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## Seasonal variations in lamb birth weight and mortality

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### ABSTRACT

The aim of the study was to determine whether lambs born in different seasons manifest a difference in birth weight and mortality rate. All year-round mating of Merinolandschaf ewes was used based on the natural occurrence of oestrus in different months of the year. The lambing seasons were grouped after birth month of lambs as follows: winter (December-February), spring (March-May), summer (June-August) and autumn (September-November). Data concerning identification number, birth date, type of birth and sex were collected on 401 lambs. Lamb mortality was recorded as number of lambs born dead and lambs born alive but that died within the first 48 hours after birth (perinatal mortality). All lambs were weighed within 12 h after birth, using suspended scales weighing from 0 to 20 kg in minimal 200 g increments. Lambs born in summer had the highest mean birth weight (4.8 kg) which was significantly ( $P<0.05$ ) different to the lowest mean weight (4.4 kg) observed for lambs born in winter. Similar results were observed within the same sex and birth type group of lambs for male singles among which lambs born in summer were significantly ( $P<0.05$ ) heavier than those born in winter (5.2 kg vs. 4.7 kg). Prominent but statistically not significant ( $P>0.05$ ) differences were also observed for birth weight of male twins born in different seasons. Between all female groups (singles and twins), birth weight of lambs born in winter, spring, summer and autumn showed relatively small and not significant differences. Season had a significant ( $P<0.01$ ) influence on perinatal lamb mortality. Low relative values (1.0 %; 2.0 %) were observed for lambs born in autumn and spring, while during winter and summer, 11.0% and 20.0% of lambs were born dead or died within 48 hours after birth. Within the same season, lambs that remained alive were always heavier than lambs which were born dead or which died after birth. Although the largest difference was observed for birth weights in spring (4.5 kg - alive vs. 3.5 kg - dead), statistically significant ( $P<0.05$ ) differences were only found within winter births (4.5 kg - alive vs. 4.1 kg - dead) and within summer births (5.0 kg - alive vs. 4.2 kg - dead).

**Key words:** season, lamb, birth weight, mortality

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## **Introduction**

For the majority of sheep in Croatia, mating is performed in the autumn, with lambing in the winter. For the remaining seasons during the year mating is seldom organised because of the small number of sheep which manifest oestrus and become pregnant. Such seasonal mating and lambing has multiple negative consequences on the production of lamb meat: lower meat production per sheep, misbalance of market supply and prices, uneconomical usage of housing space, equipment and working power.

To increase the production of lamb meat in Croatia, a Programme of Sheep Breeding and Selection (MIOČ et al., 1999) has been undertaken. One of the measures is using sheep breeds whose fertility is not dependent on the season, so that they can mate and give birth all year round.

Influence of lambing during various seasons on sheep production has been studied by several authors (FOGARTY et al., 1984; MENDEL et al., 1989; DEMIROREN et al., 1995; SORMUNEN-CHRISTIAN and SUVELA, 1999; HANSEN and SHRESTHA, 2002; FISHER, 2004; ROSA and BRYANT, 2003). In the majority of cases the results have shown that season has a significant influence on important economic features, such as litter size, daily gain and meat quality. The mentioned factors can be connected with vegetation growth (as a food source), temperature and day length, all of which depend on seasonal and climate characteristics specific for different geographic regions.

The aim of the study was to determine whether lambs born in different seasons manifest differences in birth weight and mortality rate.

## **Materials and methods**

The study was performed for the years 2000 and 2001 at the one sheep farm located in the continental, lowland region of Croatia. The initial breeding flock consisted of 180 German Merinolandschaf ewes and 5 rams. All-year-round mating was used based on the natural occurrence of oestrus in different months of the year. Ewes were exposed to rams in single-sire groups for a period of approximately 35 days. The lambing seasons were grouped after the birth month of lambs as follows: winter (December-February), spring (March-May), summer (June-August) and autumn (September-November).

The ewes were kept under normal farm-like conditions and the same animal husbandry practices were used for all pregnant groups. Young ewes lambing for the first time were not included in the experiment, so the age range of the ewes was from 2 to 8 years. All ewes were in good health and condition. Four weeks before and during first month of mating the ewes, depending on their condition, were flushed with 300-500 g of barley grain per ewe per day. Over late pregnancy, the ewes were supplemented with a concentrate mixture consisting of barley grain and soya bean meal.

At birth, new-born lambs and their mothers were housed in small pens with straw bedding for 24-48 h. Data concerning identification number, birth date, type of birth and sex were collected on 401 lambs. Lamb mortality was recorded as number of lambs born dead or born alive but which died within the first 48 hours after birth (perinatal mortality). All lambs were weighed within 12 h after birth using suspended scales weighing from 0 to 20 kg in minimal 200 g increments.

SAS software (Version 8.02; 1999-2001) was used for statistical analysis of data. Birth weight data were analysed by ANOVA and Tuckey post hoc test, while data pertaining to mortality were analysed by chi-square ( $\chi^2$ ) test.

## Results

Birth weight data from 401 lambs born in different seasons are shown in Table 1. Total number of lambs born during a particular season varied from 41 lambs born in spring to 164 lambs born in winter. In general, lambs born in summer ( $n = 94$ ) had the highest mean birth weight (4.8 kg) which was significantly different ( $P < 0.05$ ) to the lowest mean weight (4.4 kg) observed for lambs born in winter ( $n = 164$ ).

Table 1. Birth weight of lambs born in different seasons

Sex and type of birth of the lambs	Season							
	Winter		Spring		Summer		Autumn	
	n	Mean ± SD	n	Mean ± SD	n	Mean ± SD	n	Mean ± SD
Male singles	35	4.7 ± 0.8	8	5.3 ± 0.6	42	5.2 <sup>a</sup> ± 0.8	27	5.0 ± 0.7
Male twins	48	4.3 ± 0.6	10	3.6 ± 0.4	12	3.9 ± 0.5	20	4.2 ± 0.7
Female singles	41	4.8 ± 0.9	15	5.0 ± 0.4	30	4.9 ± 0.8	30	5.0 ± 0.6
Female twins	40	4.0 ± 0.6	8	3.8 ± 0.6	10	3.8 ± 0.9	25	3.9 ± 0.6
Total	164	4.4 ± 0.8	41	4.5 ± 0.8	94	4.8 <sup>b</sup> ± 0.9	102	4.6 ± 0.8

<sup>a</sup>Indicate a significant difference ( $P < 0.05$ ) to the birth weight of male singles born in winter

<sup>b</sup>Indicate a significant difference ( $P < 0.05$ ) to the birth weight of total number of lambs born in winter

Similar data were observed, within the same sex and birth type group of lambs, for male singles among which lambs born in summer were statistically ( $P < 0.05$ ) heavier to those born in winter (5.2 kg vs. 4.7 kg). Prominent but statistically not significant ( $P > 0.05$ ) differences were also observed for birth weight of male twins born in different seasons. Between all female group (singles and twins), birth weight of lambs born in winter, spring, summer and autumn showed relatively small and not significant differences.

Season had a significant ( $P < 0.01$ ) influence on perinatal lamb mortality (Table 2). Low relative values (1.0%; 2.0%) were observed for lambs born in autumn and spring, while during winter and summer mortality was higher (11.0% and 20.0%, respectively).

Table 2. The number (%) and mean birth weight of live lambs, born dead and died within 48 hours after birth

Season	Lambs at birth and within 48 hours after the birth			
	Alive		Born dead or died	
	Number (%)	Birth weight Mean $\pm$ SD	Number (%) <sup>a</sup>	Birth weight Mean $\pm$ SD
Winter	146 (89.0%)	4.5 <sup>b</sup> $\pm$ 0.8	18 (11.0%)	4.1 $\pm$ 0.6
Spring	40 (98.0%)	4.5 $\pm$ 0.8	1 (2.0%)	3.5 $\pm$ 0.0
Summer	75 (80.0%)	5.0 <sup>c</sup> $\pm$ 0.9	19 (20.0%)	4.2 $\pm$ 0.9
Autumn	101 (99.0%)	4.6 $\pm$ 0.8	1 (1.0%)	5.5 $\pm$ 0.0

<sup>a</sup>Indicate chi-square ( $\chi^2$ ) test results (23.4; df = 3;  $P < 0.0001$ )

<sup>b</sup>Indicate a significant difference ( $P < 0.05$ ) to the birth weight of lambs born dead or died in winter

<sup>c</sup>Indicate a significant difference ( $P < 0.05$ ) to the birth weight of lambs born dead or died in summer

Within the same season, lambs that remained alive were always heavier than those lambs that were born dead or which died after birth (Table 2). Although the largest difference were observed for birth weights in spring (4.5 kg vs. 3.5 kg), statistically significant ( $P < 0.05$ ) differences were found only within winter (4.5 kg vs. 4.1 kg) and within summer (5.0 kg vs. 4.2 kg).

## Discussion

Birth weight is one of the most important factors influencing pre-weaning growth in young animals, since lambs heavier at birth grow faster than lightweight lambs.

Birth weight is influenced by breed (genotype), sex of lamb, birth type, age of dam, feeding conditions and production system (NOTTER et al., 1991). Lambs which are heavier

at birth are usually males, singles, produced by ewes with larger body sizes and good feeding conditions.

Lambs born in different seasons of the year tend to have different birth weights. MENDEL et al. (1989) stated that Merinolandschaf lambs born in spring (mean birth weight 3.9 kg) and summer (mean birth weight 3.9 kg) are heavier than those born in autumn (mean birth weight 3.8 kg) and winter (mean birth weight 3.7 kg). Similar information has been confirmed in our study, since the total number of lambs born in summer had the highest birth weight (4.8 kg). The difference to mean birth weight of lambs born in autumn was 0.2 kg to lambs born in spring - 0.3 kg, and to lambs born in winter - 0.4 kg ( $P < 0.05$ ). The higher birth weight of lambs born in summer could be explained by the fact that their mothers had a qualitatively and quantitatively better forage availability during the final two to three months of gestation period than those which have lambed in other seasons, especially winter. Despite the expectation that lambs born in summer should be the heaviest, when sex and type of birth were considered, this was observed only for male singles, which were significantly heavier than male singles born in winter.

Perinatal lamb deaths, which occur around parturition time, result in significant lamb losses. MENDEL et al. (1989) reported that Merinolandschaf ewes suffered lamb losses of 18.4%, while the corresponding value for the Bergschaf breed was 26.0%. The extent of perinatal mortality depends mostly on the management system, but the major factors affecting lamb survival include age of lamb, litter size, birth weight, nutrition and parity of the ewe and season of birth (GATENBY et al., 1997; AMBRUSTER et al., 1991; NOTTER et al., 1991). In our study, season had significant ( $P < 0.01$ ) influence on perinatal mortality. The greatest loss (20.0%) was observed for lambs born in summer, during which dead lambs had a significantly ( $P < 0.05$ ) lower mean birth weight (4.2 kg) compared to those alive (5.0 kg). Similar results were observed during winter, when perinatal mortality was 11.0%, and the difference (0.4 kg) between mean body weight of lambs born dead (4.1 kg) and alive (4.5 kg) was significant ( $P < 0.05$ ). During spring and autumn, our results show a low lamb mortality (1.0%), which is difficult to interpret, since in both seasons only 1 lamb died.

Mortality rates tend to increase at extremely low or extremely high birth weights (MENDEL et al., 1989; NOTTER and COPENHAVER, 1980). Also, it has been reported that higher litter sizes have reduced birth weight and hence the survival of lambs (TURKSON and SUALISU, 2005). Results of our study partially support those findings, since during summer and winter, when we observed the highest and the lowest birth weights, relatively high perinatal mortality was found.

As sheep production is directly influenced by the number of lambs born and reared from a flock at any given time, it is highly important to identify the cause of lamb loss and to take appropriate measures to reduce it. Apart from low birth weight, causes of early

lamb losses could be stress, injuries, organ malfunction, starvation or mis-mothering. Some of these causes are closely connected to the season, since during different times of year, sheep (and the newly born) are exposed to different environmental circumstances with regard to humidity and temperature. Therefore, for proper lambing management the season should be taken into consideration since it has great impact on birth weight and perinatal lamb mortality.

## References

- AMBRUSTER, T., K. J. PETERS, A. HADJI-THOMAS (1991): Productivity of sheep raising in the forest region of Ivory Coast. III. Mortality and productivity. *J. Anim. Breed. Genet.* 108, 220-226.
- DEMIROREN, E., J. N. B. SHRESTHA, W. J. BOYLAN (1995): Breed and environmental effects on components of ewe productivity in terms of multiple births, artificial rearing and 8-month breeding cycles. *Small Rum. Res.* 16, 239-249.
- FISHER, M. W. (2004): A review of the welfare implications of out-of-season extensive lamb production systems in New Zealand. *Livest. Prod. Sci.* 85, 165-173.
- FOGARTY, N. M., G. E. DICKERSON, L. D. YOUNG (1984): Lamb production and its components in pure breeds and composite lines. I. Seasonal and other environmental effects. *J. Anim. Sci.* 58, 285-300.
- GATENBY, R. M., G. E. BRADFORD, M. DOLOKSARIBU, E. ROMJALI, A. D. PITONO, H. SAKUL (1997): Comparison of Sumatra sheep and three hair sheep crossbreeds. I. Growth, mortality and wool cover of F1 lambs. *Small Rum. Res.* 25, 1-7.
- HANSEN, C., J. N. B. SHRESTHA (2002): Consistency of genetic parameters of productivity for ewes lambing in February, June, and October under an 8-month breeding management. *Small Rum. Res.* 44, 1-8.
- MENDEL, C., W. SCHOLAUT, F. PIRCHNER (1989): Performance of Merinolandschaf and Bergschaf under an accelerated lambing system. *Livest. Prod. Sci.* 21, 131-141.
- MIOČ, B., V. PAVIĆ, M. POSAVI, K. SINKOVIĆ (1999): Program uzgoja i selekcije ovaca u Republici Hrvatskoj. Hrvatski stočarski selekcijski centar, Zagreb.
- NOTTER, D. R., J. S. COPENHAVER (1980): Performance of Finnish Landrace crossbreed ewes under accelerated lambing. II. Lamb growth and survival. *J. Anim. Sci.* 51, 1043-1050.
- NOTTER, D. R., R. F. KELLY, F. S. McCLAUGHERTY (1991): Effects of ewe breed and management system on efficiency of lamb production. II. Lamb growth, survival and carcass characteristics. *J. Anim. Sci.* 69, 22-33.
- ROSA, H. J. D., M. J. BRYANT (2003): Seasonality of reproduction in sheep. *Small Rum. Res.* 48, 155-171.
- SAS Institute Inc., Cary, NC, USA. Copyright (c) 1999-2001

SORMUNEN-CHRISTIAN, R., M. SUVELA (1999): Out-of-season lambing of Finnish landrace ewes. *Small Rum. Res.* 31, 265-272.

TURKSON, P. K., M. SUALISU (2005): Risk factors for lamb mortality in Sahelian sheep on breeding station in Ghana. *Trop. Anim. Health and Prod.* 37, 49-64.

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## SUŠIĆ, V., V. PAVIĆ, B. MIOČ, I. ŠTOKOVIĆ, A. EKERT KABALIN: Sezonska kolebanja u porodnoj masi i smrtnosti janjadi. *Vet. arhiv* 75, 375-381, 2005.

### SAŽETAK

Cilj rada bio je utvrditi očituje li janjad ojanjena u različitim sezonama razlike u porodnoj masi i smrtnosti. Ovce pasmine merinolandschaf pripuštane su, bez poticanja estrusa, tijekom cijele godine. Pojedine sezone definirane su na osnovi mjeseca janjenja: zima (prosinac-veljača), proljeće (ožujak-svibanj), ljeto (lipanj-kolovoz) i jesen (rujan-studenj). Podaci o identifikacijskoj oznaci, datumu janjenja, tipu legla i spolu prikupljeni su za ukupno 401 janje. Smrtnost je registrirana kao zbroj mrtvoobjanjene i živoobjanjene janjadi uginule unutar 48 sati nakon janjenja (perinatalna smrtnost). Sva janjad vagana je unutar 12 sati nakon janjenja vagom koja je imala raspon od 0 do 20 kg i minimalnu razdiobu od 200 g. Janjad ojanjena ljeti imala je najveću prosječnu porodnu masu (4,8 kg) koja je bila značajno ( $P < 0,05$ ) različita od najmanje prosječne porodne mase (4,4 kg) utvrđene u janjadi ojanjene zimi. Slično je ustanovljeno i u slučaju kada je janjad razvrstana u skupine prema spolu i tipu legla. Jedinci ojanjeni ljeti bili su značajno ( $P < 0,05$ ) teži u odnosu na one ojanjene zimi (5,2 kg prema 4,7 kg). Uočljive ali statistički neznačajne ( $P > 0,05$ ) razlike opažene su i između prosječnih porodnih masa muških dvojaka ojanjenih u različitim sezonama. Unutar pojedinačnih skupina ženske janjadi (jedinica i dvojaka), porodne mase utvrđene tijekom zime, proljeća, ljeta i jeseni pokazivale su relativno male i statistički neznačajne razlike. Sezona je imala značajan ( $P < 0,01$ ) utjecaj na perinatalnu smrtnost janjadi. Relativno niske stope smrtnosti (1,0%; 2,0%) ustanovljene su u janjadi ojanjene tijekom jeseni i proljeća, dok su za janjad ojanjenu zimi i ljeti one iznosile 11,0% i 20,0%. Unutar iste sezone, živa janjad bila je uvijek teža u odnosu na mrtvorodenu i janjad uginulu unutar 48 sati nakon janjenja. Iako je najveća razlika između živih i uginulih utvrđena za porodne mase janjadi ojanjene u proljeće (4,5 kg - živi prema 3,5 kg - uginuli), statistički značajne ( $P < 0,05$ ) razlike ustanovljene su samo za janjad nakon janjenja zimi (4,4 kg - živi prema 4,1 kg - uginuli), te za janjad ojanjenu ljeti (5,0 kg - živi prema 4,2 kg - uginuli).

**Ključne riječi:** sezona, janjad, porodna masa, smrtnost

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