M. V. Gladiy, G. S. Kovalenko, S. V. Priyma, G. O. Golyosa, A. V. Tuchyk, L. V. Marchuk, V. P. Otsabryk, B. B. Lyolya. Comparative characteristics of milk productivity of Ukrainian Red-and-White Dairy, Ukrainian Black-and-White Dairy and Holstein cows in SE «Research Farm «Oleksandrivske»

The main goal of dairy breeds selection should be improving breeding and productive qualities of animals under modern conditions. The majority of farms, using native breeds to produce milk, has created optimal conditions for keeping and feeding, selection and matching, growing of replacements etc. Further improvement of created native dairy breeds for economically useful traits occurs at total use of purebred Holstein bulls (semen) of foreign selection. In order to realistically assess milk productivity (milk yield, fat content in milk and fat yield) of Ukrainian Black-and-White and Red-and-White Dairy cows should be conducted a comparative analysis of Holstein cows under the same conditions of feeding and keeping.

It was established that Ukrainian Red-and-White Dairy cows were characterized by the highest milk yields for 305 days of all lactations, taken into account, the among three investigated breeds. Their milk yield during the first lactation was 5933 kg of milk, during the second – 6393 kg, the third – 6391 kg and during higher lactation – 6650 kg. Ukrainian Black-and-White Dairy cows were second by milk yield (except for the second lactation), during the first lactation – 5932 kg of milk, the third – 6462 kg and higher – 6541 kg, and Holstein cows were third, during the first lactation – 5794 kg of milk, the second – 6381 kg, the third – 6335 kg and higher – 6469 kg.

The fat content was almost the same and varied within 3.49-3.58% in milk of Ukrainian Red-and-White Dairy cattle, 3.50-3.60% in milk of Ukrainian Black-and-White Dairy cattle and 3.50-3.56% in Holsteins' milk. The difference between the breeds was within 0.01-0.04%.

All the investigated breeds had predominance in fat yield for three lactations over standards of these breeds: Ukrainian Red-and-White Dairy cows from 75.1 to 93.4 kg, Ukrainian Black-and-White Dairy cows – 75.1-89.0 kg respectively and Holstein cows – 41.9-60.2 kg.

It was found different level of positive correlation between milk yield and fat yield in all the cases and high correlation ($r = 0.604\text{-}0.921$, $P < 0.001$) in five cases (41.7%)

Negative correlation coefficients indicate that selection of animals to higher milk yield in the herd will decrease the second trait – fat content in milk. Positive and highly significant correlation between milk yield and fat yield indicates that selection of cows in the herd to higher milk yields will increase fat yield.

It was revealed that bulls were among the factors impacted the milk productivity (milk yield, fat content, fat yield) of three investigated breeds. So, the force (η^2x) of father's impact on milk yield was15.4-47.9%, fat content – 22.0-43.4% and fat yield – 14.9-47.7% taking into account a lactation and a breed. The force of lines impact (η^2x) was second; it was on milk yield 6.1-24.5%, fat content

– 4.1-17.1 and fat yield – 5.8-23.5%. The force of breeds impact ($\eta^2 x$) was last; it was on milk yield 0.3-2.9%, fat content – 0.2-0.3% and fat yield – 0.6-2.7%.

So, the comparative studies of milk productivity of Ukrainian Red-and-White and Black-and-White Dairy cattle with Holsteins indicate that under similar conditions of feeding and keeping, these native breeds can compete with Holstein cattle. The milk yield for 305 days of higher lactation was 6650 kg of milk in Ukrainian Red-and-White Dairy cows, 6541 kg in Ukrainian Black-and-White Dairy cows and 6469 kg in Holsteins.

It was found the inverse correlation r = -0.025-0.316 between milk yield and fat content in milk in most cases. Selection and matching of animals in the herd should be carried out simultaneously on these traits. It was found positive repeatability of milk yields between the first and second, the third and higher lactations (r_s = 0.036-0.741), indicating the reliability of forecasting increase in milk productivity during the next lactations in all herd. Bulls have the greatest impact ($\eta^2 x$) on milk productivity among the factors taken into account: milk yield – 15.4-47.9%, fat content in milk – 22.0-43.4% and fat yield – 14.9-47.7%.

Keywords: **breed, lactation, milk yield, fat content in milk, fat yield, correlation, force of impact**

Yu. V. Vdovychenko, L. O. Omelchenko, A. V. Pysarenko,R. M. Makarchuk, N. M. Fursa, L. V. Vishnevskiy. Characteristic of Tauride type of Southern Beef cattle

One of the directions of modern breeding programs for native beef breeds of cattle is organization of activities to preserve genetic variability under control of absorptive pressure of initial breeds and inbreeding level. Therefore, the topical is search of alternative ways of improving genetic potential of productivity and its phenotypic realization based on population monitoring organization, substantiation of theoretical and methodological approaches for determining breeding value and analysis of inheritance and consolidation of main breeding traits in beef cattle. Geographically isolated breeds of cattle, which include Southern Beef cattle, need special attention. Adaptability to extreme conditions of the steppe zone, achieved through interspecific hybridization and receiving animals with poly-heterozygous genotype, allows using the breed as a basis for developing beef cattle breeding in Southern Ukraine.

The success of producing breeding resources depends on many factors, one of which is to work in specific herds. The aim of the publication is characterization of Tauride type of Southern Beef cattle.

The research was based on the breeding cattle of Tauride type of Southern Beef breed in «Askaniiske» farm of Kherson region. Analysis of productive and reproductive qualities of cows, growth and development of young cattle was carried out according to the initial breedingrecords. Materials of electronic information database SUMS "ORSEK-M" as of 2015were used. Statistical processing was performed using Microsoft Excel software.

Live weight of cows is one of main traits in beef cattle breeding. Cows' live weight after the first calving for Tauride type reliably increased by 5.97-7.04% (31-35 kg) accordingly, $P > 0.999$, due to improvement of growing conditions for replacement heifers and increase in live weight at the 1st mating to 380-390 kg.

Milk ability of cows reliably increased by 26.7 kg or 15.0% (204.9 against 178.2 kg), $P > 0.999$. Variability of the trait during consolidation by genotypes decreased by 1.26-1.30% and was 13.11-12.8-13.5% against 14.40-14.06-14.80% in 2008. Level of phenotypic variability is sufficient for further improvement of trait. The results caused by the trait selection of cows and improvement of paratypical factors, mainly feeding, during suckling period in calves.

Cows' age at the1st calving in Tauride type unreliably decreased by 0.4 months or 12 days, the level of the trait in type with low share of zebu blood declined by 1 month, in type with high share of zebu blood – by 0.3 months. Cows' age at the 1st calving in type with low share of zebu blood was reliably lower than in type with high share of zebu blood by 3 months (31.8 against 34.8 months), $P > 0.999$ and in Tauride type by 1.3 months (31.8 against 33.1 months), $P > 0.99$.

The number of cows with age at the 1st calving 36 months or less increased in Tauride type by 13% (from 74.1 to 87.1%), in type with low share of zebu blood – by

16.1% (from 76.5 to 92.6%), in type with high share of zebu blood – by15.8% (from 64.8 to 80.6%).

These results were obtained due to use proven bulls and assessed on own performance including daughters' reproductive ability, tough selection of replacement heifers, improving conditions of their growing.

In addition, the important at reduction in age at the 1st calving is consolidation of genotypic heredity by zebu in animals' genotypes, which in type with low share of zebu blood decreased by 2.93%, from 19.25% in 2008 to 16.32% in 2014, which contributed to prematurity and reduction in age at the 1st calving. "Share" of zebu heredity in type with high share of zebu blood increased by 2.68% (from 59.80 to 62.48%), reduction in age at the 1st calving – by 0.3 months or 9-10 days.

Reduction in cows' age at the 1st calving in Tauride type accompanied by the increase in level of consolidation of this trait, as evidenced by the decreased coefficient of variability in Tauride type by 5.2% (16.5 to 11.3%) in comparison with the approbation period. But the level of phenotypic variability is sufficient for further improvement of this trait.

In 2011-2014 length of calving interval decreased in comparison with the approbation period for cows of Tauride type by 22 days (5.43%) from 405 days to 383 days, including in type with low share of zebu blood – by 28 days (6.87%) from 407 to 379 days, in type with high share of zebu blood – by19 days, 4.71%, from 403 to 384 days respectively.

During consolidation the number of cows with calving interval 365 days and less increased in Tauride type by 2.9% (from 47.7 to 44.8%), in type with low share of zebu blood – by 4.0% (from 48.7 to 52.7%), in type with high share of zebu blood – by 3.6% (from 38.7 to 42.3%). This length of calving interval and presence of cows with calving interval 365 days and less (42.3-52.7%) provide receipt of calf per cow annually.

In 2011-2014 output of calves per 100 cows and heifers was 92.5% on average, which exceeded the level of 2001-2008 by 2.8% (89.7%), calf survival to 7 months' age – 97.3% (+ 7.2% to level of 2001-2008), output of calves at 7 months' age per 100 cows and heifers – 90.1% (+ 9.3% to level of the previous period).

Analysing bull calves' growth intensity and rate at consolidation determined that bull calves' live weight at 12 months' age increased by 2 kg (0.5%) in 2011-2014 and by 14 kg (3.7%) in 2014, and was 381-393 against 379 kg accordingly. Bull calves' live weight in type with low share of zebu blood increased in comparison with the period of approbation by14 kg, 3.6% and by 8 kg (2%) – 393-399 kg accordingly; in type with high share of zebu blood – by 4 and 6 kg (1.1-1.63%) – 372-374 kg.

In comparison with the previous period (2006-2010) increase in bull calves' live weight in Tauride type was 9 kg (2.4%) in 2011-2014 and 21 kg (5.6%) in 2014; increase in live weight in type with low share of zebu blood was 4 kg (1.0%) in 2014; in 2011-2014 bull calves' live weight was on the level of 2006-2010 – 393-395 kg. In 2011-2014 bull calves' live weight in type with high share of zebu blood was higher compared to level of 2006-2010 by 15 kg (4.2%), compared to 2014 – by17 kg (4.76%) and was 372-374 kg against 357 kg.

The variability of the trait during consolidation slightly decreased and was 9.2-15.4% in 2014.

During 2011-2014 bull calves' growth rate in Tauride type increased in comparison with approbation period by 36 g (3.13%), in 2014 – by 128 g (11.4%) and was 1187-1277 g against 1149 g. In comparison with the previous period (2006-2010) increase in growth rate was 31-121 g (2.5-10.46%). The increase in growth rate in type with low share of zebu blood was 80-145 g (6.7-12%) – 1273-1322 g in 2011-2014 and 2014 against 1193 g (2008). In comparison with the previous period, increase in this trait was 27-92 g (2.16-7.38%) – 1273-1322 g against 1246 g.

Growth rate in type with high share of zebu blood during consolidation increased by 58-95 g (5.4-8.9%) – 1119-1156 g against 1061 g. In comparison with the previous period increase in growth rate was 26-63 g (2.4-5.76%) – 1119-1156 g against 1093 g.

These results were obtained without use of any growth stimulants and biologically active substances. The main method of improvement is intrabreed selection at systematic assessment of bulls on its own performance and progeny quality and use of bulls with the index of breeding values $A \geq 110,1$ (on its own performance), $B \geq 101,1$ (progeny quality) for reproduction with simultaneous improvement of paratypical factors.

Consolidation of genotypic and phenotypic heredity under breeding "in itself" is aimed at further improving the breeding and productive qualities of cattle and further differentiation of Tauride type on two genetic types by "heredity" share of zebu.

Since the time of approbation (2008), cows' live weight after the 1st calving has increased by 31-35 kg (5.97-7.94%), $P > 0.999$, after the 2nd calving – by 0.5-1.85%. Age at the 1st calving declined for cows of Tauride type by 0.4 months or 12 days.

Growth intensity and rate increased by 10.46-12.0%. The influence of genotype on growth intensity and rate during periods of monitoring was 0.489-0.701 and it caused by "heredity" share of zebu.

Keywords: **zebu-like cattle, Tauride type of Southern Beef breed, adaptation, consolidation, variability**

P. P. Dzhus, O. V. Sydorenko, O. V. Bilous, R. G. Pashyan, R. F. Katsevych, O. V. Martynyuk. Assessment of bulls on their own performance as a part of Aberdeen-Angus native population improvement

Introduction. Aberdeen-Angus breed, selection achievement of United Kingdom, long time ago ceased to be merely a cultural heritage and became a global transcontinental obtainment in beef cattle breeding. Productive "attractiveness" of Aberdeen-Angus breed makes it a popular genetic resource in the cattle branch production. It causes the optimistic results of the statistical analysis of farm animal biodiversity for data of European EFABIS data base, according which the status of this breed can be defined as "not at risk".

Ukrainian population of Aberdeen-Angus formed in 1961 by importing breeding stock from Canada and animals of compact small type of Scotland (1962) and the establishment of breeding plant at the research station "Vorzel" of Agrarian Academy of Ukraine. The modern breed area covers 11 regions of Ukraine. According to the State register of breeding subjects in animal breeding on 01.01.2016, the stock has 7637 controlled heads (including 3475 cows, 80 bulls) and concentrated in 23 breeding subjects. For a long time, the Principal breeding center of Ukraine engaged with breeding farms' development and controlled the situation in the breed. At this institution base bulls were evaluated, semen was sampled and stored, information database of individual data was being formed and automated, breeding program were developed and plans for the bulls' matching were formed.

Currently low share of artificial insemination at 18%, lack of control of live bulls involvement in the matching campaign, limited activities of regional breeding associations on centralized bulls' assessment resulted in irreversible changes in the genetic structure of Aberdeen-Angus population, phenotypic manifestation of which is the youngsters' growth and development declining, low efficiency of feed conversion, cows' milk production decreasing, impairment in reproductive quality, increased exterior faults' and genetic anomalies level. One of the measures for improvement of breeding herds is individual evaluation of bulls, which can optimize the selection and matching of bulls for breeding stock for calves of high breeding value production. However, the re-orientation in consumer demand, incapability of internal market to ensure profitable beef production and breaks of export-import relations naturally led to a weakening of motivation for breeding bulls branch business and its state control. Thus, according to the technology of beef cattle breeding mainly with natural mating feasible is the realization of sires' on their own performance evaluation initial phase directly at the base of breeding farms in accordance with "Instructions on beef bulls' selection" and to perform the Ministry of Agriculture Order N154 on 13.04.2016 on the approving of the "Procedure of sires' breeding value determination by pedigree, their own performance, and progeny quality testing."

Analyzing the quantitative and qualitative indices of economic activity we've found that one of the prospective objects for future beef bull evaluation is breeding farm "Buffalo" of Manevychi district, Volyn region. There are 850 Aberdeen-Angus

dams (cows, heifers), evaluation power of the farm gives the possibility to evaluate simultaneously more than 400 animals. So, the aim of this paper is the analysis of Aberdeen-Angus bulls' evaluation on their own performance results.

Materials and methods of research. The study engaged 30 Aberdeen Angus breeding bulls of "Buffalo" farm. The selection of animals for evaluation was performed at the 210 days' age with previously conducted individual analysis of their growth during suckling period, using the materials of electronic information database "ORSEK-M". At the time of evaluation diet of growing calves presupposed gain getting not below 1200 g per day. Analysis of the growth and development of youngsters was done by the results of monthly weighing during the period from 8 to 12 months. Key bull's measurements was taken at 12 months' age. The evaluation was carried out according to Regulation "Instruction on beef bull selection". Statistical data processing was performed, using the Microsoft Excel software.

Results. Algorithms of determination and calculation of selection indices for evaluation of beef animals are chosen by representative organizations and approved at the level of each state. For countries participating INTERBULL (INTERBEEF) bulls' evaluation results are converted to a common information data base on which the matching and comparison of data for further use in the breeding work correction. The main features taken into account in the assessment of the breeding value are share of pure blood, live weight at different ages, the intensity of growth for average daily gains, exterior parameters (body measurements, linear features), milk production, calving ease, temperament (for some breeds, such as Charolais), term of economic use, sperm productivity indices and others. According to international recommendations EBV and EPD indices are calculated, which define contribution weight of each feature into integrated breeding value of an animal. Under the current law of Ukraine, the evaluation of beef animals is done with the definition of an integrated class at appraisal, bulls are evaluated by index A – own performance, B – quality of progeny. The main results of sires' evaluation were obtained during the process of native beef breeds creation.

In the course of our studies we've initially selected bulls of Aberdeen-Angus breed, taking into account the indices of their individual growth till 7-months' age. Totally there were selected sons of 7 Aberdeen-Angus bulls, including 5 native and 2 of German selection. Native bulls were of Wright Iver 9251195, BV Vinton 1342, Sauthoma Extra 715968, V.B.M. Henri 158013 lines.

At 210 days' age the average live weight of calves was 228,03 ± 6,750 kg, the average daily gain – 964,1 ± 30,881 g. Coefficient of variation for average daily gain at 17.5% reflects both the individual differences in eating behaviour of the researched calves during suckling and the differences in their mothers' milk production and nutritional value of milk. The average live weight of animals evaluated at 12 months was 389,3 ± 8,35 kg, average daily gain when growing – 1114,47 ± 34,208 g. The coefficients of variability of these traits are under 11.5% and 16.8% accordingly.

Average live weight at weaning and at 12 months' age exceeded its corresponding values, determined due to the minimum requirements for live weight of beef calves to reach the complex class "elite" and "elite-record."

Phenotypic features of farm animals' body built are the indicators of species' and breeds' specificity and individual characteristics of the organism, the totality of which forms the parametric basis for primary estimation of genetic potential of productivity. Expressiveness, harmony and age matching of body parts outline a general picture of individual growth and development and reflect the level of balanced nutrition and optimal technology accepted as a whole. At the group studied the bull's average height in rump at the age of 12 months was 115,70 ± 0,622 cm with a coefficient of variation 2.9%. Chest girth is 158,33 ± 1,18 cm with variability 1.2%. Average body length was 126,63 ± 1,162 cm with a coefficient of variation 5.0%. Testicular circumference, as one of the evaluation parameters of bull reproductive system, was 31,10 ± 0,564 cm with a coefficient of variability 9.9%. Thus, among the recorded traits, the largest variability was indicated on live weight, average daily gain and scrotal circumference. The least variability was indicated on rump height and chest girth.

Average value of complex selection index on all the researched bulls is 100,5 ± 0,9. According to the positions of Instructions, 14 calves with complex selection index above 100.0 may be allowed for further use as at the herds with natural mating, so put for assessment on sperm productivity at the State Enterprise "Volynian regional agricultural production enterprise on breeding business in animal breeding." This will allow to re-new the genetic material store from native valued representatives of the Aberdeen-Angus breed and partially restore local control over the use of sires in breeding herds as well as in households.

Therefore, it is feasible to continue similar research involving a larger number of animals, to consider the power of influence of mother genotype and conduct further evaluation of sires of Aberdeen-Angus breed on performance of their sons and daughters.

Conclusions. In similar conditions of feeding and management the realization of the genetic potential of productivity of Aberdeen-Angus bulls is different. The given results are the first step in the organization of systematic evaluation of sires' breeding value, analysing of inheritance of key traits of growth and development of animals and rationalization of the use of genetic resources of the breed in general and reduction in cost per unit of production in live and carcass weight.

Keywords: **beef cattle, Aberdeen-Angus, bulls, live weight, growth rate**

Y. P. Dynko. Growth and development of replacement heifers of Ukrainian Black-and-White Dairy breed of different constitution types

The features of growth and development of Ukrainian Black-and-White Dairy heifers of different constitution types were investigated in the article. The study was conducted in 2016 in the breeding farm APC named after Shchorsa, Kyiv region (n = 109). Differentiation of cows on constitution types was conducted by the methods proposed by O. M. Chernenko and N. N. Kolesnik.

According to the classification of O. M. Chernenko distribution of first-calf cows by constitution types was as follows: big-capacity type – 75 %, mid-capacity – 16 %, low-capacity – 9 %; according to the classification of N. N. Kolesnik – wide-body type – 56 %, narrow-body type – 44 %.

Advantage for most body measurements was in first-calf cows with big-capacity type which prevailed over the low- and mid-capacity type animals by height at withers by 2.9 and 0.9 cm, respectively, chest girth – 6.6 cm and 5.0 cm ($P < 0.05$). Advantage over low-capacity type by width and depth of chest behind the blades, width and depth of chest behind the last rib and the length of thoracic was 4.9 cm, 4.4 cm, 7.0 cm, 7.3 cm and 3.7 cm, respectively ($P < 0.01$ in all the cases). It was found the significant advantage for the metacarpal girth of big-capacity type animals over mid-capacity type animals – 0.5 cm ($P < 0.01$).

The first-calf cows with narrow-body type of constitution had advantage over wide-body type on such measurements: height at withers – by 1.3 cm, chest girth – 4.9 cm ($P < 0.01$), depth of chest behind the blades – 0.9 cm, depth of chest behind the last rib – 0.8 cm, width between pin bones – 0.9 cm, sloped body length and metacarpal girth – by 0.3 cm. The first-calf cows with wide-body type had advantage for width of chest behind the blades – by 2 cm ($P < 0.01$), width of chest behind the last rib – 3.1 cm ($P < 0.01$), length of thoracic – 0.6 cm and width between hips – by 2.9 cm ($P < 0.001$).

According to the classification of O. M. Chernenko the significant advantage only was found for long-leg index in animals with low-capacity type over big-capacity type – by 2.1% ($P < 0.01$). The animals with wide-body type of constitution compared to narrow-body type (according to N. N. Kolesnik) predominated by wide rear, long-leg, stretching and thoracal indexes by 2.4% ($P < 0.01$), 0.2%, 0.7% and 3.4% ($P < 0.01$), respectively. The first-calf cows with narrow-body type of constitution predominated for pelvic-breast index by 2.0%, compactness index – 3.1%, boniness index – 0.2% and narrow rear index – by 6.6% ($P < 0.001$).

It was found that the highest live weight from 3 to 18 months had heifers with mid-capacity type of constitution. The first-calf cows with mid-capacity type of constitution predominated over the first-calf cows with big-capacity type at 3 months' age by 7.6 kg ($P < 0.05$), the advantage over low-capacity type was 6.9 kg. Heifers with mid-capacity type of constitution at age of 6, 9, 12, 15 and 18 months compared to other groups had live weight by 13.8–18.6 kg, 16.7–23.2 kg, 11.4–29.3 kg 5.1–28.2 kg and 12.8–20.1 kg higher, respectively.

It was found that live weight of newborn heifers with narrow-body type was significantly higher by 1.2 kg ($P < 0.05$). Significant differences of live weight from birth to 18 months between replacement heifers with narrow- and wide-body types of constitution were not found; the difference varied within 0.5–3.3 kg depending on the age of the animals. Live weight during the first insemination of heifers with wide-body type was higher by 17.1 kg, but the difference was insignificant.

The heifers with mid-capacity type of constitution had the advantage over the other by the absolute gain from birth to 3 months – 9 kg ($P < 0,01$), low-capacity type – 6 kg. Also the heifers with mid-capacity type were characterized by the highest absolute gain in periods of 3.1–6.0 months and 6.1–9.0 months, that 6.1–11.7 kg and 2.9–4.6 kg higher compared with heifers of other types of constitution. In periods of 9.1–12.0 and 12.1–15.0 months the highest absolute gain was in animals with big-capacity type of constitution – 69.8 kg and 69.2 kg, respectively.

Regarding absolute gain from birth to 18 months significant differences between the repair heifers of wide- and narrow-body types of constitution weren't found, the differences varied within 0.1–3.8 kg.

The highest relative gain of live weight in periods of 0–3.0 and 3.1–6.0 months was observed in heifers with mid-capacity type of constitution – 206.2% and 72.8%, respectively. The relative gain of heifers in period of 6.1–9.0 months varied within 41.8–42.8%. In periods of 9.1–12.0 and 12.1–15.0 months heifers with big-capacity type had 3.9–4.3 % and 1.2–3.0 % higher relative gain compared to heifers with other types of constitution. In period of 15.1–18.0 months heifers with mid-capacity type of constitution predominated over animals with big-capacity type by the relative gain – 2.4 % ($P < 0.01$).

The difference of relative gain between the narrow- and wide-body types of constitution was 0.2–5.8 %, depending on the age period.

The heifers with mid-capacity type of constitution significantly prevailed over heifers with big-capacity type by daily gain by 100 g ($P < 0.01$) at the age of 0–3.0 months, the advantage over animals with low-capacity type was 67 g. At the age of 3.1–6.0 and 6.1–9.0 months daily gain of heifers with mid-capacity type was 29–68 g and 32–51 g higher compared to animals of other types. The heifers with low-capacity type significantly prevailed over heifers with big-capacity type at age of 15.1–18.0 months by 182 g ($P < 0.05$).

Significant differences for live weight and live weight gain between first-calf cows with wide- and narrow-body types weren't found.

Keywords: **Ukrainian Black-and-White Dairy breed, types of constitution, body measurements, body indices, live weight, live weight gain**

V. S. Kozyr, A. D. Gekkiev. Evaluation of lactation curves cows of the Ukrainian black-and-White cows depending on paratypical factors

It was proved that features of lactation curves of cows should be considered at developing breeding programs in dairy cattle breeding, contributing to an objective assessment of a genotype and thus, use of genetic and mathematical methods would increase probability of predicting performance for dairy herd.

Keywords: **cow, lactation, paratypic factors**

I. S. Kosko, I. P. Sheyko. Effect of hybrid boars of import selection on meat performance of pigs

Pig breeding is an industry the development of which makes it possible to provide an increase in accelerated meat production due to the precocity of animals, feed recoupment by weight gain, maximum adaptability to the conditions of industrial production at complexes. This makes it possible to provide an uninterrupted supply of the population with products in the shortest possible time.

Final assessment of meat productivity is set after slaughter of animal on the basis of quantitative and qualitative carcass parameters, which are subdivided into slaughter and meat traits. Performance of pigs is determined by quantity of the products obtained from them and suitable to be used in food products. The life determination of meat traits makes it possible to carry out their preliminary assessment.

The aim of the research – to determine the effect of hybrid boars (Duroc × Pietrain) on the progeny's meat performance.

A graded cutting and boning of five left half-carcasses of pigs of each genotype was conducted to determine the morphological composition and meat content in carcasses.

Analysing the data, it should be noted that animals of genotype (BLW×Y)×(D×P) by slaughter traits surpassed their coevals in the control group for pre-slaughter live weight by 2.0 kg (2%), weight of pair carcass – by 3.8 kg (5.4%), slaughter output – by 6.3 p.p., respectively.

Young animals of genotype (BLW×Y)×(D×P) surpassed coevals of other experimental groups on the pre-slaughter live weight by 0.6-1.6 kg, or 0.6-1.6%, by weight of pair carcass – by 0.4-1.1 kg, or 0.6-1.6%, by slaughter output – by 0.9-2.4 p.p. respectively.

The variation ratio for slaughter yield ranged 1.56-3.86%, indicating the uniformity of index in all the experimental groups.

The degree of variability in pair carcass weight was within 0.57-4.00%. A high variability of this trait was noted in the control group animals of genotype (BLW×BM)×D, and was 4.00%.

It was determined that the highest percentage in composition of chilled carcasses is taken by shoulder cut. So, for the young animals of genotype (BLW×Y)×(D×P), it takes 34.17%, that is 0.07 p.p. higher than in the control group and 0.21-0.27 p.p. than in other experimental groups.

The yield of spinal rib cut was higher with combination of the I experimental group and was 31.90%, that is 0.13 p.p. higher than with the control group hybrids and 0.3-0.9 p.p. compared with the other experimental genotypes. As for specific weight of the rear third part of carcass, the highest figure was observed in the animals of combination (BLW×Y)×(D×P) – 34.83%, that is 0.7 p.p. higher compared with animals in the control group. According to this indicator, young animals of genotype (BLW×Y)×(D×P) surpassed their coevals of the other experimental groups by 0.39-0.63 p.p. respectively.

The most valuable part of pork is the meat, consisting mainly of muscle tissue, concentrated in the skeletal muscle area. The definition of "meat" includes muscle, fat and connective tissue. The most important and useful part of the muscle tissue is

proteins. Adipose (fat) tissue is a type of loose connective tissue, the cells of which are filled with fatty inclusions. The fat in pigs is deposited under the skin almost uniformly (depending on the genotype). Uniform deposition of adipose tissue between the muscle fiber bundles gives “marbling” to meat, thus enhancing its taste, nutritional and culinary values.

When analysing morphological content of chilled half-carcass of pigs of different genotypes, it was determined that the young animals of genotype (L×Y)×(D×P) by meat yield significantly surpassed the control group coevals by 1.8 p.p. (R≤0.001) and coevals of other experimental groups – by 0.7-1.1 p.p., respectively.

Carcasses of pigs of genotypes (BLW×BM)×(D×P) and (BLW×Y)×(D×P) also surpassed the control group of animals of genotype (BLW×BM)×D on the meat yield by 1.1-0.7 p.p. (P≤0.05), respectively.

Carcasses of pigs of genotype (L×Y)×(D×P) had less lard in the body: so, the lard content in carcass was by 1.5 p.p. lower compared with the control group animals of (BLW×BM)×D (P≤0.01).

Content of bones in carcasses of pigs of all the groups was within 11.5-11.7% with a trend towards reduction of this indicator in animals of experimental groups by 0.1-0.2 p.p. (P≤0.05).

For the comparative assessment of carcasses an indicative criterion is the ratio of tissues: meat/bone – “meat content index” and meat/fat – “lean meat index”.

Having analysed the data we can say that the highest index of “meat content” was obtained in animals of genotype (L×Y)×(D×P) – 5.62. When defining index of “lean meat”, animals of genotype (L×Y)×(D×P) surpassed all the groups of animals with 3.81 index, which exceeded the index for the animals in the control and experimental groups.

Conclusions.

1. It was determined that hybrid young animals of genotype (BLW×Y)×(D×P) surpassed their coevals of other experimental groups on the pre-slaughter live weight by 0.6-1.6 kg, or 0.6-1.6% by weight of pair carcass – by 0.4-1.1 kg or 0.6-1.6%, on slaughter output – by 0.9-2.4 percentage points, respectively.

2. On the specific weight of rear third part of carcass the highest figure was observed in the animals of combination (BLW×Y)×(D×P) – 34.83%, that is 0.7 p.p. higher compared with animals in the control group. On this trait young animals of genotype (BLW×Y)×(D×P) surpassed their coevals of other experimental groups by 0.39-0.63 percentage points, respectively.

3. When analysing the morphological content of chilled half-carcasses of pigs of different genotypes it was determined that young animals of genotype (L×Y)×(D×P) by meat yield significantly surpassed their coevals of the control group by 1.8 p.p. (P ≤ 0.001), and coevals of other experimental groups – by 0.7-1.1 percentage points, respectively. Combination of this genotype also showed higher index of “meat content” (5.62) and index of “lean meat” (3.81).

Keywords: **hybrid, fattening and meat productivity, hybrid boars**

A. P. Krugliak. Methodical bases of crossbreeding using in dairy cattle

The scientific research analysis of crossbreeding using in dairy cattle of guiding countries has been implemented. There has been proved, that positive results of crossbreeding can be only for observing methodical basis of its using. They are: successful selection of initial-breeds, types and plans of theirs crossing, definition of feeding conditions and management of crossbred animals, application of methods of traits valuing, directed selection of bulls.

Methodical bases of crossbreeding using in dairy cattle are following:

- clear determination of main aim of crossbreeding program;
- selection of improve breed may realize not for the most positive but for the less number of traits.

A complementary breed shouldn’t have lower milk productivity but higher level of traits, for the sake of which it is selected to crossbreeding. It should be suitable to concrete system of milk production, have satisfactory population, the ramified genealogy and sufficient number of bulls-improvers.

Plan of crossing significantly influences on the results of crossbreeding. The complex rotational crossing using 3-4 selected unrelated breeds is effective.

The bulls, which are selected to crossbreeding, should have the highest estimation for traits, by which the selection is being carried out. They should be free from of exterior and genetic defects.

The selection level should correspond to pure breeding.

The innerbreed crossbreeding of Ukrainian Red-and-White dairy cows with top bulls of Montbeliarde, Holstein Red-and-White and Fleckvieh breeds has been suggested.

Keywords: **crossbreeding, breed, geterosis, inbreeding, milk yield, milk fat, protein, days open, independent period, reproduction ability**

V. P. Oleshko. Efficiency of lifetime use of imported cows

The study was conducted in high productive herd of Holstein breed in JV "Agrosvit" Myronivka district, Kyiv region by retrospective analysis of the primary materials of zootechnical and pedigree records.

The research involved analysis of data about 78 cows imported from Hungary to the farm in 2000 and 2003 and the first calving was during 2002-2004 and 117 cows imported from Denmark in 2005, the first calving was during 2005-2006. In comparison to the imported cows, contemporaries of local reproduction were selected based on respective years of the first calving (n = 409). The selection of animals and computing performance were conducted by the method of Polupan Yu. (2010).

The aim of the research was a comparative study of economic use duration and lifetime performance of the imported Holstein cows.

Analysis of milk production during lactation showed high milk yield during the first lactation (7315-7688 kg) in the imported animals at this farm. A slight decrease in yields by 3.4-5.1% (to 6939-7426 kg) was observed to the third lactation This downward trend in milk yield of cows with age does not match the physiological capabilities of animals. No significant difference ($P > 0.05$) in fat content of milk also was found with its tendency to increase by 0.08-0.22% with age. For the third lactation fat content in milk was 0.13% ($P > 0.05$) higher for the cows imported from Denmark. Predominance in protein content of milk ($P > 0.05$) was in the imported cows from Hungary on average values within 3.34-3.42%. This figure declined with age from 3.3% to 3.1% in the cows from Denmark.

Significant differences were not revealed in comparing milk productivity of cows imported from Denmark with performance of their contemporaries of native origin. Difference in milk yield did not exceed 6.6%, fat yield – 5.8% and protein yield – 6.8% ($P > 0.05$). The fat and protein content in the milk of cows in the compared groups was at the same level within 3.1-3.3%.

Similar comparison of Holstein cows imported from Hungary and their contemporaries of native origin had slightly different results. The predominance in milk yield during the first lactation was noted for the local cows by 4%, fat content in milk – by 0.04% and protein content – by 0.1%, fat yield – by 5.4% and protein yield – by 7.1 %. Milk yield during the third lactation was significantly higher for imported livestock by 13.5% (1000 kg), fat content – by 0.04% and protein content – by 0.08%, fat yield – by 15%, protein yield – by10% at $P > 0,05$.

The research of duration and efficiency of economic use found slightly higher levels of lifetime measures of the imported cows from Denmark ($R > 0.05$). In the calculation of milk yield per a day of life, economic use and lactation slight advantage ($P > 0.05$) also was noted for the imported cows (by 0.6, 2.2 and 1.9 kg). The numbers of lactations and calves obtained from the cows were within 2.4-2.7 and 3.4-3.5 respectively. A similar slight predominance ($P > 0,05$) of the animals imported from Denmark was for coefficients of economic use (by 6.5%), lactation (by 1.8%) and productive use (3.5%).

A slightly different situation was observed in comparing the lifetime measures of the cows imported from Hungary with their contemporaries. In these groups of animals, small and insignificant predominance was in all the studied traits ($P > 0.05$) recorded for local contemporaries. Lifetime milk yield was 2.641 kg lower, so fat yield was 73 kg less and protein yield – 64 kg less. Lifetime fat and protein content in milk was within 3.69-3.70% and 3.35-3.36% on average, respectively.

Milk yield per a day of life, economic use and lactation in the both groups was almost at the same level (9.1-9.7, 16.2-16.7 and 20.2-20.6 kg respectively). On average in the both groups during lifetime of cows 3.5-3.8 calves were received and number of lactations was within 2.9-3.2.

Coefficients of economic use, lactation and productive use were 0.5, 2.4 and 6.0% lower respectively in the cattle imported from Hungary as compared to the local contemporaries.

Coefficient of variability of lifetime measures averages for the imported cows was to 66.6%. Coefficient of variability of average fat and protein content in milk during lifetime (1.9-2.9%) indicated high consolidation of the traits. High variability of lifetime measures confirms significant opportunities for selection of cows on these traits.

Consequently, Holstein cattle imported from Hungary and Denmark showed satisfactory adaptive ability under condition of "Agrosvit" breeding farm that provided high milk yield (7315-7688 kg) during the first lactation with small (by 3.4-5.1%) reduction in yields during the third (to 6939-7426 kg). Fat content in milk was 3.64-3.86% and increased by 0.08-0.22% with age. The protein content in milk fluctuated within 3.30-3.42%.

There was no difference in comparing milk productivity of imported Holstein cows and their local contemporaries. The difference in all cases is insignificant. The revealed tendency of higher productive performance is in favour of livestock imported from Denmark. The same traits in cattle from Hungary were slightly lower.

Average lifetime measures at the imported animals from Denmark were slightly higher and insignificant ($P > 0.05$) compared to local contemporaries. And the same averages at the cattle imported from Hungary were slightly lower and insignificant.

High coefficients of variability of the studied traits were found that would allow intensive selection of cows and to create herds with high productivity and long-term economic use.

Keywords: **imported cows, Holstein breed, milk yield, economic use duration, lifetime performance**

L. V. Onyschenko, M. I. Danylchuk. Characteristic of productive qualities of families of Red White-belted swine in SE "RF Zoryane" breeding farm

The most perspective genotype in our region is Red White-belted breed, which has high performance both under pure breeding and under crossing with other breeds. The results of complex evaluation of Red White-belted swine of the herd bred in SE "RF Zoryane" breeding farm are presented. It was revealed that animals of the farm comply with elite class and the first class. The main breeding boars used at the farm belong to such genealogical lines: Deviz, Division, Dantist, Debut, and Dobryak. In the structure of the herd, the most numerous was Dobryak line, which part was 58.8%, Division, Debut, Devis lines – 11.8% per line, Dantist line – 5.8%.

The herd sows belong to 7 families: Drabowka, Dekada, Dyktsiya, Doina, Dylema, Delta, Dogma. Average prolificacy of the sows was 10.0 piglets. Litter weight at 60 days' age was 181.0 kg, and live weight of piglet – 19.0 kg. The performance of sows as prolificacy increased by 0.6 head on average. The complex appraisal index for the herd was 104.1 points.

The average daily gain of the replacement pigs was 570 g. The highest daily gain was from five to six months – 611.2 g, and the figure of compactness index characterized a certain elongation of animals, increasing meat traits.

Further work with Red White-belted breed aims at preserving and expanding the breeding base and genealogical structure, as well as increasing the reproductive, fattening and meat traits.

Keywords: **productive traits, reproduction, breeding, gain, prolificacy, genotype, crossbreeding**.

Polupan Yu. P. Ontogenetic features of formation of young cattle exterior

The aim of the research was to study patterns of forming exterior in dairy cattle during postnatal ontogenetic development (particularly in terms of uneven growth for individual measurements and changing proportions of body structure).

Instrumental assessment of young's exterior was performed in three scientific and economic experiments by taking measurements of new-born calves and heifers at the age of 1, 3, 6, 9, 12 and 16 months. For the experiment 30 bull-calves of Ukrainian Black-and-White Dairy were taken in "Aleksandrivka" breeding farm, Kiev region, 29 bull-calves and 21 heifers of Ukrainian Red Dairy and red-and-white Holstein (German selection) – in "Bilshovyk" breeding farm, Donetsk region and 38 bull-calves and 31 heifers of Ukrainian Red Dairy and Angler breeds – in "Shyroke" breeding farm, Crimea.

The analysis of age dynamics showed uneven development of young by individual measurements. Several clusters with similar values can be distinguished by the relative degree of development of new-born or one-month-old animals compared to older age. The highest level of relative development (69.4-74.3%) and slower growth rate till age of a year (34.8-44.7%) were fixed for girth of metacarpus. The high degree of development of new-born or one-month-old bull-calves and heifers (63-67.6% of age of a year) and low rates of relative growth during the first year of growing (48.2-58.7%) were revealed for measurements of height (the first cluster). The second cluster includes measurements of length showing significantly lower level of development in new-born or one-month-old animals (52.7-61.3%) and consequently higher rates of (63.4-90.7%) relative growth rate till age of a year. Lower degree of "maturity" in new-born or one-month-old bull-calves and heifers (47.7-57.7%) and higher rate (73.8-110.0%) of relative growth rate till age of a year were observed for measurements of breast depth and girth. The lowest degree of relative development (43.0-58.5%) and the highest relative growth rate till the age of a year (71.4-132.9%) were found in cluster of width measurements. The separate cluster, approximated to measurements of length by degree of "maturity" in new-born calves, was observed for measurements of a head and forehead. The lowest degree of relative "maturity" was revealed for scrotal circumference measurements, which at the age of three months was only 53.4% of its size in one-year-old bull. It has the most intensive growth in period of puberty (6-9 months).

The revealed uneven age dynamics of growth for individual measurements logically leads to an adequate age-related changes in proportions of the relevant indices of body structure. Stable steady decline was noted from birth to age of a year for index of long legs (by 13.5%) and growth for indices of chest depth (by 13.5%), chest width (by 10.0%), massiveness (by 31.9%), steepness of edges (by 15.8%), lengthiness (by 17.7%) and a large head (by 6.4%). Significant increase with age was observed for thoracic index (by 5.5%), downedly (by 10.3%), format of a pelvis (by 17.0%) and conditional body volume (3.5 and 3.3 times) and significant reduce for indexes of eirisomia (by 111.7%), boneness (by 1.3%) and broad forehead (by 6.5%). Proportion of a body has no unidirectional significant

age-related changes on the indices of outgrowth, narrowbuttly and pelvic-thoracic.
Keywords: **heifer, bull-calf, exterior, age dynamics, frame proportion, uneven growth**

A. Ye. Pochukalin. Importance of families for genealogical structure of Volyn Beef cattle

One of the ways of increasing level of animal economically useful traits is selection work with farm families. In pedigree cattle breeding of Ukraine families are a statistical component of breed genealogy. Among the main scientific works on working with families, it should be noted minimum number of female ancestors, proposed by D. T. Vinnichuk, to determine the breeding value, different categories, classification and techniques for evaluating related groups of females.

The aim of our research was to analyse importance of farm families for genealogical structure of the breed.

The research was on basis of data of primary breeding records at the herd of Volyn Beef cattle of "Zorya" breeding farm, Kovel district, Volyn region. Akula 102, Galka 37 and Galka 1537 families belonging to Krasavchyk 3004 bloodline, Smorodyna 613, Korona 2382 and Visla 1016 families – Tsebryk 3888 bloodline, Kalyna 212, Verba 1536 and Garna 536 families – Yamb 3066 bloodlines, Kazka 433, Galka 421 and Bystra 1124 families – Buinyi 3042 bloodline, Rozetka 1313, Arfa 599 and Bulana 943 families – Sonnyi-Kaktus 3307-9828 bloodline, and Palma 275, Desna 870 and Veselka 444 families – Mudryi 9100 bloodline were characterized. Belonging to a bloodline was determined by the father's side of female ancestors. Structural units of families: branches, branching with identifying the best individuals on breeding traits were submitted to identify the best combinations and successful use of closely related breeding.

Comparing assessment of related groups of females on the main breeding traits belonging to Krasavchyk 3004 bloodline, it was noted that the cows of Akula 102 family predominated in live weight at 5 years' age, milk ability and economic use duration, whereas the cows of Galka 1537 family – on traits of reproductive ability. Smorodyna 613 family of Tsebryk 3888 bloodline had high duration of economic use and cows' live weight at 5 years' age compared with Korana 2382 and Visla 1016 families with equal values of the exterior traits (height measures) and coefficient of reproductive ability. The families of Mudryi 9100 bloodline in terms of reproduction (calving interval, coefficient of reproductive ability) had the highest figures of cows' milk ability and live weight.

The cows of Bulana 943 family had a considerable predominance over representatives of Rozetka 1313 and Arfa 599 families of Sonnyi-Kaktus 3307-9828 bloodline by main economically useful traits. High indices of reproductive ability were noted in these families. Heifers of the families of Buinyi 3042 bloodline had high live weight at 18 months' age at average values of milk ability and cows' live weight at 5 years' age.

More equal figures of growth rate, exterior and economic use duration were observed in the cows of Kalyna 212, Verba 1536 and Garna 536 families of Yamb 3066 bloodline.

Breeding by families in beef cattle breeding is an important element of selection, because it allows to evaluate not only related group of female ancestor, but

also to analyse a successful combination with lines and purposeful use of closely related breeding by the best representatives of a breed.

Keywords: **Volyn Beef breed, family, line, live weight, milk ability**

A. Ye. Pochukalin, Yu. M. Reznikova, S. V. Priyma, O. V. Rizun Breeding achievement of beef cattle-breeding of Ukraine: Znamensk intrabreed type of Polessian Beef breed

The aim of our research was to conduct a retrospective analysis and to study the current state of the subjects breeding Znamensk intrabreed type of Polessian Beef breed and to assess main economically useful traits and genealogical structure.

Material and methods. Research of productive and economic activity of breeding farms has been carried out based on the electronic database of State Register of Breeding Subjects in Livestock for 2003-2016. Analysis of the number of breeding animals, distribution of cows by age, animals' live weight, milk (as a calf's live weight at the age of 7 months) and reproductive abilities has been performed based on breeding account (form №7-myas) for 2010, 2012, 2014, 2016.

Results of research. The most breeding farms meet the minimum requirements of the target standard of Znamensk intrabreed type on the main quantitative traits of animal productivity. "Kolos" ALLC, Kirovograd region and «Agrikor Holding" LLC, Chernihiv region were the most numerous. High realization of genetic potential of meat productivity (daily gain of live weight above 1000 g) was observed at animals in «Kolos» ALLC and «Sharivske» PE. There have been sold 222 head of the breeding youngsters for 13 years.

The greatest number of animals was observed according to annual reports in 2012. It can be explained by the number of subjects conducting the selection and breeding work with the intrabreed type. The share of cows did not exceed 43.0% (2012), bull – 1.5% (2010), calves of different gender and age groups – 66.1% (2014). 85.5% of all the available breeding stock (5369 head) was approved and 67.8% corresponded to elite and elite-record classes.

Live weight of the approved cows has increased by 7.5% at the age of 3 years, 9.7% at the age of 4 years and 11.1% at the age of 5 years since 2010. Differential for live weight of cows at the age of 4 and 5 years was 9 and 11 kg on the average.

There was adequate number of animals, live weight of which was in a wide range, that is from 551 kg and above. So, such cows were 111 head in 2010 and 234 head in 2016. These cows realise genetic makings of high productivity sufficiently and they are material for selecting the best representatives of Znamensk intrabreed type.

Gradual increase of milk ability was noted from 2010 till 2016 after the first calving by 13.7%, the second – 12.2, the third – 11.7, and by 11.9% on average. Differential for milk ability of cows was 5 kg (2010, 2012), 11 kg (2014) and 2 kg (2016) on average.

Average calving interval of cows for the period are oscillatory in nature and didn’t exceed 420 days during 2010-2014. Gradual increase of age at first calving of heifers by 101 days was observed from 2010 to 2014 with reduction to 824 days for next two years. It should be noted violation of course of cows’ and heifers’ calvings, it was 29 and 36 cases in 2010 and 2012 respectively, whereas in subsequent periods, these values were significantly lower or non-existent. It may indicate a high level of veterinary services and compliance of technologies of feeding and management.

Efficiency of beef cattle-breeding depends on the growing of calves. Analysis of the results shows that live weight of calves at the age of 210 days has increased in each investigational year. The values are oscillatory in nature between 8 and 15 months. Sexual dimorphism was confirmed and proven – bull-calves had higher growth rate compared to heifers.

Significant reduction in the livestock number of the approved bloodlines and their absence in some cases (Radyst 113 and Darovanyi 400) was observed. This is due to the increased share of Polessian Beef and Charolais bulls used for reproduction. There were 139 cows, 27 heifers and 13 calves in group belonging to Polessian Beef and Charolais bloodlines in 2012, whereas in 2014, 281, 193 and 18 respectively, representing 81% of the total population.

Conclusions. The research revealed that livestock of the type were concentrated in «Agrikor Holding» breeding farm, Pryluky district, Chernihiv region with a total of 922 head, including 348 cows. Productivity of animals by the valuation results at the beginning of 2016 (live weight, milk ability, reproduction) significantly increased. Current genealogical structure of Znamensk intrabreed type was represented by bulls belonging to Polessian Beef and Charolais bloodlines, share of which was 81%.

Keywords: **Znamensk intrabreed type, live weight, milk ability, bloodlines, families, maternal effect**

K. O. Skoryk. Dairy productivity of Saanen goats of Latvian selection

The aim of the work was to study the basic productive traits of Saanen goats of Latvian selection in the order of their selection value: milk yield, fat and protein content in milk. These traits were investigated in the daughters from different goats-fathers.

Materials and methods of research. The study was conducted at "Grandmother's Goats" breeding farm, Galaiky village, Tetiiv district, Kyiv region on Saanen goats of Latvian selection. From mid-spring to mid-autumn the goats grazed and were kept in a corral. In winter, the goats were indoors on deep litter. Milking was twice a day into milk pipeline, it took place in the milking room with 12 seats. The farm is provided enough by coarse, succulent and concentrate feeds. It is considered that the winter diet of dairy goats is hay, twigs, concentrate feed, root vegetables, and mineral supplements.

The primary livestock data of milk production in 41 goats for seven lactations were considered. The basic selection traits were studied in the order of their breeding value: milk yield, fat and protein content in milk. The same traits were investigated in terms of fathers of milking goats. The obtained results were processed statistically by N. A. Plohinskiy (1970).

Results of research. The research results show that milk yield of Saanen goats of Latvian selection varied depending on lactation. It was found that the milk production during the 1^{st} lactation was 565 kg, fat content in milk – 3.2% and protein content – 3.0%. Milk yield per lactation tended to increase – from the 3^{rd} to 6^{th} lactation inclusively, as compared with the 1^{st} and 7^{th}.

The maximum level of milk yield was during the 6^{th} lactation. The differences in milk yield between the 6^{th} and the 1^{st}, 2^{nd}, 5^{th} and 7^{th} lactations are significant with the second degree of reliability. Significant coefficient of variation for milk yield (20-35%) gives reason to consider it possible to conduct the selection by this trait.

Several other data are presented by T. Orlovskaya. She considers that goats produce maximum milk yield on average after the 3^{rd} parturition. Milking ability of goats after the 5^{th}-6^{th} lactation begins to fall gradually. She also thinks that biological value of milk is reduced with increase in milk yield, namely reduced fat content and, in some cases, changing the taste of milk.

Subsequently, the fat content in milk during the 2^{nd}-4^{th} lactations increased by 0.1%, and during the 5^{th} lactation it reached the maximum level – 3.6%. The protein content in the investigated goat milk was small and ranged from 3 to 3.1%. Differences in fat and protein content during all the lactations were unreliable.

Ratio of fat content to protein content in Saanen goats' milk was studied for seven lactations. It was found that the ratio of fat to milk for all the seven lactations did not reach the optimal levels. This is lack of milk quality of the investigated goats.

Milk yield, fat and protein content in milk of daughters of four Saanen billy goats were investigated to determine the influence of fathers on the daughters' productivity.

Analysis of milk productivity data for daughters of goats Amors 046062340091, Wicks 030810040238, Priers 0460623640427 and Frends 038028540074 showed that the highest milk yield was in daughters of Amors 046062340091 – 622 kg. Several less milk yield (590 kg) was in the daughters of Frends 038028540074, and the lowest milk yields were observed in daughters of Wicks 030810040238 and Priers 0460623640427. Thus, daughters' milk yields depend essentially on fathers. At the same time the fat and protein content in the milk of daughters from different fathers is almost identical. This should be taken into account at matching billy goats for breeding stock of goats. In our research of milk yield of daughters from different billy goats there was a significant difference, but protein and fat content in daughters' milk almost was no different. Thus, the findings don't always coincide with the data given in the literature. This concerns with the milk production of Saanen goats and its quality (fat and protein content). Earlier, we have shown that Saanen goats' milk had a little lower density than in Lamancha, Russian, Nubian, Alpine and Megrelian goats. Protein content was at level of 3.85%, or 1.4% greater than in Russian goats' milk, but 0.15% less than in Lamancha, 1.23% less than in Nubian, 0.4% – in Alpine, and 1.65% – in Megrelian goats' milk.

The fat content in goat milk of the compared breeds was also the lowest (by 1.85% than in Lamancha, by 0.79% than in Russian, by 0.97% than in Nubian, by 0.57% than in Alpine and 1.12% than in Megrelian breeds). Also, content of dry milk residue was low (0.67-1.48% less).

Despite these differences in milk yield of goats, research in this area should be expanded in order to determine the prospects for further goat breeding of certain breeds.

Conclusions. Milk yield per lactation tended to increase – from the 3rd to 6th lactation inclusively, as compared with the 1st and 7th. The maximum level of milk yield was during the 6th lactation. Significant coefficient of variation for milk yield (20-35%) gives reason to consider it possible to conduct the selection by this trait. The differences in the level of milk production of daughters from different goats were revealed that should be taken into account at matching billy goats for breeding stock. In Ukraine goats' milk yield of different breeds requires further study.

Keywords: **goat, milk, lactation, fat content, protein content, goats-fathers**

N. V. Sokolovska, O. D. Biryukova. Influence of genotypical and paratypical factors on the disease incidence of limb in Ukrainian Black-and-White Dairy cows

Introduction. In the world there is widespread lameness in the dairy cattle herds. More than at 90% cases lameness is conditioned by affections in area of a hoof. The affections of extremities at cattle inflict considerable economic losses through the decline of the dairy productivity, reproductive function, loss of pedigree value, protracted treatment and premature culling. Principal reason of illness is violation in feeding and keeping of cows, thus they not always are related to the failure to observe of norms of feeding; it is necessarily needed to take into account comprehensibility of nutrients of feed, productivity of cows and genetic inclination them to the diseases. At the same time it follows to take into account the inherited factor, especially in relation to the form of hoofs, quality of hoof horn and others. It is set that a form of hoofs is a trait which is well inherited.

To the preventive factors belong breeding measures, foremost. In Ukraine Holstein population increases annually, part of heredity of Holstein breed grows in the herds of domestic dairy breeds. The high-producing cows of Holstein Friesian breed have a genetic predisposition to chronic and subclinical laminitis of extremities, that conditioned by the friable structure of hoof horn, structure of back legs, by the size of angle between soil and dorsal wall of hoofs and weakness of copulas. Taking into account it the actual is a study of problem of morbidity of extremities and evaluation of the state of hoofs for cows.

The aim of our researches was study of influence of genotypical factors on morbidity of extremities in Ukrainian Black-and-White Dairy cows.

Materials and methods of researches. Researches of the state of extremities in cows were conducted in the herd of "Osrikiyvske" farm (Kyiv region) at Ukrainian Black-and-White dairy breed. The statistical processing of data and analysis of variance were conducted by M. A. Plokhinskiy method (1969) using STATISTICA 6.0 software. Elements of ethological researches and materials of veterinary records at the farm were used for identifying cows with the diseases of extremities. Amount of the cows taken into account is 470 head.

Results of researches. According to State breeding register in 2015 the average dairy productivity of cows of the herd at "Osrikiyvske" farm was 7731 kg of milk per year. The dairy productivity of first-calf heifers was over 6000 kg of milk, the level of milk yield during the third lactation increased by 16%.

Observation of the animals in the herd during milking, consumption of feed and movement showed that 9.4% of cows had traits of lameness, 45% of them were first-calf heifers. Average milk yield of healthy cows (6756 ± 133.0kg) was significant ($P < 0.05$) and higher, than in limping cows (5654 ± 329.0 kg). It follows, that at comparison of healthy first-calf heifers and those which limped, this difference was greater (7001 ± 145 against 5391 ± 305 kg accordingly, $P < 0.05$). In both cases the difference is significant.

Considerable divergences of frequency of limping cows were found in progeny of different bulls. Frequency of cows with sick extremities in progeny of bulls D.Lobbi 16210, L.Kingli 9948, G.Tandem 34213 was within the limits of 7%. Mostly

sick extremities were in daughters of bulls Vasari 18899, A.Audini 55912 – 20 and 13.3%, accordingly.

Circumstance that the level of morbidity of extremities for daughters of different bulls is different, can testify to influence of father on this trait. However, by results of the analysis of variance it was not found significant influence of genotypical factors on morbidity of extremities at Ukrainian Black-and-White dairy cows. So, force of father's and line influence on the investigated trait was – 0.22 ± 0.31 ($P > 0.05$) and 0.043 ± 0.04 ($P > 0.05$), accordingly.

Also it was not revealed significant influence of sequence number of lactation on morbidity ($\eta^2_x = 0.012 \pm 0.01$ ($P > 0.05$)). But significant influence of level of the dairy productivity (milk yield, kg) on health of extremities ($\eta^2_x = 0.018 \pm 0.03$ ($P < 0.01$) was found.

Conclusions. 9.4% of limping cows were found in the herd of "Osrikiyvske" farm. Reliable influence (1.8%) of dairy productivity on health of extremities was revealed. It was not educed significant influence of factors "father", "line", "sequence number of lactation" on the investigated trait.

Thus, selecting animals for the increase in dairy productivity, it is necessary to search ways and methods for increasing durability of hoof horn for the sake of increase in productive use duration of cows.

Keywords: **cows, Ukrainian Black-and-White Dairy breed, lameness, diseases of distal portion of extremities, frequency of morbidity**

E. I. Fedorovych, O. Y. Ilnytska, N. P. Babik. Milk productivity of high-producing cows and their progeny of Precarpathian innerbreed type of Ukrainian Red-and-White Dairy breed

The studies were conducted on high-producing cows of Precarpathian innerbreed type of Ukrainian Red-and-White Dairy cattle and their progeny, according to zootechnical accounting in private farm enterprise "Mamayivske" in Kytsman district of Chernivtsi region. It was established that during the period from 1995 to 2010 the farm had 20 cows with milk yields over 8000 kg. The highest milk production by the best lactation had cows Maratka 3235, Vorovka 5982 and Chaika 3839, their milk yields were 10586; 9380 and 9008 kgrespectively, fat content in milk – 3.61, 3.79 and 3.77% and fat yield – 382.2, 355.5 and 339.6 kg. The cows had the highest milk yields mostly during the third lactation, and milk yields on average reached record in 3.85 lactations.

High-yielding cows belonged to 5 bloodlines: R. Sovering 198998, P. Astronaut 1458744, R. Citation 267150, Rigel 352882 and Hanover 1629391. The most numerous one was Astronaut bloodline (11 cows). Daughters of Tyulpan 7451 (R. Sovering bloodline) had the highest level of milk production during the best lactation. They predominated in milk yield during the best lactation over Gybrid's daughters (Citation bloodline) by 156 kg, T. Tourist's daughters (Rigel bloodline) by 401 kg , Sekret's daughters (P. Astronaut bloodline) by 473 kg and M. G. Horizont's daughters (Hanover bloodline) by 812 kg , by fat yield – by 4.6, 8.6, 9.9 and 26.8 kg, respectively but they were inferior by fat content in milk by 0.02, 0.07, 0.09 and 0.04%. Sekret's daughters had higher fat content in milk. By this trait, they predominated over Hybrid's daughters by 0.07, T. Tourist's daughters – by 0.02 and M. G. Horizont's daughters – by 0.05%. The average breeding value of bulls, daughters of whom had milk productivity of more than 8000 kg, was +276 kg.

The highest milk yields were in cows whose mothers belonged to P. Astronaut and Hanover bloodlines and fathers – to R. Sovering bloodline (daughters' milk yield was 9303 and 9008 kg respectively). High milk yield (8842 kg) also was in cows whose mothers belonged to P. Astronaut bloodline and fathers – to R. Citation bloodline. The best cows by fat content in milk were obtained from a combination of bloodlines V. Ideal – P. Astronaut (3.80%), Rigel – Rigel (3.80%), V. Ideal – Rigel (3.78%) and V. Ideal – Rigel (3.78%).

Coefficients of repeatability for milk production decreased with increase in period between the comparable lactations. By milk yield for I-VI and the best lactations they were within 0.206-0.495, and by fat content in milk – within 0.337-0.469.

The better daughters by milk yield not always were obtained from high-yielding cows and, on the contrary, the worse ones – from low-yielding cows. Most cows with high milk yields were from mothers with yields not exceeding 6000 kg of milk, and only with average milk performance of mothers not more than 7281 kg of milk, their daughters predominated in milk yields. With the increase in average productivity of mothers to 8456 kg of milk or more, daughters were inferior to their

mothers by1180-3454 kg of milk, but, in all cases, they had a higher milk yield than the average for the herd.

Positive correlations were found between mothers' milk yield and milk yield, fat content in milk and fat yield of their daughters, but their values partly depended on mothers' productivity. The highest correlation coefficients between productivity of daughters and mothers were observed at the mothers' yields not higher than 6999 kg (r = 0.221-0.273), and the lowest – at mothers' yields over 9,000 kg (r = 0.155-0.182).

It was found that bull Arbat 1577, estimated on milk production in 69 daughters, had the highest breeding value. The rank of its breeding value was P5 (improver "excellent"). Cows Maratka 3235 (+3204 and +1860 kg), Krona 8490 (+2202 and +1315 kg) Vorovka 5972 (+1710 and +1121 kg), Kava 5450 (+1626 and +1004 kg) Shchoka 5870 (+1602 and +937 kg) had the highest breeding value in terms of best lactation and based on three sources of information, respectively.

Keywords: **high-producing cows, milk yield, mothers, fathers, daughters, sons, line, repeatability and correlation coefficients, breeding value.**

I. V. Khatko, A. O. Onyshchenko, V. O. Vovk, T. M. Konks. Comperative study of fat deposition regularities in the different parts of young pigs' trunk of Large White and Mirgorod breeds

The modern state of social-economic processes development demands increasing the level of food safety of the state, especially providing population by the high quality foods of domestic production, specifically by pork.

One of criteria for estimating pigs' meatness is determining the fat thickness in different points of a trunk. The informative content of measuring in different parts of a trunk is different and it needs detailed study.

The fat thickness is the most common as trait for pigs' meatness in the practice of pig breeding because it has high correlation with meat yield in carcasses.

The aim of our research was the comparative study of fat deposition regularities in different parts of a trunk of Large White and Mirgorod pigs in different age periods.

For conducting researches 24 pigs of both breeds with average live weight about 40 kg and at age not more 4 months were selected. The fat thickness was measured at live animals using ultrasonic device Draminski in such points: on withers, the level of the 6-7th thoracic vertebra, the level of the 1st-2nd loins vertebra and sacrum. Measuring the fat thickness was carried out at the age of 4, 5, 6, 7 and 8 months.

During researches it was carried out the statistical processing of obtained material. Reliability of obtained indexes of productivity was determined. Regularities of formatting fat thickness and fat deposition rate depending on the age were studied.

For the results of researches it has been studied and compared economically valuable traits of the most spread domestic pigs of Large White and Mirgorod breeds.

By comparative study of growth and development of young pigs of experimental and control groups it has been found that animals of Large White breed differed by lesser fat deposits in all points of measuring. Thus, at 6-months' age they had lesser thickness of fat in all parts of a trunk. More expressed tendency was at withers and the level of the 6-7th thoracic vertebra, at that in the first case the difference between groups was reliable ($p < 0.01$). The fat deposition rate in young pigs of both breeds was not the same in different points of measuring along a trunk.

Above mentioned tendencies were intensified with the age. Purebred animals of intrabreed type LW-1 at 7-months' age had reliable less thickness of fat in comparison with the control group: on withers ($p < 0.01$), at the level of the 6-7th thoracic vertebra, the level of the 1st-2nd loins vertebra ($p < 0.05$) and on sacrum ($p < 0.01$). In future, according to economic and scientific expediency, the animals of Mirgorod breed were excluded from the experiment. Concerning Large White breed, the researches were finished when animals were at 8 months' age.

The process of fat deposition in Large White pigs was less intensive in comparison to Mirgorod breed.

The highest relative rate of fat thickness increase in both breeds was observed at the level of the 1st-2nd loins vertebra.

By statistical processing of the obtained materials it has been found that the difference of average arithmetical indexes (as absolute and relative) between the experimental and control groups during growth and development had distinct tendency to increasing in all points of measuring. The reliability of the difference between the averages in groups with the age of animals increased. A higher reliability of data was obtained at measuring of the front parts of a trunk of pigs at the level of the 6th-7th thoracic vertebra and on withers.

The carried out researches at all points of measuring give the reason to confirm that the fat deposits of Large White pigs are less comparing to Mirgorod breed.

Conclusions. 1. Carcasses of animals of intrabreed type ULW-1 are comparatively more technologically suitable and economically beneficial for agricultural proceeding industry.

2. Animals of intrabreed type ULW-1 at 7-months' age had reliable less thickness of fat in comparison with the control group: on withers, at the level of the 6-7th thoracic vertebra, the level of the 1st-2nd loins vertebra and on sacrum.
3. The process of fat deposition in Large White pigs was less intensive in comparison to Mirgorod breed.

Keywords: **back fat, breeds, thoracic vertebra, young pigs, selection, correlation**

L. M. Khmelnychyi, V. V. Vechorka. Productive longevity of Ukrainian Black-and-White Dairy sires' daughters

In pedigree farm of Cherkasy region, in the modern highly mechanized technologies of milk production, research on studying influence of sires' heredity on the duration of use and lifetime productivity of their daughters was conducted. The research materials were withdrawn livestock of daughters of Ukrainian Black-and-White and Holstein sires in the amount of 784 head.

Duration of lactation, milk yield, content and yield of milk fat for the entire lactation were recorded for each lactation. The following indicators were studied: lifetime, duration of economic use, lifetime milk yield, lifetime milk fat yield, average lifetime fat content in milk, average milk yield per day, average milk yield for a day of economic use and the number of used lactations.

On assessing lifetime, the best were daughters of Ukrainian Black-and-White Dairy sires with indicators 3589 and 3303 days. A reliable difference in their favor in comparison with the average for the herd was 1351 and 1065 days ($P < 0.001$). Comparison of progeny of native sires and Holstein sires also showed significant predominance in lifetime of daughters in their favor, which ranged from 373 to 1841 days ($P < 0.001$), and duration of productive use – from 438 to 1815 days ($P < 0.001$).

Variability in the number of used lactations varied widely from 1.7 to 6.1 units. In the ranking on the ground of number of used lactations the first and second were sires of domestic breeding – Fajans (6.1lact.) and Avans (5.2 lact.). Most daughters of Holstein sires were used less than the average for the herd.

Highly reliable negative correlation between milk yield during the first lactation and the use duration indicators, the lack of correlation between the first lactation yield and lifetime yield obtained in our studies on experimental livestock of 784 head, gives grounds to assert that high milk yield during the first lactation leads to reduction in duration of use and does not always guarantee high figures of lifetime productivity.

Milk yield for a day of economic use has a high positive correlation with yield in the first lactation ($r = 0.438$), lifetime milk yield ($r = 0.325$), lifetime milk fat yield ($r = 0.283$) and, especially, yield for a day of life ($r = 0.701$). With traits of lifetime, economic use duration and CEU, milk yield per day of life has slight negative correlation.

Thus, according to figures of use duration and lifetime productivity for progeny of estimated sires of different origin, it is possible to make the generalization that improvement of Ukrainian dairy breeds should be based on the best genetic resources of sires of domestic breeding. When you use foreign breeding sires it is advisable to combine their breeding qualities with assessment of longevity.

According to the research should make the following conclusions. The duration of use and lifetime productivity of Ukrainian Black-and-White Dairy cows in the breeding herd are determined by of sires' individual heredity. High level of milk yield during the first lactation in estimated sires' progeny does not guarantee an increase in traits of economic use and lifetime productivity. Progeny of domestic breeding bulls was better by traits of productive longevity than purebred progeny of Holstein sires.

Keywords: **Ukrainian Black-and-White Dairy breed, sires, duration of use, lifetime milk yield**

S. L. Khmelnychyi. Variability of population-genetic parameters of cows' exterior of Sumy innerbreed type of Ukrainian Black-and-White Dairy cattle

The study of variability of population-genetics parameters of cows' exterior was conducted on the livestock number of Sumy interbreed type of Ukrainian Black-and-White Dairy breed in the pedigree farm Pidlisnivska branch of PJSC «Rise-Maksymko», Sumy district.

The level of positive correlation coefficients and their reliability showed that milk yield of first-calf heifers in the experimental herd to the greatest extent depended on the height at withers (r = 0.458) and rump (r = 0.324), depth of chest (r = 0.375) latitudinal measurements of backside (r = 0.263-0.375), body length (r = 0.303) and chest girth (r = 0.388). With age, the relation between the measurements of body conformation and the amount of milk yield of first-calf heifers in this direction remains, but with a slight decrease of correlation coefficients that can be the result of natural growth of age variability of exterior traits under the influence of ontogenetic regularities of development and paratypical factors.

Analysis of inheritance coefficients of the body conformation measurements of the estimated cows of Sumy innerbreed type of Ukrainian Black-and-White Dairy breed showed their genotypic variability, which varied within the recorded lactations.

In the pedigree farm a sufficient, reliable according to Fisher criterion, level of inheritance coefficients was found, which would provide appropriate effectiveness of mass selection on the measurements of height at withers and rump, depth of chest, latitudinal measurements of backside which were different in the first and second lactations.

Somewhat lower and less reliable levels of the inheritance coefficients of body measurements traits were obtained from cows according to the third lactation, which is explained, in a certain way, increasing age variability of the estimated traits.

The level of correlation of the measurements with milk yield allows to perform indirect selection by type, and the figures of inheritance of the measurements confirm the possibility of efficient selection of dairy cattle at the age of the first lactation with the aim of improvement of exterior for the herd and breed.

Keywords: **correlation, inheritance, measurements of body conformation, milk yield**

V. N. Balatsky, L. P. Grishina, A. M. Saenko, V. A. Vovk, P. A. Vaschenko. Association of ESR1 gene polymorphism with reproductive traits of sows of Large White and Mirgorod breeds

The speciality of the modern methodology in breeding is using the molecular information, received during genome analysis. This methodology can significantly accelerate the improvement of productivity traits and it is particularly useful in relation to the traits with low coefficient of inheritance while classic methods are not effective enough. The reproductive traits are one of the most important in pig farming, estrogen receptor 1 gene (*ESR*1) is involved in their control. Meanwhile, the use of *ESR*1 locus polymorphism in the marker-assisted selection needs to determine the extent of its association with the reproductive traits of animals in those populations where it is planned to conduct such selection. Implementation of marker-assisted selection in Large White and Mirgorod breeds for improving the reproductive traits is an actual task, but a necessary step in this work is the associative analysis.

The purpose of the work is to research the association of polymorphisms of *ESR*1 locus with some reproductive traits of sows of Large White breed (ULW-1 and ULW-3 lines) and sows of Mirgorod breed.

Materials and methods of research. Experimental groups: 1) the sows of Large White breed, ULW-3 line, bred in "Bahmutskiy Agrarian Union" farm, Donetsk region; 2) the sows of Large White breed, ULW-1 line, bred in “Stepne” farm, Poltava region; 3) the sows of Mirgorod breed, bred in «Named after Dekabristy» farm, Poltava region. All the experimental animals were previously genotyped on *RYR*1 gene and had *RYR*1^{CC} genotype. The animals were genotyped on estrogen receptor 1 locus with aid of PCR-RFLP analysis on *Pvu*II-polymorphic restriction site in the third intron of the gene – DNA marker for estrogen receptor 1 gene. Associations between genotypes and the studied traits were calculated using ANOVA in Excel 2007.

Results. ULW-3 sows with *ESR*1^{BB} genotype turned out to have 1.36 more piglets in a litter (analysing data from 2nd-4th farrows) comparing to animals with *ESR*1^{AA} genotype. There is a tendency for bigger amount of newborn piglets in the heterozygotes animals than in sows with homozygous *ESR*1^{AA}. A similar pattern appears in the 1st farrowing, the sows with *ESR*1^{BB} and *ESR*1^{AB} genotypes had the advantage in the total number of piglets at birth. In the experimental group of ULW-1 sows statistically proven patterns were not found, there was only a tendency to slight predominance of sows with *ESR*1^{BB} and *ESR*1^{AB} genotypes comparing to individuals with *ESR*1^{AA} genotype. In the experimental group of Mirgorod sows there was a tendency to have most part of individuals with heterozygous genotype. Analysis of prolificacy of ULW-3 sows due to their genotype for the estrogen receptor 1 gene confirmed the superiority of *ESR*1^{BB} and *ESR*1^{AB} genotypes comparing to *ESR*1^{AA} sows. According to 2nd-4th farrows, sows with *ESR*1^{BB} and *ESR*1^{AB} genotypes had the advantage in prolificacy comparing to *ESR*1^{AA} sows by 1.15 and 0.53 piglets, respectively. According to the 1st farrowing difference between genotypes was absent. *ESR*1/*Pvu*II-polymorphism do es not

influence on prolificacy of ULW-1 sows. According to the 1st farrowing the trend towards a higher level of prolificacy of Mirgorod sows with *ESR*1^{AA} genotype was found, while difference in 2nd-4th farrows between the groups was absent.

It was found that *ESR*1/*Pvu*II-polymorphism impact on the total number of piglets at birth and prolificacy for ULW-3 sows is characterized by predominance of additive component with a little contribution of the dominant component, the similar trend is observed for ULW-1 sows. There is a complex nature of the impact of *ESR*1/*Pvu*II-polymorphism on the reproductive traits of Mirgorod sows in the predominance of the dominant component.

Conclusions. The impact of polymorphism in estrogen receptor 1 gene on the total number of piglets in the litter after the birth and prolificacy in ULW-3 sows was detected. ULW-3 sows with *ESR*1^{BB} genotype have 1.36 more piglets in a litter (analysing data from 2nd-4th farrows) and 1.15 more comparing to animals with *ESR*1^{AA} genotype. *ESR*1/*Pvu*II-polymorphism was not associated with total number of piglets in a litter and prolificacy in ULW-1 sows and Mirgorod sows. The counted parameters of additive-dominant model indicate that *ESR*1/*Pvu*II polymorphism impact on the total number of piglets at birth and prolificacy for ULW-3 sows is characterized by predominance of additive component with a little contribution of the dominant component.

Keywords: **pigs, Large White breed, Mirgorod breed, estrogen receptor l gene, reproductive traits, association analysis**

M. M. Peredriy, V. V. Dzitsiuk. Karyotype variability of Ukrainian Red-and-White Dairy cows with different level of reproductive ability

The article deals with the results of cytogenetic research on Ukrainian Red-and-White Dairy cows with different level of reproductive ability. Cultivation of lymphocytes, preparation of cytogenetic samples, classification and count of chromosome aberrations were performed using conventional methods.

For cytogenetic study three groups of cows were formed by data of zootechnical records depending on traits of cows' reproductive ability. The I group (17 head) composed of animals with impaired reproductive ability. 33 cows with open days not less than 150 days were included to the II group, 25 cows with open days of 51-90 days – the III group.

Significantly greater frequency of cells with aneuploid and polyploid set of chromosomes and cells with chromosomal aberrations was revealed in karyotypes of animals with impaired reproductive ability than in cows with normal reproductive function. Aneuploidy among the numerical chromosomal violations is most common, frequency of which was significantly greater in the I group – 10.5 ± 2.38%, frequency of aneuploid cells in the II group of cows was 6.3 ± 1.45% and in cows with normal reproductive function – 4.46 ± 0.73. The largest number of polyploid cells was found in the I group of cows (1.0 ± 0.01%), frequency in the II and III groups was significantly 2 time and 6 times less, accordingly.

In the studied groups significant differences were revealed in the frequency of chromosomal aberrations. In most cases breaks and gaps, including chromatid gaps, chromosomal and chromatid breaks, deletions, and formed as a result of this the fragments of genetic material were observed. There were not constitutional chromosome rearrangements, including Robertsonian translocation. In the I group of animals, the frequency of chromosomal aberrations was a third higher than the same figure in the II and III groups. The difference between frequencies of higher and lower group value of this figure was 4.15%.

A positive correlation was found between open days and main cytogenetic indicators in all the groups. The highest positive correlation ($r = 0.70$; $r = 0.50$; $r = 0.44$) was revealed between length of open days and frequency of structural aberrations, open days and polyploidy, open days and aneuploidy in the II group of cows with open days 150 days and more. In the I group the highest positive correlation ($r = 0.48$) was found between length of open days and aneuploidy. In the third group defined as control, positive correlation ($r = 0.55$) was also between open days and aneuploidy.

The results of the research give the reason to use indicators of karyotype variability as a criterion for assessing reproductive traits of dairy herd cows.

Keywords: **cattle, karyotype, instability, numerical and structural chromosomal aberrations**

V. V. Dzitsiuk, S. G. Kruhlyk, V. G. Spyrydonov. Genetic analysis of German Shepherd dogs using microsatellite DNA markers

Modern methods of breeding dogs are based on getting of stable phenotypic uniformity by using close inbreeding or breeding by one line, but such strategy leads to a loss of genetic diversity, and as a result there are genetic defects in breeds which have no external manifestations or manifest in adulthood of dogs and are transmitted from generation to generation. Therefore, to prevent use of dogs with genetic abnormalities in breeding, and to develop standards for a breed and make an accurate pedigree, must carry out the genetic evaluation of animals.

One of the modern tools for dogs' genetic evaluation is DNA-testing using microsatellite loci permitting to match the parental couple effectively, identify (to certify) animals, undertake a comprehensive assessment for heterozygous and homozygous genotypes in populations, permitted for use in the selection process, and illustrate clearly the impact of artificial selection on the genetic characteristics of breeds.

The study was conducted in Ukrainian Laboratory of Quality and Safety of Agricultural Products in Department of Molecular Biology Research. For the genetic analysis 42 German Shepherd dogs, used for breeding in kennels of Ukrainian Kennel Union (UKU), were selected. The material for the research was DNA isolated from dogs' buccal epithelium cells and blood. Genomic DNA was extracted using a standard set of reagents for DNA isolation.

Level of theoretically expected heterozygosity (H_{exp}) varied between 0.385 (PEZ1) to 0.835 (PEZ8). On average theoretically expected heterozygosity with coefficient of 0.657 had not significant advantage over value of actual heterozygosity (0.629), it also shows that the status of the sample of dogs is close to balance. The same is observed in actual and expected heterozygosity for PEZ 6 (0.629) and PEZ 8 (0.657) loci, which also shows the balance.

For FHC2010 loci actual heterozygosity is higher than expected, indicating increasing the number of heterozygous individuals. For FHC2054 locus, by contrast, theoretically expected heterozygosity (0.670) dominates the actual (0.429), indicating the lack of heterozygous genotypes in this micropopulation.

The value of PIC (polymorphism information content) of the analysed loci ranged from 0.325 to 0.740 with average value 0.574. PEZ6, PEZ8, FHC 2010 and FHC 2054 loci optimally meets their suitability for genetic certification of genotypes because their frequency varies from 0.587 to 0.740. The reduced average index of polymorphism for PEZ1 locus with coefficient of 0.325 confirmed the insufficient level of its polymorphism for full genetic evaluation of the micropopulation of German Shepherd dogs (PIC < 0.500), as confirmed by Chinese researcher J.-H. Ye, according to his data PIC value for PEZ1 locus was 0,320, which correlates with our results. And PIC value for PEZ8 locus was 0.740 in our studies, whereas according to J.-H. Ye – 0,720, which, by contrast, indicates high polymorphism and confirms the effectiveness of its use in genotyping of dogs.

Probability of exclusion of accidental allele coincidence (PE), which is 0.675 on average, indicates a lack of the number and informativeness of the selected microsatellite markers for German Shepherd as in this case a combined probability (CPE) of accidental allele coincidence is 0.933886 or 93.3%.

The chosen microsatellite loci to study the genetic structure of the German Shepherd dog population, show a sufficiently high informativeness of chosen system of molecular genetic DNA markers. However, there is the need for using additional microsatellite markers which will increase the combined probability of accidental allele coincidence (CPE) from 93.3% to 99.9%.

The analysis of heterozygosity is important in studying the dynamics of genetic processes in populations, because heterozygosity has an effect on many factors, including mutations, selection, non-random mating, genetic drift, etc., so continuous monitoring of genetic diversity is required for their timely identification and development of measures to improve breeding work on biodiversity in different dog breeds.

Keywords: **German Shepherd, microsatellites, DNA, polymorphism, genotype, homozygosity, heterozygosity**

M. D. Palkina, O. I. Metlytska. Optimization of DNA extraction methods from biological materials of honey bees in different metamorphosis phases

The aim of the research – adaptation, optimization and using of existing DNA extraction methods from bees' biological material with the reagent «Chelex-100" under complex economic conditions of native laboratories, which will optimize labour costs and improve the economic performance of DNA extraction protocol.

Materials and methods. In order to conduct the research the samples of honey bees' biological material: queen pupae exuviae, larvae of drone brood, some adult bees' bodies (head and thorax) were selected. Bowl and drone brood were obtained from the experimental bee hives of Institute of Apiculture nd. a. P. I. Prokopovich of NAAS. DNA extraction from biosamples of Apis mellifera ssp. was carried out using «Chelex-100®» ion exchange resin in different concentrations and combinations. Before setting tests for determination of quantitative and quality indexes, dilution of DNA samples of the probed object was conducted in ratio 1:40. The degree of contamination with protein and polysaccharide fractions (OD 260/230), quantitative content of DNA (OD 260/280) in the extracted tests were conducted using spectrophotometer of «Biospec – nano» at the terms of sample volume in 2 µl and length of optical way in 0,7 mm [7]. Verification of DNA samples from biological material of bees, isolated by «Chelex-100®», was conducted after cold keeping during 24 hours at 20°C using PCR with primaries to the fragment of gene of quantitative trait locus (QTL) Sting-2 of next structure [8]:

3' – CTC GAC GAG ACG ACC AAC TTG – 5';

3' – AAC CAG AGT ATC GCG AGT GTT AC – 5'

Program of amplification: 94 °C – 5 minutes – 1 cycle; 94 °C – 1 minute, 57°C – 1 minute, 72 °C – 2 minutes – 30 cycles; elongation after 72°C during 2 minutes – 1 cycle. The division of obtained amplicons was conducted by gel electrophoresis at a low current – 7 µÀ, in 1,5 % agarose gel (Sigma ®) in TAE buffer [7].

The results. At the time of optimization of DNA isolation methods, according to existing methods of foreign experts, it was found optimal volume of ion exchange resin solution was in the proposed concentration: instead of 60 µl of solution used 120 µl of «Chelex-100®», time of incubation was also amended from 30 minutes to 180 minutes [9]. The use of the author's combination of method «Chelex-100®» with lysis enzymes, proteinase K and detergents (1M dithiothreitol), as time of incubation was also amended, which was reduced to 180 minutes instead of the proposed 12 hours [10]. Changes in quality characteristics of obtained DNA in samples after reduction in incubation time were not found.

Conclusions. The most economical method of DNA isolation from bees' biological material is 20% solution of «Chelex-100» ion exchange resin with the duration of the incubation period of 180 minutes. It should also be noted that the best results can be obtained from exuviae, selected immediately after the queen's exit from bowl, that reduces the likelihood of DNA molecules destruction under the influence of nucleases activation, but not later than 12 hours from release using the technology of isolated obtain of queens.

Keywords: **DNA, «DNA Sorb-B», «Chelex-100», proteinase K, exuviae, extinction**

N. K. Sarantseva, V. M. Balatskyi, V. Y. Nor, Ye. K. Oliinychenko. Genetic and population practicability of using SNP (c.232T>A) of LEPR gene as a marker for further selection for Large White and Mirgorod pig breeds

Leptin is an important regulator of energy metabolism and reproduction and is mainly synthesized in the adipocytes and then secreted into bloodstream. Leptin receptor is one of regulating components of organism energetic homeostasis. Receptor influences on leptin effects by regulating feed intake, body weight and fat deposition. Leptin receptor gene (LEPR) is located in the sixth chromosome in the region that correlates with content of intramuscular fat, thickness of back fat, growth rate and pig carcass parameters. Due to these correlations, LEPR is known to be gene candidate that controls quantitative traits.

Leptin receptor gene consists of 20 exons; not less than 25 single nucleotide polymorphisms (SNPs) were found in gene structure in different gene sites (exons, introns, 5' and 3' regions).

SNPs of LEPR gene can be chosen as useful markers for predicting breeding value in pigs. For the experiment SNP c.232T>A was chosen; it is located in the second exon of LEPR gene.

The aim of work was to study spreading of SNP c.232T>A in LEPR gene of breeds under Ukrainian selection; to estimate if marker selection for proving meat quality is possible using chosen SNP as a marker.

Materials and methods. For genetic population analysis, DNA samples of Large White breed (bred in Stepne farm, Poltava region, Ukraine) and Mirgorod breed (bred in Dekabristy farm, Poltava region, Ukraine) were used; 50 samples of each breed were taken for the research. Samples were genotyped using PCR-RFLP method. Deviations from genetic equilibrium found using the Hardy-Weinberg coefficient were signified with chi-square criterium, the frequency of alleles, estimation of gene frequencies, determination of heterozygosity were counted using GenAlex 6.0.

Results. Genetic researches showed polymorphism c. 232T>A in LEPR gene to be spread in population of Large White breed and Mirgorod breed under Ukrainian selection. Polymorphism with AA genotype was shown to be spread the most. In studied Large White population highly probable deviation of the actual distribution of genotypes of the expected value for the Hardy-Weinberg equilibrium ($\chi^2 = 15.759$, $p \leq 0.001$) was found. The deviation was caused by increasing homozygotes (AA = 0.680). Small amount of heterozygotes (AT = 0.160) and alternative homozygotes (TT = 0.160) was found. Positive designation of Rayt index (0.561) and the advantage of expected heterozygosis (0.365) on the actual (0.160) also show existence of selection pressure of LEPR in this herd. In Myrgorod pig population big amount of animals turned out to be homozygotes AA (0,720), small amount of heterozygotes was found (AT=0.280), alternative homozygotes TT were not found.

Deviation from spreading of genotypes of the expected value for the Hardy-Weinberg equilibrium was not significant and did not have a significant nature ($\chi^2 = 1.325$); SNP variety (c. 232T>A) in LEPR gene is not spread, so this SNP in

Mirgorod breed wasn’t under selection pressure. The fact of low selection pressure of (c. 232T>A) in LEPR gene in Mirgord breed can also be proved of negative designation of Rayt index (-0,163) and domination of heterozygotes (0.280). Allele A is found to be dominative above allele T in both studied populations.

Conclusions. After DNA analysis of two breeds under Ukrainian selection (Mirgorod and Large White breeds) polymorphism c. 232T>A in LEPR gene SNP was found to be spread; chosen SNP can be used for further researches in association analysis for finding correlation between SNP and meat traits.

Keywords: **marker assisted selection, pigs, population, polymorphism, DNA marker, leptin receptor gene**

A. B. Zyuzyun. Cytomorphological research of rabbit oocytes in the process of in vitro embryogenesis

Introduction. Using genetic potential of rabbit ovaries and studying patterns of meiotic maturation of gametes in female *in vitro* is a basis for success in cloning and the creation of transgenic animals, so there is a need for in-depth study of cytomorphological characteristics of oocytes during *in vitro* embryogenesis.

The aim of the research is cytomorphological study of oocytes during embryogenesis, derived from matured rabbits' ovaries and before the sexual cycle.

Materials and methods of research. The ovaries of the rabbits (n = 8) aged 4 months and rabbits aged 11 months, coming into heat (n = 10) were used in the study. All the ovaries derived from females, were at follicular growth phase. Rabbits' oocyte-cumulus complexes were cultured *in vitro* during 24 hours in plastic Petri dishes (25 - 30 OCC per ml) in the medium for maturing – 199 with Earle's solution (Sigma, M 5017), supplemented by 20% heat-inactivated (56°C, 30 min.) homemade estrous cow serum, 0.068 mg/ml kanamycin sulfate, 0.11 mg/ml sodium pyruvate and 0.1 mg/ml glutamine. Granulosa cells derived from the antral follicles without atresia evidence were necessarily added in the culturing medium in amount of 3–5x10^6 per ml. Received *in vitro* the ova were fertilized by freshly derived rabbit's epididymal spermatozoa.

Results. As a result of extracting oocytes from all the ovaries (n = 18), 245 OCC were received, including 115 OCC from eight rabbits' ovaries before the sexual cycle and 130 OCC from ten ovaries of mature rabbits. Analysis of cytomorphological studies found more ($P < 0,05$) oocyte-cumulus complexes can be received from rabbits' ovaries during puberty being suited for cultivation than from mature rabbits' ovaries.

After *in vitro* culturing 85,5 % of OCC (47 of 55) derived from rabbits' ovaries during puberty and 75.6% of OCC (62 of 82) – from mature rabbits' ovaries reached MII meiosis. It was revealed the level of *in vitro* maturation of oocytes was 10 % higher in the group derived from rabbits' ovaries at puberty, compared with the group derived from mature rabbits' ovaries. Ripened outside a body the oocytes were fertilized *in vitro* by freshly derived rabbit's epididymal spermatozoa. The embryos developed in the both groups, but with a significant difference in the level of division. Cytomorphological research found that the level of 2-4-cell embryos formation in the group of oocytes derived from rabbits at puberty was 68,1% and in group of gametes from mature rabbits – only 46.8 % ($P < 0.05$). 22.2 % of embryos on average developed to the morula stage *in vitro*. In terms of embryo development to early morula stage significant difference between the groups wasn't found. The significant difference between the study groups in the number of zygotes have not passed division block ($P < 0.05$) was noted. In the group of oocytes derived from mature rabbits' ovaries the zygotes which have not divided were 23.8 % more.

Conclusions. It was found that more oocyte-cumulus complexes ($P < 0,05$) were received from rabbits' ovaries during puberty, being suited for *in vitro* cultivation, than from mature rabbits' ovaries. And oocytes with degeneration signs, being unsuited for *in vitro* cultivation, were received more ($P < 0.05$) from mature

rabbits' ovaries. The level of maturation also was 10 % higher in the group of OCC derived from rabbits' ovaries at puberty.

So, for biotechnology research as oocyte donors more effective is use of rabbits during puberty, which have not yet begun sexual cycle, because significantly more ($P < 0,05$) fully-fledged oocytes cumulus complexes, being suited to culture outside a body, can be derived from their ovaries which will provide greater percentage of preimplantation embryos.

Keywords: **rabbit oocyte-cumulus complexes (OCC), epididymal spermatozoa, *in vitro* maturation and fertilization, rabbit embryos**

S. I. Kovtun, N. P. Galagan, O. V. Shcherbak. Evaluation of biological activity of nanobionaterials

The main role in modern technology of long-term preservation of livestock gene pool is not only in conditions of low temperature conservation of reproductive cells and embryos, but also in composition of biomedia which are able to preserve their maximum integrity during this process. That is why cryomedia have been permanently improved in order to provide maximum vitality of cells after deconservation. Previously it was found that admixture of slight amount of high disperse (nanosized) silica (UFS) to the standard LGY-cryomedium for bull sperm freezing result in the increase of gametes survival after deconservation. As for UFS, it is widely used in preparation of drugs as a supporting substance, because in certain concentration limits it is physiologically non-harmful and compatible with biological systems. Such SiO_2 has the developed surface, covered by hydroxyl groups, which demonstrates high adsorption activity with respect to a lot of substances. Replacement of hydroxyls by synthetic or natural compounds makes it possible to synthesize on this base immobilized biologically active preparations with prolonged and adsorption action. Thus, immobilization of some carbohydrates on UFS surface allowed us to obtain nanobiomaterials (NBM) which, being admixed to some cryomedia, provided higher survival of gametes after their defrosting in comparison with initial SiO_2.

The aim of present work was obtaining NBM, based on UFS, bovine serum albumin (BSA) and N-acelylneuraminic acid (N-ANA) and also examination of its biological activity using ejaculated bovine gametes of Holstein bulls (Strolh 379536/678, Tom 379545/345 and Tryplle 244), which are kept more than 29 years in the Bank of Animal Genetic Resources of Institute of Animal Breeding and Genetics nd. a. M.V.Zubets of NAAS.

NBM UFC/N-ANA was obtained by impregnation of UFS, surface of which was preliminary heated during 2 hours at 200^{o} C. NBM UFS/BSA and UFS/BSA/N-AHK were obtained by non-covalent adsorption of biomolecules. They were added to bovine gametes on the stage of their deconservation in concentration 0,001 %. Effect of NBM on spermatozoa was estimated in percents using the index of vitality according to activity of their movement.

It was found out that after defrosting of bovine spermatozoa they demonstrated average activity of about 50,0 ± 5,77%. The same index of gametes activity in the control (without NBM admixture) lowered during 30 minutes only 3,3%, and reached 46,7 ± 6,01%. In experimental groups after 30 minutes the most active ones were gametes, which were in contact with UFS/BSA/N-ANA (56,7 ± 8,82 %). Gametes mixed with UFS demonstrated the lowest activity. In comparison with the control it decreased by 10 % and by 20 %, in comparison with UFS/BSA/N-ANA. Thus, admixture of UFS in concentration 0,001 % to deconservated bovine spermatozoa, stored in frozen state for considerable time, is inappropriate.

In presence of NBM UFS/BSA, unlike to UFS/BSA/N-ANA, the mobility of gametes decreased only by 1,7 %. At the same time, in presence of NBM without

protein – UFS/N-ANA, the decrease of mobility by 11,7 % was observed. It testifies in favour of possible stabilization of mobile cells number in presence of protein in NBM. But at low concentrations of nanoparticles in the media, containing cells, the probability of their contact with cell surface is insignificant. So, it may be assumed that this effect is observed due to interaction of NBM with components of semen plasma and cryomedium and this may result in redistribution of forms of water.

After 60 minutes of experiment, the most active were gametes in compositions with UFS/N-ANA (48,3 ± 4,41 %) and UFS/BSA/N-ANA (51,7 ± 8,82 %). In the control during this period the lower mobility was observed (41,7 ± 7,26 %) in comparison with upper mentioned samples and higher mobility by 13,4 % and 1,7 % in comparison with BSA and UFS/BSA. After 1,5 hours of the experiment both in control and experimental samples the gradual decrease of mobility was observed.

Summarizing the estimation of biological activity of NBM, the most promising was UFS/BSA and UFS/BSA/N-ANA. The first NBM provided for initial increase of spermatozoa mobility up to level 55,0 ± 5,77 %, whereas UFS/BSA/N-ANA, as it was shown previously, – up to 56,7 ± 8,82 %. Difference between them was not practically observed, but special role of protein was noted as a surface active substance. But mechanisms of activity of each NBM seem to be different. As for N-ANA in NBM, according to its functional properties it is able to provide for increase of chemical affinity of nanomaterials to certain components of semen or corresponding cell receptors, in contrast to protein.

Thus, we have proved the possibility to increase the level of mobility of deconservated bovine spermatozoa, previously stored for a long period in liquid nitrogen, caused by addition of NBM based on UFS and upper mentioned biomolecules, which result is particularly important further, on the initial stages of egg fertilization.

Keywords: **bulls, nanobiomaterials, ultrafine silica, ejaculated spermatozoa, preservation of the gene pool, cryopreservation**

S. L. Voitenko, L. V. Vishnevskiy. Modern condition and prospects of development of Ukrainian Whiteheaded breed.

The article shows the state of Ukrainian Whiteheaded cattle, which includes distribution of cattle, the number of animals belonging to respective bloodlines, evaluation of young animals with live weight in the process of growing and milk production of cows during the first lactation. It reflects the historic development of the breed when it was colonism whiteheaded cattle, which turned into the original breed, undergone a significant expansion in livestock and increase of productivity, decreased in the number, was as basis for creation of Ukrainian Black-and-White dairy breed and now bred only in one breeding farm. Visual estimation of animal exterior showed good development of cows and calves and their belonging to the dairy type. In the vast majority the cows of the herd have a black suit, a white head with " glasses" around the eyes, white belly, udder, lower legs and brush of the tail. The youngsters aren't consolidated by the exterior, and among them there are animals which are not typical for Ukrainian Whiteheaded breed. The young animals have some lag in live weight behind the breed standard [12] to 7 months' age with exceeding of this trait in certain periods quite significantly in the future. It was established that selection of heifers on live weight will be effective at the early age (1-5 months), given the coefficient of variation of live weight – 22,63-30,21% and will not have a significant influence in the future.

Milk yields of first-calf heifers vary considerably depending on the origin. The milk yield of first-calf heifers in the herd was 4238,5 kg on average, the heifers belonging to Mart 171 and Ozon 417 bloodlines had the best milk performance – 4483,1 and 4254,9 kg accordingly. The most aligned milk yield during the first lactation was in the cows belonging to Ozon 417 bloodline, the limits of the trait are 4128,5-4327,4 kg with the average value by the line 4254,9 kg. In contrast, the first-calf heifers of Ryezvyi 33 bloodline with average milk yield 4048,9 kg had limits of the trait 2199,3-4736,1 kg. Even greater range in cows' milk yield during the first lactation R= 4939 kg (limits 1687 – 6626 kg) is characterized for the herd in general, it shows, on the one hand, the possibility of qualitative improvement of cows' productivity due to selection on the investigated trait and lack of selection in the herd on the other hand. It was established that daughters of bull Chardash belonging to Ryezvyi 33 bloodline produced 4736,1 kg of milk for 305 days of the first lactation with fat content 3,6%, whereas Zlak's descendants of the same line were characterized by the lowest milk yield for the first completed lactation – 2199,3 kg with fat content 3,7% and the average value by the line – 4048,9 kg of milk, fat content 3,6%. Similar variability of first-calf heifers' milk yields, depending on the origin, is typical for other bloodlines of Ukrainian Whiteheaded breed.

To increase milk productivity of Ukrainian Whiteheaded cows is recommended to repeat successful combinations of parental forms, and to preserve the breed – to carry out an objective assessment of animals by a range of traits, given the efficiency of selection of heifers on live weight at early age.

Keywords: **breed, milk productivity of cows, impact of bulls, live weight, young animals, conservation perspectives.**

Yu. V. Guzeiev, O. V. Melnyk, E. A. Gladyr, N. A. Zinovieva. The polymorphism of five microsatellite DNA loci in the study of Ukrainian Grey and Bulgarian Grey cattle breeds

The problem of preserving genetic diversity as a component of the environment, has recently become global. Among the cattle breeds that require special attention in terms of preserving genetic diversity is grey steppe cattle. Grey steppe cattle are very ancient livestock, representatives of grey steppe cattle in Ukraine is Ukrainian Grey, in Bulgaria – Bulgarian Grey breed. The purpose of this study was to conduct a comparative analysis of allele diversity of Ukrainian Grey and Bulgarian Grey cattle breeds using microsatellite DNA loci.

This analysis was performed on 32 animals of Ukrainian Grey breed bred in the LLC "Holosiyevo", Brovary district, Kyiv region. Their genetic studies were carried out in the Laboratory of Molecular Genetics and Cytogenetics of Animals in the center of biotechnology and molecular diagnostics of the All-Russian Research Institute of Animal Husbandry (Dubrovitsy vil., Moscow reg.). Genomic DNA was isolated from the biological material obtained from the earmark, according to the method described by N. A. Zinovieva and co-authors.

Genetic analysis of Ukrainian Grey and Bulgarian Grey breeds was conducted at five microsatellite DNA loci: BM1824, BM2113, ETH225, SPS115, TGLA126, which are included in the list recommended by the ISAG-FAO for genotyping of cattle. The data on Bulgarian Grey breed were used after Teneva A. et.al. (2005).

Electrophoretic separation of DNA fragments by capillary electrophoresis was performed on the device MegaBace 500. For identification of alleles of studied loci MS Genetic Profiler 2.0 software was used. These alleles of each animal were summed to a Microsoft Excel spreadsheet. The resulting matrix of genotypes served as the basis for the statistical processing of the results.

For statistical data processing software Cervus 3.0.3, PowerStatsV12 (Promega), GENALEX 6 was used.

The studies carried out in 5 microsatellite DNA loci identified 26 alleles in Ukrainian Grey breed and 30 alleles in Bulgarian Grey breed. The SPS115 locus in both breeds identified 7 alleles, with the highest frequency of allele 248 bp.

At Ukrainian Grey breed in BM2113 locus the highest frequency was discovered at the alleles 135 and 139 bp, while in micropopulation of Bulgarian Grey breed the highest frequency was demonstrated by the allele 133 bp.

In BM1824 locus allele 188 bp has the highest frequency. Alleles 188 and 192 are present only in the micropopulation of Ukrainian Grey breed. In the micropopulation of Bulgarian Grey breed allele 184 is identified with frequency of occurrence 0.386.

In ETH225 locus in the micropopulations of Ukrainian Grey and Bulgarian Grey breeds 6 loci were revealed. Allele 152 was present only in the group of Ukrainian Grey breed, and allele 158 with frequency 0.043 and allele 146 with frequency 0.129 were identified only in the micropopulation of Bulgarian Grey breed. The highest frequency of alleles in the studied Bulgarian Grey breed was at allele 140

with frequency 0.371, and in the micropopulation of Ukrainian Grey breed it was at allele 148.

In TGLA126 locus 7 alleles were identified: 109, 115, 117, 119, 121, 123, 125. Allele 115 was detected only in the micropopulation of Ukrainian Grey breed, and allele 109 with frequency 0.014 and allele 121 with frequency 0.014 were detected only in the micropopulation of Bulgarian Grey breed.

Furthermore, the quantity of the informative value of the used markers (PIC) was calculated. The larger the value for the PIC locus is, the more informative the locus is as a marker. According to Botstein et al. the locus with PIC > 0.500 value is very informative (high polymorphic); with 0.5 > PIC > 0.25 is informative enough (moderately polymorphic); and with PIC < 0.250 is slightly informative.

In the micropopulation of Ukrainian Grey breed the highest value was observed at loci BM1824 PIC = 0.710, and ETH225 PIC = 0.710. In the micropopulation of Bulgarian Grey breed most polymorphic loci were BM2113 PIC = 0.790 and ETH225 PIC = 0.740.

The average value of N_a at Ukrainian Grey breed was 5.2 alleles in five loci; in the micropopulation of Bulgarian Grey breed the average value of N_a was 6.0 alleles; the average value of the observed degree of heterozygosity H_o in micropopulations of Ukrainian Grey breed was 0.656, at Bulgarian Grey breed it was 0.783. The expected degree of heterozygosity H_e at Ukrainian Grey breed was 0.704, at Bulgarian Grey breed it was 0.813, that indicates a greater genetic diversity in the micropopulation of Bulgarian Grey breed. The total average value of F_{is} in the micropopulation of Ukrainian Grey breed was 0.074, at Bulgarian Grey breed it was 0.030. The excess of heterozygotes was detected in the micropopulation of Ukrainian Grey breed on loci BM2113 and BM1824 (18.2 and 2.5%, respectively), in the micropopulation of Bulgarian Grey breed it was detected on BM1824 locus (15.1%).

Heterozygosity deficit was identified on all the loci, with the exception of the loci BM2113 (-0.182) and BM1824 (-0.025) in the micropopulations of Ukrainian Grey breed and BM1824 locus (-0,151) in Bulgarian Grey breed. The highest value F_{is} was found in SPS115 locus (0,444) of Ukrainian Grey breed. Precisely this can explain the high deficit of heterozygosity in the micropopulation of Ukrainian Grey breed.

This study confirms the effectiveness of the use of microsatellite DNA loci to characterize the genetic diversity of populations of grey steppe cattle bred in many countries around the world. Ukrainian Grey and Bulgarian Grey breeds are genetically very similar to each other. The genetic analysis shows that they have a low genetic variability, although in both micropopulations deficit of heterozygotes was detected, but it was higher in micropopulation of Ukrainian Grey breed. The results may be useful in breeding grey cattle breeds, to monitor them in order to preserve their genetic diversity.

Keywords: **genetic analysis, grey steppe cattle, breed, microsatellite DNA loci, alleles, polymorphism, micropopulation**

O. V. Kruglyak, I. S. Martynyuk. Economic bases of gene pool preservation of local and endangered breeds of farm animals in Ukraine

The aim was to determine the amount of state financial support for the full gene pool preservation of local and endangered breeds of farm animals in Ukraine for 2016-2020.

Given the great strategic and economic importance of the problem of gene pool preservation and rational use to enhance food security, the level of state financial support for preservation of the gene pool of local and endangered breeds of farm animals was determined for using two methods of conservation: in situ (live animals) and ex situ (cryoconservation of their genetic materials).

The level of budget support to preserve gene pool objects involves calculating the minimum (normative) amount of genetic resources (livestock females, bull semen, embryos) and rational choice of methodical approach to determining the level of budget support for the preservation of each type of genetic resources.

The level of budget support for *in situ* maintenance of gene pool objects was determined based on level of budget subsidy per head and livestock number of each species, recommended to preserve (normative). The basis of the level of budget subsidies was determined as compensation amount of normative costs for feed produced at cost. Normative costs of feed were determined on the basis of scientifically grounded rations for species and breeds of animals taking into account their productivity.

The full *in situ* preservation of dairy and dual-purpose breeds of cattle requires the holding herds of each breed which include animals of all main bloodlines, where at least 3 live bulls and 60 cows should be kept per bloodline. In gene pool subjects of beef breeds at least 3 bulls and 20 cows should be kept per bloodline. Breeding cattle of all breeds should be performed by linear purebred breeding and randomized fixing of bulls in lines. Under these conditions, it is possible to preserve purebred livestock number for 5-6 generations, or 20 years. To preserve *in situ* the gene pool of local and endangered breeds of pigs, sheep and poultry it is necessary to provide herd size not less than 25 boars and 100 sows, 20 rams and 200 ewes, 10 stallions and 50 mares, 50 geese and 200 fowl, 50 drakes and 250 ducks, 50 cocks and 250 hens.

The constancy of gene pool of local and endangered breeds is fully possible to provide only by *ex situ* method, providing measures to preserve genetic fund of breeds, types, lines in an artificial environment (cryoconservation of gametes, somatic cells, zygotes, tissues).

Ex situ preservation of the gene pool of local and endangered breeds is expedient as a "virtual" cryo-herds. For their expansion annually 1-3 thousand doses of bull semen of dairy, dual-purpose and beef breeds per each farm or genealogical line (depending on the number of bulls in a line) must be collected and stored in cryo-depositories in over 3 thousand doses of bull semen for each line. Annual accumulation and storage of semen of rams should be accordingly 1.2 and 2.4 thousand doses, boars – 2 thousand doses and stallions – 300 doses in both cases. The annual need for purchasing sires' semen of farm animals is 35.7 thousand doses. For

implementation of programs for preserving the gene pool of local breeds it is necessary to pass 10% of annual purchased semen to the Bank of Animal Genetic Resources of Institute of Animal Breeding and Genetics nd. a. M.V.Zubets of NAAS.

The normative costs for an annual storage of sires' semen in 2015 have been determined, which amount is UAH 4.54 and UAH 2.98 according to normative capacity of cryo-depositories (5 thousand doses and 20 thousand doses).

The project of preserving populations of local and endangered breeds of cattle as "cryo-herds" (cryopreserved bovine embryos) during 2016-2020 requires the state support for obtaining 250 bovine embryos, prepared for long-term storage, of each breed and storing them in Bank of Animal Genetic Resources of Institute of Animal Breeding and Genetics nd. a. M. V. Zubets of NAAS.

To provide the full preservation of the gene pool of local and endangered breeds of farm animals in Ukraine using two methods of conservation: in situ (live animals) and ex situ ("virtual cryo-herds") during the next five years it is necessary to finance UAH 75,137.5 thousand from the State Budget. The implementation of the developed economic mechanism ensures the gene pool preservation of domestic autochthonous and local breeds of farm animals and their further use for breeding animals of specialized and dual-purpose breeds, the execution of commitments laid down by international agreements of Ukraine for the biodiversity preservation. These research results have been used in the development of the Programme of preservation of local and endangered breeds of farm animals in Ukraine for 2016-2020.

Keywords: **gene pool preservation, local, endangered breed, budget support, genetic resource, normative number, annual subsidy level**

Yu. M. Reznikova. Comparative characteristics of Ukrainian Grey cattle and some specialized beef breeds by economically valuable traits

For the last years significant reduction of breeding farms has led to decrease in the number of populations and these trends are particularly concerning beef livestock, competitiveness of which is lower compared with dairy cattle-breeding. There is observed to decrease not only number of indigenous populations, which aren't able to compete on productivity, but also native specialized cattle. So, population of Ukrainian Beef breed declined 1,5 times (8 breeding farms, 2733 head, 1135 cows on January 1, 2010 vs. 3, 1824, 665 respectively on January 1, 2016), Polessian Beef breed – 2,2 times (27 breeding farms, 8904 head, 3705 cows on January 1, 2010 vs. 10, 4113, 2157 respectively on January 1, 2016), Ukrainian Grey – 1,2 times (4 breeding farms, 1075 head, 437 cows on January 1, 2010 vs. 2, 903, 341 respectively on January 1, 2016).The reality of the recent years indicates that some native beef cattle breeds can be considered as local and as needing conservation in the nearest future.

Thereby, **the aim of our work** was to study dynamics of growth, productivity and reproductive ability of breeding stock of Ukrainian Grey breed compared with Ukrainian Beef, Polessian Beef having been created with its participation, and Blonde d'Aquitaine – a foreign specialized beef breed being bred under the same conditions.

Materials and methods. The investigations were carried out at the herds of SE «Polyvanivka» Research Farm», Magdalynivka district, Dnipropetrovsk region and AF «Klen», Zhovkva district, Lviv region at breeding females of Ukrainian Grey (n = 279), Blonde d'Aquitaine (n = 42), Ukrainian Beef (n = 159) and Polessian Beef (n = 100) breeds. The indicators of growth rate, reproduction, and productivity were analysed based on data of zootechnical primary account registered at breeding farms.

Results of research. Comparison of averages by a group found that the Ukrainian Grey animals were characterized by slightly lower figures of live weight at all the investigated ages. Under the same growing conditions, live weight of the Ukrainian Grey animals at the age of weaning was 14 kg ($P < 0,001$) less compared with the Ukrainian specialized beef breed (Ukrainian Beef) and by 19 kg ($P < 0,001$) less compared with the French specialized beef cattle (Blonde d'Aquitaine). The results are quite predictable that the indigenous breed isn't able to compete with specialized beef cattle.

The Ukrainian Grey animals were characterized by lower figures of average daily gain of live weight almost for all the investigated age periods with the greatest difference from birth to weaning – 56 g ($P < 0,001$) compared with Ukrainian Beef and 79 g ($P < 0,001$) compared with Blonde d'Aquitaine. The Ukrainian Grey heifers at the age from 1 to 2 years were characterized by almost the same growth rate as Ukrainian Beef and Polessian Beef contemporaries and predominated slightly over Blonde d'Aquitaine.

The greatest difference was observed between milk ability of the Ukrainian Grey and Polessian Beef cows within 15-21 kg ($P < 0,001$). Predominance of cows

of other studied breeds over Ukrainian Grey was 13 kg (*P < 0,001)* after the 1st calving, 14-19 kg (*P < 0,001)* after the 2nd calving and 11-15 kg (*P < 0,001)* after the 3rd calving. Reliable differences in calving interval weren't revealed between Ukrainian Grey and Ukrainian Beef, Blonde d'Aquitaine (except for calving interval between the 1st-2nd calving).

Comparative analysis of age repeatability of live weight revealed that gradual reduction of repeatability coefficient with each distance from the age of 210 days or 1 year was characterized for the animals, kept in "Polyvanivka" breeding farm. So, the highest age repeatability was observed at adjacent periods – 210 days-1 year, 2-3 years. Higher levels of age repeatability of live weight were found at the Polessian Beef and Blonde d'Aquitaine animals.

The results of research of Ukrainian Grey cows' productivity should not be assessed pessimistically, because productivity for indigenous and local breeds has never been the main traits in their preservation. It is studied to monitor their state.

Conclusions. So, indigenous Ukrainian Grey cattle are inferior to all the investigated beef breeds by productivity that caused by its triple-purpose specialization with working ability at the first place in the past. The significant high and middle levels of age repeatability indicate the possibility of effective selection of Polessian Beef and Blonde d'Aquitaine heifers on live weight at weaning (210 days), whereas for Ukrainian Grey and Ukrainian Beef animals at 1-years' age. No reliable correlation of live weight with milk ability was found at the Ukrainian Grey, Polessian Beef, and Blonde d'Aquitaine cows and inverse correlation of live weight at 4-years' age with milk ability after the 2nd calving – at the Ukrainian Beef cows.

Keywords: **beef cattle-breeding, breed, live weight, milk ability, growth rate, reproductive ability, correlation, age repeatability**

I. V. Stefurak, Yu. P. Stefurak, M. V. Pasailyuk. Natural resistance of Hutsul horses from the Pokuttya Carpathians

Introduction. Carpathian Mountains are a place which favoured formation of the main breed characteristics of Hutsul horses. We think different climate conditions influence to the isolated populations of Hutsul horses. It is reflected at the level of horses' adaptation to changing environmental conditions by different reactions in contact with pathogens.

Differences are expected for the bactericidal properties of blood serum of Hutsul horses living in the conditions of high mountains, middle height mountains and the pre-Carpathians.

Therefore, the aim of this study was to explore indicators of nonspecific resistance of the organism of Hutsul horses living in the conditions of high mountains of the Carpathians, the middle height mountains of the Carpathians and the pre-Carpathians.

Materials and methods. The blood samples of healthy Hutsul horses living in the conditions of high mountains of the Carpathians, the middle height mountains of the Carpathians and the pre-Carpathians were studied. To assess the status of horses morphological and biochemical indicators of blood were studied. Peripheral blood samples were selected from horses before early feeding by puncture of the jugular vein according to the standard technique into test tubes with anticoagulant (10 IU/ml) and without it. To obtain serum the blood samples were centrifuged. To study the resistance of animals in the whole blood the index of completed phagocytosis (ICF) was determined, in the serum of blood bactericidal activity (BABS), lisozyme activity (LABS), total protein and its fractions were determined. To determine lisozyme and bactericidal activities culture of *Micrococcus lisodecticus* ATCC 10240 та *Bacillus subtilis* ATCC 6633 was used respectively.

Statistical processing of the results was conducted according to the procedures of G. F. Lakin using Microsoft Excel software.

Results and discussion. Exploring the parameters of nonspecific resistance of the organism of Gutsul horses from different climate zones, differences were revealed for cellular immune parameters depending on the localization of the horses. For individuals living at altitudes of 1600 meters above sea level the index of completed phagocytosis was lower. The bactericidal and lisozyme activities of blood serum were lower for horses living in highland, than for horses in pre-Carpathian region and the middle height lands. These facts suggest the view that the nonspecific resistance intensity is lower for natives of the mountains as compared with animals, whose habitat is limited to the terms of the pre-Carpathians and middle height lands.

The protein fractions content from blood serum of horses is typical. So, deviations from the norm of the total protein were not revealed, however, difference in the percentage content of protein fractions was noticeable. For animals of middle height lands, and from the pre-Carpathians, in contrast to animals living in highland, the content of albumin and α-globulins was higher but content of γ-globulins was slightly reduced.

Fractional composition of proteins from the blood serum is a diagnostic indicator of the animal organism. The higher content of albumin fraction is indicator of the more stable organism to changing conditions, i.e. its adaptive capabilities are

better. Thus, horses living in the middle height lands and the pre-Carpathians are better adapted to changing environmental conditions than their highland relatives.

On the other hand, the increased levels of γ-globulin in highland Hutsul horses are indicator of compensatory mechanism of nonspecific protection in the organism, especially on the background of lower indicators of cellular immunity and nonspecific humoral factors. At the same time, in this group of horses the level of α-globulin was low relatively. It is evidence of pathological state absence in organisms of the experimental animals, as proteins of this fraction are the informants of the stressful situation intensity and probable inflammation in a body.

It is known that levels of some blood components depend on height above sea level. We have shown that for the horses living in the pre-Carpathians and middle height lands the characteristic of protein content is similar, but for the representatives of highland the difference in the same indicators is statistically significant.

Analysis of the cellular and humoral factors of nonspecific resistance showed weaker intensity of the indicators in the horses from high altitudes. Trend to increase of indicators was at horses living in middle height mountains, and the highest was at horses from the pre-Carpathians.

Conclusions. It is established the nonspecific resistance indices of an organism in the Hutsul horses depend on localization of individuals above sea level. So, the intensity of nonspecific resistance of an organism in the animals kept under conditions of the Carpathian highlands is lower as compared with animals, whose habitat is limited to the terms of the pre-Carpathians and middle height lands. These representatives have lower level of ICF, BABS, LABS, α-globulin. Also the level of γ-globulins is the highest compared with the Hutsul horses from the Carpathian Mountains and middle height lands and that may be a trait of compensatory mechanism of nonspecific protection of an organism.

The indicators of nonspecific resistance of an organism show a similar pattern for representatives from pre-Carpathians and middle height lands, statistically significant differences are noted only for LABS, which is higher in horses living in the pre-Carpathians.

Keywords: **Hutsul horses, the pre-Carpathians, middle height mountains, highland, index of phagocytosis completeness, bactericidal activity of blood serum, lysozyme activity of blood serum, content of proteins**