methodology to evaluate food motivation in horses. What is more, food is often used as a reward in learning tests and there is possibility that food motivation affects the willingness of animals to work for food and thus it may also affect their performance.

The aim of this study was to compare different methods to evaluate food motivation in horses.

Methodology: 25 Hucul horses between 1-2.5 years old were used in this study. Different tests to assess motivation in animals were adapted from the literature. In all tests, food that was familiar to horses was used (full grain oat). Before testing all horses were habituated to the testing conditions. Training was considered as completed when all horses proceeded calmly to the food container that was placed in the end of the test arena. In the first test (L) horses had to touch a lever to get food. The number of touches increased by 3 every two trials. The highest number of touches was measured. In second test (OB) food was placed behind an obstacle and the horse had to cross it to get food. After each trial the level was raised (approx. 5 cm) from level 1 = 42 cm. The highest level scored by each individual horse and time taken to cross the obstacle in level 1 was analyzed. In the third test (B) the bucket was placed 9m from a starting point. The time to reach the bucket was measured. Furthermore, all horses were fed from a bowl (2500 ml, approx. 1 kg) and time taken to finish eating was measured (F). Horses that did not eat all the food were assigned to maximum time 20 minutes. During all tests, the heart rate was measured with Polar heart rate monitor (RS400) and behaviour was recorded.

Mean and standard deviation from each test are shown in table 1. Spearman rank correlation was used to analyze the correlation between tests. A significant correlation was found between L test and the level scored in OB test ($r = 0.46$, $p < 0.05$) and between time to reach food in OB test and time to finish eating in F test ($r = 0.49$, $p < 0.05$). No further correlations were found.

The lack of correlation between these tests suggest that not all methods are appropriate to evaluate horses' food motivation or indicate existence of other factors that could influence the results (e.g. weather, reactivity). However, the OB test involves horses natural predisposition to movement and the correlation with the F test may justify the use of this test as proper motivational test for horses. Nevertheless, this statement requires further investigation.

Table 1. The mean results scored by horses in each test

Test	Mean	Standard Deviation
Lever (L)	11.64	6.01
Obstacle (OB_1) – level max	6.40	2.75
Obstacle (OB_2) – time	36.85	54.42
Bucket (B)	8.49	4.15
Feeding (F)	13.24	4.26

L: number of touches, OB_1:level of obstacle scored by horses, OB_2: time (s) to cross obstacle in level 1, B: time to reach bucket at 9 m distance (s), F: time to finish eating 2500 ml of oats (min).

ASSESSMENT OF POLLEN SHEDDING AND GENETIC POLYMORPHISM WITHIN THE HYBRID RYE CULTIVAR GONELLO F_1

OCENA PYLENIA I POLIMORFIZMU GENETYCZNEGO W OBRĘBIE ODMIANY HETEROZYJNEJ GONELLO F_1

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Winter rye (*Secale cereale*, L.) is commonly cultivated in Poland and other countries of Central and East Europe. Primary reason for this are relatively low environmental requirements: high uptake potential of macro- and micronutrients from a sandy soils with low level of components, extreme winter hardiness and tolerance to highly acidic soils.

Hybrid rye cultivars have been grown for over 30 years and its importance systematically grows up. Their productivity is higher than population varieties. Almost all registered hybrids are bred with the use of the Pampa cytoplasmic male sterility (CMS-P) system which was discovered by Geiger and Schnell (1970). Utilization of this CMS type usually results in troubles with full restoration of male fertility.

The aim of this study was to evaluation of fertility and assessment of their genetic polymorphism using the DArTseq technology.

The level of male fertility was assessed using two methods: visual observations of pollen shedding by individuals with the use of the 9-step scale of Geiger and Morgenstern (1975) and evaluation of seed setting within spikes isolated on each plant before flowering .

In total 240 single plants was phenotyped, between them 94 randomly selected individuals were analyzed using DArTseq technology.

Similar results were obtained after using both methods for male fertility assessment. Majority of plants efficiently produced pollen but significant amount of male sterile genotypes were also found. Performed genetic analysis based on DArTseq technology allowed for preliminary estimation of the genetic polymorphism occurring within hybrid cultivar Gonello F_1.

CHANGES IN PROTEIN PHOSPHORYLATION DURING THE LIQUID STORAGE OF DOG SEMEN

ZMIANY W FOSFORYLACJI BIAŁEK PODCZAS PRZECHOWYWANIA NASIENIA PSA W STANIE PŁYNNYM

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It is generally accepted that protein phosphorylation is one of the most important post-translational modifications of proteins. Protein phosphorylation–dephosphorylation processes play a key role in normal sperm functioning i.e. capacitation, hyperactivation motility and acrosome reaction. Thus, the aim of the study was to analyze and identify changes in protein phosphorylation degree declining in the course of the liquid storage of dog semen.

After semen collection obtained sperm-rich fractions were divided in two equally volumetric portions. The first portion was centrifuged at 800 x g in order to remove seminal plasma and the second was not. Then both portions of every ejaculate were diluted to $50x10^6$ spermatozoa/ml in extender containing: 3.025% TRIS, 1.7% citric acid and 1.25% fructose (pH = 6.7). All portions of ejaculates of dogs (n = 4) were stored at 5^oC for three days (approx. 72 h). Right after semen dilution procedure and 24, 48 and 72 h of liquid storage from each portion of ejaculate there were taken samples of 0.5 ml every and centrifuged at 800 x g to regain seminal plasma from the second portions of ejaculates. The next step was to rinse probes twicely with 0.85% NaCl and centrifuge them at 3000 x g and 10000 x g by turns. Obtained sperm pellets were resuspened in 10 mM TRIS, 1 mM sodium orthovanadate, 1% Triton X-100 buffer (pH = 7.4) and stored in -20^oC for further analyses.

Phosphoproteins from seminal plasma and spermatozoa were isolated with use of immobilised iron ion affinity chromatography with chelating sepharose serving as a gelbed. Gained phosphoprotein fractions were initially concentrated with TCA/DOC protein precipitation protocol (Kessler Lab-Proteomics Protocols, Oxford, GB) and then separated on 12% SDS-PAGE gels using the MiniProtean III apparatus (BioRad, Hercules, CA, USA). After electrophoresis, the gels were stained with Coomassie Brilliant Blue R-250 (Sigma-Aldrich, MO, USA) for visualizing proteins. Chosen proteins were cut out of the gels, hydrolysed using Trypsin profile IGD Kit (Sigma-Aldrich, MO, USA), and submitted to mass spectrometry on Autoflex III Smartbeam (Bruker Daltonics, Germany) with Mascot programme application (Matrix Science Inc., USA).

SDS-PAGE electropherograms of seminal plasma revealed at most 8 phoshoproteins fractions of molecular weights in the range of 10 to 110 kDa, whereas electropherograms of sperm extracts demonstrated at most 12 fractions from 10 to 135 kDa. Proteins were subjected to excessive phosphorylation mainly in fresh semen and right after dilution procedure accomplishment. Mass spectrometry showed the highest similarity of three polypeptides present in seminal plasma to: serum albumin precursor (score = 221; 24% protein sequence coverage), lactotransferrin precursor (score = 112; 11% coverage), and arginine esterase isoform X1 (score = 118; 15% coverage). Moreover, two proteins present in sperm extracts demonstrated similarity to arginine esterase isoform X1 also (score = 98; 6% coverage) and heparin sulfate glucosamine 3-0 sulfotransferase 3A1 isoform X2 (score = 83; 9% coverage). The degree of phosphorylation status of serum albumin precursor present in seminal plasma diminished along with the time of storage as well as status of lactotransferrin precursor, whereas intensified phosphorylation occured in case of arginine esterase isoform X1. Both proteins present in sperm extracts underwent an excessive phosphorylation especially after 48 h of liquid storage. Further studies conducted with use of different laboratory methods are needed to extend obtained results.

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ASSESSMENT OF BOURKE'S PARROT (*NEOPSEPHOTUS BOURKII*) HATCHING IN PRIVATE BREEDING

OCENA LĘGÓW ŁĄKÓWKI LILIOWEJ (*NEOPSEPHOTUS BOURKII*) W HODOWLI INDYWIDUALNEJ

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Bourke's parrots are very pleasant research materials, especially because they can be kept even in a small cages. So we can learn their behaviour, without big and expensive aviaries.

The study was taken in a private breeding in Masovian voivodeship in 2009-2014. Breeding was carried out in the year-round outdoor aviaries. Observations where carried out on 6 pairs of bourke's parrots. Pairs were formed by: female 1 at the age of 2 years with a male 1 at the age of 2 years, female 2 at the age of 2 years with a male 2 at the age of 1.5 years, female 3 at the age of 3 years with a male 3 at the age of 5 years, female 4 at the age of 6 years with a male 4 at the age of 4 years, female 5 at the age of 8 years with a male 5 at the age of 6 years, female 6 at the age of 5 years with a male 6 at the age of 5 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 second egg. The analysis of hatching was based on the following indicators: the number of eggs laid by 6 females in the system of two clutches in one year.

Females of all pair in each of the two clutches, laid up from 14 to 24 eggs. The number of laid eggs differed between particular clutches. The greatest number of eggs females laid in the first clutches (133). It was 23 eggs more than in the second clutch. Indicators of reproductive bourke's parrots show some individual variation between females. The worst results were observed in pair 4, with indeed raised 31 chicks, but the difference between the numbers of laid eggs and the number of hatched chicks was 11. The weakest results of this pair were in 2012, when 7 eggs were laid, 6 eggs were fertilized with only 4 hatched chicks. Pair 5 showed good effectiveness of fertilization and good hatchability where 32 eggs were laid, only 2 were unfertilized and 28 chicks hatched. Most chicks, 35, were obtained from the pair 1 and 6, both couples laid 45 eggs each, but some of the eggs were unfertilized and not hatched.

Observations pairs of bourke's parrots 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 bourke's parrots and can be used in comparison of this kind of studies carried out in nature.

CHARACTERIZATION OF METABOLIC PROFILE OF *TALAROMYCES FLAVUS* WITH BIOLOG FF MICROPLATES

CHARAKTERYSTYKA PROFILU METABOLICZNEGO *TALAROMYCES FLAVUS* Z WYKORZYSTANIEM PŁYTEK FF BIOLOG

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Heat-resistant fungi (HRF) are defined as able to survive heat-treatment during process of pasteurization. HRF are the major source of heat-processed food spoilage. *Talaromyces flavus* belongs to the HRF group and is one of the most common heat-resistant species.

T. flavus occurs mainly in soil under the fruit plantations and is also often isolated from fruits like strawberries, raspberries or blueberries. Moreover *T. flavus* is able to grow under both aerobic and microaerobic conditions. *T. flavus* may also be a serious risk factor to human health as it is able to produce numerous mycotoxins, such as talaromycin or mitrorubrin.

These traits of *T. flavus* may cause a danger of economic losses in food industry.

Filamentous fungi are known to have unique metabolic profile of utilization compounds available to them. Characterization of this profile may be useful in acquiring knowledge of biochemical pathways of studied species.

The aim of this study was the determination and characterization of *Talaromyces flavus* metabolic profile under aerobic and microaerobic conditions.

To determine the metabolic profile of *T. flavus*, we used a system Biolog with FF Microplates.

The FF MicroPlate contains of 96-wells coated with 95 discrete carbon sources and water. Substrates are grouped in carbohydrates, amino acids, carboxylic acids, polymers, amines and amides.

The growth process results in reduction of tetrazolium dye and as a result colour change of suspension inside each well. Detection is based on 490 nm and 750 nm absorbance measurements of each well with Biolog Microstation.

The *T. flavus* DSM 63536 strain was used in this study. The ascospores of fungus grown on PDA medium were sterilely transferred into the FF-IF inoculation fluid until it reached the transmittance of 75%. Then the FF Plates were inoculated with 100 µl of inoculating fluid per each well. Plates were incubated in darkness at 30°C under aerobic and microaerobic (6% of O_2) conditions, respectively achieved with anoxomat AN20P. The data was collected every 24 hours for 192 hours.

The average well colour development (AWCD), substrate Richness (R) values and percent of substrate group utilization were calculated. AWCD presents the microbial activity in each plate and R represents functional diversity as the number of utilized carbon sources.

The results showed that *T. flavus* was able to grow both under the aerobic and microaerobic conditions. The calculated richness value for aerobic conditions was 66 while for microaerobic conditions it was 79. *T. flavus* grown under microaerobic conditions was also characterised by higher AWCD value.

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CHARACTERISTICS OF RYE DWARFING GENES USED IN TRITICALE HEIGHT REDUCTION

CHARAKTERYSTYKA ŻYTNICH GENÓW KARŁOWATOŚCI WYKORZYSTANYCH DO SKRÓCENIA ŹDŹBŁA PSZENŻYTA

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Reduction of cereals' height prevents lodging. In the 80's the introduction of rye dwarfing gene *Dw1* into triticale genome led to derivation of semi-dwarf cultivars which were 20 cm shorter than the normal height plants. *Dw1* was first discovered in Russian mutant EM-1 and was mapped on chromosome 5RL (Kobyliansky 1972). In Poland there are currently a few registered semi-dwarf cultivars of triticale.

The aim of this study was to introduce new rye dwarfing genes into triticale cultivars in order to increase its lodging resistance and grain yield. There are many dwarfing genes identified in rye: four dominant (*Dw1, Dw2, Dw3, Dw4*) and a number of recessive ones. Most of them were assigned to chromosomes (Melz 1989, Korzun et al. 1996, Stojałowski et al. 2015) but their exact position is still unknown.

Triticale cultivars of normal height were pollinated with short-straw rye inbred lines with known (723, K10028) and unknown (S44, Malys 72) dwarfing genes. Moreover, gibberellic acid (GA_3) test was performed on seedlings of rye dwarfing inbred lines, to assess their sensitivity to exogenously applied gibberellin. This allowed to classify the genes responsible for reduced height of the rye lines as sensitive or insensitive to GA_3.

The efficiency of intergeneric crossing was very low – 49 F_1 plants were derived. In order to confirm their hybrid character ISSR analysis was performed. A set of markers was selected to be tested on parental forms. The polymorphic ones were subsequently used on F_1 plants. The number of primers used in this investigation enabled to identify 5 hybrids. The gibberellic acid test showed that all of the studied dwarfing genes were sensitive to GA_3, which is in agreement with other authors' studies.

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ANALYSIS OF THE POSSIBILITIES OF USING RENEWABLE ENERGY SOURCES IN RURAL AREAS

ANALIZA MOŻLIWOŚCI WYKORZYSTANIA ODNAWIALNYCH ŹRÓDEŁ ENERGII NA OBSZARACH WIEJSKICH

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As a result of the currently used technologies for producing energy, there is a problem of depletion of fossil fuel resources and increasing environmental pollution, carrying behind enlarging the ozone hole, the greenhouse effect, acid rain, accumulation of radioactive substrates and the presence of smog. Proceedings of environmental contamination contributes to increased incidence of genetic disorders and the growth of human diseases. There is also damage to the flora and fauna, occur excessive corrosion of reinforced concrete construction and destruction of cultural heritage.

Renewable energy sources have minimal impact on the environment, are highly economical, have a fixed unit cost of energy conversion, can work on separate networks, eliminating the need to transport energy generated by them. A number of advantages of this method of generating energy, promotes the use of energy in this branch of agriculture.

The aim of the study was to analyze the possibilities of renewable energy sources in rural areas.

The paper presents the most important factors affecting the opportunities for developing renewable energy sources in Poland, with particular emphasis on rural areas. Closer characteristics were possibilities for generating energy (both electricity and thermal), wind, solar, water and biomass inside the earth. Discusses in detail the possibilities of using large and small wind turbines, solar collectors and photovoltaic panels, heat pumps and biomass, including agricultural biogas plants.

The beginning of the new millennium resulted in the search for new forms of energy based on renewable carriers. The effect is visible by the desire to reduce the burning of coal to alternative energy sources. In order to increase use of renewable energy sources are increasingly began to use hybrid systems manufacturing. They represent a combination of several energy technologies, for example photovoltaic panel and a small wind turbine. The main advantage is a much smaller dependence of the amount of electricity than the current wind speed or the solar radiation, as is the case in systems with only one source.

BLOOD INDICES OF GROWING-FINISHING PIGS FED THE DIET WITH ALFALFA PROTEIN CONCENTRATE

WSKAŹNIKI KRWI TUCZNIKÓW OTRZYMUJĄCYCH MIESZANKI Z DODATKIEM KONCENTRATU BIAŁKOWEGO Z LUCERNY

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After withdrawal of antibiotic growth promoters (AGP), intensive research has focused on alternative sources of biologically active additives that can be effectively included as feed supplements to swine diets (Thacker, 2013; Vondruskova et al., 2010). Some of the more interesting feed additives include herbs and phytobiotics such as alfalfa protein concentrate (APC) that contain a number of valuable biologically active compounds that aid digestion and stimulate feed nutrient conversion (Hashemi and Davoodi, 2011; Windisch et al. 2008). The aim of the research was to determine the effect of APC on blood parameters of growing-finishing pigs.

The trial involved 60 crossbred pigs (PL×PLW)×Duroc of 29.0 kg of initial body weight allocated into three treatment groups. Control group (C) was fed without APC addition, group E30 were fed the diets with 3.0% APC inclusion during the whole fattening period and group E30P where animals received experimental or control mixture alternately (at 2-week intervals). Blood samples for haematological and biochemical tests were collected twice (at 50 and 100 kg body weight) from the external jugular vein. The following determinations were carried out in full blood: haemoglobin (HB), haematocrite (HCT), number of erythrocytes (RBC) and leukocytes (WBC). White blood cell composition was determined. In blood serum were determined: glucose (GLU), total protein (TP), urea nitrogen (BUN), uric acid (UA), cholesterol (CHOL) and triglycerides (TG), alkaline phosphatase (ALP), alanine aminotransferase (ALT), aspartate aminotransferase (AST).

Dietary incorporation of APC into diets increased the red blood cell indices (HB, HCT, RBC) and the differences between values of the treatment groups (E30 and E30P) and the control (C) were statistically significant. The leukocyte level (WBC) was significantly higher in fatteners` blood from E30 as compared to group C. Addition of 3.0% APC to diets promoted growth of protein concentration in blood plasma in both fattening periods. Such correlation was not noted at periodic application of feed with 3.0% APC additive. The activity of AST, ALT and ALP was markedly higher with APC feed supplement, especially in group E30. There was not reported significant influence of APC on the content of other parameters of lipid metabolism, like BUN and UA. The analysis of biochemical profile indices demonstrated a noticeable decline of the TG and CHOL level in blood plasma of experimental animals, in that LDL fraction. An important elevation of HDL fraction in blood of the animals from E30 and E30P groups was recorded.

The obtained results show that the best effects are noted at continuous 3.0% APC supplementation to fatteners diets. However similar positive effects are obtained at the same level of APC supplied periodically, which seems to be economically justified.

THE EVALUATION OF SELECTED BOAR SEMEN PARAMETERS VS THEIR CAPACITATION ABILITIES

OCENA WYBRANYCH PARAMETRÓW NASIENIA KNURA A JEGO ZDOLNOŚĆ DO KAPACYTACJI

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One of the most basic conditions for effective *in vitro* fertilization of porcine oocytes is the ability of boar semen to capacitate correctly. This is evaluated by calculating sperm motility. Therefore the aim of this study was to find out if and to what degree, the selected boar semen parameters have an effect on this process.

The material used in this study was semen obtained from 27 boars of 6 various breeds, aged from 10 months to 4 years old from the AI Center in Klecza Dolna. A total of 27 ejaculates were collected over a one year period. After collecting and diluting in a commercial diluter, the semen quality was evaluated under a microscope and by the Computer Assisted Sperm System (SCA). The following parameters were evaluated: motility, progressive motility, straight- line velocity (VSL), curvilinear velocity (VCL), beat cross- frequency (BCF), hyperactivity, and sperm concentration. After this, the sperm underwent capacitation in a medium based on TCM-199 and incubation for a period of 1 hour, after which the same parameters were evaluated. The results are shown in table 1.

Table 1. Mean values of selected parameters of fresh boar semen and semen after capacitation

		Fresh semen		Semen after capacitation	
Ejaculate n (%)		11 (40.74)	16 (59.26)	21 (77.78)	6 (22.22)
Motility (%)		50-60	over 60	under 50	over 50
Progresive motility (%) $\bar{x}$		52.65 (31.1-74.2)	60 (42.1-77.9)	25.75 (0-51.5)	64.7 (50.2-79.2)
Sperm concentration (mln/ml) $\bar{x}$		26.55 (14-39.1)	23.8 (12.1-35.5)	4.75 (1.7-7.8)	4.65 (2.4-6.9)
Hyperactive (%) $\bar{x}$		7.4 (2.9-11.9)	23.8 (3.4-28.6)	24.6 (0-49.2)	52.05 (25.1-79)
Motility	BCF (Hz) $\bar{x}$	6.9 (6.4-7.4)	7 (6.2-7.8)	3.95 (0-7.9)	6.95 (5.6-8.3)
	VCL (μm/s) $\bar{x}$	29.1 (24-34.2)	39.15 (26.7-51.6)	22.5 (0-45)	43.4 (31-55.8)
	VSL(μm/s) $\bar{x}$	59.5 (42.2-76.8)	62.5 (45.3-79.7)	34.8 (0-69.6)	96.5 (56.9-79.2)

The study has found that about 22%, i.e. 6 out of 27 boar ejaculates, both fresh and after capacitation, possessed very good parameters. It seems that the standard semen evaluation parameters, like motility and concentration are insufficient to evaluate its capacitation abilities. The following parameters should be added to the evaluation process: BCF, VCL, VSL and hyperactivity. In the next stage of this study, the correlation between semen parameters and their fertilization abilities using *in vitro* fertilization will be evaluated.

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THE EFFECT OF DIETARY SUPPLEMENTATION WITH XYLANASE AND GLUCANASE ON THE GROWTH PERFORMANCE OF BROILER CHICKENS

WPŁYW ZASTOSOWANIA DODATKU KSYLANAZY I GLUKANAZY W MIESZANKACH DLA KURCZĄT BROJLERÓW

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The aim of this study was to determine the effect of a dietary supplement containing xylanase and glucanase on the growth performance of broiler chickens.

The experimental materials comprised a total of 3600 one-day-old Ross 308 broiler chickens divided into 4 groups (T1, T2, T3, T4), with 15 replicates per group and 60 birds per replicate. The birds received diets containing 0, 100, 200 or 300 mg of a dietary supplement containing xylanase and glucanase per kg of feed. All diets were isocaloric and isonitrogenous. The birds had free access to drinking water and feed.

The growth performance parameters of birds, including body weight gains, feed intake and feed conversion as well as mortality rates, were monitored throughout the study.

During the first study period (days 0-14 of the feeding trial), broilers from experimental groups T2, T3 and T4 gained significantly more weight than broilers from control group T1 (ADG – 31.5 g, 32.0 g, 32.3 g vs. 27.1 g, respectively; $P < 0.001$). Feed efficiency values in groups T2, T3 and T4 were significantly ($P < 0.001$) improved in comparison with control group T1. Over the entire experiment (days 0-35), broilers from experimental groups T2, T3 and T4 gained significantly more weight (ADG – 60.6 g, 60.8 g, 60.7 g vs. 57.1 g, respectively; $P < 0.001$) and consumed significantly more feed (ADFI – 105.5 g, 105.5 g, 105.3 g vs. 101.1 g, respectively; $P < 0.001$) than broilers from control group T1. Feed intake was similar in all experimental groups. Birds from all treatment groups were in good health; mortality rates were lowest (0.55%) in group T2 and highest (0.89%) in groups T1 and T3.

The results of our study indicate that a dietary supplement containing xylanase and glucanase improves broiler performance if added at a minimum dose of 100 mg per kg of feed.

EFFECT OF FEEDING THE PREGNANT SOWS ON THE SELECTED BIOCHEMICAL AND HORMONAL BLOOD PARAMETERS

WPŁYW ŻYWIENIA LOCH PROŚNYCH NA WYBRANE WSKAŹNIKI BIOCHEMICZNE I HORMONALNE KRWI

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Nutrition of the sows during production cycle is subject to the changes due to the differentiated demand, determined by physiological state and varying productivity of females (Norms of nutrition, 1993, 2014; Results of assessment, 2013). In the case of deficit nutrition of mothers, we observe the negative consequences in the progeny, both during the pre- and the post-natal period and in mature age (Wu et al., 2006). The problem consists, first of all, in the incorrect intensity of individual growth and development of various animal species and in lowered quality of their products. The mentioned phenomenon is studied and quite well recognized, *inter alias*, in pigs (Oksbjerg et al., 2013; Rekiel et al., 2014; Rekiel and Królewska, 2014).

On the grounds of the results of the tests of blood parameters, we may evaluate the state of homeostasis of the organism and protein-energy reserves, as being important for mothers (condition) as well as for their progeny (the results of rearing) (Beyga and Rekiel, 2009; Bocian et al., 2015; Rekiel et al., 2015). On the mentioned above basis, we may also verify the intensity of female nutrition, what may be favourable in aspect of production, its level and quality.

The aim of the studies was to determine the basic blood parameters, characterizing the metabolic and hormonal changes of the sows fed during the low pregnancy period (41-70 day) with the standard (control group) or by 30% increased feed rate (experimental group). The observations included 16 F1 sows (PL x PLW), 8 animals in each group, fed individually since mating until termination of progeny rearing. The blood samples were three times collected from all sows from the main front vein (*v. cava cranialis*): I – at mating, II – on 70 day of gestation and III – at weaning of the piglets (35 day of rearing). In blood serum, the following biochemical indices were determined: albumins (ALB), total protein (TP), alkaline phosphatase (ALP), glucose (GLU), cholesterol (CHOL), triglycerides (TG), creatinine (CREA), urea protein (UREA) and also, hormones of growth (GH) and insulin (INS) as well as iron (Fe).

After periodical change in the level of feeding, the lowering of GH concentration (by 20%) and ALP in the blood of the sows from E group vs. C, was found, with the preservation of stability of differences between the groups for the remaining studies biochemical parameters, and insulin and iron. The lowering of GH concentration, as recorded in the own studies, is typical of the different, intensively fed animal species (Hornick et al., 2000; Martinez-Ramirez et al., 2009). It is also one of the compensating growth trait (Blum et al., 1985) what in relation to the own studies, should be recognized as a positive phenomenon.

Any statistically differences for the studied biochemical parameters, hormones and Fe between the sows from the experimental and control group during three research periods were not found ($P > 0.05$). It indicates that the employed change of the nutrition level has enabled preservation of homeostasis of the organism.

The studies were implemented within the frames of Grant of the Ministry of Science and Higher Education. Registration number of the research project: N N311 082639.

BARRIERS TO THE BEEF CONSUMPTION ACCORDING TO THE RESIDENTS OF PODKARPACKIE VOIVODSHIP

BARIERY KONSUMPCJI WOŁOWINY W OPINII MIESZKAŃCÓW PODKARPACIA

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For many people from different countries the beef is essential in the diet. The highest beef consumption is in the USA – the annual consumption per capita is 30 kg. Just behind the American are the French (27 kg per capita/ annually). Statistically in Poland in 2013 the annual consumption of that nutritional and precious meat was only 1.5 kg per capita. The beef consumption in 1990 in our country was 16.4 kg per capita. It dropped from 7.1 kg in 2000 to 3.4 kg in 2010. These dates underline that the beef becomes the Gourmand meat.

The aim of the researches was to learn what barriers to the beef consumption are among the residents of podkarpackie voivodship. These empirical researches were conducted in the second part of the year, using the original interview method. The number of surveyed people was 2110. All the respondents were adults who buys meat. The analysis of the barriers to the beef consumption took into consideration four criteria: – the fattening technology, – the price of the meat, – the meat quality and – the availability of meat.

The majority of the respondents were females (61.84%). Taking age into account, we can see that – 17.72% of the respondents were from 18-25 years old, – 23.75% were from 36-45 years old, – 21.75% were from 46-55 years old, and – 13.51% of the respondents were more than 55 years old. The biggest number of the respondents (46.78%) were people with the higher education.

Taking the place of residence into consideration – 55.07% of respondents were from villages. Almost half of the surveyed people said that their material status was good.

Considering the number of people belonging to one household – 3.56% of respondents came from one-person household. 43.55% of survived came from four-person or five-person households.

The researches have shown that 64.55% of all respondents were beef consumers, but the frequency of their consumption was quite rare. 29.74% of all survived people declared that they ate beef 2 or 3 times per month. 18.86% of respondents ate beef once a month and a very small group of respondents (21.14%) ate beef only a few times per year.

One of the barrier to the beef consumption was the fear of using some forbidden substances like antibiotic or hormones (36.96% of respondents pointed that problem) and using GMO fodder in animals (for 28.07% of respondents).

For 59.91% of survived people, the acquisition of beef in the shops was not a problem. The factor that made the beef consumption low was the price. In respondents' opinion (45.96% of respondents) the price of beef was high. For 37.59% of respondents the price was very high and for 7.19% of surveyed people the price was absolutely not reasonable. According to the majority of respondents (59.39%) the quality of beef was poor, and for 16.07% of respondents beef was not good enough to make a good food dish.

A quite big group of respondents (39.86%) did not want to buy beef due to its very poor assortment.

USAGE OF AZAPERONE TREATMENT TO MODIFY SOWS' BEHAVIOUR AFTER WEANING

ZASTOSOWANIE AZAPERONU W CELU MODYFIKACJI ZACHOWANIA LOCH PO ODSADZENIU

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The aim of the study was to evaluate efficacy of azaperone treatment of weaned sows in modification of behaviour, especially appease of aggression and moderation of social hierarchy fights.

The study was performed in large commercial unit and utilized 36 primiparous sows, F1 crossbreds of Polish Landrace x Polish Large White. The sows after weaning were housed in group pens of six animals each. Sows of randomly chosen three pens (n = 18) were subjected to azaperone treatment (Stresnil, Jansens, Belgium) by intramuscular injection in dose 2 mg/1 kg of body mass immediately after weaning (group A). The rest of females were served as controls (group C). The behaviour of sows were recorded using cameras and digital recorder, and analyzed hour to hour in case of rest, activity and aggression. The results were analyzed using U Mann Whitney test to compare the behavior of treated and control sows, and LSD test to compare behavioral changes hour to hour inside groups.

Control sows showed large activity during the 1st hour after weaning, followed by rapid decrease in the 2nd h, and maintaining of stable level until 5th h. Activity of treated sows was significantly ($P < 0.01$) lower during the 1st hour, because of stress blocking effect of azaperone, however, it was similar to normal activity of sows that time of day and was maintained during 3 hours, followed by mild, but significant ($P < 0.05$) increase in the 4th hour. There were no significant differences between groups between the 2nd and 5th hour, and then activity of both groups decreased, while the fall in control sows was more rapid causing an emergence of significant ($P < 0.01$) difference between groups (tab. 1). The level of aggression was significantly ($P < 0.01$) larger in control sows until the 10th h after weaning. The peak of aggressive behaviour occurred between the 3rd and 4th h in both groups, however, in control sows it was 10 times larger ($P < 0.01$) than in females after azaperone treatment (tab. 1).

Table 1. A comparison of mean (±SD) percentage of different behaviours in consecutive hours (1 hour = 100%) after weaning and the whole first day (24 hours = 100%)

Time	Resting		Activity		Aggression	
	A	C	A	C	A	C
1	52.9 ± 26.7^{X}	17.6 ± 16.7^{Ya}	47.1 ± 26.7^{X}	82.4 ± 16.7^{YA}	0.00 ± 0.00^{X}	1.14 ± 1.20^{Y}
2	56.8 ± 30.0	61.0 ± 13.0^{b}	43.2 ± 30.0	39.0 ± 13.0^{B}	0.00 ± 0.00^{Xa}	1.01 ± 1.48^{Ya}
3	60.1 ± 26.8^{a}	59.0 ± 29.7	39.9 ± 26.8^{a}	41.0 ± 29.7	0.47 ± 0.94^{Xb}	4.03 ± 5.87^{Yb}
4	49.0 ± 22.8^{b}	55.9 ± 29.3	51.0 ± 22.8^{b}	44.1 ± 29.3	0.22 ± 0.29^{XA}	3.30 ± 4.82^{Yc}
5	49.4 ± 22.4	57.3 ± 35.9^{b}	50.6 ± 22.4	42.7 ± 35.9^{C}	0.00 ± 0.00^{XB}	0.68 ± 1.10^{Yd}
6-10	54.5 ± 18.7^{XA}	75.0 ± 20.2^{Yc}	45.5 ± 18.7^{XA}	25.0 ± 20.2^{YD}	0.00 ± 0.02^{XB}	1.04 ± 3.96^{YA}
> 11	81.9 ± 21.2^{XB}	88.8 ± 22.2^{Yd}	18.1 ± 21.2^{XB}	11.2 ± 22.2^{YE}	0.00 ± 0.00^{xC}	0.00 ± 0.02^{yB}
Day	70.3 ± 25.7^{X}	77.9 ± 28.2^{Y}	29.7 ± 25.7^{X}	22.1 ± 28.2^{Y}	0.03 ± 0.22^{X}	0.64 ± 2.60^{Y}

means in rows inside category denoted different letter superscripts differ $^{xy}(P < 0.05)$ $^{XY}(P < 0.01)$
neighboring means inside columns denoted different letter superscripts differ $^{ab}(P < 0.05)$ $^{AB}(P < 0.01)$

To conclude, azaperone treatment was effective method decreasing aggressive behavior of sows after weaning, and this effect seemed to be long-lasting. Surprisingly, total activity of sows after azaperone treatment was larger than control females, except only the 1st hour after weaning.

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EFFECTS OF LYCOPENE USED FOR CURING TURKEY BREAST MUSCLES

EFEKTYWNOŚĆ STOSOWANIA LIKOPENU W PROCESIE PEKLOWANIA MIĘŚNI PIERSIOWYCH INDYCZEK

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For producers and consumers, the most important quality parameters of meat and its products include hydration properties and sensory characteristics that can be modified through the use of various additives. Therefore, the aim of this study was to evaluate the effects of lycopene addition in the curing process on acidity, water holding capacity and sensory quality of turkey meat.

The experimental material comprised 32 female Hybrid XL turkeys, reared to the age of 15 weeks. Throughout the experiment, all birds had *ad libitum* access to the same commercial pelleted feed. Turkeys weighing approximately 10 kg were slaughtered, and carcasses were dissected with the use of industrial methods in accordance with technological and sanitary standards applicable to the poultry industry. Carcasses were chilled at 4±1°C for 24 h.

The analysed material comprised a total of 64 breast muscles, of which 16 (RBM) were immediately transported to a laboratory. Another 16 (UBM) were heat treated in a convection steam oven, and 32 muscles were cured for 3 days in two types of curing mixture: without (CBM) and with addition of lycopene (CBM+Lyc) (0.27%). After completed curing, they were heat treated under the same conditions as UBM samples. All meat samples were analysed for pH_u value, water holding capacity by the Grau and Hamm method, shear force, hardness by TPA (texture profile analysis), and evaluated for sensory characteristics such as aroma, juiciness, tenderness and flavour.

Results demonstrated no significant effect of lycopene addition on the pH_u of final products (mean pH_u for all samples was 5.78). Water holding capacity for products with lycopene (5.67 cm^2) was lower than that of chilled muscles (4.59 cm^2) and UBM or CBM samples (4.83 and 5.20 cm^2, respectively).

Analysis of results from the sensory evaluation demonstrated that the addition of lycopene reduced ($p \leq 0.01$) scores for the intensity and desirability of the aroma of final products. CBM+Lyc samples were also less juiciness, and the differences with other products were statistically significant. The addition of lycopene for curing turkey breast muscles also deteriorated tenderness, which corresponded with higher ($p \leq 0.01$) values of shear force when compared to other samples. The highest scores ($p \leq 0.05$) for desirability and intensity of flavour were found for UBM and CBM products. However, no statistically significant differences in flavour were found between chilled muscles and CBM+Lyc products. Evaluation of hardness using TPA demonstrated that lycopene caused a significant increase ($p \leq 0.01$) in hardness compared to samples from other processing groups.

To summarize, the addition of lycopene for curing meat reduced water holding capacity and deteriorated the sensory properties of final turkey products, which was most likely associated with its acidity and characteristic tomato taste. Nevertheless, samples cured with carotenoid, despite reduced mean scores, were still characterised by good sensory quality.

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INFLUENCE OF BUTYRIC ACID OR SODIUM BUTYRATE SUPPLEMENTATION ON GASTROINTESTINAL FUNCTION IN LAYING HENS

WPŁYW DODATKU KWASU MASŁOWEGO LUB MAŚLANU SODU NA FUNKCJONOWANIE PRZEWODU POKARMOWEGO KUR NIOSEK

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Short-chain fatty acids (SCFA) play a very important role in maintaining normal structure, integrity and function of the intestine. SCFA or their salts prevent or reduce the growth of unwanted microorganisms and fungi in the digestive tract of poultry. Those acids play an important role in regulation of intestine pH and helps to improve the solubility of the feed ingredients, digestion and absorption of the nutrients. The main source of energy in the metabolism of intestinal epithelial cells in the intestine of poultry is butyric acid, which also is necessary for the proper development of the gut-associated lymphoid tissue (GALT), and is also considered as an important modulator of growth symbiotic intestinal microflora.

A total of 432 Lohmann Brown laying hens in age of 48 weeks were randomly assigned to three dietary treatments (9 replicates of 16 birds each treatment). The hens were housed in three-tier battery cages for 24 weeks. All birds were fed iso-nitrogenous and iso-caloric diets in mash form, and had free access to water. Control group (T1) hens were fed a basal diet, T2 group received basal diet supplemented with butyric acid (in amount of 500 g/t feed), T3 group received basal diet supplemented with sodium butyrate (in amount of 700 g/t feed). At the end of the experiment 9 hens from each group were slaughtered and gastrointestinal tract parameters were determined. The results were processed statistically by one-way ANOVA.

In the T2 significantly higher ($P = 0.005$) small intestine weight (with content) compared with T1 and T3 was obtained. The viscosity of the small intestine content tended to be higher in the T1 group compared to the T2 and T3 groups ($P = 0.069$). There were no significant differences ($P > 0.05$) in dry matter contents in the small intestine and pH of the intestinal contents. Hens supplemented with butyric acid had lower concentration ($P = 0.038$) of ammonia in caeca. Dietary supplementation with butyric acid or sodium butyrate contributed to a significant higher ($P < 0.05$) activity of bacterial enzymes in caeca, and concentration of butyric acid in the caecal content.

It can be concluded that butyric acid and sodium butyrate had a beneficial influence on selected parameters of gastrointestinal tract.

THE EFFECT OF SOURCE OF FAT IN THE DIET ON THE N-6 AND N-3 FATTY ACIDS METABOLISM PATHWAYS IN THE BODY OF GROWING PIGS

WPŁYW ŹRÓDŁA TŁUSZCZU W PASZY NA SZLAKI PRZEMIAN KWASÓW TŁUSZCZOWYCH Z RODZINY N-6 I N-3 W CIELE ROSNĄCYCH ŚWIŃ

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The aim of the study was to determine the effect of source of fat in the diet on the n-6 and n-3 metabolism pathways in the whole body of growing pigs.

The study was carried out on 24 gilts (♀Polish Large White × ♂Danish Landrace). At 60 kg BW, six pigs were slaughtered (group "0"), the remaining were allotted into 3 groups (n = 6) and from 60 to 105 kg BW fed isoenergetic (average 13.5 ME MJ/kg) and isolysinic (average 7.4 g/kg standardized ileal digestible lysine) diets compounded with barley, maize, wheat, soyabean meal, and rapeseed meal. In each diet 13% of ME was replaced by energy coming from different fat sources supplying various fatty acids (FA): diet R – 5% rapeseed oil (source of linoleic acid, C18:2 n-6, LA); diet L – 5% linseed oil (source of linolenic acid, C18:3 n-3, ALA), diet F – 5% fish oil (source of eicosapentaenoic (C20:5 n-3, EPA) and docosahexaenoic (C22:6 n-3, DHA) acids). Experimental pigs were slaughtered at 105 kg BW. Regardless BW at slaughter, the entire gastrointestinal tract was removed. Then emptied gastrointestinal tract, viscera, and blood (VB) were autoclaved. After the chilling period, each right-half carcass was dissected according to a procedure described by Różycki (1996). Each primal cut was dissected into soft tissues (ST) and inedible parts (IP – skin, bone, head and feet). IP were autoclaved. Next, VB, IP and ST were ground separately and random sample of 500 g was taken, homogenized, packed into foil bags, frozen, and kept at -20^{o}C until analysis of the ether extract and FA composition (Folch et al., 1957). FA deposition was calculated as the difference between final and initial content.

Diets had no effect on the feed intake, average daily gain, chemical composition of the carcass, or total FA content in the body. Content of LA was about 15% higher in the body of pigs fed diets L and R than in those fed diet F (average 2204 vs 1910 g, $P < 0.01$). Arachidonic acid (C20:4 n-6) content ranged from 85.6 g (group F) to 125.9 g (group L, $P < 0.01$). Deposition of ALA and long chain (LC) n-3 PUFA was 11% and ten-fold greater in pigs fed diet F and three-fold and two-fold greater in those fed diet L compared with animals fed diet R (average 618 and 547, 1808 and 96 vs 555 and 55 g, $P < 0.01$). Pigs from groups F, L, and R deposited in the body approximately 65.7, 68.2, and 70.7% of consumed LA, respectively, of which 64.4, 64.9, and 67.2% was deposited as LA and 1.2, 3.4, and 3.5% as LC n-6 PUFA. The amount of oxidized LA ranged from 29.3% (in group R) to 34.3% (in group F). Pigs from groups F, L, and R deposited in the body approximately 69.4, 81.7, and 88.3% of consumed ALA, respectively, of which 78.1, 81.7, and 69.4% was deposited as ALA. Deposited EPA and DHA in pigs fed diets L and R were fully synthetized *de novo* from ALA (3.7 and 6.3% of consumed ALA, respectively), whereas in pigs fed diet F (rich in LC n-3 PUFA) it was hard to determine whether EPA and DHA were deposited directly from the diet or synthetized *de novo*. However based on the results of other authors (e.g., Poureslami et al., 2010) we assumed that the pigs deposited EPA and DHA directly from the diet. The remaining amount of consumed ALA (from 11.7% in group R to 30.6% in group F) was oxidized.

Based on the results of the study, it can be concluded that fat sources, even in isoenergetic and isolysinic diets, influence the deposition of both n-6 and n-3 FA in the pig body. Intake of LA and ALA influences their deposition in the body as well as the end products of the n-6 and n-3 metabolism pathways.

MORPHOLOGICAL AND MOLECULAR CHARACTERISTIC OF RYE NILS DIFFERING IN RECESSIVE DWARF GENE

MORFOLOGICZNA I MOLEKULARNA CHARAKTERYSTYKA BLISKOIZOGENICZNYCH LINII ŻYTA ZRÓŻNICOWANYCH POD WZGLĘDEM WYSTĘPOWANIA RECESYWNEGO GENU KARŁOWATOŚCI

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The aim of this study was to detect a morphological and molecular polymorphism between near-isogenic lines (NILs) of rye varied in terms of height. A number of researchers look for morphological traits correlated with lodging, which could be used in the selection of resistant genotypes. It is considered that the most associated with resistance to lodging is the height of the plants. Significant height reduction in cereals is caused by dwarfing genes. Experimental material was developed from the RIL population S120×S76. The dwarf mutant-plants appeared in the S_4 generation which was due to the presence of the recessive allele. The pair of sublines (typical and dwarf variant) were selected from the segregating heterozygous high plants of S_5 generation. NILs were characterized in terms of: plant height, number of internodes, length of the second internode and 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. Dwarfing genes are divided into two groups: gibberellin (GA) insensitive (unresponsive to exogenously applied GA) and sensitive. The gibberellic test executed in hydroponic experiment showed sensitivity to GA of both dwarf and tall forms of NILs. Three molecular techniques (DArT, DArTseq and RAPD) were used to assess genetic diversity of NILs and to find markers for dwarf gene. 3739 DArTs were obtained and 3 of them were polymorphic. There were 59672 SilicoDArT (DArTseq) markers obtained and 618 of them were polymorphic. Among 19049 SNP (DArTseq) markers 7 were polymorphic in investigated sublines. Out of 1 445 RAPDs tested, none were polymorphic for selected NILS. The results indicate a very high genetic similarity of obtained NILs. DArT-seq technology and F_2 mapping population, derived from hybrid between typical and dwarf NIL were used to establish a position of analysed gene in the rye genome.

GILT GROWTH ASSOCIATIONS WITH SOW LIFETIME PERFORMANCE

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Sow longevity and reproductive efficiency are critical for producers managing commercial farms. The fattening pig production is based on the appropriate sow keeping and feeding. However, worldwide the more and more intensive sow breeding led to decrease in productive lifetime of sows. It can be observed, that the management of several nucleus farms feed the gilts for sale more intensively than stipulated by technological specification – either for faster financial outcomes or for certain professional reasons – resulting overweight by the gilts.

The objective of this study was to compare the lifetime performance of the sows with different body condition and evaluate the effects of rearing intensity in Hungarian breeding farm.

Data of present study were collected form multiplier farms belong to commercial swine integration in Hungary. The examination was carried out on records of crossbred Dutch Large White and Dutch Landrace sows which were culled. Information from growth and reproductive performance were available in the farms led to breeding program (performance testing, herd book).

Dataset contained individual compositional traits (body weight, fat and loin thickness, percentage of lean meat), information about the reproductive performance (age at first mating, number of farrowing, total number of piglets born, number of piglets born alive and number of piglets stillborn) and culling records. The comparative examination was based on the body condition of sows, thus animals were divided in three categories according to their weight at the performance test (underweight, optimal and overweight). The number of underweight animals was minimal therefore these data were not taken into consideration.

All statistical analyses were carried out using SPSS 22.0 computer software. To the comparative examination were used the non-parametric Mann-Whitney test and the methods of survival analysis (Kaplan Meier method, Cox proportional hazard model).

In case of the overweight animals it was showed significantly higher fat thickness ($p < 0.001$) and higher loin thickness ($p < 0.001$). However, based on the results of nonparametric test it was not found statistical difference in case of other performance traits.

Analyzing the lifetime of animals the survival curves of two categories differed from each other. The values of test statistics showed significant difference ($p < 0.05$) in survival probability. Sows with optimal weight had significantly higher survival rate than of the overweight sows.

In addition, it was observed that the overweight sows had weaker reproductive performance: lower number of farrowing ($p < 0.001$) and lower number of piglets ($P \leq 0.001$).

Based on the results it can be said that the gilts growth have statistically significant effect on sow's lifetime performance. The overweight sows produce lower piglets than the optimally fed sows with normal body weight. Compliance to the technological specifications is the interest of the management, because the optimally kept animals produce on the best during their lifetime.

EFFECT OF YELLOW LUPINE IN THE MIXTURES FOR FATTENERS ON PRODUCTION RESULTS AND PORK QUALITY

WPŁYW ŁUBINU ŻÓŁTEGO W MIESZANKACH DLA TUCZNIKÓW NA WYNIKI PRODUKCYJNE I JAKOŚĆ WIEPRZOWINY

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Many experiments were carried out on model animals (rats) and pigs with the aim to determine value and suitability of the seeds of various species and varieties of lupines in nutrition of monogastric animals (King et al., 2000; Salgado et al. 2002; Jezierny et al. 2010; Stanek et al. 2010). After introducing them into feed rates, the obtained results encouraged to their application (Gdala et al. 1996; Roth-Maier et al. 2004; Froidmont et al. 2005; Zralý et al. 2007; Pisarikova et al. 2006; Hanczakowska and Księżak, 2012; Milczarek and Osek, 2014; Sońta, 2014). Therefore, the studies were undertaken with the aim to determine how the yellow lupine of Mister variety, being introduced as replacer of extraction soy meal affected the results of fattening and slaughter traits and pork quality. The studies included 30 three-breed ((Landrace x Yorkshire) x Duroc) hogs and gilts (1:1), with mean body weight of ca. 27 kg which were assigned to three groups (C, E1 and E2) and then, were fattened in three phase system, employing *ad libitum* feeding with a constant access to water. Extraction soy meal (group C) was the basic source of protein in full-ration mixtures for fatteners. Its participation in feed for experimental fatteners was decreased, replacing it partially with yellow lupine; the pigs from group E1 and E2 received the mixtures, containing ground lupine seeds in the quantity of 7.5% and 15%, respectively. The pigs were kept in groups, ten animals in each group. After completion of fattening, at mean body weight of ca. 116 kg, the animals were killed in accordance with the procedure, binding in the meat industry. After slaughter, the slaughter parameters were determined and the samples of *M. longissimus dorsi* were collected. Basic meat composition (protein, fat, collagen, humidity) were determined, using meat analyzer FoodScantmLab of Foos company. The own water-binding capacity, meat colour, free drip, cutting force, and fatty acid profile, were determined. From the main front vein (*v.cava cranialis*), blood sample was collected, separated and the following parameters were determined in blood serum, using biochemical analyzer Accent 200 of Cormway: TP, ALB, ALP, GLU, CHOL, HDL, TG, CREA, UREA, ASPAT, ALAT, and elements: Ca, P, Mg, Fe. The results were statistically elaborated, using package IBM SPSS Statistics 21. Normality of distribution was checked by Shapiro-Wilk test and the differences between the groups – by U Mann-Whitney test or Kruskal – Wallis test. Very good results of fattening were obtained; daily body weight gains in groups C, E1 and E2 were equal to 1056, 1075 and 1081 g, respectively. Meatiness of carcasses allowed classifying them in class E (EUROP); it was very good and little differentiated (C – 58.8%, E1 – 59% and E2 – 59.2%). Any significant differences in chemical composition of meat and its certain physical parameters (*inter alia*, water-binding capacity, colour) between the groups, were not found. Cutting force (N) differed between the groups (C – 92.3, E1 – 89.0, E2 – 83.6) but it was statistically insignificant ($P > 0.05$). The highest (2.23) and the lowest (1.23) percent of drip was recorded in groups E1 and C ($P \leq 0.05$). The participation of acids as specified in fatty acid profile, differed between the groups only in few cases; the participation of C18:2 was higher in group C vs. E1 ($P \leq 0.05$) and C18:2 and C20:4 was higher in group C vs. E2 ($P \leq 0.01$). The participation of PUFA, PUFA/SFA ratio and participation of acids from n-6 group was significantly higher in group C vs. E1 ($P \leq 0.05$) and C vs. E2 ($P \leq 0.01$). Values of all examined biochemical blood parameters were higher for the fatteners from group C as compared to experimental groups E1 and E2; significance of differences ($P \leq 0.05$, $P \leq 0.01$) was confirmed for GLU, CHOL, TRIG, HDL, TP, CREA, UREA, ALAT, Ca, P, Mg. The own studies confirmed the justness of applying yellow lupine in the mixtures for growing pigs.

THE USE OF LYOPHILIZED BOVINE COLOSTRUM IN REARING OF PIGLETS

WYKORZYSTANIE LIOFILIZOWANEJ SIARY BYDLĘCEJ W ODCHOWIE PROSIĄT

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Colostrum is the first milk gland secretions, appearing shortly before and secreted only in the first hours after birth. It provides for newborn piglets pre-humoral immunity and energy for the first few hours after birth. Fertility of sows is constantly increase, but it does not increase the production of colostrum. In addition, the access to the mammary gland for piglets coming from larger litters becomes very difficult, especially for the weaker piglets with lower birth weight. As a consequency of that there are the lost of piglets during rearing. The alternative seems to be the use of lyophilized bovine colostrum, which production often exceeds the actual requirements of calves. High quality of lyophilized bovine colostrum allows to use of it as a supplement or even substitute in the first hours of piglets life. The colostrum gives an appropriate level of immunity and energy and therefore have a positive influence on the body weight gains and minimize the cases of diarrhea of rearing piglets.

Therefore, the aim of the initial study was to compare of two groups of piglets receiving 5 and 10 g of lyophilized bovine colostrum and the influence of the colostrum on rearing piglets in the first 26 days of life. The research material consisted of 27 piglets originated from two primiparous crossbreds gilts Landrace and Yorkshire breeds.

Piglets from each litter were allocated into two groups (I group – 13 and II – group 14 piglets). In the first three hours after birth piglets received lyophilized bovine colostrum in doses of 5 g (I group) and 10 g (II group). The piglets after birth had free access to the sows. Before giving colostrum and at 26. day of life piglets were individually weighed. During the rearing of piglets the observations of cases of diarrhea and lost of piglets were made.

Analysis of the results of the body weight of piglets at birth, showed that the mean body weight in both groups were similar (1230 g in the I group and 1219 g in the II group). The body weight of piglets at 26. day of life were difference between the groups (I group – 4142 g, II group – 5014 g). This shows that the piglets which received the supplement of 10 g of lyophilized bovine colostrum were heavier on average 872 g than the piglets in group I (5 g colostrum). Higher body weight of piglets in II group was caused by the higher average weight gain about 883 g per day. In both groups, there were no observed cases of cases of diarrhea and lost of piglets.

The results indicate that the use of lyophilized bovine colostrum supplement at a dose of 10 g in the first hours after birth had beneficial effect on health of piglets and their higher body weight gains. In order to confirm the preliminary results the authors plan to continue the study on a large number of animals coming from higher numbers of litters as weel as to peform the other analyses which allow to explain the possitive effect.

MICROSCOPIC ANALYSIS OF MICROORGANISMS IN SMALL WASTEWATER TREATMENT PLANTS

ANALIZA MIKROSKOPOWA MIKROORGANIZMÓW W MAŁYCH OCZYSZCZALNIACH ŚCIEKÓW

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The small wastewater treatment plant is a device or group of devices which – through mechanical, biological and chemical processes – reduces the pollution load to the values specified in the Regulation of the Minister of the Environment (2006). The quality of treated sewage in small wastewater treatment plants have a significant effect on the environment.

The aim of this research is to show the relationship between the growth of biomass and the effectiveness of removing contaminants from wastewater in individual wastewater treatment systems. The research was conducted in the SBR reactor and the hybrid reactor (SBR reactor filled plastic trickling, which support the process of nitrification).

The results of activated sludge volume after 30 min settling, microscopic analysis and quantitative and qualitative parameters of biomass in the aeration chambers were analysed. Microscopic analysis of biomass suspended was conducted to evaluation of the activated sludge. It showed an irregular shape of sludge floc originating from the classical SBR reactor. Biodiversity of activated sludge confirmed a good condition of sludge. Biofilm formed on carriers (hybrid reactor) didn't grow enough due to the long period of winter (low temperatures).

In summary, the structure of the biofilm and activated sludge floc is very sensitive to system parameters and external factors. Biofilm develops more slowly than activated sludge.

EFFECT OF SOIL TILLAGE SYSTEM AND STRAW RETENTION ON SOIL AGGREGATION AND WATER CAPACITY

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In Experimental station of Aleksandras Stulginskis University, Kaunas district, Lithuania, a long-term field experiment has been running since 1999. The experiment was investigated in 2014-2015, with soil samples from 2013-2014. The soil characteristics was sandy loam (*Endohypogleyi-Eutric Planosol*), horizon of 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}.

The experiment was performed by split plot design, 4 replications, totally 48 plots. Size of the plots: plot area – 102 m^2 (6 m x 17 m), net area – 30 m^2 (15 m x 2.0 m). The experiment was performed by six different tillage systems: 1) deep ploughing, 23-25 cm in autumn (CP), 2) shallow ploughing, 10-12 cm in autumn (SP), 3) shallow loosening with sweep cultivator and disc harrows, 8-10 cm in autumn (SL), 4) shallow loosening with rotor cultivator, 5-6 cm before sowing (SR), 5) catch crops for green manure incorporation with rotor cultivator, 5-6 cm before sowing (GMR), 6) no tillage, direct drilling (NT). Another factor of this experiment was straw incorporation (S) and straw removal (R) in the different tillage systems. The aim of our investigation to find out the differences in soil structure and water capacity with different tillage systems and straw retention.

The experiment showed that with straw incorporation in 0-10 cm depth there were less micro aggregates than in the treatment were straw was removed. The aggregate stability was higher in 10-25 cm depth with straw incorporation compared to straw removal. Shallow loosening was the treatment who gave the highest bulk density in both depths, which means that the soil with this treatment was more compacted than with deep ploughing. No-tillage treatment had a lower bulk density in the deeper layer, which means that this soil had more porosity. Deep ploughing had tendency not to be able to hold a high amount of water at 0-10 cm depth up to 300 hPa, while no-tillage treatment in deeper layer could hold water the best at lower pressures 4-100 hPa. In the treatment with shallow loosening, porosity significantly decreased in upper and deeper layer, while in the no-tillage treatment porosity increased in deeper layer to company whit deep ploughing.

BIOCHEMICAL PROPERTIES OF ZINC-CONTAMINATED SOIL

WŁAŚCIWOŚCI BIOCHEMICZNE GLEBY ZANIECZYSZCZONEJ CYNKIEM

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The aim of this study was to determine the degree of change the activity of enzymes in soil treated with increasing doses of zinc. An examination was also the role of urea fertilizer in alleviation of stress connected with the presence of zinc in the soil.

The experiment was performed in the laboratory condition using clay sand. Zinc was applied in the form of an aqueous $ZnCl_2$ solution, in doses corresponding to 0, 250, 500, 750, 1000, and 1250 mg Zn^{2+} kg^{-1} DM of soil. Also, urea as a nitrogen source was introduced into the soil samples in the amounts of 0, 250 and 500 mg N kg^{-1} d.m. of soil. During the experiment, the samples in triplicate were incubated at a temperature of 25°C, and the humidity was maintained at the level of 50% of the maximum water capacity. In the 2nd and 20th week of the experiment was determined activity of following enzymes: catalase, dehydrogenase, alkaline and acid phosphatase, urease and β-glucosidase.

The activity of the studied enzymes in the highest degree was depends on dose of zinc. The interaction between the degree of contamination with zinc and the retention time, was more important only in the case of urease activity. The highest disturbance associated with the pressure of zinc on the biochemical properties in the soil has been observed with 1250 mg Zn^{2+} kg^{-1} d.m. soil. In the 20th week of the experiment, in objects without nitrogen fertilization, sensitivity of enzymes under zinc pressure can be ranked as follows: dehydrogenase> urease> acid phosphatase> catalase> alkaline phosphatase> β-glucosidase. Confirmation of negative effect of zinc on the enzymatic properties is also low resistance index of enzymes in objects subjected to a strong pressure of the metal. Resistance of enzymes significantly dependent on the degree of the soil contamination, and soil supplementation of urea contributed to the reduction of disturbances caused by excess zinc. Cluster analysis (CA) shows similarity in the reaction of catalase, dehydrogenase and acid phosphatase activity to influence of zinc. But alkaline phosphatase and β-glucosidase respond otherwise. In turn, significantly influence to urease activity had retention time, which is reflected in the results of the percentage of observed variability factors (eta-square effect size). Distribution of vectors describing enzymes in principal components analysis (PCA) suggests that the dehydrogenases and catalase, and to a lesser extent urease too, similar responded to dose of zinc, dose of nitrogen and time of incubation. The clusters of cases suggest that the high activity of all tested enzymes was depended on application of the zinc in the range of 0 to 500 mg Zn^{2+} kg^{-1} DM soil, than from 750 to 1250 mg Zn^{2+} kg^{-1} DM soil.

ASSESSMENT OF CATTLE MINERAL STATUS BASED ON HAIR ANALYSES AND THE EFFECT OF SAMPLING LOCATION

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The exact mineral intake in the case of group housed and/or grazing cattle is unknown. Therefore we need markers which help us to control the mineral status of the animals. The mineral content of blood does not reflect the mineral supply as it is fluctuating uite rapidly. Several researcher proved that hair can be a good alternative method for blood or histological examinations of mineral exposure. However, there are some contradictory result, of which can be a reason of different sampling sites. The aim of our research is to examine the mineral status of Charolais cattles based on hair samples collected from several parts of the body. We tested 10 Charolais cattle of the Jászdózsa farm (Hungary). We examined samples from 3 body location (wither, side and quarter) for Ca, Mg, Na, Cu, Se, Zn. We cleaned the samples with ethanol from dirt. After adding nitric acid we predigested in ultrasonic cleaner. After being cooled we examined with hydrogen peroxide. Mineral analyses were carried out with ICP-OES (Perkin-Elmer, Optima 3300 DV). Statistical analyses were carried out with SAS (SAS Institute Inc., Cary, NC) GLM procedure. The difference among the body parts were tested with Tukey test. There were no significant differences in hair mineral content between the different sampling areas. In comparison to Puls (1994) reference values the concentration of Ca, Cu and Se showed adequate supply. We can conclude that when we take hair samples from body parts covered with short hair, than the location has no effect on mineral content. Based on the hair analysis we can agree that the mineral status was satisfactory.

CHROMOSOME INSTABILITY IDENTIFICATION IN FARM CATTLE BREEDS MAINTAINED IN POLAND, INCLUDING THOSE COVERED BY THE GENE POOL PROTECTION PROGRAM

IDENTYFIKACJA NIESTABILNOŚCI CHROMOSOMOWYCH U RAS BYDŁA HODOWANYCH W POLSCE Z UWZGLĘDNIENIEM RAS OBJĘTYCH PROGRAMEM OCHRONY ZASOBÓW GENETYCZNYCH

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The study was aimed at assessing the incidence of sister chromatid exchanges in the chromosomes of selected milk cattle breeds kept in Poland, including those covered by the gene pool protection program. The study involved the following varieties: Polish Holstein-Friesian, Simmental, as well as Polish Black and White, Polish Red and White, Polish Red, and White-Backed.

The experimental material was constituted by mitotic chromosomes obtained from an *in vitro* culture of peripheral blood lymphocytes collected from the analysed cattle breeds. 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. We determined the incidence of sister chromatid exchanges in the chromosomes.

Altogether, 6083 exchanges in 1200 metaphases were observed. Varying SCE frequencies were identified in the analysed cattle breeds. The Polish Holstein-Friesian cattle featured the highest sister chromatid exchange (1280), followed by Simmental (1046), Polish Red and White (1001), Polish Black and White (976), and White-Backed (920) breeds. The lowest SCE incidence was observed in the Polish Red cattle (860).

The observed differences in SCE frequency in the analysed animals can stem from breeding practices of varying intensity, the farming systems, and exposure to environmental factors with mutagenic and genotoxic properties – destructively affecting DNA replication and damage repair. Important factors with influence on the observed damage levels include the sex, age and breed.

The SCE test is a sensitive and reliable method enabling the assessment of animals for their vulnerability to negative environmental conditions. It helps evaluate the genetic resistance of both entire populations and individual animals. It can also serve as an important tool for the identification of genetically affected animals to eliminate them from reproduction and breeding procedures.

COMPARISON OF THE REPRODUCTIVE PERFORMANCE, FATTING AND SLAUGHTER BOARS UTILIZED IN ARTIFICIAL INSEMINATION

PORÓWNANIE WARTOŚCI TUCZNEJ I RZEŹNEJ KNURÓW WYKORZYSTYWANYCH W SZTUCZNEJ INSEMINACJI

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Insemination plays a big role in pig breeding and production. It allows a short time to get a large number of offspring after boars outstanding high fattening and slaughter. Selection of insemination boars with high performance features and high potential utilitarian can increase the profitability of pig breeding. In the present study investigated the usefulness of purebred boars and hybrids for use in artificial insemination. On the basis of these results, it was found that the greatest volume of boar ejaculates were characterized hybrids, which had the greatest number of sperm, resulting in an average of 27 doses from one ejaculate.

PHENOTYPIC TRENDS AND PHENOTYPIC CHARACTERISTIC OF WORKABILITY TRAITS IN POLISH HOLSTEIN-FRIESIAN COWS

TRENDY FENOTYPOWE I CHARAKTERYSTYKA FENOTYPOWA CECH ZDOLNOŚCI UDOJOWEJ W KRAJOWEJ POPULACJI KRÓW RASY POLSKIEJ HOLSZTYŃSKO-FRYZYJSKIEJ

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Workability traits are very important group of functional traits, which has a significant effect on the profitability of milk production. Two most important traits from this group are milking speed (MS) and milking temperament (MT).

The aim of this study is the investigation of phenotypic trends of workability traits and phenotypic characteristic for these traits in Polish Holstein-Friesian black and white cows (PHF HO). The research covered a total of 142 701 born in the years 2010-2013 and routinely evaluated in Poland in terms of workability traits. Analysis was conducted on data collected in database system SYMLEK belonging to Polish Federation of Cattle Breeders and Dairy Farmers. Data set was created based on half-sisters groups and HYS classifier (min. 10 half-sisters and min. 10 HYS). In Poland, in terms of workability traits cows are evaluated in points scale, during the second milking proof. Milking speed is evaluated in the range from 1 to 5 points and temperament from 1 to 3 points.

Depending on the age of birth mean scores for milking speed increases in the range from 3,1 points in 2010 to 3,17 points to 2013. For milking temperament mean score also significantly increases in the same period from 1,99 to 2,02 points. Tendencies to increase the average value of workability traits for cows also confirmed estimated phenotypic trends. Obtained coefficients of linear regression of mean values of workability traits depend on age of birth were 0,018 for MS and 0,01 for MT.

The results of the study indicate, that in the national PHF cows population there is a tendency to average, slightly accelerating milking by cows born in the following years, but at the same time they are increasing their nervousness.

In a study also examined the correlation between milking speed and temperament. Evaluation of workability traits were transformed in this way, the intermediate notes, reflecting the most desired form of workability traits are assigned the highest value rating scale (3 points for MS and 2 points for MT), a unwanted – were assigned lower values. Phenotype correlation coefficient between MS and MT calculated on such prepared data set was 0,195. This shows that cows which are milking fastest are the most nervous during milking. And calm cows milk with the optimal number of kg/min, which is not a threat for the health of their udder.

Based on the results of the study it can be concluded, that in Polish population of Holstein-Friesian cows there are partly negative tendencies in terms of workability traits, that justifies the work which aim is genetic improvement in terms of these group of traits.

CONTENT AND SAMPLING OF PHOSPHORUS WITH THE YIELD OF SPRING BARLEY AND WHITE CHARLOCK IN CONDITIONS OF SULFUR FERTILIZATION

ZAWARTOŚĆ I POBRANIE FOSFORU Z PLONEM JĘCZMIENIA JAREGO I GORCZYCY BIAŁEJ W WARUNKACH NAWOŻENIA SIARKĄ

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In connection with the deepening deficit of sulfur in plant production and the need to maintain a high yielding plants, must take into account of this component at the fertilization not only plants with the biggest demand for sulfur. The consequence of this is the need to conduct research on the effects of sulfur fertilizer on the chemical composition of crops, in particular on the macronutrient content, among them – on the phosphorus content. In years 2006-2008, in the strict three-factorial field trial was assessed the impact of sulfur application method (factor I, n = 2: soil, foliar), its forms (factor II, n = 2: elementary, ion) and dose (factor III, n = 4: 0, 20, 40 and 60 kg S · ha^{-1}) on the content and sampling of phosphorus of total yield (seeds and straw) spring barley variety "Antek" and white charlock variety "Barka". 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.
Charlock seeds were characterized by higher the average phosphorus content (7.94 g · kg^{-1}) than a grain of spring barley (3.58 g · kg^{-1}); also sampling this component with charlock crop (35.2 kg^{-1}) was higher than in the case of spring barley (32.0 g · kg^{-1}). Among the factors studied, only the amount of sulfur significantly shaped the value of these traits in both species tested. The use of 20, 40 and 60 kg S·ha^{-1} resulted reducing the phosphorus content in the seeds in comparison with the control. For the barley, the corresponding differences in compared with the control for the three years of study were middling 8.0%, 7.2%, 4.0%, and for charlock 3.9%, 5.3%, 7.5%. In the case of sampling of phosphorus, in both species not showed distinct directional changes depending on the dosage of sulfur. However in spring barley was found a higher phosphorus absorption by applying of elemental sulfur than ionic (mean difference was 4.6%). For the charlock higher absorption of the component was under the influence of sulfur ion (difference – 7.4%). Method of sulfur application generally was not affected on the content and sampling phosphorus with the yield of spring barley and white charlock.

THE ANALYSIS OF THE SULFUR FERTILIZERS MARKET IN POLAND WITHIN 1989-2014

ANALIZA RYNKU NAWOZÓW SIARKOWYCH W POLSCE NA PRZESTRZENI LAT 1989-2014

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In the last century, the acid rains were a serious threat to the European environment. They were mainly caused by the emission of the sulfur and the nitrogen oxides to the atmosphere from the anthropogenic sources (industry, motorization, and energetic policy based on the coal). Poland in 1980 s, in terms of the mentioned emission, occupied a third place (just after the German Democratic Republic and the United Kingdom) in Europe, which was counted as 10% of the global emission of these compounds on our continent. The average fall of the sulfur derived from the acid rains within those years in our country was amounted 60-80 kg/ha per year. The political changes in Poland after 1989 had a negative effect on the economic situation of the agriculture. The decrease of the farmers income had contributed to limitation in the usage of the mineral fertilizers as well as those containing the sulfur compounds as ballast (e.g. $(NH_4)_2SO_4$, K_2SO_4). An another example of this is the single superphosphate fertilizer (12% S) containing $CaSO_4$ whose consumption, over the past three decades declined nearly seven times. As a result of the political transformation and the ecological action taken, especially after the accession to the European Union, in many regions of Poland the plants showed the symptoms of the sulfur deficiency as a consequence of the deficiency of this nutrient in the soil.

The analysis of the assortment of the mineral fertilizers produced by Siarkopol in Tarnobrzeg, Zakłady Chemiczne Police, and Fosfory Grupa Puławy in Gdańsk, in the mid-90 s and in 2014 indicates that the fertilizer industry adopted to the agricultural needs in sulfur. While in the last decade of the XX century, the sources of the sulfur fertilizers were primary: the single superphosphate and the ammonium sulphate. Nowadays, the range of the mineral fertilizers containing this ingredient is very rich. On the fertilizer market a high growth in the share of the concentrated fertilizers is observed, most of them contains the sulfur. Apart from the fertilizers applied to the soil, farmers have many foliar fertilizers containing sulfur. In Poland, the largest sulfur fertilizer consumption takes place in provinces that are characterised by a high share of the oilseed rape in the crop structure. One of the leaders of this consumption is Kujawy and Pomorze Province with the participation of soils with low level of sulfur equals 71%.

EVALUATION OF FEEDING A DIOCTAHEDRAL SMECTITE CLAY TO DAIRY COWS FOR THE REDUCTION OF AFLATOXIN EXCRETION IN MILK

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Aflatoxins (AF) are a secondary fungal metabolites of *Aspergillus flavus* and *A. parasiticus*. They are known to be immunosuppressive, anti-nutritional, mutagenic and carcinogenic in a variety of species including humans. When AF-contaminated diets are fed to lactating animals, a metabolite from AFB1, is transferred to the milk as AFM1. We used 15 primiparous crossbred dairy cows (114 ± 14 DIM and 662 ± 52 kg of BW) in replicated 5×5 Latin squares to test the efficacy of smectite clay (Novasil Plus, BASF, Florham Park, NJ. United States) for the reduction of AF excretion in milk. Cows were housed in a free-stall barn, fed once a day via individual feeding gates and milked twice a day. The experiment consisted of five 14 d periods in which d 1 through 7 of each period were considered for data collection and d 8 through 14 were considered a wash-out phase. In each period, cows within square were randomly assigned to 1 of 5 dietary treatments: 1) control (**CONT**), consisting of a basal TMR with no clay or mycotoxin supplement; 2) clay diet (**C230**), consisting of control TMR plus 230 g of clay; 3) aflatoxin diet (**AFXN**), consisting of the control TMR plus AF fed at 117 μg/kg/d; 4) low dose clay with AF (**C115+AFXN**), composed of control TMR plus 115 g of clay and AF fed at 117 μg/kg/d; and 5) high dose clay with aflatoxin (**C230+AFXN**), consisting of TMR plus 230 g of clay and AF fed at 117 μg/kg/d. Data were analyzed using the MIXED procedure of SAS where square, period within square and treatment were fixed effects and cow within square was random. Feed intake ($P = 0.34$) and milk production ($P = 0.75$) were similar across treatments and averaged 19.7±0.56 kg/d and 21.1±1.33 kg/d, respectively. Concentration of milk fat ($P = 0.17$), protein ($P = 0.38$) and lactose ($P = 0.22$) were similar across treatments with averages of 4.91±0.20%, 3.85±0.10%, and 4.70±0.06%. Concentration of AFM1 in milk from cows fed CON and C230 was lowest ($P < 0.01$) at 0.03 and 0.01±0.06 μg/L. Addition of smectite clay reduced ($P < 0.01$) AFM1 in milk from 1.10±0.06 μg/L with the AFXN diet to 0.58 and 0.32±0.06 μg/L with the C115+AFXN and C230+AFXN diets, respectively. Total daily AF excretion of AFM_1 was reduced ($P < 0.01$) by the addition of clay; values were 0.64, 0.23, 24.38, 11.86, 7.38±1.71 μg/d, for CON, C230, AFXN, C115+AFXN, and C230+AFXN, respectively. The reduction in AFM1concentration and excretion are due to a reduced ($P < 0.01$) transfer rate by adding clay. Specifically, 1.07±0.08% of the daily AF intake was transferred to the milk of cows consuming the AFXN diet whereas the AF transfer rates in milk from cows that consumed the C115+AFXN and C230+AFXN were 0.52 and 0.32±0.08%. Adding smectite clay to the diet of lactating cows is an effective method to reduce the transfer and excretion of AFM1 in milk with no negative effects on dry matter intake, milk production and composition.

DETERMINATION OF CONTENTS SELECTED METALS IN HONEYS FROM REGIONS WITH DIFFERENT LEVELS OF CONTAMINATION

OZNACZANIE ZAWARTOŚCI WYBRANYCH METALI W MIODACH POCHODZĄCYCH Z REGIONÓW O RÓŻNYM STOPNIU ZANIECZYSZCZENIA

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Honey is a natural product made by worker bees from flower nectar or honeydew gathered by them. Honey belongs to a group of products which producing method has remained unchanged for thousands of years. Bees are an important factor for wildlife and also for people, because they are a key link in the process of pollination – the core of existence and reproduction when it comes to plants. Although having many features, preventive function of honey is amongst the most crucial ones. It is mainly due to chemical composition, determined by the type and species of a plant of which it is made from. Rich biodiversity of Poland's lands has a profound effect on the diversity of honeys, which contain macro- and microelements with amounts depending on apiaries' location, as honeys originating from non-industrial regions tend to support the healing processes more effectively than those from regions where substantial industrial presence can be observed.

In the study the content of zinc, copper and ferrum was determined in, respectively, rapeseed honey (*Brassica napus*), lime honey (*Tilia spp*.) and multifloral honey from several polish regions with different level of pollution in the total of 19 samples. Mineral elements were determined by flame atomic absorption spectrophotometer Thermo Scientific ICE 3000 SERIES AA and method of standard curves. Samples originated from various private-owned apiaries from all of the Republic of Poland, namely from the following voivodeships: Warmian-Masurian, Kuyavian-Pomeranian, West Pomeranian, Lesser Poland, Greater Poland, Pomeranian and Silesian.

The average metal content in the analyzed honey samples was: Zn 1.31 μg/g, Fe 0.48 μg/g and Cu 0.22 μg/g. The highest concentration of Zn, Cu was proved in multifloral honey (4.10 μg/g) and the highest concentration of Fe in the rapeseed honey (1.60 μg/g). The type of honey and its region of origin were determined as factors influencing levels of Fe and Zn. In all of the samples on average concentration of copper was fairly low, which could indicate no substantial environmental pollution and/or use of proper techniques during production.

In none of the analyzed samples of honey from different geographical regions of Poland the content of zinc and copper was higher than appointed by the Polish Standard PN-88/A-77626, being 15 mg/kg and 10 mg/kg, respectively.

THE INFLUENCE OF LITTER SIZE ON THE NUMBER OF STILLBORN PIGLETS AS RELATED TO VAGINA CERVIX LENGTH OF GILTS

WPŁYW WIELKOŚCI MIOTU NA LICZBĘ PROSIĄT MARTWO URODZONYCH W ZALEŻNOŚCI OD DŁUGOŚCI POCHWY I SZYJKI MACICY LOSZEK

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The aim of the study was to evaluate relation between litter size and the number of stillborn piglets according to vagina cervix length (VCL) measured in gilts during the first insemination.

The study was performed on 199 female pigs and included whole life reproductive performance (762 litters in total). A VCL of every gilt was measured during the first insemination using calibrated spiral catheter. Three groups of females were assigned according to the result of measurements: group S (short VCL 21-28 cm; n = 36), group M (medium VCL 28.1-34 cm; n = 121) and group L (long VCL 34.1-39 cm; n = 42) The information about litter size, liveborn litter size and the number of stillborn piglets were gathered after every parturition. The analyses of the mean number of stillborn piglets showed only numerical, but no significant differences among females with short, medium or long VCL (tab. 1). That is why 762 analyzed litters were additionally divided into 3 categories according to total number of piglets born: small litters (the number of piglets <10; n = 146), medium litters (the number of piglets 10-14; n = 457) and large litters (the number of piglets >14; n = 159). One way ANOVA and Duncan test were performed to analyze differences in the number of stillborn piglets: 1. among litter categories inside every female group, and 2. among female groups inside every litter category.

There were no significant differences among groups in the number of stillborn piglets in small litters, while, in medium ones this parameter in females from group L was significantly lower and in large litters in females from group S was significantly higher than in the rest analyzed sows ($P < 0.01$). The differences in the number of stillborn piglets in females of group S and M were significant ($P < 0.01$) among every litter categories, while in sows of group L significantly higher ($P < 0.01$) number of stillbirth were noted only in large litters (table 1).

Table 1. Mean (±SD) number of stillborn piglets depending on litter size and VCL

Litter size	Vagina cervix length			Total
	Short	Medium	Long	
Small (<10)	0.36 ± 0.87^{X}	0.31 ± 1.01^{X}	0.39 ± 0.78^{X}	0.33 ± 0.95^{X}
Medium (10-14)	$1.29\pm1.76^{A\,Y}$	$1.00\pm1.66^{A\,Y}$	$0.76\pm1.38^{B\,X}$	0.99 ± 1.62^{Y}
Large (>15)	$4.46\pm3.71^{A\,Z}$	$2.57\pm2.43^{B\,Z}$	$2.25\pm1.75^{B\,Y}$	2.61 ± 2.40^{Z}
Total	1.41±2.20	1.16±1.89	1.16±1.61	1.20±1.88

^{AB} means inside rows denoted different letter superscripts differ significantly ($P < 0.01$)
^{XYZ} means inside columns denoted different letter superscripts differ significantly ($P < 0.01$)

To conclude, the number of stillborn piglets increases with growing litter size, however, the level of increase is dependent on reproductive tract longevity reflected in vagina cervix length. The longer the VCL, the lower number of stillborn piglets in litters over 10 total born. Results seem to be next evidence indicating that VCL reflects uterine capacity and may be additional, simple to obtain index of potential fertility of sows, of large practical importance.

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THE CHARACTERISTICS OF SELECTED SPERM MOTILITY PARAMETERS IN THE MIXED AND NON-MIXED BOAR SEMEN

CHARAKTERYSTYKA WYBRANYCH PARAMETYRÓW RUCHU PLEMNIKÓW W MIESZANYM I NIEMIESZANYM NASIENIU KNURÓW

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Motility is a unique feature that distinguishes the sperm from other cells, and is closely related to the sperm fertilizing ability. Thus, the motility is a basic criterion taken into account in semen evaluation. 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 sperm motility is affected by many environmental and genetic factors, and semen plasma plays a crucial role in motility through its content of motility-stimulating substances. In practice, sows fertility may be higher if a mix of ejaculates from several boars is applied in the insemination procedure.

For this reason, the aim of this study was to compare the sperm motility in a liquid-preserved semen samples from the individual boars with the sperm motility in the semen mix, obtained by mixing the examined ejaculates.

The study was performed on 35 liquid-preserved ejaculates obtained from the purebred and hybrid boars. 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). At least 70% of progressively motile sperm was the main criterion for classifying the semen as useful for preservation. In the CASA analysis, the following subpopulations of sperm were considered: total motile sperm (rapid+medium+slow), progressively motile sperm (rapid+medium), fast motile sperm (rapid), slow motile sperm and no motile sperm (static). Every two days, for the period of ten days, we evaluated the preserved semen samples from two groups: group 1 – semen obtained from the individual boars (non-mixed) and group 2 – mixed semen from 2 or 3 different boars (mixed).

The results have shown that traditionally assessed progressive motility in the first day of the examination was 82.3% in the first group and 78.6% in the second group. After ten days of semen storing, the percentage of progressively motile sperm was 57.3% and 63.7%, respectively. In the CASA evaluation, the number of motile sperm in the first day of the study was 43.2% in the first group and 44.6% in the second group. At the end of the experiment, these values were 40.8% and 44.5%, respectively. In the case of total motility, we have shown that 97.4% of sperm in the first group and 96.7% of sperm in the second group were motile at the beginning of the study. At the end of the experiment these values were 87.8% and 90.5%, respectively. A similar tendency, expressed by a faster decrease in sperm motility in the non-mixed semen compared to the mixed semen, was observed in the case of the rapid and medium motility. Finally, less sperm showed slow motility or were static in the mixed semen in comparison with the non-mixed semen (25.3% vs. 36.1% and 13.8% vs. 24.3%, respectively).

Additionally estimated correlation coefficients have demonstrated the positive relationship between the percentage of progressively motile sperm assessed traditionally and CASA-assessed total motility (0.859), progressive motility (0.629) and fast motility (0.911) as well as the negative relationships with the medium motility (-0.134), slow motility (-0.860) and the lack of motility (-0.859).

To sum up, this preliminary study has demonstrated the clearly better sperm motility in the mixed semen in comparison with the non-mixed semen, especially in the last days of the analyzes. This indicates the merits of heterospermia in the pig stock production, particularly useful within the technologies that require the long-term semen storage.

EFFECT OF DIFFERENT TILLAGE AND FERTILIZATION ON DYNAMICS OF INORGANIC NITROGEN FORMS IN THE SOIL UNDER WINTER WHEAT

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The aim of this study was to review effect of different tillage and fertilization on inorganic nitrogen forms during the growing season 2013/2014 under winter wheat (*Triticum aestivum* L.). Dynamics of inorganic nitrogen forms was monitored in two soil depth (0-0.3 m; 0.3-0.6 m). In the experiment three main tillage systems for winter wheat were used: B1 = conventional tillage (to 0.25 m); B2 = shallow tillage (to 0.20 m); B3 = minimization tillage (to 0.15 m). Within each treatment were used three variants of the fertilization: 0 = unfertilised control; PH = NPK fertilization; PZ = NPK fertilization + plough down of post harvest residues. The study site was located at Dolná Malanta (48°19'N, 18°09'E) in southwest of Slovakia. Locality of Dolná Malanta is in 175-185 m above sea level and belongs to warm climate zone. A mean temperature of growing season was 10.2°C and a mean annual rainfall was 631.4 mm. The studied soil was a Haplic Luvisol (loess parent material). The experiment was organized by method of vertically divided blocks (divided into four parts). In each tillage systems were randomly placed three variants of the fertilization. Experiment was with four replications.

The average concentration of nitrate nitrogen was 4.55 mg · kg^{-1} over the whole research period. N-NO_3^- was ranged from 1.67 to 19.11 mg · kg^{-1}. Its dynamics was significant which is characterized by high coefficient of variation (79.70%). On the basis of our statistical result was found ($p < 0.01$) that depth of soil sampling and date of soil sampling had significant influence on changes of concentration of N-NO_3^-. On the other hand, tillage ($p = 0.3494$) and fertilization ($p = 0.3393$) did not show a statistically significant influence on the nitrate nitrogen concentration.

Dynamics of ammonium nitrogen is not subjected to such significant changes in the soil against to nitrate nitrogen. It also confirms coefficient of variation of N-NH_4^+ which was approximately 2 times lower (40.47%) as CV% of N-NO_3^-. Soil samples of N-NH_4^+ varied between 3.25-27.54 mg · kg^{-1} and its average concentration was 7.92 mg · kg^{-1}. With regard to the results of analysis of variance, treatments tillage and date of soil sampling showed a statistically significant effect on concentration of ammonium nitrogen at the 99% confidence level. Depth of soil sampling has a statistically significant ($p = 0.0115 < 0.05$) effect on N-NH_4^+ concentration. On the contrary, amount of N-NH_4^+ has not statistically influenced by the variants of fertilization.

The highest average concentration of inorganic nitrogen (19.56 mg · kg^{-1}) was found in autumn period. It was result of more favourable temperature and moisture conditions in the soil and climatic conditions and also of poor uptake by plants. Analysis of variance showed that only fertilization ($p = 0.2225$) had no statistically significant effect on amount of N_{in}. Despite this fact, we have seen slight increase in inorganic nitrogen concentration (0 = 12.46 mg · kg^{-1}; PZ = 12.46 mg · kg^{-1}; PH = 12.82 mg · kg^{-1}). We can conclude that increase in the content of N_{in} have been found at minimization tillage (13.91 mg · kg^{-1}) compared with conventional tillage (11.64 mg · kg^{-1}) and shallow tillage (11.86 mg · kg^{-1}).

On the basis of our results we can conclude that soil and climatic conditions were major factors influenced concentration of inorganic nitrogen in the soil.

EFFECT OF CLA AND LINSEED IN PIG DIET ON MEAT QUALITY OF PRESTICE BLACK-PIED PIGS

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The quality of meat is influenced by many factors ranging from piglet rearing to the final mechanisms of meat processing. External factors determining the quality also include nutrition. The components with higher proportion of omega-3 polyunsaturated fatty acids (PUFA) must be added to feed in order to change fatty acid profile. In pig diet, an emphasis is laid on the omega-3 fatty acids in fish oil and vegetable oils. The aim of this work was to study the effect of the combination of conjugated linoleic acid (CLA) and linseed in pig diets on meat quality and oxidative stability of meat.

Sixteen Prestice Black-Pied pigs were divided into two groups and *ad libitum* fed control diet and diet supplemented with ground linseed (70 g · kg^{-1}) combined with CLA-oil (20 g · kg^{-1}). The control, resp. experimental feed mixtures were characterized by 2.81 resp. 9.13 rel. % of omega 3 PUFA and omega6/omega3 PUFA ratio 9.39 resp. 2.91. The experiment started three months before slaughter. The parameters of meat quality were determined in meat samples collected 24 h post mortem. The statistical evaluation was performed using the computer program QCExpert (TriloByte Statistical Software Ltd.).

The supplementation of linseed and CLA did not significantly influence drip loss, meat shear force, intramuscular fat and cholesterol content ($P > 0.05$) in meat (Table 1). Production of aldehydes was increased during the storage of meat. Linseed and CLA supplementation resulted in higher values of TBARS. Dietary supplementation with linseed and CLA significantly ($P < 0.05$) decreased proportions of oleic acid and total MUFA in meat fatty acids. The supplementation with linseed and CLA also significantly ($P < 0.05$) increased percentage of linoleic, alpha-linolenic acid and both isomers of CLA (c9, t11 and t10, c12).

It can be concluded that linseed combined with CLA significantly changed the fatty acid profile of meat and but did not improve oxidative stability and several other meat quality traits.

Table 1. Meat quality of pigs fed a control diet and diet supplemented with linseed and CLA-oil

Parameter	Control	Linseed +CLA
Intramuscular fat (g · kg^{-1})	23.20±7.11	19.00±4.29
Cholesterol (mg · kg^{-1})	74.68±3.13	72.71±6.22
Drip loss (%)	2.37±0.34	2.32±0.30
Shear force (N)	71.74±2.02	67.03±6.99
Oxidative stability (malonaldehyde, mg · kg^{-1})		
day 1	0.037^{a}	0.121^{b}
day 3	0.065^{a}	0.175^{b}
day 6	0.104^{a}	0.222^{b}

Values with the same row not sharing the same superscripts differ significantly at $P < 0.05$

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EFFICIENCY NON-CHEMICAL WEED CONTROL SYSTEMS IN ORGANICALLY GROWN SPRING OILSEED RAPE

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Field experiments were conducted at the Experimental Station of Aleksandras Stulginskis University (Lithuania) in 2013 and 2014 and the soil was a *Calc(ar)i-Endohypogleyic Luvisol* (Drainic) according to the WRB 2014. This aim of research was to determine the impact of different non-chemical weed control systems on organically grown spring oilseed rape (*Brassica napus* L.) crop weediness and yield of seeds. Non-chemical weed control systems: 1) thermal (water steam), 2) mechanical (inter-row loosening), and 3) smothering (self-regulation). The spring oilseed rape variety 'Fenja' (8 kg · ha^{-1}) was cultivated in a certified organic field. Thermal and mechanical weed controls were applied in spring oilseed rape crops cultivated at a wide row spacing of 48 cm. For thermal weed control, a mobile thermal water steam device was used. The steam temperature was 99°C, and the heat exposure duration was 2 s. For mechanical weed control, inter-rows were loosened twice with a soil loosener (KOR-4.2-01, Ukraine) at the three-leaf stage of spring oilseed rape. In the smothering treatment, spring oilseed rape was cultivated at an inter-row spacing of 12 cm. Four replications were carried out in this experiment. Prior to the crop was bare fallow. The first analysis of number of weed seedlings was done prior to the application of weed control methods in three- to four- leaf stage of the spring oilseed rape. The number of weed seedlings was estimated in each replication in four randomly selected 0.10 m^2 sized plots. The second analysis was performed in marked weed accounting plots seven days after the application of weed control systems. The number and dry matter mass of weeds was assessed before spring oilseed rape harvesting in four randomly selected 0.25 m^2 sized plots. Data was statistically evaluated for quantitative characteristics using a one-way ANOVA and correlation-regression methods.

Thermal (1.5-1.8 times) and mechanical (2.5-6.8 times) weed control systems significantly reduced the number of weed seedlings in spring oilseed rape crop, compared with the weed smothering system. The most effective system of weed control in spring oilseed rape crop was mechanical (efficiency 30.9-75.5%). Efficiency of thermal weed control system, compared with mechanical, was lower – 28.4-40.0%. Before spring oilseed rape harvesting in plots where mechanical weed control was applied, compared with plots where weed smothering was used, the number of weeds was significantly 3.2-4.4 times lower, and dry matter mass of weeds was 2.2-3.1 times lower. In 2014, a nonlinear correlation was established between the yield of spring oilseed rape and the number of weeds and dry biomass of weeds before rape harvesting. In 2013, a nonlinear correlation was not established. The yield of spring oilseed rape seeds increased with increasing efficiency of thermal and mechanical weed control.

IMPACT OF UV-C RADIATION AND STORAGE ON CONCENTRATION OF PLANT PIGMENTS IN RASPBERRY FRUIT 'POLKA' CULTIVAR

WPŁYW PROMIENIOWANIA UV-C ORAZ PRZECHOWYWANIA NA ZAWARTOŚĆ BARWNIKÓW ROŚLINNYCH W OWOCACH MALINY ODMIANA 'POLKA'

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Raspberry (*Rubus idaeus* L.) is one of the most important species of orchard plants. Its fruit is suitable for an immediate consumption, freezing and it constitutes a good material for food processing industry. Its greatest advantage is the high nutritional value. Raspberries contain many vitamins, macro- and microelements. Additionally, they are an excellent source of powerful antioxidants, including, among others, plant pigments: carotenoids and anthocyanins. Carotenoids are unsaturated hydrocarbons naturally found in plastids in pant cells. They are the reason for the yellow, orange and red tones in fruits, vegetables and flowers. Furthermore, they are the precursors of vitamin A. Anthocyanins belong to polyphenol organic compounds – flavonoids. They occur in various plant parts, including leaves, stems, flowers, and fruits, less frequently in roots and wood. They are, however, unstable and their colours might undergo changes in an aquatic environment, depending on the pH. In acidic solutions (pH < 3) they are red; purple in neutral solutions (pH = 7); greenish-yellow or even blue in alkaline solutions (pH > 11).

The aim of this research is to study how the UV-C light affects the content of plant pigments in raspberries fruit.

The research material consisted of red raspberries (*Rubus idaeus* L.) 'Polka' cultivar. After irradiation with UV-C light for 0, 8, 16 and 24 minutes, one part of fruit was frozen right after irradiation, second part was stored for two days, and third for four days and than frozen as well. Subsequently, all fruit was lyophilized and ground. In so prepared material, two groups of plant pigments were determined, namely carotenoids and anthocyanins. The assessment of the total content of carotenoids was carried out according to the Wellburn methodology (1994) – for the extraction of pigments, methanol was used and the content of carotenoids was determined with a spectrophotometer. The total anthocyanins content was measured using the spectrophotometric method by Giusti and Worlstad (2000), which involves measuring differences between solutions of anthocyanins in pH = 1 and pH = 4.5.

Regarding the anthocyanins, their concentration increased until the 2 nd day and then started to decrease. Moreover, the highest concentration of anthocyanins was observed in unirradiated material and in the material irradiated for 16 minutes. Concerning the carotenoids, their concentration rose throughout 4 days of storage. However, there were no significant differences observed within different radiation stages.

The UV light has an impact on the level of anthocyanins in raspberry fruit but it does not affect carotenoids concentration. In addition, it is worth mentioning that the both groups of pigments are continuously synthesized throughout the storage time. Anthocyanins are synthesized within a much shorter time – two days after the harvest utmost. Carotenoids, on the other hand, were produced for at least 4 days.

COOLING OF BOAR SEMEN IN DIFFERENT EXTENDERS AND STORAGE TEMPERATURES AFFECT POST-THAW SPERM QUALITY CHARACTERISTICS

WPŁYW SPOSOBU SCHŁADZANIA NASIENIA I RODZAJU ROZCIEŃCZALNIKA NA WYBRANE PARAMETRY WŁAŚCIWOŚCI BIOLOGICZNYCH PLEMNIKÓW KNURA PO KRIOKONSERWACJI

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The success of boar semen cryopreservation is dependent on many factors, such as the type of extender and storage temperature used prior to freezing. This study investigated the effects of cooling of boar semen in different extenders at 17°C or 10°C on motion parameters and plasma membrane integrity of spermatozoa following freezing-thawing. Sperm rich fractions, collected from 3 boars, were diluted in 4 extenders: Androhep® Plus (AHP), Androstar® Plus, ASP (Minitübe, Germany), Safecell® Plus, SCP (IMV Technologies, France) and TRIXcell® Plus, TCP (IMV Technologies, France). The extended semen was stored for 2 h at 17°C and then for 24 h at 10°C prior to freezing.

EFFECTS OF TASCO© SUPPLEMENTATION ON EQUINE SEMEN CHARACTERISTICS

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Tasco© is a seaweed extract that has been studied previously to determine its effects on ability to increase reproductive traits in cattle and goats. For both artificial insemination and frozen semen techniques to advance it is important that the stallions produce sperm cells with high concentration and motility. The current study objective was to determine if oral supplementation of Tasco © would positively enhance equine semen quality by increasing sperm motility. Four, mature-aged, Quarter Horse stallions were blocked by age, body weight (BW) and body condition score (BCS) and randomly assigned into either a control group (CONT; n = 2) or treatment group (TASCO; n = 2); CONT horses received a basal diet of alfalfa, Bermuda grass hay and commercial grain product while TASCO group received the basal diet plus 1.5% of total dry matter intake in Tasco © daily for 90 days. Semen was collected from each stallion every 26 days. Semen samples were evaluated for motility, concentration, volume and progressive motility using a Computer Assisted Sperm Analysis (CASA) machine. Body weight and body condition scores were taken every 7 and 14 day respectively. Semen characteristics did not differ between CONT and TASCO horses. Body weight and body condition was similar among all stallion prior to the study and through the trial period. Ninety days of oral supplementation of Tasco © had no effect on sperm motility or concentration. This is the first study to investigate Tasco © supplementation in the horse; the calculated dose of Tasco © in the current study was determined from previous studies involving ruminants. Future inquiries should include digestibility of Tasco © and evaluation of dosage amounts in the non-ruminant animal. Additionally a longer feeding period (< 90 days) may result in significant difference.

THE OBJECTIVE EVALUATION OF BEEF CARCASSES

OBIEKTYWNA OCENA TUSZ WOŁOWYCH

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The objective evaluation of beef carcasses is becoming increasingly popular not only in the EU but on around world. In the recent time more and more researches have been performed on the automatic evaluation of beef carcasses. Also, the number of these devices in slaughterhouse is increasing. Despite the high costs associated with the installation of an objective evaluation of beef carcasses, the calibration process and certification tests required by the EU, system offers accurate evaluation system for precise valuation of the quality of beef carcass. WSVIA is a technology for the evaluation of the lateral parts of the carcass, which can be applied to industrial and commercial lines. For various reasons existing method of the objective assessment of beef carcass have limitation for scientific and commercial applications. It's a the method that can improve the precision and accuracy of beef carcasses evaluation, and currently used method of classification of beef carcasses in the EUROP system are subjective and dependent assessment of the classifier.

THE ASSESSMENT OF THE CLASSIFICATION OF BEEF CARCASSES IN EUROP DEPENDING ON THE CATEGORY SLAUGHTER

OCENY KLASYFIKACJI TUSZ WOŁOWYCH W SYSTEMIE EUROP W ZALEŻNOŚCI OD KATEGORII RZEŹNEJ

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Evaluation of beef carcasses in EUROP system consists of five classes of conformation and fat from E to P and from 1 to 5 and the category slaughter from A to E. The conformation score ranges from S (Superior), used to describe rare double-muscled carcasses, via E (Excellent) through to P (Poor) and from 1 (low) to 5 (high) for fat cover. Each conformation and fat class is subdivided into low medium and high classes marked as "+" for high, "without indication" for medium and "-" for low, respectively. Independent classification made a 3 evaluators. Evaluated 905 carcasses belonged to A slaughter category (carcasses of castrated males aged from 12 months to 24 months); 427 carcasses belonged to B slaughter category (carcasses of castrated males animal aged above 24 months); 856 carcasses belonged to D slaughter category (carcasses of cows); 501 carcasses belonged to E slaughter category (carcasses of other male animal aged above 12 months).The most common carcasses were characterized by a low level of muscle mass and the average fat content.

THE DIFFERENCE IN THE VISUAL ASSESSMENT OF THE CLASSIFICATION OF BEEF CARCASSES IN EUROP

RÓŻNICE W WIZUALNEJ OCENIE KLASYFIKACJI TUSZ WOŁOWYCH W SYSTEMIE EUROP

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A visual evaluation of beef carcasses in EUROP system determines the level of muscle and fat. Unfortunately, it is vitiated by an error subjective evaluation. 2689 beef carcasses are classified in different categories slaughter. 3 classifiers evaluated them in the same conditions prevailing on the slaughter line in accordance with the guidelines set out in Commission Regulation No.1249/2008. On the basis of the assessments made statistical analysis. The coefficient of variation (CV) for the standard deviation (SE) was the conformation class ~ 3% for the three categories slaughter A, B and E, and D – 2.16%. For a class of fatness CV for SE was 3 times higher. The results suggest that visual assessment of beef carcasses is not objective and is fraught with error evaluator.

THE OBJECTIVE EVALUATION OF BEEF CARCASSES*

OBIEKTYWNA OCENA TUSZ WOŁOWYCH

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Classification of slaughter animals in EUROP system is obligatory for all EU countries. Visual assessment of beef carcasses determines the level of muscle and fat in scales from E to P and from 1 to 5. Visual assessment is not fully objective and is fraught with classifier error, which has an impact on the final assessment of the carcass.WSVIA (whole side video image analysis) is a technology for the evaluation of the lateral parts of the carcass, which can be applied to industrial and commercial lines. For various reasons existing method of the objective assessment of beef carcass have limitation for scientific and commercial applications. Currently used method of classification of beef carcasses in the EUROP system is biased of an subjective assessment of the classifier. WSVIA is the method that can improve the precision and accuracy of beef carcasses evaluation. Consumption of beef has decreased over the recent years and the quality of meat which mainly originates from the dairy cattle is unsatisfactory for the consumers. Additional reason of lowering beef consumption is the high price of beef and the relatively low profitability of cattle fattening. Improved precision and accuracy of beef carcasses evaluation through the consolidation of the final product can guarantee the growth of both beef producers and consumer satisfaction and induce growth both demand and production of beef on the basis of terminal crossbreeds.

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EFFECTIVE ENTOMOPATHOGENIC FUNGI *BEAUVERIA BASSIANA* ON *SYRISTA PARREYSSI* SPIN. (LEPIDOPTERA: CEPHIDAE) UNDER LABORATORY CONDITIONS

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The female rose shoot sawfly (*Syrista parreyssi* Spin.) lay eggs in soft young rose stems. Larvae damage rose plant shoots and causes significan yield loss. Although various methods are being used to control this pest, its damage still continues on rose. In order to detect more effective microbial control agents against rose shoot sawfly and contribute to the integrated pest management studies of rose shoot sawfly, we studied the insecticidal effects of 15 (O-5, O-6, O-7, O-8, O-16, O-34, O-37, O-38, O-55, O-80, O-88, O-89, O-90, and O-94) different *Beauveria bassiana* isolates which obtained from soil collected different parts of Ordu province. Within 3 days incubation period, the isolates O-6, O-38 and O-90 had the highest (100%) mortality on larvae with 1×10^{8} spore/mL^{-1} followed by isolates O-80 with 91.7% mortality. Some isolates such as O-6, O-38, O-55, and O-90 had 100% mortality but they shown lower mycosis rates. Mycosis rates of O-38, O-55, and O-90 were 11.1%, 22.2%, and 22.2% respectively. Isolate O-6 had no mycosis. On the other hand, mortaliy and mycosis rates of isolate O-80 were 91.7% and 55.6% respectively. These results indicated that isolate O-80 can be used for microbial and integrated management of the rose shoot sawfly.

SEASONAL EFFECTS ON ANTIOXIDANT CAPACITY IN FRACTIONATED BOAR EJACULATES

WPŁYW SEZONU NA WŁAŚCIWOŚCI ANTYOKSYDACYJNE PLAZMY NASIENIA Z RÓŻNYCH FRAKCJI EJAKULATU KNURA

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Boar seminal plasma (SP) comprises a variety of antioxidants, which protect spermatozoa against oxidative damage. This study characterized the antioxidant capacity of boar SP originating from different ejaculate fractions. Ejaculates from 5 boars were split into 3 fractions as follows: F1, the first part of the sperm-rich fraction, SRF (F1); the remaining part of the SRF and the first part of the post-SRF (F2); and the remaining part of the post-SRF (F3). Besides analysis of total protein (mg/mL) content, the parameters representing the SP antioxidant capacity of each ejaculate fraction included the activity of superoxide dismutase (SOD, U/mL), glutathione peroxidase (GPx, U/mL) and antiperoxidant (APO, %), and total glutathione (GSH+GSSG, μM) content and Total Antioxidant Status (TAS, mM). The ejaculate fractions were allocated into two seasons: autumn-winter period (from October through March) and spring-summer (from April through September). ANOVA results revealed that seasonal period had a significant effect ($P < 0.05$) on all the analyzed parameters of the antioxidant capacity. Besides TAS, all the analyzed parameters of the SP were affected ($P < 0.05$) by individual boar variability and differences in the ejaculate fraction. It was demonstrated that the total protein content and APO activity were highest ($P < 0.05$) in F3 compared with both F1and F2 in either seasonal period. The SP harvested during the autumn-winter period exhibited approximately 2-fold higher total protein content and APO activity in each boar, irrespective of the ejaculate fraction. Significantly higher ($P < 0.05$) SOD activity and GSH+GSSG content were observed in F1 and F2 either during the autumn-winter period or spring-summer period. Furthermore, the SP displayed markedly higher ($P < 0.05$) SOD activity and GSH+GSSG content during the autumn-winter period in comparison with the spring-summer period, regardless of the ejaculate fraction. There were wide variations in the activity of GPx, being significantly higher ($P < 0.05$) in F2 and F3 in either seasonal period. However, the SP retrieved from each boar exhibited greater GPx activity during the autumn-winter period. The level of TAS did not differ ($P > 0.05$) among the boars and the ejaculate fractions within each seasonal period. However, it was found that TAS level was approximately 3-fold higher in the SP of most of the boars in each ejaculate fraction during the spring-summer period. Correlations were found between the parameters of the antioxidant capacity, but were more prevalent in F1 in either seasonal period, particularly during the spring-summer period. The results of this study indicated boar-to-boar differences in the antioxidant protection of the SP among the ejaculate fractions and between the seasonal periods. Furthermore, it has been reaffirmed that the SP of F1 and F2 confers better antioxidant capacity, which is required to protect spermatozoa against oxidative-mediated damage. Further studies are warranted to assess the relevance of these finding in the cryopreservation of boar semen. Supported by funds from the University of Warmia and Mazury in Olsztyn (No.11.610.003.300;11.620.016.300).

AGE-RELATED CHANGES IN TOTAL TESTOSTERONE LEVELS IN ZIELONONÓŻKA KUROPATWIANA (GREEN-LEGGED PARTRIDGE) ROOSTERS AND CAPONS

ZMIANY POZIOMU TESTOSTERONU WRAZ Z WIEKIEM U KOGUTÓW I KAPŁONÓW ZIELONONÓŻKI KUROPATWIANEJ

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In the European Union member states, birds can be caponized only by surgical castration. The method requires great precision, because fragments of the testicles or cells which remain in the body may induce testicular regeneration and production of sex hormones. Incompletely caponized birds are called slips [SIRRI et al. 2009]. A drop in testosterone levels leads to regression of secondary sexual characteristics and changes in the behavior of male birds. The comb and wattles are cut in caponized birds, capons do not crow, they become more docile and less aggressive, and do not fight for dominance [SIRRI et. al., 2009, CHEN et al. 2005]. Total testosterone levels decrease also with age. The aim of this study was to determine testosterone levels in Zielononóżka kuropatwiana (Zk) roosters, slips and capons.

The experimental materials comprised 200 Zk roosters. At 8 weeks of age, 100 birds were subjected to surgical castration. All birds were raised to 28 weeks of age, and were fed *ad libitum* commercial diets. Starting from 4 weeks of age, at 4-week intervals, blood samples were collected from randomly selected birds (10 roosters and, starting from 12 weeks of age, 10 caponized birds). Blood testosterone levels were determined by radioimmunoassay (RIA) using the DIAsource TESTO–RIA– CT kit (DIAsource ImmunoAssays S.A., Belgium). The data were analyzed statistically.

In Zk roosters, plasma testosterone levels were found to increase until 20 weeks of age (from 0.15 ng/ml in week 4 to 1.84 ng/ml in week 20, $P < 0.05$), and they remained stable in successive weeks (approx. 1.90 ng.ml A highly significant ($P < 0.05$) decrease in testosterone concentrations was noted in 12-week-old capons (4 weeks after caponization), in comparison with the control group. In this group, testosterone levels remained stable at 0.13 ng/ml until the end of the rearing period. In slips, testosterone concentrations tended to increase and reached 0.26 ng/ml at 16 weeks of age.

In Zk roosters, blood testosterone concentrations were found to increase until 20 weeks of age. Starting from week 20, they remained stable, which indicates that the birds reached sexual maturity. Testosterone levels were approximately 20-fold lower in capons than in roosters, which suggests that castration was performed correctly. In slips, blood testosterone concentrations increased after caponization, which indicates that fragments of the gonads remained in the body and continued to produce the hormone.

THE APPLICATION OF ACID OR ALKALINE HYDROLYSIS FOR THE DETERMINATION OF PHENOLIC COMPOUNDS IN SOIL SAMPLES MEADOW

ZASTOSOWANIE HYDROLIZY KWASOWEJ I ZASADOWEJ W OZNACZANIU ZWIĄZKÓW FENOLOWYCH W PRÓBKACH GLEB ŁĄKOWYCH

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The aim of this study was to determine the significance of the use of basic hydrolysis, after acid hydrolysis in the determination of phenolic compounds by high performance liquid chromatography (HPLC) in extracts from the selected soil samples collected in the complex of Czersk Meadows.

Pasture soil as compared with soil and forest crops have a higher moisture, more caries and decaying organic matter are thus adapted to grow lush grass and herbaceous vegetation. The surface layers of the soil profile is rich in humus, appearing due to the presence of roots and continuous biomass production, as well as slow anaerobic underground parts of plants.

The basic compounds belonging to the cell walls of plants are: cellulose, hemicellulose and lignin. Lignin play an important role in the formation of humic substances in soils damp and poorly aerated. Among the phenol derivatives of lignin present in the plant cells can be mentioned the following acids:

- hydroxybenzoic and derivatives thereof - acids: p-hydroxybenzoic, protocatechuic, syringic, vanillic, salicylic,
- hydroxycinnamic and derivatives thereof - acids: ferulic acid, p-coumaric, caffeic.

The research material was a sample of soil from the turf taken at six sites Czersk Meadows in two distances (5 and 25 m) from an irrigation ditch. Regardless of where sampling to testing, in all analyzed extracts 11 phenolic compounds were identified. Significant was the distance space sampling from the irrigation ditch: the total content of phenolic compounds in the extracts increased with distance.

An important element of this work was to study the use of so-called method of re-hydrolysis by subjecting the test material after acid hydrolysis, alkaline hydrolysis. As is apparent from the results, the higher the total amount of the analyzed compounds isolated by means of alkaline hydrolysis than the same acid hydrolysis method. The results obtained confirmed the literature reports that the method of re-hydrolysis enables higher yields of phenolic compounds present in the material, compared to the method which uses only the acid hydrolysis.

THE CORRELATIONS BETWEEN MORPHOMETRIC EVALUATION OF THE REPRODUCTIVE SYSTEM OF IMMATURE GILTS AND REPRODUCTIVE PERFORMANCE OF THEIR SISTERS

WSPÓŁZALEŻNOŚCI MIĘDZY MORFOMETRYCZNĄ OCENĄ UKŁADU ROZRODCZEGO LOSZEK NIEDOJRZAŁYCH PŁCIOWO A UŻYTKOWOŚCIĄ ROZPŁODOWĄ ICH SIÓSTR*

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The aim of the study was to evaluate the possibility of predicting the gilts' reproductive value based on morphometric characteristics of their sisters' reproductive system.

To perform tests in Slaughter Pig Testing Station (SKURTCh) in Mełno were selected 2 gilts from every 34 litters of Polish Landrace breed. Gilts were slaughtered after achieving 100 kg body weight. Dissected reproductive systems have been subjected to a detailed morphometric evaluation (Kapelański i wsp. 2013). The morphometric evaluation of the reproductive system included the following traits: uterine weight with the ligament, the length of the vagina and uterus cervix, uterus horns and uterus capacity as well as the dimensions of the oviducts. Part of gilts of the same 34 litters were allocated to reproduction. The reproductive value was assessed based on 3 litters subsequent born by gilts, included following traits: number of piglets in the 1st and 21st days of age, mortality of piglets, the proportion of boars and gilts in the litter and the length of the farrowing interval. Calculated the phenotypic correlations between the results of morphometric assessment of the tested gilts' reproductive system and reproductive performance results of their sisters.

It is worth to underline the significant correlation between the weight of the uterus ligament and the number of boars and gilts in the litter (in sequence: r = -0.248*; r = -0.326**); the length of uterine horns and the length of farrowing interval (r = -0.379*), where a shorter period between farrowing were occurred by gilts, which sisters were characterized by longer uterus horns. Moreover, demonstrated a significant correlations between the length of the right oviduct and both oviducts and the number of piglets at 21 days of age (in sequence: r = 0.242*; r = 0.257*). The authors suggest the possibility of predicting the reproductive value of gilts for reproduction based on reproductive system analysis of their sisters tested in SKURTCh.

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BACTERIA PROMOTING THE GROWTH OF RAPE IN THE STRICT FIELD EXPERIMENT

BAKTERIE STYMULUJĄCE WZROST RZEPAKU W ŚCISŁYM EKSPERYMENCIE POLOWYM

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In the research bacterial strains stimulating the growth of different varieties of the rape (*Brassica napus* L.) were selected. The strain selection was based on the analysis of their physiological properties, such as enzymatic activity, synthesis of siderophores and use of different carbon sources. The selected bacteria stimulated the growth and development of roots and hypocotyls of rape seedlings, both spring and winter varieties. Moreover, they served a protective role in the germination of seeds and the growth of seedlings under stress conditions, such as salinity or the presence of heavy metals in soil.

The aim of this study was to evaluate the effect of applying bacterial inoculum directly onto seeds on growth, development and condition of plants and a yield of the spring rape in the strict field experiment.

The seeds of the spring rape were inoculated with the bacterial suspension containing the rhizosphere bacteria *Massilia* sp. or/and *Serratia* sp. in the amount of $5.0 \cdot 10^7$ cfu/cm^3 immediately before sowing.

The strict field experiment was carried in 2014 at the Research Station Mochełek of the University of Science and Technology in Bydgoszcz. The beneficial effect of applying *Serratia* sp. or/and *Massilia* sp. directly to seeds on the growth of above ground parts and roots, concentration and accumulation of macronutrients and a seed yield of the spring rape was observed. The tested bacterial strains used together or separately resulted in the elongation of the roots as compared to the scientific control group. The analyses performed on the above ground part of the rape at the flowering stage showed that the single application of *Serratia* sp. increased the weight of the dry matter and the accumulation of the macronutrients (N, P, K, Ca, Mg) by 16.2% as compared to the scientific control group. The increase in a seed yield after the application of this strain also was larger and amounted to 11.1%. The use of *Massilia* sp. strain increased a seed yield by 5.8%, while the combination of both strains by 7.4% as compared to the scientific control group. The increase in a seed yield resulted primarily from an increase in the number of pods per plant. The tested strains used individually or in combination resulted in an increase in straw weight as compared to the scientific control group. However, this increase, similarly to the response of a seed yield and other characteristics, was larger after the single application of *Serratia* sp.

The results obtained indicate that in the future the tested bacterial strains can be used as components of biological substances potentially applicable in rape farming.

THE USE OF INDUCED GYNOGENESIS IN MAIZE BREEDING: RESEARCH ON *EMBRYO MARKER* TYPE INDUCER LINES

WYKORZYSTANIE INDUKOWANEJ GYNOGENEZY W HODOWLI KUKURYDZY: BADANIA NAD LINIAMI INDUKUJĄCYMI TYPU *EMBRYO MARKER*

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Due to the many benefits of using the doubled haploids in maize breeding process (e.g shortening of the breeding cycle, reduction of costs), this method is currently in the area of breeders' interest. Maize maternal haploids can be produced by using one of methods: androgenesis in vitro or gynogenesis in situ. In maize gynogenesis can be induced by pollination of normal maize with specific genetic stock, called "the inducer". The usefulness of inducer is determined by efficiency of induction (HIR- haploid induction rate-%), understood as the ratio of kernels with haploid phenotype (anthocyanin coloration of the endosperm and the lack of coloration in the embryo) to the total number of kernels obtained from the pollination. In 1966 Nanda and Chase, used for the first time a marker conditioning pigmentation of kernels in their research on maize haploids. Efficiency of induction increase (to a level of 3-5%) with the production of a first inducer by Lashermes and Becket in 1988. This inducer was called WS14, and was the result of cross between lines W26ig and Stock6. In 1994 Stock6 line was used by Sarkar and Shatskaya to cross with the Russian lines, which resulted in an inducer with induction efficiency of 6%. The same efficiency of induction was obtained in 1999 by Chalyk, in cross between Stock6 and Moldovian genotype. In 2005 a team from the University of Hohenheim, led by Rober has created a new inducer- RWS (a cross between an inducer KEMS and WS14), with an average induction of 8%. The efficiency of induction of the latest inducers (UH400, UH402) is about 9% (8-15%). In Poland, research on generation of maize maternal haploid-inducing lines are carried out in the Laboratory of Maize and Triticale at Plant Breeding and Acclimatization Institute-NRI in Radzików. These studies relate both to evaluation of the HIR of selected lines in crosses with different source of maternal genotype, as well as characterization of inducer lines. Already received lines are currently testing in terms of efficiency of maternal haploid induction. In the studies, in addition to having obtained the desired characteristics marker is used RWS inducer provided by prof. H. Geiger from the University of Hohenheim. As a result of research conducted in 2012-2014 difference in HIR was found among inducer lines depending on the genotype of the maternal genotype undergoing induction.