

1. Йордан Марчев, 2017, Автореферат за присъждане на научна степен „Доктор на науките” Eastbalkan swine. Characteristics and productivity in environmentally farming. Formation of a breeding policy for sustainable development.

The recent position of the specialists on the rebirth of indigenous breeds has determined the purpose of the present scientific paper united in several directions:

- a complex phenotypic and genetic characteristic of the East Balkan swine in order to develop a breed standard and a breeding program;
- studying the impact of some factors on reproductive and productive indices;
- analysis of the prospects for preservation and development of the population for the formation of the breeding policy;
- developing technology for environmentally friendly pig breeding.

To achieve the purpose of the present scientific paper, 26 experiments were carried out with 774 animals from different categories. The obtained results could be summarized in several directions:

- The phenotypic characteristic indicates that the East Balkan swine is a medium-sized semi-cultural breed with a strong body constitution. Type for meat and fat. A well-expressed sexual dimorphism and non-upbringing of animals have been established in number of measurements.
- Genetically in the East Balkan swine breed there are mainly two major mDNA subtypes: European E1 (61.3%) and Asian A (38.7%).
- The seasonal system of pig reproduction predetermines a higher average age of 1 farrowing (553 days). The average number of economical use of animals is 5,2 expressed through the number of obtained litters from one sow. For the whole study period the number of the obtained born alive piglets in one litter was 7,06. The impact of the year and season on reproductive performance was statistically significant ($p \leq 0,05$; $p \leq 0,001$).
- Sexual hormone serum levels of gilts reached levels typical for sexually mature animals at 350 days of age. In the East Balkan swine breed, the reproductive process is more strongly influenced by the metabolism provided by the food resources.
- The grassland of Strandzha used by the Eastern Balkan swine in pasture farming is characterized by low nutritional value and the yield of green mass is the highest one in grass with the most balanced botanical composition.
- The Eastern Balkan beechnut is characterized as an extremely valuable feed - containing of 15.50% protein, 17.99% fat and 3.18% minerals.
- The higher total gain of East Balkan swine breed fed with processed feed in the form of a flour mixture containing of 10.3% crude protein, 0.50% lysine and 12.61 MJ metabolizable energy was with 23% compared to those fed only with unprocessed grain barley in fattening up to 90 kg live weight.
- In fattening pigs from the East Balkan breed the percent of meat with bones is highest in the shoulder (92,12%), followed by the real ham (80,83%) and the neck chop (78,70%).
- Meat of the East Balkan swine breed raised traditionally in grassland and fed with barley is characterized with good dietary qualities - a higher content of polyunsaturated fatty acids and an optimal n-6 / n-3 ratio according to European standards for healthy eating.

- Intramuscular fat indicate significantly higher content of saturated fatty acids than subdermal fat. With regard to the content of polyunsaturated fatty acids, the latter was characterized with higher content of linoleic (C18: 2) and linolenic (C18: 3) compared to fat in m. Longissimus dorsi.

2. Недева, Р., **Й.Марчев**, Н.Палова, К.Стоева, 2009. Химичен състав на естествени фуражни ресурси използвани от Източнобалканската свиня, *Journal of Mountain Agriculture on the Balkans*, 12, 3, 2009, 443-454.

R.Nedeva, **Y.Marchev**, N.Palova, K.Stoeva, 2009. Chemical composition of natural forage resources used by the East Balkan pig, *Journal of Mountain Agriculture on the Balkans*, 12, 3, 2009, 443-454.

A chemical analysis of sward of four natural pastures and oak acorn, used for feeding pigs in the region of the village of Drachevo (Strandzha) and beechnut from Strandzha and the village of Veselinovo (the East Balkan) was done during the period 2007-2008. A botanical composition analysis of the swards studied was done with respect to the content of wheat, leguminous and weed species. It was established that the sward of the natural pastures from Strandzha used by the East Balkan pig raised in pastures was characterized by low nutritional value. Oak acorn from the East Balkan (the village of Veselinovo) was defined as extremely valuable forage, containing 15.50% protein, 17.99% fat and 3.18% mineral traces. The green grass yield (914.8 kg/da) was the highest in sward 2 which botanical composition was the most balanced one in grass content.

3. **Й.Марчев**, Н.Палова, 2010, Сравнителна оценка на нерези от Източнобалканската порода по репродуктивните способности на заплодените от тях свине, *Journal of Mountain Agriculture on the Balkans*, vol 13, 4, 851-863.

Yordan Marchev, Nadezhda Palova, 2010, Comparative study of East Balkan boars on the base of the reproductive ability of the mated by them sows, *Journal of Mountain Agriculture on the Balkans*, vol 13, 4, 851-863.

A comparative assessment of 14 boars from the East Balkan breed on the base of the fertility and development of the offspring up to 21-day of age of the mated sows was performed. The data of the number and live weight of the newborn piglets of a litter and the number and live weight at 21-day of age of a litter was analyzed. Significant differences between studying boars on the average number of piglets born alive in litters of mated by them sows were established. The average live weight at birth (976 g) is in the physiological limits typical of the breed. Significant differences in the values between the boars' offspring were estimated. The correlation between the live weight at birth and the survival rate of piglets up to 21-day of age has average value and shows that the survival rate depends on a complex of factors - manner of breeding and feeding, sow's milk yield, health status etc.

4. Палова, Н., Р.Недева, **Й.Марчев**, Ж.Накев, Е.Гинева, 2010. Сравнително проучване на ефекта от използването на преработени и непреработени фуражи върху продуктивността на прасета от Източнобалканската порода. I. Угоителна способност, Екология и бъдеще, 3, 34-37.

N.Palova, R.Nedeva, **J.Marchev**, J.Nakev, E.Gineva, 2010. Comparative study of the effect of whole intact grain and compound feed on the productive performance of East Balkan pigs. I. Fattening ability. Ecology and future, 3, 34-37

In the Experimental Agricultural Centre – Sredetz was carried out a field trial on two groups of eight East Balkan fattening pigs each. All pigs were raised by the traditional technology, those in group I being fed an additional compound feed consisting of 10.3% crude protein, 0.50% lysine and 12.61 MJ metabolizable energy and those in group II – whole intact barley only. The obtaining results shown that under fattening from 60 kg till 90 kg live weight the pigs, being fed an additional compound feed were realized 23% higher daily gain v.s. those in group II-whole intact barley only. Cost price of 1 kg gain from the direct forages' charges was with 0.17 leva low in pigs, being fed with whole intact barley.

5. Накев, Ж., Н.Палова, Р.Недева, **Й.Марчев**, Е.Гинева. 2010, Сравнително проучване на ефекта от използването на преработени и непреработени фуражи върху продуктивността на прасета от Източнобалканската порода. II. Кланични качества, Екология и бъдеще, 3, 38-41.

J.Nakev, N.Palova, R.Nedeva, **J.Marchev**, E.Gineva, 2010. Comparative study of the effect of whole intact grain and compound feed on the productive performance of East Balkan pigs. II. Slaughter qualities. Ecology and future, 3, 38-41

In the Experimental Agricultural Centre – Sredetz was carried out a field trial on two groups of eight East Balkan fattening pigs each. All pigs were raised by the traditional technology, those in group I being fed an additional compound feed consisting of 10.3% crude protein, 0.50% lysine and 12.61 MJ metabolizable energy and those in group II – whole intact barley only. At reaching the pre-slaughter live weight a slaughter analysis was conducted. It was established that in the both groups the percentage of meat and bones is highest in the fore ham, followed by the real ham, and the neck chop. The pigs in group I resulted in significantly better slaughter qualities compared to group II.

6. Марчев, Й., Р.Недева, Ж.Накев, С.Иванова-Пенева, Е.Гинева, Н.Палова, 2010. Качество и мастнокиселинен състав на месото на прасета от Източнобалканската порода, отглеждани в различни местообитания, Животновъдни науки, 5, 48-56.

J.Marchev, R.Nedeva, J.Nakev, S.Ivanova-Peneva, E.Gineva, N.Palova, 2010. Quality and fatty acid profile of meat from pigs from the East Balkan breed reared in different habitats, Journal of animal science, 5, 48-56

A trial conducted on 27 fattening pigs from the aborigine East Balkan breed from three different regions divided into three groups was carried out. All pigs were reared by the traditional technology in the pasture. Those in group I being fed an additional whole intact barley, those in group II-whole intact wheat and those in group III-scrap from the bread and sweet industry. The aim of the trial was to make a comparative assessment on the carcass quality and fatty acid profile. The obtaining results shown that carcass of three groups characterized by good quality. Desirable meat pH (6.11, 6.14 and 6.12), protein content (21.57%, 22.82% and 23.00%), high water holding capacity (29.28, 30.13% and 30.85%) and meat color (23.29, 24.77 and 28.68) were found. The established higher fat content (6.16%,

4.55% and 5.46%) is due to breed of the pigs. The fatty acid profile shown higher content of PUFA (13.540%-15.177%) in comparison with the pigs in intensive schemes of fattening. The pigs fed an additional whole intact barley have the best dietetic qualities and optimal n-6/n-3 correlation (4-71) according to EU standards for healthful feeding.

7. Палова, Н., Р.Недева, К.Стоева, **Й.Марчев**, 2011, Влияние на различни видове фуражи върху продуктивността на подрастващи прасета от Източнобалканската порода, Аграрни науки, Пловдив, 6, 95- 98.

Nadezhda Palova, Radka Nedeva, Kera Stoeva, **Yordan Marchev**, 2011. Influence of two different fodders on the productivity of growing – finishing pigs from the Eastern Balkan swine breed, Agricultural sciences, Plovdiv, 6, 95-98

The experiment was performed at the Regional Centre for Scientific and Applied Services in Sredetz in the Region of the Strandzha Mountain, with 18 growing-finishing pigs divided into two groups, each including 9 animals (5 male and 4 female). The pigs from the first group were fed with a compounded fodder, consisting of 15.5% crude protein and 0.73% lysine. The pigs from the second group received full – grain Triticale. The experiment started when the pigs were weaned, at 60 days of age (9.1 kg b.w.) and continued up to day 152 after birth (21.6-22.8 b.w.). The obtained results showed that the pigs from the first group had higher body gain (149 g) compared to the pigs in the second group (135 g). The used pasture in the above mentioned region (from 550 kg/da to 840 kg/da verdant grass) was not appropriate for independent feeding of the Eastern Balkan swine breed pigs.

8. Nadezhda Palova, **Yordan Marchev**, Zhivko Nakev, 2011, Phenotypic characterization of East Balkan sow of the herd of the experimental station of agriculture – Sredets, Journal of mountain agriculture on the Balkans, vol.14, 4, 678-687.

A phenotypic evaluation by exterior measurements of 50 sows, 7 boars, 20 replacement pigs (10 male and 10 female) from the East Balkan breed of the herd of Experimental Station of Agriculture - Governmental Enterprise Sredets was carried out.

The results show that in sows and boars who had reached full growth, the coefficients of variation by some traits, such as body length, depth, breadth and scope of chest are high - in the female animals these values are higher than those of males. Male and female pigs significantly ($P < 0.05$) differ in diagonal body length and width of chest with 8.8 and 5.4 cm. According to this study the East Balkan pigs of the herd of Experimental Station of Agriculture - Sredets refer to the group of pigs of middle height and solid bones without significant variations in exterior. These animals have well pronounced sexual dimorphism in most of the measurements carried out.

9. Накев, Ж., **Й.Марчев**, Р.Недева, Н.Палова, Е.Гинева, 2012. Състав на трупа при свине от Източнобалканската порода, отглеждани по традиционна технология. I. Състав на трупа на свине от Източнобалканската порода, отглеждани в различни региони на страната, Селскостопанска наука, 45, 5-6, 20-24.

Jivko Nakev, **Jordan Marchev**, Radka Nedeva, Nadejda Palova and Elena Gineva, 2012. Carcass composition of East Balkan swine rearing by traditional technology I. Carcass composition of East Balkan swine rearing in different country regions, Agricultural science, 45, 5-6, 20-24

Investigation with 17 fattening pigs was carry out. The animals were rearing by traditional technology on pasture, divided into 2 groups - I group with 7 pigs from Veselinovo region (Shumen district) and II second group with 10 pigs from Tzonevo region (Varna district). The pigs were slaughtered at 90 kg live weight for establishing the carcass composition. The aim of the study was to determine the carcass composition from East Balkan swine rearing by traditional technology in different regions of country. East Balkans pigs rearing in Shumen district (Veselinovo) were characterizing by better carcass composition comparison with these pigs rearing in Varna region (Tzonevo). The pigs from Shumen region have thinner back fat thickness (CKL2) by 6,89 mm and higher meat with bones in real ham (5.51%, $P \leq 0.01$), waist part (6.52%, $P \leq 0.01$) and neck shop (4.36%, $P \leq 0.01$) in comparison to these pigs from Varna region. The region influenced on carcass composition in traditional rearing in East Balkan swine. In this connection for providing the standard production, it is necessary basic nutritional analyze of pasture using from these pig breed.

10. Накев, Ж., **Й.Марчев**, Р.Недева, Н.Палова, Е.Гинева, 2012. Състав на трупа при свине от Източнобалканската порода, отглеждани по традиционна технология. II. Състав на трупа на свине от Източнобалканската порода в различни тегловни класове, Селскостопанска наука, 45, 5-6, 25-29.

Jivko Nakev, **Jordan Marchev**, Radka Nedeva, Nadejda Palova and Elena Gineva, 2012. Carcass composition of East Balkan swine rearing by traditional technology II. Carcass composition of East Balkan pigs at different weight classes, Agricultural science, 45, 5-6, 25-29

Study with 18 fattened East Balkan pigs from the same farm reared in natural system of breeding was carried out. Pigs from I group were slaughtered at 90 kg live weight and those from II group at 125 kg. Vertical strip off the skin was used for carcass treatment. Slaughter analysis was made according to Regulation for breeding value estimation, production and classification of pigs for breeding purpose, Shumen (BG), 1996. Obtained results show that increasing of live weight from 90 kg to 125 kg leads to increase of carcass separated parts and slaughtered yield (output) with 19.62 kg and 0.63%. Belly part (17.29% in I group and 21.84% in II group), real leg (20.00% in I and 20.52% in II group), neck chop (15.33% in I and 16.35% in II group) are with highest share from carcass weight. Pigs from the high weight class are characterized significantly ($P \leq 0.01$) with higher relative share of bacon in all carcass parts.

11. Палова, Н., Р.Недева, **Й.Марчев**, Д.Кънев, 2013. Ефект от включването на люцерново брашно в смеските за бозайници от Източнобалканската свиня, Животновъдни науки, 6, 3-6.

N.Palova, R.Nedeva, **Y.Marchev**, D.Kanev, 2013. Effect of alfalfa meal in the compound feed on the productivity of East Balkan pigs, Journal of animal science, 6, 3-6

A trial with 92 East Balkan suckling piglets, progeny of 16 farrowed sows from Experimental station of agriculture- Sredets was carried out. The sows were divided into 2 groups of 8 sows – 4 sows of second, 3 sows of third and 1 sow sixth farrowing. The piglets fed with compound feed consisting of 19.7% crude protein, 1.1% lysine and 12.1-12.2 MJ metabolizable energy, and those in group II received 5% Alfalfa meal with increased content of crude fibers with 32%-from 3.17% in I to 4.19% in II group. A trial begins at 25 days after farrowing and continued to the weaning of piglets of 60 days of age. The increasing of the crude fibers from 3.17% to 4.19% in compound feeds for East Balkan piglets do not influence negatively on their growth performance. Including of 5% Alfalfa meal in the compound feed for suckling piglets from East Balkan breed is recommended.

12. Й.Марчев, Н.Палова, Д.Абаджиева, М.Червенков, В.Младенова, Е.Кистанова , 2015, Возможности улучшения воспроизводства аборигенной породы Восточно-балканская свинья в естественной среде обитания, Сборник статей Международная Научно-практическая конференция, Пенза, 15-16 мая, 3-11.

Y.Marchev, N.Palova, D.Abadjieva, M .Chervenkov, V. Mladenova, E.Kistanova, 2015, Features of reproduction and means for its improvement in the East Balkan pig breed reared under natural conditions, Collection of articles, International scientific-practical conference, Пенза, 15in-16l May, 3-11

As a genetic resource of Bulgaria the East Balkan pig breed is valuable source of unique genes, which may help to improve health and performance traits of commercial breeds. The reproduction of this breed closely depends on the available natural feeding sources in the environment. The results of current study shown that the enhancement of reproductive potential of East Balkan pigs reared in natural conditions can be achieved through flushing of sows in both breeding and non-breeding seasons.

13. T. Popova, J. Nakev, Y. Marchev, 2015, Fatty acid composition of subcutaneous and intramuscular adipose tissue in East Balkan pigs, *Biotechnology in Animal Husbandry* 31 (4), p 543-550

The aim of this study was to provide information on the fatty acid profile of different adipose depots – subcutaneous (upper and inner backfat layers) and intramuscular (*m. Longissimus dorsi*) in East Balkan pigs. The animals were reared in free-range conditions and slaughtered at an average live weight of 107 ± 1.65 kg. The results of the study showed that the various adipose tissues in pigs have different lipid metabolism and hence differ in their fatty acid composition. Intramuscular fat had significantly higher content of the saturated C16:0 and C18:0 ($P < 0.001$), as well as the C16:1 ($P < 0.001$) than the subcutaneous fat. In regards to the content of the polyunsaturated fatty acids, the latter displayed considerably higher content of both C18:2 and C18:3 ($P < 0.001$) in comparison to the intramuscular fat in *m. Longissimus dorsi*. The differences between the subcutaneous and intramuscular adipose tissue in the individual fatty acids determined the similar trend of change in the total content of saturated and polyunsaturated fatty acids. Significant differences between the backfat layers were detected for C16:1, C18:0 and C18:3 ($P < 0.001$). Stearic acid (C18:0) displayed higher content of the inner, while both C16:1 and C18:3 had higher proportion in the outer backfat layer in the East Balkan pigs. Except for C20:2, the long chain polyunsaturated n-6 and n-3 fatty acids had

significantly higher proportions in the intramuscular fat, however no differences were determined between the two backfat layers.

14. N.Palova, Y.Marchev, 2009, Reproduction of East Balkan sows from the herd of the Experimental station of agriculture – Sredets, *Slovak J. Anim. Sci.*, 42, (1): 1 – 5.

The reproductive ability of the aborigin breed East Balkan sow were performed over a three-year period (2004-2006). The study was carried out with 50 sows and the results of 7 litters were analysed. The duration of the active period of sows, the percentages of fertilized and farrowed sows, and their lifetime fertility were monitored. The live body weight of offspring at farrowing and their survival and development up to the age of 21 days were followed out.

The following conclusions were outlined:

The seasonal pattern of reproduction of sows determined the higher average age of the first farrowing – 553 days.

The period of active utilization, determined through the number of litters per sow, was 5.2 on the average.

For the entire period of the survey, 1.45 litters per year with 7.06 live-born piglets per litter, were determined.

The effect of the year on the live body weight at birth (0.988 kg), the litter size at the age of 21 days (6.05) and the growth and development up to the age of 21 days, was statistically significant ($P \leq 0.05$).

15. Marchev, Y., Szostak, B, 2007, Jabowienie loch w zaleznoczi od systemu ytrzywania i sezonu, (The opening periods of sows depending on conditions of rearing system and season), WUP, Lublin, Rocznik, XXV, 1927-1932. *Annales Universitatis Mariae Curie-Sklodowska. Sectio EE Zootechnica* (Poland)

The main aim of the survey was to determine the influence of the rearing system and season on length of open periods of sows (weaning to first estrus interval). Sixty nine sows were analyzed: thirty five were Danubian White pigs and thirty four – Landrace sows. Depending on conditions of the rearing system they were divided into three groups I – individual system of sows, II – group systems, III – group systems with individual feeding places. A tendency was observed for the length of open periods of sows in group breeding to increase. The difference in the length of open periods of sows in group rearing and individual rearing was 1.54 day and it was not statistically significant. A significant effect of the season on the of open period was observed. The shortest length of open periods of sows was in autumn (6.2–6.3 days) and the longest in the summer (8.3–8.8 days).

16. Yordan Marchev, Bogdan Szostak, 2013, The season effect on the sexual behavior and sperm quality of East Balkan boars, *Acta Sci. Pol., Zootechnica* 12 (2) 2013, 31–37.

The aim of this study was to determine the season effect on sexual behavior and sperm quality of East-Balkan boars and changes in different periods of the year (April, August and October). During a 7-month study period, 120 ejaculates were collected from 8 mature boars. In each ejaculate the volume of liquid fraction, percentage of spermatozoa motility, spermatozoa concentration and the percentage of spermatozoa aglutination were determined.

Before each collection the boars' sexual behavior, involving courting time and time for ejaculation was estimated. A tendency for more strongly expressed libido and more continued ejaculation into the autumn vs. the summer was observed. The semen of East-Balkan boars do not differ from those of commercial boars, but season have a significant effect on the sperm quality. The ejaculates of the highest volume (228 ml) are produced in the autumn in comparison in the summer (193 ml). The seasonal influence is more strongly expressed on the spermatozoa concentration where the difference of 33 mln/ml between two seasons is significance ($P \leq 0.05$), and especially in spermatozoa agglutination ($P \leq 0.01$), where the difference between the summer (27.2%) and the autumn (10.7%) is more than 2.5 times.