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GENETIC DIFFERENCES BETWEEN MANGULICA AND YORKSHIRE OF CERTAIN TRAITS IN RELATION TO SELECTION CRITERIA

GENETSKE RAZLIKE IZMEĐU MANGULICE I JORKŠIRA ZA VAŽNIJA SVOJSTVA U ODNOSU NA KRITERIJE SELEKCIJE

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ABSTRACT

The trial was done on the same farm on Mangulica (M) and Yorkshire (Y) from 2009. to 2012. The data included 432 M and 675 Y litters. Mass selection was used to select M in all traits. Meanwhile Y was selected by selection index. The Y sows produced 23.4 weaned piglets per sow/year. In case of M it was only 11. To analyse growth and carcass traits the trial included 157 M and 212 Y animals. The farm condition was similar during gestation and lactation. The MME was used to analyse fixed effects of YS, breed and parity and sire as random ones. The losses of piglets in lactation were 8.8 % for M and 7.5% at Y. Losses in weaning for M were 12.7% and for Y 3.0%. In fattening up to 132 kg M age was 540 days. At the same time Y reach 133 kg using only 227 days. There were no losses during fattening. The life gain of M was 243 g and of Y 584g. Feed conversion (FC) for M was 5.2 kg or 678 kg of feed in total and Y was 3.2 FC, 419 kg in total. The difference of 259 kg of feed was statistically significant. Taking value of 0.25 euro for kg of food, it comes out that M pig cost 66 euro more than Y. Both M and Y had no losses during fattening period. Dissection of carcass was done following EU Procedure 92. Meat content in carcass in M was 29.0% and 58.6% in Y. The difference of 29.6 % was highly significant. It comes out that M produced about 23.6 kg meat less compared to Y. Protein content was measured at 4 places in carcass of both breeds. Average protein in M was 20.4% but in Y 2.4% more i.e. 22.8%. In conclusion, M showed economically very poor results related to Y. To improve genetic potential in M certain breeding programs must be developed and knowledge and money provided for better results. Mass selection showed inefficiency and inferiority in M compared to index one in Y where aggregate genotype included 5 hereditary different traits.

Key words: pigs; genetic differences, production traits

INTRODUCTION

Production of pig meat today is based on the application of modern methods of breeding and highly specialized breeds of swine (Vidović et al., 2011). The production has a long tradition. In Serbia, during the 19th century, pigs were a primary export product (Zekić et al., 2007; Teodorović et al., 2001). Then the pig based on the local authentic breed was the dominant Shumadinka. It was crossed with Bak-

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onyi and Szalantor on the farm Jeno Kis, to produce formation a special breed of pigs named Mangulica (M). Due to the extreme resistance it was very popular in Vojvodina (especially Srem) and Hungary until the fifties. Today in Serbia there are three authentic local breeds of pigs: Mangulica, Moravka and Resavka while Shumadinka and Šiška have lost in its original form. In Serbia the 3 type of Mangulica existing: Blond (Sremska, Black lasso, or Buđanovačka pigs), White and Subotica strain. In Hungary and Romania there light strain (Egerszegi et al., 2003; Gajić et al., 1997). In recent times there has been a growing interest in authentic breeds, not only in order to preserve genes, but also for the production meat products produced in the traditional way. Mangulica is a typical fatty breed the carcass has 65-70% of fat and about 30-35% of meat (Egerszegi et al, 2003). Results of other studies (Sabo, 2001, 2002; Cit Egerszegi et al., 2003) show that there is less than 40 % of lean meat in the carcass, which is sufficient to produce high-quality hams and other products.

On the other hand, intensive farming and index selection has resulted in, among other things, the big difference between Mangulica and modern breeds (Vidović, 2009). Mangulica is generally the result of natural and a mass selection and the conditions of rural households that have applied the classical veterinary preventive and curative breeding. The extensive breeding only needs a simple shelter from rain and snow, especially true for pregnant animals. The care should be taken in requirements in breeding is it could get to cannibalism. Therefore, they are given regular feed premixes. Needs for foods are modest, but diversity in the free grazing is not the limiting factor (Lazarević, 2011; Kralik et al., 2011; Zekić et al., 2007; Andrić, 1998). Good to exploit what they find in nature, with the addition of concentrated feed and space limitation they are subject to fattening and accumulation of fatty tissue, whereas older animals reach a weight of 200 kilograms or more. Due to the extremely slow growth and high feed conversion, Mangulica can be economical only if free grazing is applied. With additional food it gains about 80 kg per year. On the other hand, Yorkshire (Y) is an intense process of selection breeds on the economically most important traits and has a completely different genome compared to M. Thus the economic effects of this production are different (Zekić et al., 2008; Zekić et al., 2011).

The basic goals of the investigation are to determine the phenotypic and genotypic differences between these two breeds and the economic effects of their breeding.

MATERIAL AND METHODS

The trial was done on a farm where they breed Mangulica (M) and Yorkshire (Y) in the period 2009. – 2012. Data analysis included 432 M 675 Y litters. The mass selection was used to select M in all traits. Meanwhile Y were selected using selection index - BLUP with more emphasis on litter size and less on growth, feed conversion than meat content and quality. To analyse growth and carcass traits trial included 157 M and 212 Y animals. The condition was similar during gestation and lactation period. The Mixed Model Equation (MME) was used to analyse year - season (YS), breed and farrowing as fixed effect than sire as random one. Weaned animals grow at the same condition at the same farm.

RESULTS AND DISCUSSION

The analysis of phenotypic and genetic differences between M and Y are presented in Tables 1- 4 and Graphs 1 - 2.

The effect of fixed factors (farm, year-season, breed and farrowing) showed significant influence on examined traits. The Y sows produced 23.4 weaned piglets per sow per year. In case of M it was only 11. The losses of piglets during lactation were 8.8% in M and 7.5 % in Y. During and after the weaning period M lost 12.7% of piglets and Y 3.0%. All differences are statistically significant (table 1and2).

Fattening up to 132.0 kg M needed 540 days. At the same time Y were growing to 133.0 kg using only 227 days. There were no losses during fattening. The life gain of M was 243 g and a Y 584g. Feed conversion (FC) for M was 5.2 kg, or total of 678 kg of concentrate, but Y consumed 3.2 FC on total of 419 kg. The difference of 259 kg more feed conversion was statistically significant. Taking the value of 0.25 euro for kg of feed, it comes out that M pig cost 66 euro more than Y. Both M and Y had no losses during the fattening period. Dissection of carcass was done following EU Procedure 92. Meat content in carcass in M was 29.0% and 58.6% in Y. The difference of 29.6% was highly significant. It comes out that M produced about 23.6 kg meat less

Table 1: Phenotypic differences in litter size

Tablica 1. Fenotipske razlike za veličinu legla

Traits - Osobine	Yorkshire - Jorkšir		Mangulica - Mangulica		Differences - Razlike
	$\bar{x}$	δ	$\bar{x}$	δ	$\bar{x}$
Alive born - Živorođenih	12.1	2.8	7.2	2.6	4.9**
Weaned - Odbijenih	10.6	2.7	5.4	2.7	5.2**
Alive born/sow/year – Živorođeno/krmači/godišnje	24.2	2.6	14.9	2.9	9.3**
Weaned/sow/year – Zalučeno/krmači/godišnje	23.4	2.6	11.0	2.8	12.4**
Finishers/sow/year – Isporučeno/krmači/ godišnje	22.6	2.8	9.6	2.9	13.0**

Table 2: Phenotypic differences in growth and carcass traits

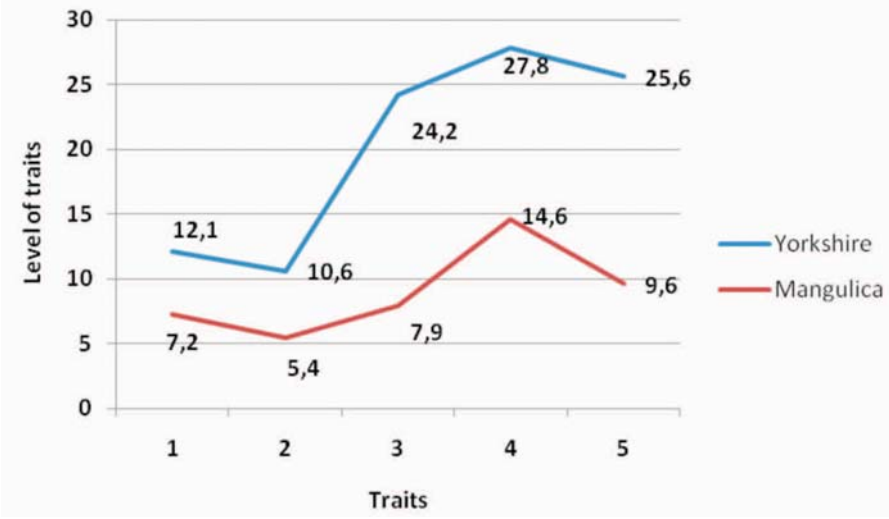
Tablica 2. Fenotipske razlike za prirast i svojstva polutki

Traits - Osobine	Yorkshire - Jorkšir		Mangulica - Mangulica		Differences - Razlike
	$\bar{x}$	δ	$\bar{x}$	δ	$\bar{x}$
Life gain to 100 kg, g – Životni prirast do 100 kg, g	579	154	203	160	376**
Life gain up to 132 kg, g – Životni prirast do 132 kg, g	584	160	242	160	341**
Age at 132 kg, days – Starost do 132 kg, dana	227	12	540	24	- 313**
Feed conversion, kg/kg – Konverzija hrane, kg/kg	3.1	0.9	5.2	1.3	- 2.1**
Meat content in carcass, % – Sadržaj mesa u polovicama, %	29.0	8	58.6	6	29.6**
Meat content in carcass, kg – Sadržaj mesa u polovicama, kg	23.2	4.6	46.2	6.8	23.0**
Protein content in meat, % - Sadržaj proteina u mesu, %	20.4	2.9	22.8	3.1	2.4**

compared to Y. Protein content in carcass was measured at 4 places for both breeds. Average protein in M was 20.4% but in Y it was 2.4% more or 22.8 %. In conclusion, M showed economically very poor result related to Y. To improve genetic potential in M it is necessary to develop certain breeding programs, invest knowledge and money for better results through generations. Mass selection showed inefficiency and inferiority in M compare to selection index one in Y where aggregate genotype included 5 hereditary different traits. As it is known between them different genetic correlation exists.

The selection differential between those breeds is presented in Graphs 1 and 2. Selection effects and genetic differences are clearly recognized.

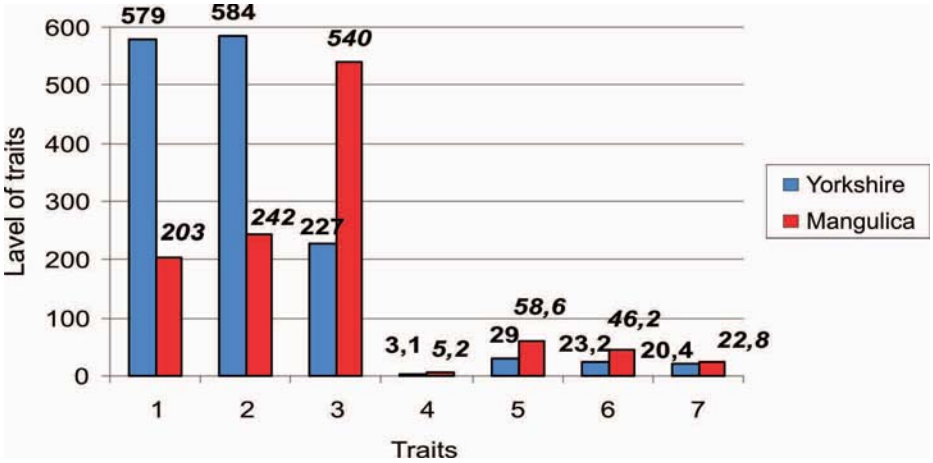
In spite of high genetic differences in examined traits between these two breeds the value of genetic parameters and variation were nearly the same. No statistical differences between them existed (Table 3



Traits – Svojstva:
Alive born - Živorođeno
Weaned - Zalučeno
Alive born/sow/year – Živorođeno/krmači/godišnje
Weaned/sow/year – Zalučeno/krmači/godišnje
Finishers/sow/year – Isporučeno /krmači/godišnje

Graph 1: Phenotypic differences in litter size

Grafikon 1. Fenotipske razlike za veličinu legla



Traits - Svojstva:
Life gain to 100 kg (g) – Životni prirast do 100 kg (g)
Life gain up to 132 kg (g) – Životni prirast do 132 kg (g)
Age at 132 kg (days) – Starost sa 132 kg (dana)
Feed conversion (kg) – Konverzija hrane (kg)
Meat content in carcass (%) – Sadržaj mesa u polovicama (%)
Meat content in carcass (kg) – Sadržaj mesa u polovicama (kg)

Graph 2: Phenotypic differences in growth and carcass traits

Grafikon 2. Fenotipske razlike za prirast i osobine polovica

Table 3: Heritability and Repeatability in litter size

Tablica 3. Heritabilnost i ponovljivost za veličinu legla

Traits - Svojstva	Yorkshire - Jorkšir		Mangulica - Mangulica		Differences - Razlike
	h^2	R	h^2	R	
Alive born - Živorođenih	0.09	0.16	0.10	0.15	0
Weaned - Odbijenih	0.09	0.17	0.09	0.18	0
Alive born/sow/year – Živorođeno/krmači/godišnje	0.11	0.17	0.12	0.15	0
Weaned/sow/year – Zalučeno/krmači/godišnje	0.09	0.15	0.09	0.16	0
Finishers/sow/year – Isporučeno po krmači godišnje	0.08	0.16	0.09	0.15	0

Table 4: Heritability and Repeatability in growth and carcass traits

Tablica 4. Heritabilnost i ponovljivost za prirast i osobine polovica

Traits - Osobine	Yorkshire - Jorkšir		Mangulica - Mangulica		Differences - Razlike
	h^2	R	h^2	R	
Life gain to 100 kg, g – Životni prirast do 100 kg, g	0.34	0.70	0.32	0.66	0
Life gain up to 132 kg, g – Životni prirast do 132 kg, g	0.33	0.60	0.34	0.59	0
Age at 132 kg, days – Starost do 132 kg, dana	0.35	0.61	0.37	0.60	0
Feed conversion, kg/kg – Konverzija hrane, kg/kg	0.39	0.59	0.40	0.61	0
Meat content in carcass, % – Sadržaj mesa u polovicama, %	0.56	0.72	0.50	0.69	0
Meat content in carcass, kg – Sadržaj mesa u polovicama, kg	0.53	0.74	0.51	0.71	0
Protein content in meat, % - Sadržaj protein u mesu, %	0.23	0.28	0.24	0.32	0

and 4). Clearly, reproduction traits join group of low values measured with heritability same as repeatability. Growth traits and meat quality, measured by protein content, belong to middle inherited group. Meat content in carcass belongs to the group of high heritages. It means that it is possible to improve carcass quality in M using selection index as already used to do selection in Y.

CONCLUSIONS

The mass selection was used to select M in all traits. Meanwhile Y were selected using selection index - BLUP with more emphasis on litter size and less on growth, feed conversion and meat content and quality. The Y sows produced 23.4 weaned piglets per sow per year. In case of M it was only 11. To analyse growth and carcass traits the trial included 157 M and 212 Y animals. The condition was similar

during gestation and lactation period. The MME was used to analyse the effect of YS, breed and parity as fixed one and sire as random one. Weaned piglets grew in the same condition at the same farm. The losses of piglets during lactation were of 8.8% in M and 7.5% in Y. According to weaned period M losses were 12.7 % and of Y 3.0% of piglets. In fattening up to 132 kg M age was 540 days. At the same time Y grew to 133 kg needing only 227 days. There were no losses during fattening. The life gain in M was 243 g and in Y 584g. Feed conversion (FC) for M was 5.2 kg, or total of 678 kg of concentrate, but Y consumed 3.2 FC 419 kg in total. The difference of 259 kg more feed conversion was statistically significant. Taking the value of 0.25 euro for kg of feed, it comes out that in term of feed cost, M pig cost 66 euro more than Y. Meat content in carcass in M was 29.0% and 58.6% in Y. The difference of 29.6 % was highly significant. It comes out that M produce about 23.6 kg less meat compared to Y. Average protein content in M was 20.4% and 22.8% in Y. In conclusion, M showed naturally and economically very poor results related to Y. To improve genetic potential in M need to develop certain breeding programs it is necessary to invest knowledge and money for better results through generations. Mass selection showed inefficiency and inferiority in M compared to index one in Y where aggregate genotype included 5 hereditary different traits.

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SAŽETAK

Pokus je izveden na farmi gdje se istovremeno uzgajaju mangulica i jorkšir. U razdoblju od 2009. do 2012. analizirana su 432 legla mangulice i 675 jorkšira. Pri izboru mangulica u svim osobinama korištena je masovna selekcija, dok je jorkšir odabiran pomoću selekcijskih indeksa - BLUP. Jorkšir krmače proizvele su 23.4 zalučena praseta po krmači godišnje, dok ih je u slučaju mangulice bilo samo 11. Za analizu porasta i osobina kvalitete trupa, uključeno je 157 mangulica i 212 grla pasmine jorkšir. Uzgoj prasadi odvijao

se u istim uvjetima i na istoj farmi. Gubitci prasadi u toku laktacije bili su 8,8% u mangulice i 7,5% kod jorkšira. Gubitci u uzgoju mangulice iznosili su 12,7% i jorkšira 3%. U tovu do 132 kg, dob mangulice je 540 dana, dok je jorkšir za 227 dana porastao do 133 kg. Nije bilo gubitaka u tovu. Životni prirast mangulice iznosio je 243 grama i jorkšira 584g. Konverzija hrane u mangulice je 5,2 kg ili ukupno 678 kg, dok je jorkšir ostvario 3,2 kg, ili ukupno 419 kg. Razlike između svih analiziranih svojstava obje pasmine bile su visoko signifikantne. Uzimajući vrijednost od 0,25 eura za kg hrane, proizlazi da mangulica košta 66 eura više nego jorkšir. Postotak mesa u polovicama mangulice je bio 29%, a jorkšira 58,6%. Razlika od 29,6% je statistički visoko značajna. Mangulica proizvede manje mesa oko 23,6 kg u usporedbi s jorkširom. Prosječan postotak proteina u mesu mangulice je 20,4% a jorkšira 22,8%. Masovna selekcija pokazala je inferiornost u odnosu na indeksnu.

Ključne riječi: svinje; genetske razlike, proizvodna svojstva