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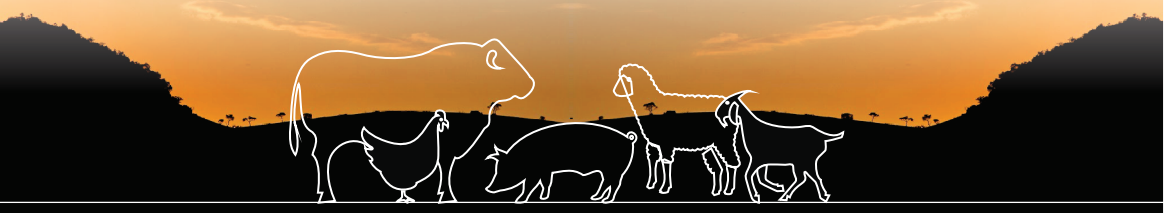

Belgrade, Serbia 7th - 9th October 2015

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Proceedings of the 4th International Congress
New Perspectives and Challenges of Sustainable Livestock Production
October 7 – 9, 2015

VARIABILITY OF BODY DEVELOPMENT TRAITS IN BUSHA COWS

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Original scientific paper

Abstract: Busha is small body native breed. It is found where the economic conditions are modest, and agriculture extensive. The intensification of livestock production, and the introduction of more productive, specialized breeds, caused diminished interest in growing Busha. Thus, Busha, as cattle oftriple productive properties, is largely suppressed, so that today we can rarely find examples of the pure breed. To protect specific geno-fund of this breed, the assessment of the level of endangerment of Busha population was carried out, which pointed to the risk status of the population and the necessity of the implementation of conservation programs. The paper analyzes the characteristics of physical development 138 Busha cows in the area of Pirot District, and the influence of non-genetic factors (farm, calving year, calving season) on the variability of traits. The average body weight of Busha cows in the area of Pirot District was 226.07 kg, height at withers 104.33 cm, rump height 104.12 cm,pelvis width 32.52 cm, chest depth 53.97 cm, chest circumference 130.48 cm and body length 119.67 cm. The analysis of the impact of non-genetic factors, showed a highly significant effect ($p < 0.01$) of the farm on all the traits except the width of the pelvis, year of calving exerted a significant effect ($p < 0.01$) on all traits of body development, whereas the calving season exerted no influence ($p > 0.05$) on any of the seven traits that have been studied.

Key words: Busha, body development, fixed factors

Introduction

In Serbia, as in all of Europe, since the 18th century, there was a significant increase in the number of breeds of all farm animals, including the cattle. Over

time, people have invested in knowledge and education, creating new breeds of the combined production traits, usually well adapted to local growing conditions. During the second half of the 20th century, cattle production became intensive and specialized. These changes have caused a change in the definition of the breeding goals. The introduction of selected breeds, suppressed domestic, indigenous breeds of lower genetic potential, which is why there are on the list of endangered or even extinct breeds.

Busha belongs to the group short horn cattle - *Bos brachieceros europeus*. It is grown in an extremely extensive way, and therefore has poorly pronounced production traits, so that the Busha and its crossbreds can be found in the underdeveloped hilly, mountainous and karst areas south of the Sava and Danube rivers.

According to 2009 data released by the FAO and the Institute for Animal Husbandry (2015), number of animals of the indigenous Busha breed in Serbia is 500-1000, and the number of female breeding animals is 350. Institute for Animal Husbandry (2015) also reported that in 2014 there were 365 registered animals of this indigenous breed.

Busha cattle achieve their sexual maturity with 13 - 15 months, and breeding (physical) maturity with 24 (20 - 28) months (*Simijonović 1980, Čobić and Antov, 2002*). Early mating of Busha cows, especially young animals, slows their normal development, primarily due to poor nutrition during pregnancy, the calves remain small and undeveloped due to poor milk yield of the dam. Early mating has very harmful consequences for both mother and calf. Full growth and development of Busha is achieved with 3 - 4 years, and even with 5 years (*Memiši et al., 2003*).

To characterize the morphological characteristics of Busha, previously performed studies are of great importance (*Rako, 1955 Ivanković, 1997*), which provide a good basis for assessing the development of the breed, variability of morphological properties within different populations, and propose a strategy of growing indigenous cattle genome.

Milutinović (1977) states the body dimensions of Metohija strain of Busha cattle -height to withersof 103.97 cm, rump height of 106.88 cm, the chest depth 53.26 cm, chest circumference 140.97 cm and 119.45 cm body length.

Over forty years later *Memiši et al. (2009)*have studied the morphometric characteristics of the population of Busha cows from the area of Šar Mountain with following results: average height at the withers in older cows is 102.3 cm and 127.4 cm body length. The values of these traits in heifers were lower by 7.78 cm (height) and 14.8 cm (body length) compared to the average values in older cows.

Rogić et al. (2011) examined the variability of morphometric characteristics of Busha and Gackocattle in order to preserve indigenous genome.

These authors suggest the following results for the height to withers, chest depth and circumference: in Gackocattle, the following values were measured: 123.67cm, 136.86 cm and 174.22 cm, Busha cattle in the region of the eastern Herzegovina 114.21 cm, 126.71 cm and 167.00 cm, while in western Herzegovina physical measures recorded were 106.11 cm, 117.82 cm and 148.55 cm, respectively. The same authors have found a significant degree of variation in morphological characteristics within the studied populations, and among populations. Identified differences are primarily a result of the effects of different natural conditions and growing conditions as well as the share of alpine cattle genome, with which the Busha was crossbred.

Material and Methods

To test the variability of body development traits, data for 138 cows of Busha breed was used, from 4 farms in the area of Pirot District, in the municipality of Dimitrovgrad. The cows have calved during the period 2005-2013, and all traits were measured immediately after the first calving. The paper investigates the impact of farm, year and season of calving on seven traits of body development: height at the withers, height at the rump, the width of the pelvis, chest circumference, chest depth, body weight and body length. Since Busha cows calf in the spring, only the influence of the first and second season of calving was considered.

Data processing was performed by statistical program *Statistica for Windows version 7* wherein the medium, minimum and maximum values were determined, as well as variability (standard deviation - SD and coefficient of variation - CV). Analysis of the influence of non-genetic factors on the studied traits of body development was performed by the method of Least squares, using a fixed model:

$$Y_{ijkl} = \mu + F_i + G_j + S_k + e_{ijkl}$$

Where:

Y_{ijkl} = Expression of the studied trait in *m* cow, which produced in *i* farm, *j* calving year, *k* calving season

μ = general average of observed trait

F_i = fixed effect of*i*farm

G_j = fixed effect of*j*calving year

S_k = fixed effect of*k*calving season

e_{ijkl} = random error

Results and discussion

Based on the results shown in Table 1, it can be concluded that the average body weight of Busha cows in the area of Pirot District was 226.07 kg, height at withers 104.33 cm, height at rump 104.12 cm width of the pelvis 32.52 cm, the chest depth 53.97 cm, chest circumference 130.48 cm and 119.67 cm body length.

If the results obtained in the present study are compared with the values of other authors, they are lower than the results obtained for Gackocattle and Busha in the eastern and western Herzegovina, which were obtained by *Rogić et al. (2011),* because in this region,the impact of the Tyrolean gray cattle used in crossbreeding with Busha is great.

The height at the withers is greater but the body length is lowercompared toBushacattle in areas ofŠar mountain,recorded by*Memiši et al. (2009).*

Comparing the obtained results with the results for Metohija strain of busha breed arrived at by *Milutinovic (1977)* we see that the results are similar or even lower compared to some properties for this strain of Busha 38 years ago.

Table 1.The mean values and variability of body development traits of Busha cows

Trait	N	Average	Min	Max	SD	CV
Body weight, kg	138	226.07	160.00	275.00	27.04	2.30
Height at withers, cm	138	104.22	98.00	107.00	1.49	0.13
Height at rump, cm	138	104.12	98.00	107.00	1.57	0.13
Pelvis width, cm	138	32.52	30.00	34.00	0.78	0.07
Chest depth, cm	138	53.67	46.00	60.00	2.80	0.24
Chest circumference, cm	138	130.48	125.00	140.00	3.34	0.28
Body length, cm	138	119.67	108.00	131.00	3.39	0.29

The analysis of the impact of non-genetic factors (farm, year and season of calving, Table 2) on the variability of body development traits, highly significant effect ($p < 0.01$) ofthe farm on all traits was found except on the width of the pelvis. The differences found between traits of body development on farms can be explained by the different dietary and housing conditions.

Table 2.The effect of fixed factors on the variability of traits

Trait	F values of studied factors		
	Farm	Year	Season
Body weight, kg	9.16^{**}	14.74^{**}	0.49^{nz}
Height at withers, cm	18.10^{**}	9.30^{**}	2.50^{nz}
Height at rump, cm	27.40^{**}	13.10^{**}	2.10^{nz}
Pelvis width, cm	3.00^{nz}	2.80^{**}	0.40^{nz}
Chest depth, cm	16.06^{**}	13.17^{**}	0.00^{nz}
Chest circumference, cm	10.70^{**}	12.70^{**}	2.90^{nz}
Body length, cm	31.30^{**}	11.20^{**}	6.70^{nz}

$p>0,05^{nz}$, $p<0,05^{*}$, $p<0,01^{**}$

Year of calving was important source of variation that had significant effect ($p <0.01$) on all traits of body development.

Season of calving did not exert influence ($P> 0.05$) on any of the seven properties that were investigated, because cows that have calved in the first season calved in February, so seasonal differences in temperature and humidity, the quality and quantity of available food have not caused significant variation of body development traits.

Conclusion

Based on the results obtained it can be concluded that the average body weight of Busha cows in the area of Pirot District was 226.07 kg, height at withers 104.33 cm, height at rump 104.12 cm, pelvis width 32.52 cm, chest depth 53.97 cm, chest circumference 130.48 cm and 119.67 cm body length.

The analysis of body development traitsshowed that Busha cattle reared in the Pirot District, have small body frame and that according to the morphological characteristics it is most similar to Metohija strain of Busha from 38 years ago, which means that there has been no adequate efforts to improve the traits of body development of this strain.

A high degree of variability ($p <0.01$) of body development traits was establishedin various farms and years of calving, which were primarily the result of different conditions and methods of rearing.

Considering that cows, that have calved in the first season, calved in February, calving season showed no significant effect (p> 0.05) on variation of body development traits.

Busha is small body frame indigenous breed. It is found in the regions with the modest economic conditions, and where the agriculture is extensive. To protect specific geno-fund of the breed, it is necessary to develop and implement the program of its preservation.

Further tests of genomic characteristics of Busha breed, based on molecular markers will show the extent to which the Busha population today is preserved in its original form.

Acknowledgment

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Varijabilnost osobina telesne razvijenosti krava rase buša

D. Nikšić, V. Pantelić, D. Ostojić-Andrić, P. Perišić, N. Stanišić, M. Lazarević, N. Delić, M. Petričević

Rezime

Buša je sitna autohtona rasa. Zastupljena je tamo gde su ekonomske prilike skromne, a poljoprivreda u celini posmatrano ekstenzivna. Inteziviranjem proizvodnje u govedarstvu, I uvođenjem produktivnijih, specijalizovanih rasa, izgubio se interes za gajenje buše. Tako je buša, kao goveče trojnih proizvodnih svojstava, u velikoj meri potisnuta, pa se danas retko mogu naći primerci u čistoj rasi. Radi zaštite specifičnog geno-fonda ove rase izvršena je procena ugroženosti populacije buša, koja je ukazala na rizičan status populacije I neophodnost primene programa očuvanja. U radu su analizirane osobine telesne razvijenosti 138 krava rase buša na području Pirotskog okruga, iuticaj paragenetskih faktora (farma, godina teljenja, sezona teljenja) navarijabilnost osobina. Prosečna telesna masa krava rase buša na području Pirotskog okruga iznosila 226,07 kg, visina grebena 104,33 cm, visina krsta 104,12 cm, širina karlice 32,52 cm, dubina grudi 53,97 cm, obim grudi 130,48 cm, i dužina tela 119,67 cm.Analizom uticaja paragenetskih faktora, utvrđen je visokoznačajan uticaj ($p<0,01$) farme na sve osobine osim na širinu karlice, godina teljenja ispoljila je značajan uticaj ($p<0,01$) na sve osobine

telesne razvijenosti dok sezona teljenja nije ispoljila uticaj ($p>0,05$) ni na jednu od sedam osobina koje su ispitivane.

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