

FEATURES OF THE NEW BREED OF SHEEP IN SERBIA CALLED MIS SHEEP 2. FATTENING AND MEAT CHARACTERISTICS OF LAMBS

Milan P. Petrovic¹, Violeta Caro Petrovic¹, Dragana Ruzic Muslic¹, Zoran Z. Ilic², Jovan Stojkovic², Nikola Stanisic¹, Radojica Djokovic³

¹*Institute for Animal Husbandry, Belgrade-Zemun, Serbia*

²*Faculty of Agriculture, Lesak, Serbia*

³*Faculty of Agronomy, Cacak, Serbia*

Autoput 16, Po.Box. 23, 11081, Belgrade-Zemun, Serbia

Tel. +381 112 670 541; Fax. +381 112 670 164; e-mail:milanppet@yahoo.com

Abstract. In this paper, the results of fattening and meat characteristics of lambs of the new breed of sheep in Serbia, called Mis sheep, are presented. Mis breed as a meaty type of sheep, has been developed for the past 20 years at the Institute of Animal Husbandry, Belgrade-Zemun. The total and daily gains in 1–30 days were of 7.5 kg and 250 g, and in 61–90 days the growth dynamics was even higher by 60% with the total gain of over 12 kg; the daily value exceeded 400 g. Food consumption, calculated in units of energy, was about 13.5 MJ with a slightly larger share of concentrate in the mass of gain of lambs. The dressing percentage of lambs at the age of three months was about 59%. In addition, the highest percentage of carcass meat was of the first category, followed by the meat of the second category and the lowest representation of the third category of meat. Muscle tissue had an absolute advantage over the other tissues and accounted for over 57%, followed by fat, bone and connective tissue, which accounted for the remaining 43% of the weight of three rib pattern. Mis sheep population, similar to the known foreign meat breeds, has a little more fat, which influences the better technological and sensory properties.

Keywords: new breed, Mis sheep, lambs, fattening, meat characteristics

Introduction

The production of sheep meat is of a major importance in most countries and the main source of income for farmers (Fisher, 2004, Arrebola et al., 2009). The situation is similar in Serbia, except that more than 70% of produced meat is young lambs aged up to 90 days. It is therefore very important to know the factors that influence the quantity and quality of meat produced in order to organize a successful sheep production. Body weight of lambs has a major role in achieving profitable results (Morris et al., 2000, Cloete et al., 2001, Zapsnikiene, 2002, Berhan and Arendonk, 2006). Not all breeds of sheep have potential for high daily gains; therefore it is necessary to create new breeds. Crossbreeding is the most effective way to improve the production of lamb meat, because it directly affects the increase in body weight of lambs (Leymaster, 2002, Petrovic et al., 2011). The efficiency of meat production is maximized in terminal crossbreeding systems by use of specialized sire breeds to complement characteristics of crossbred ewes (Petrovic, 2000, Cloete et al., 2003, Hoffman et al., 2003).

Generally meat can be produced from each sheep. However, the price depends on the quantity and quality, which in turn are conditioned by breed. First of all, the complex local indicators of productivity and economic efficiency of the production of sheep meat, especially lamb, are specialized for fast growing meaty sheep.

In order for the production of lamb meat to be profitable, it is necessary that the sheep population is of high genetic potential in terms of body development, yield and meat quality, lower food consumption and nutrient generated per unit increment.

The aim of this paper is to present the most important

production parameters of fattening lambs and their yield and meat quality.

Material and Methods

The study was conducted in the experimental sheep farm of the Institute of Animal Husbandry, Belgrade – Zemun. A long-term scientific research on the development of new sheep population began in 1991. For realization of this project, three breeds of sheep were utilized, namely: Pirot pramenka, Merinolandschaf and Ile de France. The details of the new breed, reproductive traits and body measurements were presented in our previous paper (Petrovic et al., 2013).

Fattening of lambs was organized every year from 2002 to 2012 with 60 lambs of both sexes per year. In this paper, the average results for all experiments are presented: gain characteristics of lambs at fattening period and the conversion of food and nutritious substances of lambs, (consumption g/hd/day, conversion g/kg). Every year, 12 lambs (6 male and 6 female) were slaughtered in order to determine the yield and meat quality. The average value for the yield and quality of lamb carcass for the period 2002–2012 year are presented. The slaughtering of lambs and meat analyzes were conducted at the experimental slaughterhouse and laboratory of the Institute of Animal Husbandry.

Carcasses were longitudinally split into two equal sides and were cut according to the Serbian regulation of cutting mutton and lamb and have been divided into three categories ("Off. Gazette of SFRY"). Under same method three rib samples were divided into muscle, fat and connective and bone tissues.

Chemical and technological characteristic of meat were analyzed using the methods of AOAC (1995).

Cooking loss was measured using a standard laboratory method of sample testing.

Statistical analysis was performed using the GLM procedure of SPSS package.

Results and Discussion

In Table 1, the characteristics of total and daily gain of lambs at fattening period are shown.

Table 1. Gain characteristics of lambs at fattening

Fattening period	Total gain, kg		Daily gain, g	
	Mean	S.E.	Mean	S.E.
1–30 days	7.50	±0.12	250	±1.21
31–60 days	10.13	±0.16	337	±1.28
61–90 days	12.12	±0.15	404	±1.03
1–90 days	29.75	±0.19	330	±1.11

The given data shows a very intensive gain which also is increasing month by month during the growing period. Thus, in the period of 1–30 days, the total and daily gains have values of 7.5 kg and 250 g, and in the period of 61–90 days, the growth dynamics was even higher by 60% when the total gain was more than 12 kg and exceeded the value of 400 g per day. As a result of a compromise between the lower food consumption and thus the potential for biological dynamics of body weight in the first month after birth and higher during the second and third months, we got the average daily gain whose value is on average 330 g and exceeds the value of this feature in other population in our area, especially if compared to Wirttemberg and Ile de France sheep (Petrovic, 1992, Mekić, 1994).

Of particular importance to the profitability of sheep farming is the price of the weight gain that is obtained through consumption of feed per unit of gain (Table 2).

Table 2. Conversion of food and nutritious substances of lambs

Item	Consumption g/head/day	Conversion, g/kg
Hay	432	1160
Concentrate	580	1680
MJNEM	4,72	13,40
DCP	123	350

Based on Table 2, we can assume that the fattening lambs tend towards good appetite and a steady consumption of forage and concentrate feeds. However, the quality of hay is usually the limiting factor in terms of increasing the intake of nutrients; therefore concentrate has some advantage (Lewis et al., 2004). Therefore, the more important in the economics of production is consumption or feed conversion per kg of weight gain. The data in Table 2 indicate that food consumption, calculated in units of energy, is 13.4 MJ with a slightly larger share of concentrate in the mass of gain of lambs. These values alone do not utter a lot unless one recalls our previous studies in which we observed the same growth

conditions and compared several important sheep breeds in the territory of Serbia. By the age of 90 days, the lambs of Mis sheep population consume a smaller amount of food per kg of weight gain by as much as 20% (Petrovic and Negovanović, 1993, Petrovic et al., 1995, 1997, Ruzic-Muslić et al., 2005).

Speaking about the leanness in sheep we mean the development, quantity and composition of muscle and adipose tissue and the physiological capacity for their formation. Good sheep lean meat are the ones in less time achieving higher growth with less food consumption per unit of gain. At first, we consider the characteristics of lamb carcasses of Mis population (Table 3).

Hot dressing percentage of lambs at the age of three months is about 59%, which is one of the high values of this property. In addition, Table 3 shows that the highest percentage of carcass makes the first category, followed by the meat of the second and third (the lowest percentage) categories. This kind of carcass compositions attests the high quality of the lamb meat.

Table 3. Yield and quality of lamb carcass (%)

Traits	Mean	S.E.
Dressing percentage	58.96	±0.22
Meat I category (leg, loin)	40.41	±0.26
Meat II category (back, shoulder, neck)	36.37	±0.37
Meat III category (chest with his forearm, lower leg)	23.22	±0.45

Taking into consideration the role of skeleton and seeking to obtain more meat, the selection of sheep needs a compromise in obtaining animals with desirable ratio of muscle and bone tissue. Muscle tissue is composed of muscle fibres and in the early age of lambs is thinner thus giving a better quality of meat. With the age, the animal muscle fibres become thicker and coarser and thus decrease the quality of meat (Velotto et al., 2010).

Table 4. Tissue ration in three-rib sample

Traits	Mean	S.E.	%	Relative %
Three-rib sample, g	271,01	±23,18	100,00	-
Muscle tissue, g	150,07	±14,01	57,16	316,60
Fat tissue, g	69,20	±8,54	23,70	145,99
Connective tissue, g	1,60	±0,11	0,59	3,75
Bone tissue, g	47,40	±4,81	17,56	100,00

It is evident that muscle tissue has an absolute advantage over the other because it accounts for over 57%, followed by fat, bone and connective tissue, which account for the remaining 43% of three rib pattern weight. It is interesting that in Mis sheep only 17.56% is bone tissue, whereas in most other populations that are grown in our country, the value of bone tissue is much greater;

even more than 30% as is the case with Wirttemberg breed (Petrovic, 1992). To avoid any confusion: the relationship between the three rib tissue sample is in a highly positive correlation with the ratio of tissue around the trunk. Also, it is worth mentioning that the lambs Mis population, akin to the known foreign meat breeds, has a little more fat, which influences the better technological and sensory properties as shown in Table 5. On the other hand, the protein content in the meat of Mis lambs is higher than in the previously mentioned species (Petrovic, 1992, Mekić, 1994). Fattening, slaughter, and carcass characteristics of lambs have been the subject of research by other authors (Ribeiro et al., 2001, Dawson et al., 2002, Momani et al., 2002, Yakan and Unal, 2009) who had a similar desire to increase sheep meat results in their countries.

Table 5. Physical–chemical and technological characteristic of meat (%)

Traits	Mean	S.E.
Water content	72.99	±0.16
Fat content	2.83	±0.06
Protein content	23.08	±0.13
Cooking loss	23.56	±0.31
Roasting loss	31.49	±0.35

Conclusions

Based on the study, the obtained and analyzed results, we can conclude the following: Mis breed lambs have all characteristics of meaty sheep breeds; high total and daily gain from birth to weaning at 90 days; good consumption and conversion of feeds and nutrients; the high yield of warm carcass; a significant share of the first and second category of meat; desired ratio of tissue in three rib sample; very satisfactory physicochemical and technological properties of meat. In comparison with other breeds of sheep in our country it can be confirmed that this new breed of sheep have better qualities of investigated traits as presented in this paper.

Acknowledgements

This study is part of the projects TR 31053 "Modern biotechnology solutions in the breeding and feeding of cattle sheep and goats for the production of valuable and safe food" and TR 31001 "An environmental approach and implementation of modern biotechnologies as a basis for the improvement of ruminant breeding technology", financially supported by the Ministry of Education and Science of the Republic of Serbia.

References

1. Abegaz S., VanWyk J.B., Olivier J.J. Model comparisons and genetic and environmental parameter estimates of growth and the Kleiber ratio in Horro sheep. *S. Afr. J. Anim. Sci.* 2005. 35. P.30–40.
2. AOAC. Official methods of analysis 16th edition Association of Official Analysis Chemists International, Arlington, Virginia, USA. 1995.

3. Arrebola F. A., Abecia J. A., Forcada F., García A., Martín R. A., Mesa O. Effects of annual rainfall and farm on lamb production after treatment with melatonin. *New Zealand. Veterinary Journal.* 2009. 57.P.141–145.

4. Baneh H., Hafezian S. H. Effects of environmental factors on growth traits in Ghezel sheep. *African Journal of Biotechnology.* 2009. 8 .P. 2903–2907.

5. Berhan A., Van Arendonk. J. Reproductive performance and mortality rate in Menz and Horro sheep following controlled breeding in Ethiopia. *Small Rumin. Res.* 2006. 63. P. 297–303.

6. Cloete S.W.P., Greeff J.C., Lewer R.P. Environmental and genetic aspects of survival and early live weight in Western Australian Merino sheep. *South African Journal of Animal Science.* 2001. 31. P. 123–130.

7. Cloete S.W.P., Cloete J.J.E., Durand A., Hoffman L.C. Production of five Merino type lines in a terminal crossbreeding system with Dorset or Suffolk sires. *S. Afr. J. Anim. Sci.* 2003. 33. P. 223–232.

8. Dawson L. E. R., Carson A.F., Mc Clinton L.O.W. Comparison of productivity of Texel and Rouge de í Ouest ewes and their crosses. *Animal Science.* 2002. 75.P.459–468.

9. Fisher M. W. A review of the welfare implications of out-of-season extensive lamb production systems in New Zealand. *Livest. Prod. Sci.* 2004. 85. P. 165–173.

10. Lewis R. M., Macfarlane J. M., Simm G., Emmans G. C. Effects of food quality on growth and carcass composition in lambs of two breeds and their cross. *Animal Science.* 2004. 78. P. 355–367.

11. Leymaster K. A. Fundamental Aspects of Crossbreeding of Sheep: Use of Breed Diversity to Improve Efficiency of Meat Production. *Sheep and Goat Research Journal.* 2002. 17. P.50–59.

12. Mekić C. Study of reproductive end productive traits of Ile de France sheep breeds. Doctoral dissertation. Faculty of Agriculture. University of Belgrade. 1994.

13. Momani S.M., Abdullah A.Y., Kridli R.T., Sada I., Sovják R. Effect of crossing indigenous Awassi sheep breed with mutton and prolific sire breeds on growth performance of lambs in subtropical region. *Czech Journal of Animal Science.* 2002. 47. P. 247–252.

14. Morris, C. A., Hickey S. M., Clarke J. N. Genetic and environmental factors affecting lamb survival at birth and through to weaning. *NZ.J. Agric. Res.* 2000. 43. P. 515–524.

15. Off. Gazette of SFRY, no. 34/74, 26/75, 13/78

16. Petrovic P. M., Ruzic Muslic D., Caro Petrovic V., Maksimovic N. Influence of environmental factors on birth weight variability of indigenous Serbian breeds of sheep. *African Journal of Biotechnology.* 2011. 10. P. 4673–4676.

17. Petrovic P.M. Genetic and improvement of sheep.

Sci. Book, Belgrade. 2000. 365 pp.

18. Petrović P.M. Study of reproductive and productive traits of Wirttemberg breed of sheep (Merinolandschaf). Doctoral dissertation, University of Belgrade. 1992.

19. Petrović P.M., Negovanović D. The effect of three breed crossing on demonstration of heterosis in major fattening traits in lambs. *Biotechnology in Animal Husbandry*. 1994. 5. P. 31–37.

20. Petrović P.M., Negovanović D., Žujović M. New ability to increase lamb breeding methods. *Biotechnology in Animal Husbandry*. 1995. 11. P. 97–103.

21. Ribeiro E.L.A., Rocha M.A., Mizubuti I.Y.S., Ribeiro H.J.S., Moris J.M. Carcass of intact or castrated Ile de France and castrated Hampshire down lambs slaughtered at twelve months of age. *Ciência Rural, Santa Maria*. 2001. 31. P. 479–482.

22. Ružić-Muslić Dragana, Petrović P. M., Josipović S. Production parameters of lambs in fattening depending on genotype. *Biotechnology in Animal Husbandry*. 2005. 21. P. 43–48.

23. SPSS for Windows, Rel. 20.0. 2012. Chicago: SPSS Inc.

24. Velotto S., Varricchio E., Di Prisco M.R., Stasi T., Crasto A. Effect of Age and Sex on Histomorphometrical Characteristics of Two Muscles of Latacauda Lambs. *Acta Vet. Brno*. 2010. 79. P. 3–12.

25. Yakan A., Unal N. Meat production traits of a new sheep breed called Bafra in Turkey 1. Fattening, slaughter and carcass characteristics of lambs. *Tropical Animal Health and Production*. 2009. 42. P. 751–759.

26. Zapasnikienė B. The effect of age of ewes and lambing season on litter size and weight of lambs. *Veterinaria in zootechnika*. 2002. 41. P. 112–115.

Received 19 June 2013

Accepted 14 November 2013