ABSTRACTS AND KEY WORDS
2020, № 1

AGRONOMY

D.A. Ryabov, M.Yu. Kozlova **INFLUENCE OF BIOLOGICAL PRODUCTS AND FERTILIZERS ON THE PRODUCTIVITY OF SPRING BARLEY WITH ADDITIONAL SOWING OF PERENNIAL GRASSES**

Two-factor field experiment was carried out at the research and training station of Ivanovo State Agricultural Academy in 2015-2017. The aim of the research was to establish cooperation effect of various biological products and modified mineral fertilizers on the productivity of spring barley with additional sowing of perennial grasses. As a result of the studies, it was found that the highest average yield of barley grain - 2.13 t / ha, was revealed in the conditions of timothy grass additional sowing as a sub-cover crop. At the same time, the combination of biological preparations Mizorin + Rizoagrin proved to be most effective; on average, the yield of grain and straw with this combination was 2.33 t / ha and 3.42 t / ha, respectively. When choosing meadow clover as a sub-cover crop, the maximum data on grain and barley straw yields of 2.92 t / ha and 4.26 t / ha, respectively, were obtained from the use of combination of biological products Mycorrhiza + Rizoagrin on the background of modified fertilizers. Under conditions of sowing a mixture of clover and timothy, the highest yields of grain and barley straw were 2.94 t / ha and 4.29 t / ha, respectively, obtained from the use of the biological product Rizoagrin on the background of modified fertilizers. In the course of the field experiment, positive data on additional income and profitability were obtained on most options, which were maximal in the conditions of replanting a mixture of herbs. Moreover, the largest value of the additional conditionally net income is 21.2 thousand rubles obtained from the use of preparation Rizoagrin on the background of modified fertilizers. And the highest profitability is 91.8% in the absence of presowing treatment of seeds.

Key words: *barley, perennial grasses, vesicular-arbuscular mycorrhiza, Bisolbifit, Rizoagrin, Mizorin, modified fertilizers.*

V.A. Alekseev, E.V. Gracheva

REACTION OF DOMESTIC AND FOREIGN POTATO VARIETIES TO THE USE OF GREEN MANURE

The article presents the productivity and quality of domestic and foreign potato varieties when grown in crop rotations with shortened rotation. As a green manure crop on control (permanent landing) we used mustard white after harvesting potatoes, in a two-field crop rotation-vico-oat mixture, and in a three-field-rotation- annual clover. The yield of potatoes of different varieties in crop rotations was significantly higher than in the control rotation. The prevalence of diseases in plantings and tubers on the background of 100% saturation was 1.5-2 times higher than in crop rotation. Plowing of green manure mass into the soil contributed to the containment of potato diseases. The most economically profitable are cultivation of a domestic variety Kolobok in crop rotations. Economic efficiency of growing potatoes in crop rotations with different degrees of saturation shows us that, on average, for 3 years, the most economically profitable cultivation of domestic variety Kolobok in the variants of 2 and 3 - full crop rotations, permanent culture are less effective. For example, the profit in the 2-pole crop rotation for the variety Kolobok amounted to 143 thousand rubles/ha, and in the 3-pole 193 thousand. rubles / ha, permanent culture-74 thousand rubles / ha (2-2. 5 times less). According to the variety Breeze, these indicators amounted to 133, 183 and 70 thousand rubles/ha, respectively.Cultivation of the Saturn variety was even less profitable, namely-112, 163 and 37 thousand rubles / ha, respectively.

Keywords: *variety, crop rotation, green manure crops, profit, recoupment.*

L. P. Kudryavtseva, O.V. Prasolova, L. N. Pavlova **SOURCES OF HORIZONTAL RESISTANCE OF FLAX TO SKEIN PATHOGEN IN THE**

SELECTION MATERIAL

The stage in studies of breeding material stability, varieties of flax to harmful organisms is the work on the formation, comprehensive study, maintenance and practical use of "Collection of microorganisms-pathogens of flax", which is formed on the basis of working collections in the 90 – ies. The study of cultural and morphological parameters is an integral part of the collection content. Cultural properties of isolates of skein pathogen are defined. Characteristics of two cultural types of skein pathogen biological samples (septoriosis) are given. The first type included biological samples forming concentric rings, differing in color, colonies in this case are dense, woolly. Here pycnidia are formed on the entire surface of the culture, the second type related strains, forming a sector dramatically different from the entire surface of the colony, pycnidia located in the centre of the colonies. Representatives of the first type are more common than of the second. Connection between morphological type of colonies and sporulating ability was found. Among the isolates of Septoria linicola, the largest number of spores formed isolates of the first type. Regularities in geographical distribution of strains of the first and second type and their relationship with certain flax varieties were not noted. Parameters of the size of spores and pycnidia of the pathogen are specified. The study of cultural and morphological properties will allow more targeted selection of biological samples to create a stable artificial population of the pathogen. In field conditions on artificially-provocative background to skein, in dynamics resistance to disease of breeding material of flax is defined. Among the studied 731 breeding lines of flax 11.3 ... 32.0 % occupied the line with a low rate of disease. Level of the sample horizontal stability is estimated on breeding lines with low "speed" of development of the disease. The selected genotypes with horizontal type of resistance for breeding practice: l-2685-6-7 l-2564-8-3, 013612-4-1-1, l-2421-5-11 l-2631-8-2 l-2654-8-11 etc. Lines: l-2634-6-4, l-2634-6-4, l-2686-7-2, l-2688-7-8, 0-13677-7-2 et al. are characterized by group resistance to Fusarium wilt, rust and skein. The use of the identified sources of stability with group stability in breeding programs allows to increase the efficiency of breeders and opens wide opportunities for stabilization and further growth, both productivity and quality of flax products. Valuable breeding material was transferred to the National collection of Russian flax for use in practical breeding.

Keywords: *flax, disease, biological sample, resistance, breeding line, skein (septoriosis), infectious background, horizontal resistance.*

Sokolov V. A. **PRODUCTIVITY OF SPRING WHEAT DEPENDING ON GROWING CONDITIONS**

Spring wheat is the main grain crop. Stable production of high-quality wheat grain is the key to the country's food independence. Therefore, the study of the elements of growing spring wheat technology, aimed at increasing the productivity of crops, is important. The study of the interaction of plants and microorganisms depending on the level of mineral nutrition in crop planning is currently of particular relevance. The use of biological products, growth regulators improves the mineral nutrition of plants, increases productivity and its quality, and also provides savings in mineral fertilizers. In the upper Volga region, the main spring crops are wheat, barley and oats. To further increase them in the region, it is necessary to study the characteristics of the formation of yields and determine the most productive crops depending on the level of nutrition, biological products and growth regulators. The scientific article presents the results of the study of these drugs on the productivity of spring wheat. In field experiments, it was planned to get 30, 40 and 50 tons of grain per hectare. Fertilizers for the planned harvest were made taking into account the agrochemical properties of the soil. From biological products used Flavobacterin, which has a protective effect against diseases and improves product quality, from growth regulators used agrochemicals HUMATE + 7 (10 % liquid concentrate), which is characterized by high biological activity. The yield level was determined taking into account the average long-term moisture supply and qualitative assessment of arable land. The indicators of photosynthetic activity of crops, crop and its structure, quality characteristics of grain and economic efficiency of growing spring wheat in the upper Volga region are presented. As a result of researches the optimum level of mineral nutrition for wheat, the efficacy of agrochemical diazotroph and programming yields of spring wheat, determined the photosynthetic activity of crops and grain yield, calculated economic efficiency of the studied techniques and established the qualitative characteristics of the crop. The program for obtaining the planned wheat yields in the years of the experiments was completed by 68-91 %. Close to the planned the program was implemented using a biological product and

growth regulator-74-91 %.

Keywords. *Crop, mineral fertilizers, biological products, photosynthetic potential, grain, economic efficiency.*

Bondarenko A. N. **INFLUENCE OF MINERAL NUTRITION AND SEEDING RATES MODES ON PHOTOSYNTHETIC PRODUCTIVITY OF WINTER TRITICALE CULTIVATED WITHIN KALMYK-ASTRAKHAN RICE IRRIGATION SYSTEM**

Increasing the production of food grain is currently one of the most important tasks of agro-industrial complex of the Russian Federation. One of its promising directions is justification and development of regional organizational and technological systems for sustainable crops and high-quality grain on the background of varying weather conditions. It is an urgent problem of agricultural production in the Caspian region. Agro-climatic conditions of the Lower Volga region are quite favorable for the development of grain direction. According to FSBNI "Caspian agricultural Federal scientific center of Russian Academy of Sciences" and the results of advanced peasant farms' activities, the development of intensive technologies of crops cultivation allows to obtain high yields of winter triticale - up to 4-5 t/ha. To reach such productivity it is necessary to make up to 400 kg of mineral fertilizers per hectare of crop rotation area. The purpose of the research was to develop elements of agricultural cultivation technology of winter triticale Valentin variety under climatic conditions of the North-Western Caspian sea, to obtain stable and high yields under irrigation (Bay checks). For the first time the author reveals the peculiarities of winter triticale crop formation depending on different seeding rates, mineral fertilizers levels at irrigation hole of 4200 m3/ha in the conditions of former fields of rice irrigation system (Deposit). A comparative analysis with the selection of the most promising treatment options was carried out. The elements of resource-saving technology of winter crops cultivation were justified under irrigation conditions, providing highly productive marketable products with high rates of photosynthetic potential.

Keywords: *winter triticale, irrigation, seeding rate, mineral nutrition mode, leaf area.*

D.I. Ivanov, N.N. Ivanova **DEVELOPMENT OF ROOT CELERY SEEDLINGS DEPENDING ON THE CONTENT OF VERMICULITE IN THE SUBSTRATE**

The article presents data of the influence of vermiculite content in the composition of soil-vermiculite substrates on agrophysical and agrochemical properties of substrates and on biometric indicators of root celery seedlings which grown on these substrates. The studies were conducted in the vegetation experiment, in the period 2014-2015 at the agricultural Institute named after N. P. Ogarev. We studied 7 levels of vermiculite content in the substrate, the properties of which were compared with the properties of pure peat and mixed soil-vermiculite-peat substrate. By the time of root celery seedlings planting into the open ground, volume of the root system, leaf area and plant biomass were determined. A positive effect on the properties of substrates and biometric parameters of seedlings was observed with the content of vermiculite in the substrate in the amount of 50 to 65 % There was a decrease in volume weight and acidity, increased moisture capacity, porosity. Adding peat to the soil-vermiculite substrate in an amount of 30% improved the properties of the substrate and biometric parameters of seedlings. The increase in the share of vermiculite in the substrate from 80 to 100% greatly reduces the biometric indicators of celery seedlings. The dependence of biomass from the agrophysical and agrochemical indicators of the substrate was curvilinear. The optimal values of substrate parameters were established: volume weight – 0.55 g/cm^3, capillary moisture capacity – 120 %, total porosity – 77 %, the proportion of solid phase – 22 %, liquid phase – 52 %, gas phase – 26 %, pH of aqueous suspension – 7.1, electrical conductivity – 0.16 mSm / cm. The greatest influence on the biometric indicators of seedlings belongs to agrophysical properties of substrates.

Keywords*: vermiculite, substrate, seedling, root celery, biometrics data, biomass.*

Shmeleva N.V. **EFFICIENCY AND FEED VALUE OF FESTULOLIUM-BASED GRASS STANDS IN THE UPPER VOLGA REGION**

Results of long-term researches on ways of creation of long – term highly productive legume-cereal grass stands on the basis of uncommon for the Ivanovo region culture-Festulolium are presented. As a result of research, for the first time in the region, an adaptive technology of cultivation of perennial grasses in mixed crops with the participation of this culture has been developed, which provides a balanced sugar-protein ratio of high quality feed and increases soil fertility. The main indicators of the technology: high adaptability to soil and climatic conditions, consistently high yields, balance and high nutritional value of green mass, increasing soil fertility due to the accumulation of a significant amount of biological residues and nitrogen, especially symbiotic, efficiency and effectiveness. The average for three years in a single crop Festulolium was characterized by the highest yield of fodder units among perennial grasses and have provided 3,88 thousand/ha of fodder units in the control and of 5.98 thousand/ha on the background of mineral nutrition. In the conditions of the upper Volga region, in order to increase the production of high quality ready-made feed, it is necessary to grow grass mixtures consisting of festulolium and basic perennial legumes, such as clover and alfalfa, variable in a ratio of 1:1, which provide a yield of green mass depending on the level of nutrition from 412 to 571 kg/ha, the collection of fodder units from 6.63 to 8.99 thousand units/ha, digestible protein from 756 to 1024 kg/ha. The effectiveness of the technology is determined by low cost, high level of profitability up to 500% and cost recovery – 4-5 rubles./ 1 rubles costs, as well as environmental friendliness.

Keywords: *festulolium, cereal grasses, monosowings, grass mixtures, sugar-protein ratio, forage crop productivity.*

M. A. Aleshin, L. A. Mikhailova **INFLUENCE OF CULTIVATION DEGREE OF SOD-PODZOLIC SOIL ON RESPONSIVENESS OF SOWING PEAS TO NITROGEN NUTRITION LEVEL**

The article presents the results of a vegetation experiment on studying an effect of increasing doses of nitrogen (factor C – N_0; $N_{0.05}$; $N_{0.10}$; $N_{0.15}$; $N_{0.20}$; $N_{0.25}$ g/kg of absolutely dry soil) and pre-sowing inoculation of seeds with biological preparation "Risotorphine" (factor B – no inoculation; by inoculation) on the formation of vegetative mass and grain yield of peas at cultivating in the conditions of a poorly cultivated (factor A_0) and of a medium cultivated (factor A_1) sod-podzolic soil. Cultivation degree of soil was expressed by such criteria as power of an arable horizon, value of metabolic acidity and content of mobile phosphorus, a degree of saturation of soil with bases. For experience tab there were used Mitscherlich cups with a capacity of 5 kg of absolutely dry soil (a.d.s.), in 16 repetitions of options. The experiments were conducted in the conditions of vegetation site on the territory of University Scientific Centre "Lipogorie" of FSBEI Perm GATA, guided by a science-based methodology. When harvesting peas for a green mass more intensive development and productivity of plants (23.3 and 58.9, 40.0, 78.8 g/cup, respectively) in the phase of stem branching and budding a beginning of flowering that is recorded for its use on the background of inoculation, usage of mineral nitrogen in a dose of 0.10 g/kg on a poorly cultivated soil and 0.15 g/kg a.d.s. on a medium cultivated soil. Applying of higher doses of nitrogen has a depressing effect on development of assimilating surface of pea plants on a poorly and a medium cultivated soil. When raising pea plants before harvest maturity of grain: in the conditions of a poorly cultivated soil for yield at the level of 7.92 g/cup, the process of carrying on only an inoculation of seed with microbial preparation "Rizotorfin" can be considered; in the medium cultivated soil varieties, plant peas impose higher requirements for the level of mineral nutrition the maximum yield in the experiment (which 9.22 g/cup), noted at a combined use of inoculation and mineral nitrogen in a dose of 0.20 g/kg a.d.s.

Keywords: *soil cultivation, sowing peas, plant responsiveness, seed inoculation, nitrogen doses.*

Mameev V. V., Torikov V. E. **VARIETY ROLE IN INCREASING PRODUCTION EFFICIENCY OF WINTER WHEAT GRAINS IN NATURAL AND GREY FOREST SOILS OF THE BRYANSK REGION**

The complex estimation of adaptability parameters of twelve varieties of winter wheat which have passed competitive ecological tests within three years on

Добавлено примечание ([M1]): Добавили, согласно замечания 4.1

the agricultural background of gray forest medium loamy soils of the experimental field of the Bryansk State Agrarian University has been presented in the article. The dynamics and growth of winter wheat yields in the region for the period 2010-2018, confirmed by the linear regression equation has been shown. The Influence of biotic and abiotic factors on the production yield of wheat is confirmed by indices of environmental conditions characterized by heat and moisture supply during vegetation period. The greatest inter-varietal yield was realized in years with high values of environment conditions index. The studied varieties realized their yields potential on average by 92.1%, and the best varieties with these indicators are: Moscovskaya 36, Moscovskaya 56, Nemchinovskaya, 57, Lgovskaya 4 and Avgustine, with the lowest coefficient of variation. The use of ranking varieties according to adaptive parameters allowed us to identify winter wheat varieties with environmental targeting. They are able to give a sustainable and stable yield in the soil and climatic conditions of the Bryansk region, such the varieties are Augustine (b_i=1,00, S_d^2 = 6,3, H_{om}=300,2, V=4,2%),, Oda (b_i=1,12, S_d^2 = 19,3, H_{om}=78,8,V=8,1%), Moscovsraya 39 (b_i=0,02, S_d^2 = 12,9, H_{om}=350,6, V=3,8%), Nemchinovskaya 57 (b_i=0,08, S_d^2 = 1,8, H_{om}=524,1, V=3,1%), Lgovskaya 4 (b_i=0,63, S_d^2 = 48,9, H_{om}=104,1, V=4,2%).

Keywords: *winter wheat, variety, yields, adaptability, stability, plasticity, homeostaticity, stress resistance, environmental conditions, productivity potential.*

VETERINARY MEDICINE AND ZOOTECHNY

N.I. Abramova, L.N. Bogoradova, G.S. Vlasova **BEST BREEDING MATERIAL OF AYRSHIRE BREED IN THE VOLOGDA REGION**

The research was carried out to determine the best breeding material of Ayrshire breed in the Vologda region on the basis of breeding study and productive characteristics of record cows. The novelty of the research is to assess the breeding material of highly productive sires, taking into account the selection of animals (domestic, foreign). The work was carried out on the basis of database on breeding cows of Ayrshire breed in the Vologda region in the amount of 1638 heads. Outstanding scientists Nikitina M. A., Matyukov V. S. believe that record cows play a significant role in the improvement of dairy cattle herds. According to the number of highly productive daughters the best bulls of the national selection were identified, namely Athlete 1592, Master 1020, Centaur 522, Oasis 1530. Also there were bulls of foreign breeds – Anatoli 711, Onni 127. The best lines of the most productive cows are: Urho of Errant 13093 – 35% of Sniperum 63640 – 20%, C. B. Commander 174233 – 20%. From the bull Baikal 3673 of Urho Erranta 13093 line four record cows were received, from the bull Centaur 522 line SB Commander 174233 – three cows. Record cows were obtained by various methods of cross-line and intra-line breeding. On the basis of the conducted researches the best breeding material of domestic and foreign selection allowing to define the perspective directions in selection and breeding work for increase of efficiency of conducting dairy cattle breeding is defined.

Keywords: *record cows, selection, genealogical line, sire, genetic potential, milk yield.*

A.S.Gerasimova, V.I.Tsys, E.A.Prishchep, D.V.Leutina

INFLUENCE OF ORIGIN ON MILK PRODUCTIVITY AND REPRODUCTIVE PROPERTIES OF SYCHEVSKAYA BREED COWS

The results of researches on studying of sires influence on milk production and reproductive properties of Sychevskaya breed cows, bred in the breeding farm, JSC "Vostok", Smolensk region. In order to determine sires, cows, which are able to increase milk productivity of the herd without compromising reproductive properties, population of full-aged cows, according to their origin, was divided into six groups. Their milk yield was analyzed for first and third lactations, mass fraction of milk fat and milk protein, live weight, coefficients of milk yield of cows and the sustainability of lactation. The most stable, in all groups, is the first lactation, then there is a decrease to the fifth lactation. Cows received from the bull of Sychevskaya breed Pyl 6782, for the first lactation have a productive advantage over livestock received from other bulls. In full-aged animals derived from this bull, this advantage is lost. The

daughters Hanke 6749, Holstein red-and-motley breed, have intensively promoting milk productivity, indicators of milk fat and protein is higher in daughters of Holstein bull Marder 6721. Reproductive properties were studied: open days and calving interval, age at first calving, days to first fertilization in lactation. The best reproductive properties have sychev bulls. After calving, reproductive function in daughters Naliv 6791(sychevskaya breed) were restored earlier, in daughters Hanke 6749 - for longer period. The correlation of signs is defined: milk yield between lactations, milk productivity with mass fraction of fat%, live weight, age of the first calving, the period of days before the first insemination in lactation.

Keywords: *sire, milk production, lactation, reproductive properties, cow, Sychevskaya breed, correlation of signs.*

Omoeva T. B., Irgashev A. Sh., Ishenbaeva S. N. **HISTOLOGICAL DIAGNOSTICS OF MAMMARY GLAND NEOPLASMS IN CATS**

Mammary gland neoplasms in cats are at the top of the list of the most common nosological diseases among domestic animals; more than half of the tumors appear as malignant. Veterinary practitioners have many questions about the prevalence of breast tumors in cats, depending on age, breed and seasons of the year. The article presents the results of diseases prevalence of benign and malignant breast tumors in cats kept in the conditions of Bishkek. The characteristic of macroscopic and microscopic studies of benign and malignant breast tumors in cats at different periods of life and depending on the breed is also described. Studies were conducted in the period from March 2018 to March 2019. Morphological methods were used in the study of breast tumors. As a result of our research, we established the morphological forms of benign and malignant breast tumors in cats. Among benign neoplastic breast diseases in cats, breast lipoma was observed. Also among the malignant tumors of the breast met highly differentiated, moderately differentiated and poorly differentiated breast adenocarcinomas malnutrition and necrosis as well as the rare phylloid (leaf-shaped) fibroadenoma of the mammary gland which makes up only 0.3-0.5 % of all breast tumors.

Keywords: *cats, neoplasms, mammary gland, adenocarcinomas, lipoma, phylloid fibroadenoma, morphological diagnostics.*

Arkhipova E.N., Glotova L.N. **REPRODUCTIVE QUALITIES OF PIGS AT CROSSING**

Providing the population with quality and safe food, in particular meat, is one of the main tasks facing agricultural producers. An important role is assigned to pig breeding, since pigs are characterized by high fertility and precocity [1, p. 25]. The aim of the work was to assess the productive qualities of purebred and hybrid sows when crossing with purebred boars. The studies were conducted in the pig farm "Slavyanka". Productive qualities of sows were assessed by multiple pregnancy, large young, milk production, weight of the nest at birth and on the 30th day at weaning, as well as by the level of pigs' safety. These studies showed that hybrid sows outperformed purebred sows (13.70±0.40) in multiple pregnancy (14.6±0.04 piglets). The milk content of purebred sows was lower by 4.73 kg or 10.50 % than that of two-breed hybrids. The mass of piglets' nest at birth in crossbred sows when crossing with Pietrain boar outperformed the mass of purebred sows' nests by 3.4 kg, or 17,60%. The output of business piglets was almost the same and amounted to 13.01 heads have hybrid sows and 12.05 heads purebred. Safety of piglets was, respectively, 90% and 87%. Two-breed hybrids significantly outperformed purebred sows by nest weight at weaning by 14.3%, the average weight of one pig by 9.42%. Thus, studies have shown that crossbred sows crossed by terminal boar of Pietren breed, outperformed purebred ones on many parametres.

Keywords*: pigs, Large White, Landrace, Pietren, hybrid, reproductive qualities, crossing.*

Mazilkin I.A. **BREEDING VALUE ASSESSMENT OF VARIOUS INBREED TYPES OF VLADIMIR DRAFT HORSES**

Vladimir draft horse belongs to the group of breeds with limited gene pool and threatening status, since the total number of mares in the breed is no more than 200 heads. Vladimir breed horses are distinguished by endurance, ambitiousness, beauty and harmonious forms, good mobility and meet all modern requirements of a draft horse. The limited number of livestock and t distribution area leads to the use of inbreeding, which affects the quality of horses. Nowadays, two original inbreeding types have formed in the breed, characterized by typological features: Yuryev-Polsky and Gavrilovo-Posadsky. The aim of our work was to evaluate the breeding qualities of Vladimir draft horses of various internal breeds, to determine the best lines and families for further breeding and increase the number of breeds. As a result of the research, a change in the number of horse stocks over the past 40 years was analyzed; differences in the development of the main parameters and body type of these inbred types during evolution were established. A qualitative analysis of the breeding value of pedigree types is carried out. For this purpose, the typicality of horses, the exterior and the constitution according to the point system were evaluated. The main body indices (format, mass and bones) were calculated, and a differential assessment of tallness and bones was carried out. Evaluation of Vladimir breed mares by categories of breeding value showed that the largest number of horses of the 1st class was in Yuryev-Polsky inbreed type.

Keywords: *Vladimir draft horse, inbreed type, exterior, constitution, line, family.*

E.V. Egorashina, R.V. Tamarova **REALIZATION OF PARENTAL INDICES OF COW PRODUCTIVITY IN DIFFERENT MILKING BREEDS AT BREEDING FARM «AGROFIRMA «PAKHMA»**

Combination of genotypes of main types' genetic markers causes milk productivity in cattle. The article studies correlation between kappa casein genotypes (C3N3), beta-lactoglobulin (LGB), their complexes and milk production indices in cows bred under equal conditions at a breeding farm. The calculation of parental milk yield and fat indices between the three breeds showed a significant difference (P>0,999) of PCI of Ayrshire and Holstein cattle breed milk yield – 3395 kg, PCI of fat – 0,22%; between Holstein and Yaroslavl cattle breeds – 3200 kg, PCI of fat – 0,16%. A significant difference of realization indices of protein between all three breeds was not stated. The highest realization of parental milk yield index was stated - between Ayrshire and Yaroslavl cattle breeds– 113%, Holstein cattle breed – 88%. As for the fat and protein indices, all three cattle breeds showed a high realization of PCI from 98% to 109%. However, Holstein cattle breed showed the highest percentage: protein - 101%, fat – 109%. A significant difference of PCI realization of milk productivity in CSN3 and LGB genotypes was not stated. It was also stated that there is a tendency of high level parental indices realization when there is a higher number of B-allele variants in genotypes of cows.

Keywords: *Ayrshire cattle breed, Holstein cattle breed, Yaroslavl cattle breed, parental cow indices, realization of PCI, milk production, genotypes*

ENGINEERING AGROINDUSTRIAL SCIENCE

V.N. Zvolinsky, M.A. Mosyakov, S.V. Semichev **PROVISION OF SOIL TREATMENT TECHNOLOGIES WITH INTELLIGENT TOOLS AND CONTROL METHODS**

Increasing productivity in agriculture is unthinkable without the use of digital technologies based on the Internet and advanced technologies. Analysis of agrotechnical and environmental requirements for various technologies of tillage, both traditional and promising means of mechanization, shows that the timely registration, preservation and transmission of this data to the head computer requires using the most modern instruments and equipment. Devices designed for testing and operation of tillage machines and software for calculating operational and technological indicators, currently produced in small

batches, meet the tasks set for them, meet the current domestic industry standards, but their high cost and narrow specialization limits their use . The use of devices is carried out during the tests of tillage equipment during technical expertise, agrotechnical and operational - technological types of assessments, during energy assessment, reliability assessment, safety and economic assessment of the structure, the use of universal controls, also used in testing almost all agricultural machinery and tractors. Similar equipment of foreign production requires knowledge of a foreign language, necessary experience with foreign computing equipment and software. Creating favorable conditions for growing crops during the entire growing season, observing all the necessary tillage techniques, including tools with elements of digital control and regulation, taking into account the physical properties of the soil, its debris, mechanical composition and erosion, predecessors and features of new technologies of cultivation, will allow to achieve high results without additional investment.

Keywords: *digital technologies, tillage, control devices, information transfer, agrotechnical requirements, ecology, productivity, software, Internet of things.*

Zh. T. Temirbekov, I. S. Kadyrov, B. S. Turusbekov, M. S. Volkhonov

DEVELOPMENT OF A UNIVERSAL AUTOMATIC CONTROL SYSTEM FOR TECHNOLOGICAL PROCESS OF HOLE PROCESSING WITH A MULTI-TOOL

The industry serially produces hydraulic power heads, tables designed for drilling, countersinking and boring holes. The disadvantage of these power heads is that they are not universal in terms of the impossibility of rapid changeover from the drilling operation to the reamer. At the same time, two methods of processing holes with multi-blade tools are implemented. The first one is drilling holes in solid metal with a drill, in which the cutting tool experiences heavy loads, leading to premature wear and breakage. The second one is boring of the obtained holes after technological operations of drilling and countersinking, which leads to increased energy costs and labor of operators. The existing fleet of drilling machines, as a rule, is not equipped with automatic control systems of technological processes, allowing to ensure the quality of hole processing at high productivity. The article presents the original universal two-circuit scheme of automatic control of technological processes of drilling and reaming holes. The system controls the technological processes of drilling holes by switching the appropriate taps in the application of hydraulic power heads and improves the quality of processing and tool life. With the help of General transfer functions and according to the Raus – Hurwitz criterion, its stable operation is achieved both during drilling and deployment. The derived mathematical models make it possible to perform calculations to determine the mass-geometric and regime parameters necessary for the design and creation of automatic systems for controlling the modes of operation of hydraulic power heads.

Keywords: *Hole processing, automatic system, drilling, reamer, flow controller, mathematical model.*

SOCIO-ECONOMIC SCIENCES AND HUMANITIES

Konovalova L.K. **ECONOMICAL EFFICIENCY OF ORGANIC FERTILISER APPLICATION IN DIFFERENT PRODUCTION CONDITIONS**

The article describes the problems of production and economic efficiency for the application of different organic fertilizer species, including green manure, in different production conditions. The investigation was created on the base of experiments, carried out by agrochemistry and ecology department at Verkhnevolzhsky Federal Agrarian Research Centre on grey forest soils at Vladimir Opolie. General results are the following:

a) expenses on green fertilizer application into soil are by 1,9-3,9 times lower, than on manure (according transportation distance);

b) expenses according to the scheme "production of fertilizer + application" for green fertilizer are by 1,2-1,7 times lower, than for manure, despite mineral fertilizer was not applicated at green fertilizer production;

c) according to analysis of production efficiency in a component of crop rotation "productive fallow+cereal crop" on whole production cycle in recording missed benefit turned out, that cost recover of technological expenses is more at green fertilizer under all conditions;

d) in previous paragraph it is implied, that cereal crop yield after using of manure and green fertilizer is equal, however if crop capacity is lower by 7% after green fertilizer (weather risk) using, the results will be the following: within 3 km distance from place of manure keep to field the application of manure is more effective, but after 3km distance the green fertilizer is more effective;
e). taking into account variant with application of mineral fertilizer $N_{40}P_{40}K_{40}$ to green crop the critical distance, from which the application of green fertilizer is more effective was 8 km.
***Keywords**: organic fertilizer, green fertilizer, organomineral fertilizer system, production and economical efficiency, cost recovery, distance of transportation*

Gubanova E.V., Demicheva M.A. **DEVELOPMENT OF AGRICULTURAL COMPLEX IN THE KALUGA REGION**
The agro-industrial complex plays one of the most important roles in the region's economy and its development, including a large number of industries that are closely related to each other. Being aimed at the production of agricultural raw materials, their processing and distribution of the finished product, it is the main source of food for population, thus becoming one of the factors on which the quality and standard of living in the region depends. The degree of food security of a country also depends on the effectiveness of agriculture and related industries. Development of the agricultural sector requires substantial modernization of economy, which largely depends on the investment attractiveness and investment potential of the industry, which is dynamically changing depending on the market conditions and the socio-economic situation in the region. In these conditions, the assessment of the development of agro-industrial complex in the Kaluga Region and its investment potential as one of the fundamental industries in the region is of particular relevance. The article explores the investment potential of agro-industrial complex in the Kaluga Region using various methods: by analyzing socio-economic characteristics of the region, conducting a SWOT analysis and assessing investment potential using a simplified method based on the determination of key indicators within the production, financial, investment and export components of the potential . The results of the SWOT analysis show that the main strengths of the industry are its high innovative potential, investment climate and the availability of government support programs. Assessment of investment potential confirms the high level of development of the complex.

***Keywords:** agribusiness, investment, investment potential, investment climate, government support, SWOT analysis, summary assessment, simplified methodology, potential components, export potential.*