

## EFFECT OF YEAR, LAMBING SEASON, SEX AND BIRTH TYPE ON EARLY PERFORMANCE IN MIS LAMBS

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**Abstract:** Considering the fact that sheep production has an important role in agriculture of Serbia, lamb performance is essential. Objective of the study was to investigate effect of year, lambing season, sex and birth type on growth performances in lambs of MIS breed. Animal data (birth date, birth type, sex, birth weight -BW0, body weight after 30 days - BW30 and body weight after 60 days – BW60) are gained from control of productive parameters maintained from 2011 to 2020. Research was conducted on the sample of 1592 lambs. Average daily gain from birth to 30 days (ADG1), from 30 to 60 days (ADG2), and from birth until 60 days (ADG3), were calculated and included in analysis. Calendar year was divided in four seasons, each season consists from 3 months: winter, spring, summer and autumn. Average body weights ( $\pm$  standard deviation) at birth, after 30 and 60 days were 4.41 kg ( $\pm$  0.99), 14.11 kg ( $\pm$  2.80), 24.05 kg ( $\pm$  3.86), respectively. Average daily gains were 319.87 g ( $\pm$  74.97), 329.84 g ( $\pm$  70.90) and 324.99 g ( $\pm$  55.48) for ADG1, ADG2 and ADG3, respectively. Lambing type and sex of the lambs affected all of the observed traits very significantly ( $p < 0.01$ ). Lambing year had very significant effect ( $p < 0.01$ ) on BW30, on ADG1 and ADG2, while lambing season significantly ( $p < 0.05$ ) affected BW60, ADG2 and ADG3. Based on the results it can be concluded that birth type and sex had strongest effects in early productive parameters of lambs.

**Key words:** growth traits, sheep, small ruminants, gains

## Introduction

Sheep production has an important role in agriculture of Serbia. With production of 34 thousand tones in 2019. it holds third place in the production of red meat (*Statistical Office of the Republic of Serbia, 2020*).

The MIS sheep was bred at the Institute of Animal Husbandry in Zemun during the period 1991-2006., by a complex combination of representatives of three sheep breeds: Pirotška pramenka, Merinolandschaf (Wurtemberg) and Ile de France (*Petrović, 2006*). This is a meaty type of sheep, with a strong constitution, with a pronounced carcass conformation and exceptional meat properties. Females enter brood at 10-12 months of age, and rams at 12 months of age. Fertile estrus occurs during most of the year. An average of 130-160 lambs are obtained from 100 sheep (lambing index 1.3 – 1.6).

Production of lamb meat obtained from young lambs up to 60 days old, and of the carcass weight of 10 to 12 kg, i.e. about 25 kg live weight, is a predominant one (*Zeljić et al., 2019*). Body weight and growth are important in the total productivity, especially when the meat production is the main objective; a high birth weight allows the animal to well start his career, and grow rapidly before and after weaning predisposes, to a better diseases resistance and to reach quickly puberty and maturity (*Zidane et al., 2015*). Body weight at birth and weaning depends on many environmental factors, and among them are year and season, which is primarily reflected through nutrition, housing and care of animals during the production cycle, especially during pregnancy (*Petrović et al., 2015*). Among other important factors on the growth of lambs maternal age, maternal body weight, type of birth and sex of lambs should be mentioned (*Caro Petrović et al., 2015*). An understanding of the factors which influence the development and growth of lambs will permit changes in the breeding and management schemes to minimize influences, which reduce production efficiency (*Bermejo et al., 2010*).

Considering the above mentioned, the aim of this study is to evaluate the influence of year, lambing season, sex and birth type on growth traits of lambs.

## Material and Methods

Animal data (birth date, birth type, sex, birth weight (BW0), body weight after 30 days (BW30) and body weight after 60 days (BW60)) are gained from control of productive parameters maintained from 2011 to 2020 on Experimental sheep farm in Institute for Animal husbandry in Zemun, Serbia. Research was conducted on the sample of 1592 lambs, offspring of 303 ewes. Average daily gain from birth to 30 days (ADG1), from 30 to 60 days (ADG2), and from birth until 60 days (ADG3) were calculated and included in analysis. Calendar year was divided

in four seasons, each season consists from 3 months: winter (december, january, february), spring (march, april, may), summer (june, july, august) and autumn (september, october, november).

Basic statistical parameters of phenotypic manifestation and variability of examined properties (body weight on birth, after 30 and 60 days and average daily gains – ADG1, ADG2, ADG3) were calculated using standard statistical procedures in PROC MEAN procedure in SAS statistical package (SAS Inst., Inc., Cary, NC). Using the PROC CORR procedure in the same statistical package, correlation coefficients for examined traits were calculated, and using GLM procedure, effects of fixed factors were examined. Fixed factors were year, lambing season, birth type (single, twin, triplets, quadruplets) and sex of the lambs.

An applied fixed model was such as follows:

$$Y_{ijkl} = \mu + G_i + S_j + T_k + P_l + e_{ijkl}$$

In which:

$Y_{ijkl}$ - is a phenotypic expression of a studied trait

$\mu$ - population general average

$G_i$ - fixed effect of  $i$  year of birth ( $i=2011, \dots, 2020$ )

$S_j$ - fixed effect of  $j$  lambing season ( $j=1, 2, 3, 4$ )

$T_k$ - fixed effect of  $k$  type of birth ( $k=1, 2, 3, 4$ )

$P_l$ - fixed effect of  $l$  lamb's sex ( $l=1, 2$ )

$e_{ijkl}$ - random error.

## Results and Discussion

Average body weights (at birth, after 30 days and on weaning), as well as ADGs are shown in table 1. Body weight of lambs at birth has an important role in achieving a good production, because of the initial body weight depends not only growth, but also vitality and mortality of sheep (*Petrović et al., 2009*). In this study, BW0 showed the highest coefficient of variation - CV (22.55%), and can be explained by lot of factors influencing on this trait. Birth weight of lambs is influenced by breed, sex of lambs, birth type, age of dam, feeding conditions and production system (*Sušić et al., 2005*).

Body weight at 60 days is higher, but ADG2 is lower than reported in *Petrović (2006)*, where values were 22.14 kg and 370.83 g, respectively. The average daily gain of lambs, can be influenced by a lot of factors. In addition to the ewe's milk production, ADG of lambs can be affected by litter size, management in lamb rearing, by available feeds on the farm, in terms of quality and quantity, but also by individual performance of lambs. For these reasons, large variations are

noticeable in the ten-year observation of these parameters, especially in minimum values, showed in table 1.

Concerning the ADG, highest CV was reported in ADG1 and ADG2, which is in line with results reported in study of *Latifi and Mohammadi (2018)*.

**Table 1. Average values and variability of studied traits**

| Traits   | n    | $\bar{x}$ | SD    | Variance | Min   | Max    | CV (%) |
|----------|------|-----------|-------|----------|-------|--------|--------|
| BW0, kg  | 1573 | 4.41      | 0.99  | 0.99     | 1.80  | 7.80   | 22.55  |
| BW30, kg | 1414 | 14.11     | 2.80  | 7.86     | 4.10  | 23.50  | 19.87  |
| BW90, kg | 1383 | 24.05     | 3.86  | 14.93    | 12.00 | 36.50  | 16.07  |
| ADG1, g  | 1412 | 319.87    | 74.97 | 5619.89  | 6.67  | 653.33 | 23.44  |
| ADG2, g  | 1382 | 164.98    | 35.39 | 1252.73  | 16.67 | 353.33 | 21.45  |
| ADG3, g  | 1382 | 216.88    | 36.86 | 1358.40  | 91.11 | 346.67 | 16.99  |

\*BW0= birth weight; BW30= body weight at 30 days; BW60= body weight at 60 days; ADG1= average daily gain from birth to 30 days; ADG2= average daily gain from 30 days to 60 days; ADG3= average daily gain from birth to 60 days.

In table 2 values of F-test for body weights and ADGs are presented. Body weights (from birth to 60 days). Lambing type and sex of the lambs had significantly influences on birth weight of the lambs, which is in line with results reported in *Dixit et al. (2001)* and *Latifi and Mohammadi (2018)*. Lambing year, lambing type and sex significantly influences on lamb weight after 30 days.

Lambing type and lambing season, as well as sex of the lambs, significantly influenced on the BW60.

**Table 2. Values of F- test for studied factors**

| Traits | Factors            |                    |              |         |                |
|--------|--------------------|--------------------|--------------|---------|----------------|
|        | Lambing year       | Lambing season     | Lambing type | Sex     | R <sup>2</sup> |
| BW0    | 1.17 <sup>ns</sup> | 1.59 <sup>ns</sup> | 1066.58**    | 25.53** | 0.41           |
| BW30   | 27.13**            | 1.00 <sup>ns</sup> | 659.60**     | 35.45** | 0.34           |
| BW90   | 0.02 <sup>ns</sup> | 5.31*              | 577.17**     | 63.01** | 0.32           |
| ADG1   | 34.09**            | 0.59 <sup>ns</sup> | 359.09**     | 22.52** | 0.23           |
| ADG2   | 41.16**            | 4.61*              | 86.08**      | 36.88** | 0.10           |
| ADG3   | 0.15 <sup>ns</sup> | 4.30*              | 369.94**     | 55.51** | 0.24           |

<sup>ns</sup>=P>0.05; \*P<0.05; \*\*P<0.01; R<sup>2</sup>= coefficient of determination.

Lambing year significantly affected BW30, ADG1 and ADG2. *Staikova and Stancheva (2009)* found out in their study that the year of birth significantly influenced the live weight at all ages. On the contrary to results of this study, *Petrović et al. (2011)* reported that lambing year significantly influenced birth weight of the lambs.

Lambing season significantly influenced only on ADG2 and ADG3. Although differences depending on the lambing season can be interpreted as the factor of food, in other words, the effect of pasture grass and natural environment

(Petrović *et al.*, 2011), these effects wasn't established in this study. This can be explained by the practice that lambs stay with their mother indoor until weaning. Dams receive sufficient amounts of hay and concentrate mixture, and creep feeding of lambs starts 7-10 days after lambing, so lambs have similar conditions throughout the year, with fulfilled nutritive demands After weaning, lambs are, depending on season, or in pastures or fed indoors, and that explains differences in ADG2 and ADG3.

**Table 3. Values of Pearson correlation coefficients for studied traits**

| Traits |        |        |        |        | Traits |
|--------|--------|--------|--------|--------|--------|
| BW30   | BW60   | ADG1   | ADG2   | ADG3   |        |
| 0.68** | 0.66** | 0.43** | 0.30** | 0.48** | BW0    |
|        | 0.84** | 0.95** | 0.22** | 0.79** | BW30   |
|        |        | 0.77** | 0.71** | 0.98** | BW60   |
|        |        |        | 0.15** | 0.77** | ADG1   |
|        |        |        |        | 0.74** | ADG2   |

<sup>ns</sup>=P>0.05; \* =P<0.05; \*\* =P<0.01.

Lambing type had very significant effect on all of the observed traits, which is in line with *Baneh and Hafezian (2009)* and *Rahimi et al. (2014)*, who reported that type of birth was significant on weight traits from lambing to weaning. Single lamb's body weight in all ages and their average daily gain were more than twins because of competition between twins to fed on their mother's milk resulting in suckling less milk compared to the singles (Petrović *et al.*, 2015).

Sex of the lambs significantly influenced on all of the observed traits. These results are in line with *Rashidi et al. (2008)*, *Rahimi et al. (2014)* and *Caro Petrović et al. (2015)*. Type and measure of hormone secretion especially sexual hormones, lead to difference in animal growth, estrogen hormone has a limited effect on the growth of long bones in females, which leads to smaller body weight in females than in males (Petrović *et al.*, 2015). *Ilić et al. (2013)* reported that male lambs were heavier than females, and that effects of lamb sex were significant on the body weight of lambs on birth, after 30, 60 and 90 days. On the contrary, *Caro Petrović et al. (2013)* didn't found effect of the sex on body weight.

In table 3. correlation coefficients of observed trait are shown, which can give more detailed information about physical development of lambs. Statistical significance was found among all of the traits. Birth body weight is strongly correlated with BW30 and BW60. These results are in line with study of *Petrović et al. (2014)* who reported that highest correlation indexes were found between birth body weight and body weight after 30 days. Higher body weight of lambs at birth affects the higher birth weight of lambs at 60 days of age (*London and Weniger, 1995*).

## Conclusion

The obtained results showed that birth body weight had biggest coefficient of correlation, with interval of values from 1.80 kg to 7.80 kg.

Lambing year had very significant effect ( $p < 0.01$ ) on BW30, on ADG1 and ADG2, while lambing season significantly ( $p < 0.05$ ) affected BW60, ADG2 and ADG3. Lambing type and sex of the lambs had strongest effects ( $p < 0.01$ ) on BW0, BW30, BW60, ADG1, ADG2, ADG3.

Body weight on birth had strongest correlation coefficients with BW30 and BW60.

Based on the obtained data and results, it can be concluded that lambing type and sex of the lambs very significantly affected observed parameters.

## Uticaj godine, sezone, pola i tipa jagnjenja na rane performanse MIS jagnjadi

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## Rezime

S obzirom na to da ovčarstvo ima važnu ulogu u poljoprivredi Srbije, produktivnost jagnjadi je od izuzetnog značaja. Cilj istraživanja je bio da se ispita uticaj godine, sezone jagnjenja, pola i tipa rođenja na produktivne parametre jagnjadi MIS rase. Podaci o životinjama (datum rođenja, tip rođenja, pol, telesna masa na rođenju -BW0, telesna masa posle 30 dana - BW30 i telesna masa nakon 60 dana - BW60) su dobijeni kontrolom proizvodnih parametara održanih od 2011. do 2020. godine, na uzorku od 1592 jagnjadi. Prosečan dnevni prirast od rođenja do 30 dana (ADG1), od 30 do 60 dana (ADG2), i od rođenja do 60 dana (ADG3), izračunat je i uključen u analizu. Kalendarska godina je podeljena na četiri godišnja doba (zima, proleće, leto i jesen), a svako godišnje doba sastoji se od 3 meseca. Prosečna telesna masa ( $\pm$  standardna devijacija) pri rođenju, posle 30 i 60 dana bila je 4.41 kg ( $\pm 0.99$ ), 14.11 kg ( $\pm 2.80$ ), 24.05 kg ( $\pm 3.86$ ), redom. Prosečni dnevni prirasti iznosili su 319.87 g ( $\pm 74.97$ ), 329.84 g ( $\pm 70.90$ ) and 324.99 g ( $\pm 55.48$ ) za ADG1, ADG2 i ADG3, redom. Tip rođenja i pol jagnjadi značajno su uticali na sve ispitivane osobine ( $p < 0.01$ ). Godina rođenja imala je veoma značajan uticaj ( $p < 0.01$ ) na BW30, na ADG1 i ADG2, dok je sezona jagnjenja značajno ( $p < 0.05$ )

uticala na BW60, ADG2 i ADG3. Na osnovu rezultata može se zaključiti da su tip i pol rođenja imali najjače efekti u ranim produktivnim parametrima jagnjadi.

**Ključne reči:** osobine porasta, ovce, sitni preživari, prirasti

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