

INFLUENCE OF BIRTH TYPE ON BODY WEIGHT OF LAMBS FROM BIRTH TO WEANING IN VARIOUS STRAINS OF SHEEP PRAMENKA

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The dynamics of increasing of bodyweight of lambs is conditioned by genetic factors, environmental factors and their interaction. The aim of this work was study variability of bodyweight of lambs related to type of birth of lambs in sheep genotype of four different strains of pramenka type and four growth stage: at the birth time, at the 30, 60 and 90 days of age after birth. For this investigation used lambs of four strains (Svrljiški, Pirotski, Sjenički, Šarplaninski) of sheep type Pramenka (450 lambs per strain) for study dynamics of bodyweight at the time of birth, 30, 60 and 90 days after birth during three years of experiment (2011-2013). The results showed that the bodyweight of lambs born singles was higher than bodyweight of lambs born twins in studied four sheep genotypes i.e. Pirotski (4.00 kg : 3.40 kg), Svrljiški (3.90 kg : 3.79 kg), Sjenički (3.73 kg : 3.61 kg), Šarplaninski (3.81 kg : 3.74 kg). The differences of bodyweight between lambs born singles and twins was significant for genotypes Pirot pramenka and Svrljig pramenka, on the level of significance for Sjenica pramenka and was not significant in Šarplanina pramenka. At the age of 30 days, the influence of birth type on the bodyweight of lambs was not statistically significant in any of the examined strains. The difference of bodyweight between singles and twins was statistically significant at the 60 days old of

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lambs in Svrljig pramenka and in lambs at 90 days old of Svrljig pramenka. On the base of results is established that type of born associated with significant differences of bodyweight at the birth time expressed later at the 60 and 90 day old lambs.

Key words: body weight, Pramenka sheep, type of birth

INTRODUCTION

The bodyweight of lambs has the most imperative role in achieving good results in sheep breeding. There were numbers of known factors of which significantly affect the fetal growth and weight of lambs, as well as the number of lambs per sheep (PETROVIC *et al.*, 2011; AKHTAR *et al.*, 2012). In addition to the number of lambs obtained per female, the bodyweight of the cub at birth plays a crucial role as the initial energy factor for the later development of the organism (PETROVIC *et al.*, 2008; RIGGIO *et al.*, 2008). Bodyweight also affects the vitality and mortality of lambs during development (ZAPASNIKIENE, 2002; BERHAN and ARENDONK, 2006; WATANKHAH and TALEB, 2009). Mentioned, and many other authors stated that knowledge of the factors that affect variations in body weight are of particular importance from the aspect of successful production and sustainability of the farm.

The development of lamb bodyweight, especially during the period from birth to weaning, is determined by the genotype and environment in which the organism develops (BOUJENANE *et al.*, 2013; CARO PETROVIĆ *et al.*, 2013; YAVARIFARD *et al.*, 2015; TORRES *et al.*, 2021).

Some of the important environmental factors which have influence to bodyweight and development of lambs are: mother's age, type of birth, and gender of lambs, mother's weight at the lambing, period of year of lambing (BAHREINI BEHZADI *et al.*, 2007). KALANTAR (2003); RASHIDI *et al.* (2008); ATASHI and IZADIFAR (2012) found that the sex of lambs significantly affected the birth weight of lambs. Male lambs had a higher mass than females. UNAL *et al.* (2006) observed the growth characteristics of lambs and concluded that the genotype had no significant influence on the examined traits. The same authors also state that the sex of lambs and the type of birth had a very significant influence on the growth of lambs. MOMANI SHAKER *et al.* (2010) state that the genotype of lambs had a significant influence ($P < 0.001$) on the bodyweight of lambs at 15, 30, 45 and 60 days of age. The sex of the lambs also had a significant effect on the bodyweight of the lambs PETROVIC *et al.* (2011) state that the average body weights of lambs at birth in Pirot and Svrljig pramenka were: 3.48 kg and 3.53 kg in singles, or 3.27 kg and 3.36 kg in twins. In studies related to the influence of mother's age and body weight, type of birth, and sex of lambs (GARDNER *et al.*, 2007; KORITIAKI *et al.*, 2013; PETROVIĆ *et al.*, 2015; PETTIGREW *et al.*, 2019).

ILIC *et al.* (2013) state that their results of testing the bodyweight of lambs of Pirot bred sheep and Württemberg showed that differences between genotypes under the influence of fixed factors have statistical significance ($P < 0.05$), except between body weight at 90 days in twins where the difference was not statistically significant ($P > 0.05$).

The aim of this work was study effect of birth type on variability of bodyweight of lambs in sheep genotype of four different strains of pramenka type and four growth stage: at the birth time, at the 30, 60 and 90 days of age after birth.

MATERIAL AND METHODS

The research was carried out in eastern, southern, and south-western Serbia, more precisely in the areas where most of Pramenka's are grown. The mating was in season from June to September, and ewes lambing has started in November and prolonged further during the winter period.

Technology applied in the raising of lambs was that, after ten days after birth, the offspring have separated from their mothers but with the possibility of sucking twice a day. Then, has started feeding with hay and concentrate mixture for lambs, and these nutrients were available up to the age of 90 days.

Material for the research included four strains (Pirrot, Svrljg, Sjenica, Sharplanina) of Pramenka sheep. In each strain, the mothers have divided into three groups according to ages (1- two years old; 2- three years old, 3-four years old). All experimental animals had properly marked and recorded. The data processing included a total of 1800 lambs (450 lambs per strain of Pramenka sheep).

The research was conducted during periods of three years, conforming to the pre-established plan. In each year of the experiment, the bodyweight of lambs of all genotypes had measured at the time of birth and 30, 60, and 90 days of age. The measurement has carried out by scale with an accuracy of 0.10 kg, and all data was used for statistical analysis by using SPSS (Statistical Package for the Social Sciences) statistical software, 20 (2012).

RESULTS

The results obtained by examining the influence of birth type on the bodyweights of lambs at birth have shown in Table 1.

Table 1. Influence of type of birth on body weight of lambs at birth

Genotype	Type of birth	M Bodyweight	Standard error	F test	Significant
PI	single	4.005	.054	86.292	.000 **
	twins	3.400	.037		
SV	single	3.905	.048	3.693	.050*
	twins	3.793	.033		
SJ	single	3.734	.058	2.942	.087
	twins	3.612	.040		
SP	single	3.810	.056	.823	.365
	twins	3.748	.039		

* Correlations significant at the level of $P \leq 0.05$

** Correlations significant at the level of $P \leq 0.01$

The type of birth of lambs Pirrot pramenka had a very significant effect ($P < 0.01$) on the bodyweight of lambs at birth. The singles had an average weight of 4.00 kg, while the twins had a significantly lower body weight of 3.40 kg. The lambs of Svrljig pramenka also differed in

weight under the influence of the type of birth. The individuals had a higher birth weight of 3.90 kg. It was statistically significant between singles and twins ($P < 0.05$) so that the type of birth had a significant impact on the observed trait. In the lambs of the Sjenica genotype, as in the previous ones, there was a difference in body weight between singles and twins in favor of the former. The bodyweight of the singles was 3.73 kg, of which the twins 3.61 kg. The existing difference is close to significant, but still, it was not significant ($P > 0.05$) so, the influence of the type of birth, in this case, was not statistically confirmed. Singles of the Sharplanin genotype had a higher bodyweight, which averaged 3.81 kg, while the weight of the twins was 3.748 kg. The existing difference was not confirmed statistically ($P > 0.05$).

The bodyweights related to genetic factor which value variate under influence of environmental factor in various ages. Genetic variation in weight of body and the relationship of these with production traits are highly consistent across ages and the stage in the production (WALKOM and BROWN, 2017). The type of birth and gender of the offspring may significantly influence birth weight and postnatal development (GARDNER *et al.*, 2007), the maternal weight has positive significant influence to bodyweight of birth lamb (KORITIAKI *et al.*, 2013) and the lambs born from ewe lambs are usually smaller and lighter than those born from mature ewes (PETTIGREW *et al.*, 2019). Also, birth year can affect bodyweight (LALIT *et al.*, 2016), so in rainy years availability of pastures has an effect on the wellbeing of pregnant ewes, ewes themselves as well as their lambs.

Table 2. Influence of type of birth on body weight of lambs at 30 days

Genotype	type of birth	M	SE	F	Sig.
PI	single	9.411	.126	1.226	.269
	twins	9.241	.087		
SV	single	9.917	.104	.772	.380
	twins	9.815	.100		
SJ	single	9.584	.118	.314	.576
	twins	9.401	.171		
SP	single	9.271	.167	.000	.987
	twins	9.268	.116		

At the age of 30 days (Table 2) in Pirot lambs, singles had a higher average body weight at birth of 9.41 kg, while the twins had a lower weight, which was 9.24 kg. Not found a significant influence of birth type in the observed trait ($P > 0.05$).

At 30 days of age, among strains, the Svrlijig lambs' showed the highest both in single born lambs having 9.91 kg, and twins lambs born it was 9.81 kg. The influence of birth type on lamb body weight was not statistically significant ($P > 0.05$).

In the case of Sjenica lambs, singles had a higher average body weight at 30 days, 9.58 kg. The twins had a lower body weight at 30 days, and it was 9.40 kg. There was no significant influence of birth type at the mentioned age ($P > 0.05$).

The bodyweight of lambs at 30 days of age in Sharplanina lambs for single born was 9.27 kg and 9.26 kg in twins. The influence of the type of birth on the bodyweight of lambs' in this case was not statistically significant ($P>0.05$).

The presented research results are in agreement with the results obtained by UNAL *et al.* (2006); PETROVIĆ *et al.* (2011); PETTIGREW *et al.* (2019).

Table 3. Influence of type of birth on body weight of lambs at 60 days

Genotype	type of birth	M	SE	F	Sig.
PI	single	15.304	.352	.007	.934
	twins	15.253	.509		
SV	single	15.589	.160	4.022	.046*
	twins	15.199	.110		
SJ	single	15.455	.113	.108	.743
	twins	15.390	.163		
SP	single	14.310	.192	.156	.693
	twins	14.218	.133		

* Correlations significant at the level of $P\leq 0.05$

The results of the influence of the type of birth on the bodyweight of lambs at 60 days show that the singles had a higher body weight. Thus, in the case of the Pirot genotype, the body weight of the singles was 15.30 kg, and that of the twins 15.25 kg, the difference was not statistically significant ($P>0.05$).

In Svrljig lambs, the singles had a significant advantage and their body weight at 60 days was 15.58 kg, while the twins weighed 15.19 kg. From this perspective, the difference was significant, which showed a significant influence of the birth type on the lamb's body weights at this age ($P<0.05$).

The bodyweight of the singles Sjenica strain pramenka was 15.45 kg, while the twin lamb was 15.39 kg. Singles had higher body mass, but this difference was not statistically significant ($P> 0.05$).

In the lambs of the Sharplanina population, the singles had an average body weight of 14.31 kg, and the twins 14.21 kg. The existing difference between lambs was not statistically significant ($P> 0.05$).

Our research is in accordance with the statements of the following researchers (BOUJENANE *et al.*, 2013; CARO PETROVIĆ *et al.*, 2013; YAVARIFARD *et al.*, 2015; TORRES *et al.*, 2021), who state that the development of lamb body weight is determined by the genotype and environment in which the organism develops.

The type of birth at age 90 days did not show a significant effect in lambs Pirot pramenka ($P> 0.05$). The singles had an average weight of 20.44 kg, while the twins had a slightly lower body weight of 20.32 kg (Table 4).

Table 4. Influence of type of birth on body weight of lambs at 90 days

Genotype	type of birth	M	SE	F	Sig.
PI	single	20.440	.170	.149	.700
	twins	20.324	.246		
SV	single	24.903	.216	3.014	.044*
	twins	23.622	.312		
SJ	single	23.377	.275	.043	.836
	twins	23.308	.191		
SP	single	20.430	.191	.038	.845
	twins	20.365	.276		

* Correlations significant at the level of $P \leq 0.05$

Also, in lambs of the Svrljig pramenka, a difference in body weight has been determined under the influence of the type of birth. The singles had a higher bodyweight, 24.90 kg, while the bodyweight of the twins was 23.62. The difference between singles and twins was statistically significant ($P < 0.05$) so, the type of birth had a significant influence on body weight at 90 days.

In the lambs of the Sjenica genotype, as in the previous ones, there was a difference in body weight between singles and twins. The bodyweight of the singles was 23.37 kg, the twins 23.30 kg. The existing difference was not significant ($P > 0.05$) so, the influence of birth type was not statistically confirmed in this genotype either.

Singles in the population of the Sharplanina strain of pramenka had a bodyweight of 20.43 kg, the bodyweight of the twins was 20.36 kg. The existing difference was not statistically significant ($P > 0.05$).

The body mass of singles was greater than the mass of twins, with greater or lesser oscillations depending on hereditary and external factors. An important factor is the limited intrauterine space as well as the availability of food, which means the distribution of food that is delivered to the twins through one mother. The singles alone and all the food is theirs. Based on our results and data from the literature, it is to be assumed that twins can achieve compensatory growth in the later months after birth.

The results of our research are in agreement with the data on the influence of the type of birth on the bodyweight of lambs obtained by other authors. Thus, a greater mass of singles compared to twins was shown by lambs in research conducted by RASTOGI (2001); KALANTAR, (2003); DIXIT *et al.* (2001); RASHIDI *et al.* (2008).

We agree with our research in the results obtained by PETROVIC *et al.* (2011). They state that the average body weights of lambs at birth in Pirov and Svrljig pramenka were: 3.48 kg and 3.53 kg in singles, respectively 3.27 kg and 3.36 kg in twins.

In addition to the mentioned authors, where the influence of the type of birth on the body weight of lambs is confirmed, we have seen the agreement with our research, in the results which, like ours, showed that the type of birth of lambs did not significantly affect all age groups

and all four genotypes. SHAHROUDI *et al.* (2003) and also MATIKA *et al.* (2003) state that the type of birth does not have a significant effect on the body weight of lambs of local breeds at birth and at the time of weaning.

DISCUSSION

The study of body weights helps or even guides the breeders to determine the optimal management practices of sheep production. Growth, especially the pre-weaning growth rate is influenced with genetic and environmental factors as well with interaction of G/E. In this study, was established that the type of birth is associated with bodyweight of birth of lambs in sheep genotype of four different strains of pramenka type and four growth stage: at the birth time, at the 30, 60 and 90 days of age after birth.

Enhancement in productivity of native breeds requires simultaneous improvement in the genetic structure of flocks and suitable environment for optimal genetic expression of desirable traits. In this investigation used 1800 lambs of sheep type Pramenka (450 lambs per strain Svrljiški, Pirotski, Sjenički, Šarplaninski) for study dynamics of bodyweight at the time of birth, 30, 60 and 90 days after birth during three years of experiment (2011-2013). Single-born lambs were heavier ($P \leq 0.05$) than twins at birth in studied four sheep genotypes i.e. Pirotski, Svrljiški, Sjenički, Šarplaninski, and later at the 60 and 90 day old lambs. The bodyweight of single born lambs at the birth time was significantly higher than bodyweight of twins in genotypes Pirot pramenka and Svrljig pramenka, and on the level of significance in Sjenica pramenka, while did not significant different in Šarplanina pramenka. The obtained results in this study are in agreement with early investigation of body weights of lambs at birth in Pirot and Svrljig pramenka PETROVIC *et al.* (2011). Also, was established that type of born related to significant differences of bodyweight at the birth time expressed later at the 60 and 90 day old lambs. The significant effects of birth type on birth and weaning weight commonly occurred in numerous investigation (KARAKUŞ *et al.*, 2008; MOMOH *et al.*, 2013; RAHIMI *et al.*, 2014; LUPI *et al.*, 2015). In this study established that lambs of four strains of pramenka sheep grow rapidly and can attain a high weaning weight from 21 kg (Sharplanina strain of pramenka) to 25 kg (Svrljig pramenka) in a 90 day period, which is an economically important characteristic in the breeding of pramenka type sheep. Single lambs performed better than twins. Therefore proper nutrition should be used for ewes having twins in order the lambs could be able to achieve their full genetic potential. For achievement of maximum genetic progress through selection, it is necessary follow reliable criteria and selection indices of estimation of non-genetic and genetic parameters.

The most studies established superiority of the body weight of single birth over multiple birth lambs (GBANGBOCHE *et al.*, 2006; RAMIREZ-TELLO *et al.*, 2013). Research on the Droper breed has found lambs grow quickly and can reach a weight of 28-30 kg in a period of 100 days, which is an economically important breeding trait (SNOWDER and DUCKETT, 2003) and single lambs performed better than multiples. In the Ascanian ewes for all genetic and non-genetic factors as well in interaction of genotype and type of birth was established that significant effect on the birth and weaning weight of lambs (KRAMARENKO *et al.*, 2021). Also, in the Segureño sheep found that birth type had significant effect on weight at every developmental stage, precisely that single birth lambs were heavier by 18.16, 10.09 and 8.41% when compared

with twins at P1, P2 and P3, respectively (LUPI *et al.*, 2015). In research (MOMOH *et al.*, 2013) showed that birth type affects the birth weight of lambs from birth to 80 days and that single born lambs achieved the highest weights, while in Brazilian sheep was not found differences in weaning weights among lambs from different birth types (QUESADA *et al.*, 2002).

CONCLUSION

The obtained results could deduce that the effect of birth type on lambs weight show influenced in Pirot and Svrlijig strains at birth ($P < 0.01$; < 0.05). Among the strains of Pramenka tested, the bodyweight at 30, Svrlijig lamb, show the highest in singles and, in twins however, birth type did not show any significant effect in all strains at this stage of age. At 60 and 90 days of ages, only in Svrlijig lamb showed a significant influence of the type of birth on the bodyweight of lambs at this ages ($P < 0.05$). Generally, the type of birth is associated to bodyweight, but did not show influence in all ages and in all strains. These studies have also shown that in genetic selection programs we need to pay more attention to the type of birth, because the final results of farmers can largely depend on it.

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UTICAJ TIPA ROĐENJA NA TELESNU MASU JAGNJADI OD ROĐENJA DO ODBIJANJA KOD RAZLIČITIH SOJEVA OVACA PRAMENKA

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Izvod

Dinamika povećanja telesne mase jagnjadi uslovljena je genetskim faktorima, faktorima sredine i njihovom interakcijom. Cilj ovog rada bio je proučavanje varijabilnosti telesne mase jagnjadi u zavisnosti od tipa rođaja jagnjadi kod četiri različita soja pramenke u vreme rođenja, sa 30, 60 i 90 dana starosti nakon rođenja. Za ova istraživanja korišćena su jagnjad četiri soja pramenke (Svrljiški, Pirotski, Sjenički, Šarplaninski), (450 jagnjadi po soju). Nakon trogodišnjeg istraživanja rezultati su pokazali da je telesna masa jagnjadi rođenih samaca veća od telesne mase jagnjadi rođenih blizanaca kod četiri proučavana soja ovaca pramenka i to Pirotska (4,00 kg : 3,40 kg), Svrljiški (3,90 kg : 3,79 kg), Sjenički (3,73 kg : 3,73 kg), Šarplaninski (3,81 kg : 3,74 kg). Razlike u telesnoj masi između jagnjadi rođenih samaca i blizanaca bile su značajne za genotipove pirotске pramenke i svrljiške pramenke, na nivou značajnosti za sjeničku pramenku i nisu bile značajne za šarplaninsku pramenku. U dobi od 30 dana, uticaj tipa rođenja na telesnu masu jagnjadi nije bio statistički značajan ni kod jednog ispitivanog soja. Razlika u telesnoj masi između samaca i blizanaca bila je statistički značajna kod jagnjadi starosti 60 dana Svrljiške pramenke i jagnjadi starosti 90 dana Svrljiške pramenke. Na osnovu rezultata utvrđeno je da je tip rođenja povezan sa značajnim razlikama u telesnoj masi u vreme rođenja i izražen kasnije kod jagnjadi starosti 60 i 90 dana.

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