

PERFORMANCE RECORDS OF AUTOCHTHONOUS GOATS IN CENTRAL SERBIA

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Abstract: The purpose of this study was to determine status, number and present level of productivity of autochthonous goats raised in Central Serbia on smallholder farms. Study included quality breeding animals of Balkan and Serbian white goat breed registered in Central herd book. Productivity data were collected from regular annual performance recordings at 11 smallholder farms for 145 Balkan does (2-9 years of age) and 203 kids and 83 Serbian white does (2-10 years of age) and 109 kids. Traits recorded were as follows: body weight of does, body weight of kids at birth, at the age of 30 days and at weaning, prolificacy of does and milk production. The analysis showed the average body weight of does to be 43.07 kg for Balkan does and 47.42 kg for Serbian white does. Average body weight of kids at birth, 30 days of age and weaning was 2.22 kg, 6.87 kg and 15.71 kg, respectively for Balkan breed and 3.66 kg, 7.24 kg and 14.23 kg for Serbian white breed. Prolificacy was 140% in Balkan and 131% in Serbian white does. Among dairy production traits, following results were obtained for Balkan and Serbian white goat respectively: lactation length 199 and 229 days, total milk yield 257.89 kg and 459.49 kg, milk fat content 4.03% and 3.79%, milk protein content 3.06% and 3.35%. Number of quality breeding animals registered at Central herd book in 2018, as presented in Institute for Animal Husbandry's annual report for goats for Central Serbia in 2018, was 159 for Balkan and 138 for Serbian white goat. As these breeds represent a valuable and irreplaceable source of genetic variability, as well as very important cultural and traditional heritage and further emphasis should be on preserving and increasing their number.

Key words: goats, autochthonous, Central Serbia, productivity

Introduction

Goat breeding had a significant place and tradition in the Republic of Serbia before the Second World War. First of all, thanks to favourable natural environment, it was mostly represented as an extensive production, alongside the

sheep production, in the hilly-mountainous area in which half of the agricultural population lived. At the time, goat farming was predominantly based on breeding of domestic Balkan goat, breed of low production capacity, modest in terms of breeding conditions, but also very resistant. With the adoption of the Law on the Prohibition of Goat breeding in 1954 (*Anonymous, 1954*), goat farming has become an unattractive and politically anathematized branch of livestock production, which negatively influenced the overall size of the goat population in Serbia, as well as the presence of the autochthonous goat breeds. Also, rapid industrialization, settlement of cities and the depopulation of villages, as well as the unfavourable economic situation in the country at the end of the 20th century, led to the almost complete abandonment of this type of livestock production, especially in mountain regions (*Maksimović et al., 2017*).

In recent years attempts have been made to revitalize the goat production, primarily through the import of high-productive foreign breeds such as the Alpine and Saanen, which resulted in an intensification of goat production and increased productivity of goats. However, at the same time, autochthonous breeds were almost completely abandoned by farmers, due to their lower productivity which made them become uncompetitive to these high-productive breeds.

However, more recently, the great efforts of the global community are aimed at preserving world's biodiversity (*Nikolov, 2015*), with farm animal genetic resources being an integral part of it. Indigenous breeds of all animal species represent a valuable and irreplaceable source of genetic variability, as well as a very significant cultural and traditional heritage. By raising awareness of the evident climatic changes, as well as the importance of the production of healthy high quality food, special attention is paid to the preservation of autochthonous breeds of farm animals.

Locally-adapted (autochthonous) goat breeds in central Serbia are especially suitable for breeding in marginal areas, in brisk-mountainous terrains, which are scarce in vegetation, where production is almost exclusively based on the use of natural pastures. This guarantees the high sustainability of local ecosystems, improves the role of agriculture in preserving the environment, and also provides the possibility of producing autochthonous traditional (typical) products. A "typical" product is a result of several factors including raw material, transformation process and sensory characteristics. All these peculiarities are closely related to the geographical origin and to the social and cultural traditions of the production area (*Scintu and Piredda, 2007*).

There are two local goat breeds currently raised in Central Serbia, Balkan goat and Serbian white goat (also known as improved domestic goat), with Balkan goat being autochthonous breed and Serbian white basically being improved Balkan by crossing with Saanen bucks in order to improve milk yield. Both of these breeds are low productive breeds, but well adapted to modest conditions of care, housing and nutrition, usually raised in high lands and are considered

endangered although the real number of these animals is not known. For Balkan goat, the meat, i.e. quality kid carcass is the most important product (*Mioč et al., 2011*), while Serbian white goat has higher milk production, but both breeds are used for combined production of both milk and meat. Balkan goat is also found in almost entire region of Balkan Peninsula and south-eastern Europe (*Bogdanović et al., 2010*) and domestic white goat is raised in former Yugoslavian republics, especially in Croatia (*Mioč et al., 2012*).

Given the importance and impact that these breeds have on preserving local as well as global ecosystems and the environment, the objective of this study was to determine status, number and present level of productivity of autochthonous goats raised in Central Serbia on smallholder farms.

Material and Methods

Study included animals of Balkan and Serbian white goat breeds registered at Central heard book which are regularly under performance recording. Number of registered quality breeding animals of these breeds was taken from Institute for Animal Husbandry's annual report "Activities report and results of the control of realization of breeding programs in 2018" for goats in Central Serbia. Data for productivity control were collected from regular annual performance recordings at 7 smallholder farms with Balkan goats located in Zaječar and Nis district and 4 smallholder farms with Serbian white goats located in Belgrade, Zaječar and Rasina districts. Data were analysed for total of 145 Balkan does (2-9 years of age) and 203 kids and 83 Serbian white does (2-10 years of age) and 109 kids. For Serbian white the average flock size was 21 goats, with a range of 12 to 27. Animals were kept extensively, mostly at pasture, except for the winter, when they were kept indoors. Nutrition was primarily based on pasture (during warm part of the year) and meadow or alfalfa hay (during cold part of the year). Goats were bred throughout natural service.

Traits recorded were as follows: body weight of does, body weight of kids at birth, at the age of 30 days and at weaning (which is approximately the age of 90 – 120 days), prolificacy of does calculated as the percentage of number of kids born on total number of does delivered and milk production.

Among milk production traits, following traits have been analysed: the milk yield in full lactation, milk fat content, milk protein content and lactation duration (in days).

The milk recording was conducted by AT method, which was done in the time interval of 28-34 days, once in the morning and next time at evening, by official recorder (*International agreement, 2009*). First recording was done 40 days after kidding. Milk components (fat and protein) were analysed using the ultrasonic milk analyser Ekomilk.

The collected data were analysed by the statistical package Statistica for Windows 7 (stat. Soft. Inc.). Obtained results were presented as mean±SE.

Results and Discussion

Table 1 shows number of quality breeding animals of Balkan and Serbian white goats under selection control, registered at Central herd book, for the period of 5 years.

Table 1. Number of goats under selection control in the period 2014 to 2018

Genotype/year	2014.	2015.	2016.	2017.	2018.
Balkan goat	37	129	154	121	159
Serbian White goat	155	150	116	145	138

Source: Activities report and results of the control of realization of breeding programs in 2018

As seen in Table 1 number of these animals was more-less consistent throughout five year period except for 2014 in which Balkan goat was quite less in number. According to the Institute for Animal Husbandry's annual report for goats for Central Serbia in 2018 there were total of 8,070 quality breeding goats under productivity control of all genotypes, which makes Balkan goat and Serbian white goat participating with only 1.97% and 1.71%. There is no data about total number of animals of these two breeds raised on Central Serbia territory, but this low percentage indicates that a majority of autochthonous goats still remain unsupervised and outside performance recording. This in turn reflects negatively in terms of insufficient knowledge of production abilities and which is most important, preservation of these breeds as valuable genetic resources.

Mean±SE for live weight of does, birth weight of kids, body weight of kids at the age of 30 days, body weight of kids at weaning and prolificacy of does are set out in Table 2.

Table 2. Body weight and prolificacy (Mean ± SE)

Traits/Breed	Balkan		Serbian white	
	N	Mean±SE	N	Mean±SE
BW of does (kg)	145	43.07±0.32	83	47.42±0.63
BW of kids at birth (kg)	203	2.22±0.04	109	2.66±0.04
BW of kids at 30 days of age (kg)	203	6.87±0.07	109	7.24±0.09
BW of kids at weaning (kg)	203	15.71±0.09	109	14.23±0.25
Prolificacy (mature does), %	140		131	

*BW – body weight

As shown in Table 1, Serbian white does were somewhat heavier with 47.42 kg live weight on average, compared to Balkan does, which weighted 43.07 kg on average. Body weight of kids was also a bit higher for Serbian white in first two control periods, but lower at the time of weaning, which can probably be attributed to perhaps different time of weaning. In extensive goat production, especially with local goat breeds, it is not uncommon to see prolonged period of weaning from 90 to 120 days or more of kids' age. As for prolificacy, Balkan does had higher rate of 140% on average compared to Serbian white with rate of 131%. *Žujović et al. (2007)* found optimal body mass of goats of Serbian White population to be from 40 to 47 kg in order to assure optimal production of milk and meat, but the authors also found birth weight of kids to be higher than in present study, with a range of 3.5 to 4.2 kg depending on body weight of does and type of birth of kids. According to *Mioč et al. (2012)* and *Mioč and Pavič (2002)* domestic white goat raised in Croatia has body weight of 35 to 45 kg, fecundity of 150 % on average and birth weight of kids of about 3 kg.

Research of *Ivanović et al. (2014)* showed average body weight of 44.7 kg for Balkan and 50.9 kg for Serbian white goats and *Memiši et al. (2009)* reported body weight of 2.7 kg and 13.62 kg for Balkan kids at birth and 90 days of age. *Mioč et al. (2011)* determined average body weight of Croatian Balkan goat kids to be 2.28 kg at birth and 23 kg at weaning (at the age of 186 days). As it can be seen from these literature data, present study showed similar values for live weight of both Balkan and Serbian white goat and birth weights of kids.

Milk performances including length of lactation, total milk yield, milk fat and milk protein content for Balkan and Serbian white goats in are presented in Tables 3 and 4 as mean±SE.

Table 3. Balkan goat milk traits according to the order of lactation (Mean ± SE)

Order of lactation	N	Lactation length, days	Total milk yield, kg	Milk fat, %	Milk protein, %
I	28	204	218.87±17.29	3.99±0.03	2.98±0.03
II	20	220	267.63±14.55	4.00±0.08	3.06±0.03
III	18	189	292.61±22.99	3.98±0.08	3.04±0.04
IV	9	211	339.75±32.30	4.21±0.04	3.16±0.03
V	19	203	279.85±16.73	4.10±0.04	3.14±0.03
VI	5	182	216.72±6.24	3.90±0.02	3.08±0.05
VII	13	160	202.15±7.50	4.05±0.03	3.06±0.02
Overall	112	199	257.89±8.31	4.03±0.02	3.06±0.01

Table 4. Serbian white goat milk traits according to the order of lactation (Mean \pm SE)

Order of lactation	N	Lactation length, days	Total milk yield, kg	Milk fat, %	Milk protein, %
I	4	214	438.85 \pm 39.21	3.51 \pm 0.01	3.38 \pm 0.02
II	16	224	448.89 \pm 20.67	3.89 \pm 0.07	3.34 \pm 0.02
III	17	241	498.85 \pm 9.01	3.81 \pm 0.01	3.30 \pm 0.01
IV	5	249	465.84 \pm 11.39	3.93 \pm 0.10	3.32 \pm 0.02
V	15	226	469.86 \pm 11.55	3.76 \pm 0.05	3.38 \pm 0.03
VI	16	219	445.9 \pm 28.46	3.67 \pm 0.03	3.43 \pm 0.02
VII	5	238	432.94 \pm 9.70	3.98 \pm 0.09	3.29 \pm 0.02
Overall	78	229	459.49 \pm 6.52	3.79 \pm 0.02	3.35 \pm 0.01

As seen from Tables 3 and 4 total milk yield regardless of order of lactation was 257.89 kg for Balkan and 459.49 kg for Serbian white goat on average, in lactation of 199 and 229 days, respectively. Milk fat and milk protein content was 4.03% and 3.06% in milk of Balkan goat and 3.79% and 3.53% in milk of Serbian white goat. *Bogdanović et al. (2010)* reported average milk yield in Balkan goat of 378.46 kg with fat content of 3.71% in lactation of 256 day which is higher than milk yield obtained in present study. On contrary, *Memiši et al. (2004)* found milk yield in Balkan goat to be 178 kg with 3.68% of fat in lactation of 235 days. In study of *Zujović et al. (2010)* Serbian white goat had production of 283.61 kg of milk in I and 385.21 kg of milk in II lactation, which is less than in present study, but found higher content of fat (4.39%) and lower content of protein (3.10%). In study of *Žujović (1993)* average milk yield of 399.83 kg was determined for Serbian white goat in 277 day lactation. These varieties of presented results can arise from different rearing conditions of goats, as well as from perhaps different milk recording methods. Nonetheless, variability in milk traits can be exploited in positive direction throughout planned selection and better rearing. As for order of lactation, linear trend of increase in milk yield up to third or fourth lactation and then decline toward seventh lactation was observed in both breeds, but those changes were very subtle in Serbian white goat. Similar results regarding the influence of order of lactation on dairy production in goats were obtained by *Bogdanović et al. (2010)*, *Memiši et al. (2011)* and *Marete et al. (2014)*.

Conclusion

From the data presented it can be concluded that there is a very small number of Balkan and Serbian white quality breeding goats registered in Central herd book, and therefore also a very small number of these animals under performance recordings. This in turn makes it difficult to determine realistic level

of productivity for these breeds. However, these breeds represent a valuable and irreplaceable source of genetic variability, as well as very important cultural and traditional heritage and further emphasis should be on preserving and increasing their number. Also, as seen from present data, variability of productive traits offers possibilities for improvement through selection and better rearing, which assures preservation of pure breeds.

Proizvodni parametri autohtonih rasa koza u Centralnoj Srbiji

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Rezime

Cilj istraživanja bio je da se utvrdi status, brojno stanje i postojeći nivo proizvodnosti autohtonih rasa koza gajenih na teritoriji Centralne Srbije na malim porodičnim gazdinstvima. U ispitivanje su bila uljučena kvalitetna priplodna grla balkanske i srpske bele rase koza, upisana u Glavnu matičnu evidenciju. Brojno stanje umatičenih grla koza ove dve rase preuzeto je iz Stručnog izveštaja i rezultata sprovođenja odgajivačkog programa u 2018. godini. Proizvodni podaci su prikupljeni iz redovne godišnje kontrole proizvodnih svojstava koza sa 11 poljoprivrednih gazdinstava za 145 plotkinja i 203 jaradi balkanske rase, odnosno 83 plotkinje i 109 jaradi srpske bele rase. Plotkinje su bile uzrasta 2 do 10 godina, a jarad u uzrastu od rođenja do odlučanja (90 do 120 dana). Analizirane su sledeće osobine: telesna masa koza, telesna masa jaradi na rođenju, sa 30 dana uzrasta i pri odlučanju, plodnost koza i osobine mlečnosti (dužina laktacije, količina mleka za laktaciju, sadržaj mlečne masti i proteina). Analizom su utvrđene prosečne vredenosti telesne mase koza od 43,7 kg za balkansku rasu i 47,42 kg za srpsku belu rasu. Prosečne telesne mase jaradi na rođenju, sa 30 dana uzrasta i pri odlučanju bile su redom 2,22 kg, 6,87 kg i 15,71 kg kod balkanske rase, odnosno 3,66 kg, 7,24 kg i 14,23 kg kod srpske bele. Plodnost je u proseku bila 140% kod plotkinja balkanske koze, odnosno 131% kod plotkinja srpske bele koze. Prosečna mlečnost balkanske koze iznosila je 257,89 kg mleka u laktaciji od 199 dana, sa 4,03% mlečne masti i 3,06% proteina. Srpska bela koza imala je prosečnu mlečnost 459,49 kg u laktaciji od 229 dana, sa 3,79% mlečne masti i 3.35% proteina mleka. Broj kvalitetnih priplodnih grla upisanih u Glavnu matičnu evidenciju bio je 159 za balkansku rasu i 138 za srpsku belu kozu. S obzirom na mali broj koza ove dve rase koji se nalazi pod kontrolom proizvodnih svojstava teško je utvrditi realan nivo njihove produktivnosti. Ipak, ove rase predstavljaju vredan i nezamenljiv

izvor genetske varijabilnosti, kao i veoma važno kulturalno i tradicionalno nasleđe i naglasak bi trebalo staviti na njihovo očuvanje, kao i povećanje brojnog stanja.

Ključne reči: koze, autohtone rase, Centralna Srbija, produktivni parametri

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