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POSTER

East Balkan swine – autochthonous Bulgarian pig breed

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Additional keywords

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SUMMARY

The East Balkan Swine (EBS) is the last remained aboriginal pig breed in Bulgaria. It is a lard-type swine similar by phenotype to the wild boar with excellent adaptability to extensive conditions. Nowadays (2016) the population size of the breed is 1114 sows and 48 boars and for that reason the East Balkan Swine is categorized as endangered maintained. The breed inhabits forest parts of the country on the East slopes of Stara Planina Mt. (the Balkan) and Strandzha Mt. Similarly to the wild pig the local pig of the East Balkan breed is characterized by a late onset of maturity - the age at first farrowing is over 500 days. Throughout their reproductive this local breed produces in average 5.2 litters. The prolificacy varies from 6 to 8 live-born piglets and 5-6 piglets at weaning. EBS reaches live body weight of 100 kg for about 14 months. Average values characterizing carcass quality at 100 kg body weight are as follows: - carcass - 56.7 kg (determined after removal of the skin, head, legs to the hock and elbow, all the viscera), total meat with bones - 41.8 kg, (73.4% of carcass) and fat - 15.08 kg (26.6% of carcass).

Palabras chave adicionais

Raça autóctone.
Origem.
Produção.
Reprodução.
Qualidade da carcaça.

Suínos dos Balcãs de Leste – uma raça suína autóctone Búlgara

RESUMO

O porco dos Balcãs de Leste (EBS) é a última raça suína indígena da Bulgária que resta. É um porco "tipo banha" fenotipicamente similar ao javali com uma excelente capacidade de adaptação a condições extensivas. Atualmente (2016) a população da raça é de 1114 porcas e 48 varrascos e por essa razão o EBS é considerado como "em perigo". Esta raça habita partes florestais do país nas encostas do leste de Stara Planina Mt. (Os Balcãs) e Strandzha Mt. Da mesma forma que o porco selvagem, o porco EBS caracteriza-se pela sua maturidade tardia – a idade ao primeiro parto ulatrapassa os 500 dias. Durante a sua vida reprodutiva esta raça local tem, em média, 5,2 ninhadas. A prolificidade varia de 6 a 8 leitões nascidos vivos e 5-6 leitões desmamados. Os animais EBS atingem um peso corporal de 100kg com cerca de 14 meses. Os valores médios caracterizadores da qualidade da carcaça aos 100kg de peso são os seguintes: carcaça – 56,7kg (determinada após a remoção da pele, cabeça, pernas pelo curvilhão e chispe e todas as vísceras), total de carne com ossos – 41,8kg (73,4% da carcaça) e gordura – 15,08kg (26,6% da carcaça).

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INTRODUCTION

The conservation of biodiversity and genetic resources is among the priorities of the European Union. The East Balkan Swine is the last aboriginal/local pig breed that has survived in Bulgaria. It is a lard-type swine morphologically similar to the wild boar. It is a result of a relatively low level of human selection and is characterized by an agro-foresty breeding system and excellent adaptability to extensive conditions. It has strong maternal instinct. Nowadays (2016) the population size of the breed is less than 1500 sows and for that reason the East Balkan Swine is categorized by FAO as endangered maintained. According to the official data of the national competent authorities pure-bred East Balkan Swine is kept only in Varna, Shumen and Burgas administrative districts in Bulgaria. Until the middle of the last century East Balkan Swine had been one of the most widely spread breeds in the country (over 65% of the total pig number). Due to the fact that it has lower reproductive performance, growth rate,

Figure 1. EBS sow and litter (Porca e ninhada EBS)

Table I. Population trends of the of Local East Balkan Swine breed (Evolução da população de suínos dos Balcãs de Leste).

Year	Number of Sows	Number of Boars	Number of Gilts	Number of Young males
2006	2536	140	670	290
2007	1294	40	750	174
2008	965	30	450	140
2009	540	31	428	138
2010	1269	30	318	52
2011	1277	30	337	112
2012	1213	30	384	136
2013	1254	72	305	143
2014	1158	70	341	121
2015	1010	55	329	139
2016	1114	48	296	108

feed conversion the breed was replaced by the modern commercial white breeds. Gradually the size of the breed population was reduced and nearly disappeared by the end of 20th century. To restore the breed, the East Balkan swine was included in the List of autochthonous breeds that are subsidized by the national Rural Development program. Despite the financial support the size of the population breed keep decreasing and in 2016 it is less than 1500 sows **(Table I)**. The animals are kept in the small herds (20-50 sows) in semi-mountain settlements on the East slopes of Stara Planina Mt. to the North and Strandzha Mt. to the South.

Origin, geographic distribution and description of the breed

On the Bulgarian lands a predecessor of East Balkan swine - Southeast Asian swine was probably firstly introduced by the Byzantyne settlers who colonized new areas at the Black Sea coast 2500 years ago. Later on, these pigs were crossed with *Sus mediterraneus* and European wild boar (*Sus scrofa scrofa*). The result of this crossing was a new breed named East Balkan Swine by Hlebarov (1921). The pigs from the East Balkan breed are very healthy and resistant under adverse conditions. They have highly developed feeling for being part of a herd. Petrov (1970) reports that the wild-like, straight ear East Balkan domestic swine is a prototype of the Mediterranean peat swine and originates from the wild *Sus scrofa scrofa*. The breed inhabits forest parts of the country on the East slopes of Stara Planina Mountain (the Balkan) and Strandzha Mountain near the West Black Sea cost. The East Balkan Swine is a lard type pig **(Figures 1 and 2)**. The neck is short and poorly muscled, and the ears are small, erected and mobile. The corpse is of short to medium length with a well-developed chest. The thoracic part is better developed than the croup. The croup is medium wide and

Table II. Body measurements carried out on different ages and sex categories of the local East Balkan pig breed (Medidas corporais de porcas e varrascos adultos e de animais de substituição).

Measurements	Sows n = 50		Boars n = 9		Young boars n = 10		Gilts n = 10	
	$\bar{x} \pm S\bar{x}$	CV %	$\bar{x} \pm S\bar{x}$	CV %	$\bar{x} \pm S\bar{x}$	CV %	$\bar{x} \pm S\bar{x}$	CV %
Live weight, kg	129.8±1.83	22.19	148.2±2.42	28.43	91.4 ± 1.07	6.08	87.7 ±1.05	5.20
Shoulder height, cm	71.2 ± 0.83	8.85	74.2 ± 1.9	14.54	70.2 ± 0.42	1.94	69 ± 1.49	6.47
Back height, cm	71.1 ± 1.76	18.68	74.0 ± 1.43	11.2	69.9 ± 2.08	4.51	68.6 ± 1.54	14.11
Gridle height, cm	70.9 ± 0.87	9.28	73.6 ± 1.66	13.31	69.5 ± 0.47	2.16	68.3 ± 1.63	7.19
Height stook,cm	70.3 ± 0.85	9.1	73.4 ± 1.58	12.4	69.5 ± 0.67	2.79	68.2 ± 1.26	5.43
Body length, cm	103.5±1.26	24.21	115 ± 1.45	14.19	110.3 ± 0.88	6.53	105.2 ± 1.43	4.29
Depth of thorax,cm	35.3 ± 1.21	24.26	42 ± 1.65	14.62	37.2 ± 0.96	8.35	36.4 ± 1.64	13.26
Width of thorax,cm	24.6 ± 1.27	30.29	30 ± 0.54	20.31	24.2 ± 0.9	11.82	21.7 ± 0.26	10.96
Thorax perimeter, cm	108.8±4.02	26.11	125 ± 3.88	16.99	112.7 ± 1.35	11.58	104.3 ± 3.44	10.32
Width stook, cm	16.9 ± 0.43	23.03	16 ± 0.62	23.03	13.6 ± 0.65	15.07	13.3 ± 0.59	13.23
Width at hipbone, cm	21.7 ± 0.44	18.19	20 ± 0.38	15.39	17.7 ± 0.43	7.63	17.9 ± 0.48	8.09
Head length, cm	31.9 ± 0.42	10.48	32.1 ± 0.44	14.81	29.4 ± 0.89	9.52	29.5 ± 0.54	5.51
Head depth, cm	24.8 ± 0.45	13.46	28 ± 1.17	18.52	24.6 ± 0.35	4.51	24.1 ± 1.13	14.11
Forehead width, cm	11.9 ± 0.25	17.57	12 ± 0.39	15.12	10.3 ± 0.15	4.67	10.4 ± 0.39	11.15
Span chin-bone, cm	14.5 ± 0.27	13.84	16 ± 0.45	11.47	14.5 ± 0.53	11.65	14 ± 0.44	9.52

Table III Reproductive performance in the local East Balkan Swine breed (Performance reprodutiva dos suínos dos Balcãs de Leste).

Traits	$\bar{x}$	±S $\bar{x}$	C
Productive live, litters/sow	5.2	0.48	10.6
Age at first farrowing, days	553	9.07	12.6
Number of litters/year	1.54	0.07	10.1
Litter size at birth:			
Male	3.72	0.20	19.7
Female	3.34	0.21	22.6
Total	7.06	0.21	20.9
Live body weight at birth, kg:			
Male	1.00	0.03	15.8
Female	0.97	0.03	17.2
Total	0.99	0.03	16.1
Litter size at the 21 day:			
Male	3.26	0.20	20.4
Female	2.79	0.21	22.2
Total	6.05	0.20	21.6
Live body weight at the 21 day, kg:			
Male	3.12	0.11	18.8
Female	3.14	0.12	16.5
Total	3.13	0.11	17.3

Figure 2. EBS boar (Varrasco EBS).

Table IV. Meat quality of the East Balkan Swine (Qualidade da carne de suínos dos Balcãs de Leste).

Indices	$\bar{x}$ ±S $\bar{x}$	C %
Water content, %	71.12 ± 0.33	2.40
pH1	6.11 ± 0.02	1.08
pH2	5.58 ± 0.04	3.38
Fat, %	5.38 ± 0.29	27.72
Ash, %	1.08 ± 0.01	6.49
Protein, %	22.41 ± 0.21	4.78
Waterholding capacity, %	30.01 ± 0.28	4.91
Color, 525nm/R%	25.24 ± 0.51	10.40
Weight loss at boiling, %	47.48 ± 0.39	4.27
Weight loss at roasting, %	42.96 ± 0.33	3.95
Thickness of muscular fibres, nm	40.72 ± 0.77	9.84

slipped. The legs are medium long and very strong. The skin is thick and covered with straight and rough bristles that on the back, especially at the withers, are longer and erected. The hair colour, bristles and hooves are usually black, rarely there are animals with spots (grey or brown) of different size on the head and/or abdomen. The average results of our measurements **(Table II)** show that the 3-year-old adult sows and boars reach 129.8-148.2 kg live weight, the body length is 103,5 – 115 cm, back height – 71,1 -74 cm. Reasonably expected is the fact that the 1-year-old male and female pigs differ significantly ($P<0.05$) in hair, body length and chest width. The boars have a higher, wider and more elongated body. Some exterior measurements of the young animals such as length and depth of head, width of forehead, and scope of whistle and back heights have the same values. The differences observed in the different sexes are probably a result of incomplete growth. The incipient selection work performed on the breed probably determines the differences in the exterior profile (Palova et al. 2011).

Reproduction

Similarly to the wild pig, the local pig of the East Balkan breed is characterized by a late onset of maturity and their growth is completed by the age of 2.5 years. The reproduction traditionally starts after reaching live body weight of 70 kg in sows or 80 kg in boars. East Balkan Swine reaches sexual maturity late – the age at first farrowing is over 500 days (Hinkovski et al. 1984). Throughout their reproductive life the breeding sows of this local breed produce in average 5.2 litters. Investigations (Palova & Marchev, 2009) on 50 sows for a three-year period have shown an average age at first farrowing of 553 days and 7.06 piglets live-born per litter, which was within the normal range for the breed **(Table III)**. It should be noted that there were

Table V. Fatty acid composition of East Balkan Swine meat (Composição dos ácidos graxos da carne suína dos Balcãs de Leste)

Fatty acid, %	I group (barley)			II group (waste of bread industry)			III group (wheat)		
	Mean ± SD	CV	E	Mean ± SD	CV	E	Mean ± SD	CV	E
C 14:0	1.666 ± 0.18	34.86	11.02	1.873 ± 0.09^{a}	15.36	4.85	1.559 ± 0.10^{a}	17.31	6.54
C 16:0	26.560 ± 0.37 A	4.43	1.40	27.076 ± 0.51^{b}	6.02	1.90	28.964 ± 0.28^{b}A	2.59	0.98
C 17:0	0.531 ± 0.02	13.09	4.14	0.521 ± 0.03	19.52	6.17	0.616 ± 0.03	15.23	5.76
C 18:0	13.745 ± 0.82	18.92	5.98	13.986 ± 0.56	12.67	4.01	12.750 ± 0.36	7.45	2.82
C 16:1	2.417 ± 0.13	17.15	5.42	2.558 ± 0.11	13.71	4.34	2.424 ± 0.09	10.05	3.79
C 18:1	39.904 ± 0.74	5.91	1.87	39.810 ± 0.59	4.71	1.49	40.203 ± 0.22	1.45	0.55
C 18:2	12.520 ± 0.87	22.01	6.98	12.664 ± 0.23^{A}	5.74	1.82	11.729 ± 0.26^{A}	5.83	2.21
C 18:3	2.657 ± 0.28^{Ab}	34.25	10.83	1.612 ± 0.09^{b}	19.18	6.06	1.811 ± 0.13^{A}	20.37	7.70
SFA	42.502 ± 0.62	4.42	1.40	45.456 ± 0.69	4.81	1.53	43.869 ± 0.33	1.93	0.73
UFA	57.498 ± 0.63	3.50	1.10	56.544 ± 0.62	3.48	1.10	56.131 ± 0.34	1.61	0.01
PUFA	15.177 ± 0.93^{A}	19.40	6.14	14.176 ± 0.26	1.83	0.02	13.540 ± 0.28^{A}	2.08	0.02
UFA/SFA	0.72 ± 0.02	8.38	2.66	0.77 ± 0.02	8.18	2.59	0.78 ± 0.01	1.00	0.37
PUFA/ SFA	0.36 ± 0.02	21.94	6.94	0.34 ± 0.01	9.09	2.42	0.31 ± 0.01	5.81	0.97
n-6/n-3	4.71 ± 0.34^{Ab}	26.83	7.48	7.85 ± 0.64^{b}	25.83	8.17	6.47 ± 0.44^{A}	17.31	6.55

Significances: a:a P<0.05; b:b P<0.01; A:A P <0.001

two peaks in farrowings – In February-May (spring) and September-December (autumn).

Housing system

The housing method for East Balkan Swine is the traditional method of growing pigs in the East Balkan region. The pigs are kept in large herds and are supervised by a herdsmen. The animals feed throughout the whole year on pasture and in the forests. Farmers keep their pigs during the night in simple wooden buildings (shelters) and during the day all pigs are shepherded in the open. More solid and with better isolation are the buildings for farrowing in which the sows stay through the suckling period of 8-10 weeks. At the age of 3-4 months the male pigs designated for fattening are emasculated. The farmers feed the pigs every day and during late autumn the quantity of the forage is increased (Palova et al. 2010). The purpose is to obtain and offer to the market fattened pigs for Christmas (Marchev et al. 2012).

Carcass composition and meat quality

The first studies on East Balkan swine were carried out by Hlebarov (1921), who found that at 115.2 kg live weight, the dressing percentage is 82.62%, and the meat with bones is 36.75 % of the carcass weight. Georgiev et al. (1959) and Benkov (1962) reported respectively 57.3% and 63.39 % meat with bones and 42.7% and 36.61% fat. Stoykov et al. (1992) at control finishing until 70, 80 and 90 kg - 60.96, 60.22 and 58.72% meat with bones, respectively. The dressing percentage of scalded carcass at 90 kg live weight is 74.60% . Slanev et al. (1992) reported significant differences in the dressing percentage. Stefanova et al. (2005) found that the contents of meat, bones and fat in East Balkan pigs, slaughtered at 90 kg live weight are 49.28%, 15.30% and 35.42%, respectively. In a similar study Katsarov et al. (1993) found dressing percentage of 66.43%. Average values of recent studies of Nakev et al. (2012a) characterizing carcass composition of fattened to 100 kg pigs shows that the carcass weight (determined after removal of the skin, head, legs to the hock and elbow, all the viscera) is 56.7 kg, neck chop – 4.5 kg, shoulder – 4.1 kg, breast part – 3.7 kg, real ham – 6.02 kg, total meat with bones - 41.8 kg, (73.4% of carcass) and fat - 15.08 kg (26.6% of carcass) **(Table IV)**.

Average data from studies of Palova (2006), Marchev et al. 2010) **(Table V)** show water content 71.12%, protein 22.41%, intramuscular fat 5.38%, in m. Longissimus dorsi. A higher intramuscular fat content for local breeds is reported by Labroue et al. (2000), Santos e Silva et al. (2000). Gandemer (2002) pointed out that lipids have crucial role for the ultimate quality of meat products. The high intramuscular fat content has positive influence on the sensory qualities and flavor of the meat (Rede et al. 1986; Suzuki et al. 1991; Essen-Gustavsson et al. 1994). According to Marinova & Stefanova, (1995) the differences in the genotype, way of rearing and the absence of intensive selection in the primitive pigs when compared to highly selected breeds affect in vivo the muscle functions and subsequently the changes in meat post mortem. The aboriginal pigs show higher content of myoglobin and good waterholding capacity (30.01%), which is an indicator of the dynamics of glycolysis post mortem. The results of Marinova & Stefanova (1995), Palova (2006), Slanev et al. (1992,1993) and Stoykov (1992) show that the values of pH_1, pH_2 and the colour of the meat indicate normal post mortem metabolic processes. According to Pinkas & Marinova (1984) the breeds that have improved meat productivity have also lower pH in comparison to the pigs of the "ancient breeds".

The specific way of rearing and nutrition affects the fatty acid composition of the meat from East Balkan pigs. This can determine the higher n-3 PUFA content in the tissue lipids of the wild or extensively reared domestic animals. This increases the tendency

to use products made of autochthonous breeds reared traditionally (on pasture with additional concentrate supplementation) such as Iberian pigs (Arnau, 1998; Olkiewicz et al. 2006), Mangalitsa (Szabó, 2001), and East Balkan Swine in Bulgaria (Nakev et al. 2012b). The free rearing system of the animals on pastures affected positively the content of the PUFA. In comparison to pigs fed with food concentrates (Doychev, 2006, Ender et al. 2002; Franko et al. 2006) the results show 4-6 % higher PUFA. The values of the ratio PUFA/SFA in the meat products is 0.37-0.52 and in the backfat values were observed in the range of 0.74-0.79. According to Wood et al. (2008); Wood et al. (2003), the values of PUFA/SFA are recommended to be above 0.4 which compared to the above results indicates beneficial fatty lipid profile of the products made of East Balkan Swine.

CONCLUSIONS

The East Balkan Swine is a lard type pig. Hair colour is usually black. The thoracic part is better developed than the croup. Three-year-old adult sows and boars reach 129.8 kg -148.2 kg live-weight, the body length is 103.5 cm – 115 cm. East Balkan breed is characterized by a late onset of maturity and low prolificacy which varies from 6 to 8 live-born piglets, but long reproductive life - the breeding sows produce in average 5.2 litters. EBS is characterized with lower growth ability and higher adipose tissue development and lower carcass value, typical of autochthonous breeds of pigs. Meat quality receives a very positive evaluation. The meat of the heaviest weight category was darker, with the higher IMF content (5.38%). The higher fat content of carcasses of EBS pigs can be used for the production of specific meat products.

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