

Evaluation of the main productive traits of Ile de France sheep in Bulgaria

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Abstract

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Subject of the study were 1115 pure-bred sheep of the Ile de France breed. The animals were born during the period 2008-2016 and were raised under similar technological conditions and nutrition in three farms in the northern part of Bulgaria. The weight growth of 1115 ewes was studied from birth to 2 years of age, as well as the reproductive traits. Live weight at birth, at 30 days, 70 days, 9 months and 2 years of the age of sheep were measured. The traits average daily gain in periods, conception rates, and biological prolificacy from first to fifth parity of ewes were investigated. 2413 observations in total were recorded. The information was derived from the Genealogy Book kept by the Breeders of the Ile de France Breeders Association in Bulgaria (AILFB), as instructed in the Instruction Codex for Control of Productive Traits and Complex Evaluation. The information was processed using the variation statistics methods. It was found that Ile de France breed was successfully adapted in our country. The average live weight recorded was: 4.564 kg – at birth, 15.049 kg at 30 days, 24.137 kg at 70 days, 54.750 kg at 9 months, and 70.465 kg at 2 years. The average daily gains gradually decreased from 0.349 kg in the first month after birth, to 0.228 kg at 70 days, and to 0.153 kg for the period from 70 days to 9 months of age. Average conception rates of 94.98 % in the ewes was established, ranging from 92.89 % at sixth parity to 97.68 % at fourth parity. Highest was the prolificacy (1.720 lambs per ewe) at fourth parity ($P < 0.001$), the average of the studied data being 1.581 lambs per ewe.

Keywords: Sheep; Ile de France; live weight; average daily gain; conception rates; prolificacy

Introduction

The Ile de France meat breed refers to the race of precoces, according to the French classification. It was established and recognized in France in the 1920s by the crossing of the French Rambouillet with England's rams Dishley (Leicester). By the 1990s it was one of the most widespread sheep breeds in the country. In the last 20 years, the population size is limited to about 270-300 thousand sheep breeding, mainly grown in Central and Northwestern France. The first import in Bulgaria was realized in 1968 – 94 sheep and 21 rams, in order to establish the acclimatization and productive characteristics of the breed and the possibilities for cross

with the breeds bred in our country. Since 2003, the population has begun to grow by introducing pure-bred female and male animals, creating daughter flocks, and swallowing crossbreeding to improve meat productivity. According to the Ile de France Breeding Association in Bulgaria, 6,543 sheep and 238 rams are being bred in our country. The fertility of the animals is about 160-185%, with an average fertility rate of 95%. The Ile de France breed is characterized by intense growth at an early age that lasts up to 100-120 days of age. The meat has excellent taste qualities, marbled, without the characteristic specific smell of some breeds bred in Bulgaria. High growth capacities, meat properties and feed consumption are in optimal combination at a slaughtering

level of 30 to 40 kg, i. e. the breed is capable of producing lambs of a heavy type. The peculiarities, the productivity and the state of the meat sheep population of Ile de France are the subject of research interest on the part of Bulgarian authors (Dimitrov, 1978, 1991, Dimitrov et al., 1987, 2011, 2013, 2014, Ivanova et al., 2017 Laleva, 1996; Methodiev et al., 2008, 2010; Raicheva et al., 2005, 2010; Tyankov et al., 2003). Some of these authors are exploring the possibilities of crossing with Bulgarian breeds and improving their meat qualities and the economic effect respectively (Dimitrov, 1988, Laleva et al., 2006, Marinova, 1976, Slavov, 2007). In view of the increased demand for meat from small ruminants in Europe and the world, there is a certain interest in specialized meat sheep breeding. France – a country which is the founder of meat-sheep breeds, is experiencing a shortage of meat-type lambs (heavy lambs) and 65-70% of the lambs that are graded (S) EUROP are imported from Australia, Great Britain and other countries. The interest of Turkish and European companies is further enhanced by the fact that Bulgaria is an environmentally friendly country close to major markets and transport links with the Middle East and Europe. Promotion and expansion of the meat industry will positively affect economically not only farmers, but our country as a whole and will lead Bulgaria out of the general crisis in livestock breeding, reaching the European markets again. In recent years, there has not been much in-depth research on productivity and the factors that affect it in the well-adapted pure-bred animals Ile de France. These circumstances determine the need for up-to-date studies on the weight gain, fertility, meat productivity and quality of the meat breed in Bulgaria. The results can serve to periodically update the parameters of the main productive traits in the Ile de France Breeding Program in Bulgaria.

The aim of this study was to analyze the main productive traits of the Ile de France breed in our country.

Materials and Methods

The subject of the study were 1115 in total pure-bred sheep of the Ile de France breed. The animals were born during the period 2008-2016 and were bred under similar technological conditions and nutrition in three farms in the northern part of Bulgaria. The weight gain of 1115 female subjects from birth to 2 years of age and reproductive traits were recorded. Live weight at birth, at 30 days, 70 days, 9 months and 2 years of the age of sheep were measured. The live weight was measured to the nearest 0.1 kg. The average daily gain in the surveyed periods was calculated. The fertility rates and biological fertility traits from first to fifth lambs of sheep were investigated, with 2413 observations. The information was derived from the Genealogy

Book kept by the breeders of the Ile de France Breed Breeding Association in Bulgaria (AILFB). The data were obtained according to the standard methods and instructions provided in the Instruction for Control of Productive Traits and Bonitation, part of the selection program for the development of the breed in Bulgaria. The information was processed using the variation statistics methods.

Results and Discussion

The data in Table 1 show that the average live weight at birth was 4.564 kg, 30 days – 15.049 kg, 70 days – 24.137 kg, 9 months – 54.750 kg, and 24 months – 70.465 kg. Dimitrov (1978) found slightly lower values of the study at birth and 1 month for lambs from imported mothers, and for sheep raised in Bulgaria the results were similar to ours. Raicheva et al. (2005) also reported about lower live weights at birth (4.370 kg), 30 days (11.826 kg) and 70 days (20.750 kg), probably due to environmental effects. Laleva et al. (2006) reported data on average weight at birth of 3.57 kg, and at other ages they were similar to those of Raicheva et al. (2005), Dimitrov et al. (1982). Ivanova et al. (2017) reported higher mean birth weights, but the values of subsequent ages were lower. Dimitrov et al. (1987) found a significant difference in the average live weight of 2.5 years of the animals, own reproduction (59.900 kg) and the sheep imported from France (70.300 kg). After 50 years of breeding, the results obtained by us were similar to those of imported pure-bred animals. The breeding goals in the breeding work in Bulgaria followed the tendencies in the breed's homeland. In line with them, the emphasis was shifted from intense growth at an early age to a higher live weight of ewes and respectively higher fertility (Dimitrov et al., 1987). The coefficient of variation for the trait in our study was 21.56%, 9.70%, 10.57%, 3.92% and 6.74% respectively. Highest was the variation of the trait on the first day of birth, with a range of variability ranging from 3 to 7 kg. This was due to the high fertility of the breed, respectively the difference in the weight of the single lambs and those of the multilamb births. At 30 and 70 days, the coefficients were about 10%, and in this period, maternal milking had a significant effect on the growth rate. After weaning the variation coefficients ranged from 3.92 to 6.74%, reflecting the individual genetic features and their phenotypic manifestation. The accuracy factor E was very low, below 1%, which proved the high representation of the results obtained. Weight development data showed that the animals in the study sample slightly exceeded the breeding limits for the live weight criterion determined in the Breeding Program in Bulgaria. Our results were similar in value to those reported in the report of the Breeding Association of Ile-de-France (AILFB) in 2017 for the entire population grown in Bulgaria.

Table 1. Average values and coefficients of variation of the trait live weight of different age and average daily gain in sheep from the Ile De France breed

Age	n	X – live weight, kg	S x, kg	S, kg	E, %	C, %
1 day	1115	4.564	0.030	0.984	0.646	21.56
30 days	1115	15.049	0.039	1.309	0.260	9.70
70 days	1115	24.137	0.076	2.552	0.317	10.57
9 months	1115	54.750	0.064	2.145	0.117	3.92
2 years	937	70.465	0.155	4.746	0.220	6.14
Time	n	X – gain, kg	S x, kg	S, kg	E, %	C, %
1 – 30 days	1115	0.349	0.001	0.046	0.40	13.31
30 – 70 days	1115	0.228	0.002	0.070	0.92	30.70
70 days – 9 months	1115	0.153	0.001	0.017	0.34	14.25
9 months – 2 years	937	0.035	0.001	0.011	1.06	22.36

The average daily gain in the first month after birth was 0.349 kg, then gradually decreases to 0.228 kg to 70 days and became 0.153 kg over the period of 70 days to 9 months of age (Table 1). These results confirmed the breed's potential for intense early growth. Dimitrov (1978) reported a lower increase of up to 1 month (0.279 kg) and a slightly higher (0.251 kg) in the second period. Dimitrov et al. (1987) also found lower values of the trait up to 30 days (0.266 kg) for the imported animals, but during the second period they observed a more intense growth with an average daily gain of 0.313 kg. The variation on this trait was high – 20.7-27.1%, which was a prerequisite for the improvement of the herd through selection (Dimitrov et al., 1987). Raicheva et al. (2005) found close to our average gain rate over the period of 30-70 days (0.226 kg). The coefficients of variation for the average daily gain rate in Bulgaria varied in the range of 13.31 to 30.70%. It was noticeable the increase of the variability in the period from 30 to 70 days of age, with individual gain ranging from 0.080 kg to 0.400 kg. This was due to the substantial change in the milk of the Ile de France mothers after the 30th and the 40th days of lactation and in its constancy. This characteristic feature of the breed allows the natives to express their individual genetic potential in terms of growth intensity during this period of 30-70 days. Data on the average daily gain rate showed that the animals in the sample surveyed were presented with similar results for the trait at 30 days compared with the data from the IELF report for 2017 for the whole a population raised in Bulgaria. With regard to the 30 to 70 day gain, the data showed that nutrition and environmental conditions needed to be addressed to fully exploit the genetic potential. The analysis showed that by adapting to Bulgarian conditions the breed retained its potential for high growth intensity at an early age and reached a high average live weight at reproductive age, as in its homeland.

The results of 2413 fertility rate surveys in the sample examined showed (Table 2) that the animals of the 4th Lamb ($P < 0.001$) were presented with the highest fertility (1.720 lambs

from sheep). The data for 5th (1.703) and 3rd Lamb (1.555) ($P < 0.01$, $P < 0.001$) followed the same trend. The conception rate of the 1st lamb (1.493) ($P < 0.001$) was the lowest and the average sample was 1.581. Lower values for fertility of sheep Ile de France were published by Dimitrov (1978) (1.312 lambs from sheep), Dimitrov et al. (1982) (1.318) and Laleva et al. (2006) (1.306-1.372). Metodiev et al. (2008) found the highest value of the trait in the 5th lamb sheep (1.885/ewe), which reliably exceeded the fertility of other levels in the herd. Metodiev et al. (2010) reported in another study of the same breed very close to ours average value of the trait. An analogous trend followed the sheep conception rate results in our study. The average value of the trait was 94.98%, with the percentages varying, depending on the lamb's order of 92.89% on the 6th lamb to 97.68% on the 4th lamb. The difference in the analysis of this trait was only that the lowest conception rate was recorded on the 6th lamb. At similar levels of fertility Metodiev et al. (2010) founded lower conception rates in sheep (76.19-86.95%). The coefficients of variation were traditionally high, which stemmed from the nature of the studied trait. In our study, they moved from 41.38% on the 6th to 47.26% on the 4th lamb, where we have 1 to 6 born lambs and the highest conception rates. The average level of variation was 44.23%, which was normal for high conception breeds. The mean value of the E-factor of accuracy was 1.97% and this confirms the representativeness of the results in terms of the population. The data on the traits of conception and biological fertility show that the animals from the studied sample exceeded the breeding limits determined in the Breeding Program in Bulgaria. The reproductive results were similar in value to the data from the report of the Breeding Association of Ile de France in Bulgaria (AILFB) for 2017 for the whole population grown in Bulgaria. The Ile de France breed, bred in their native France, is also presented with similar data from the control of fertility. In the annual edition of INSTITUT DE L, ELEVAGE and the French Agrarian Academy in 2017, 1.551-1.781 lambs were reported from one sheep and these were very close to our

Table 2. Percent of the conception rate, average values and coefficients of variation for the trait biological fertility of different age in sheep from the Ile De France breed

Age Years	n	Conception rate %	Biological fertility Number of lambs/sheep	S x	S	E %	C %
2	826	93.21	1.493 AB	0.022	0.639	1.489	42.78
3	605	94.70	1.555 Ca	0.028	0.685	1.790	44.04
4	443	97.68	1.720 ACD	0.039	0.813	2.248	47.26
5	313	96.41	1.703 Bab	0.040	0.710	2.357	41.71
6	226	92.89	1.531 Db	0.042	0.633	2.752	41.38
Total	2413	94.98	1.581	0.014	0.699	1.966	44.23

Significance of differences within columns – when symbols identical:

A to Z – $P < 0.001$; a to k – $P < 0.01$; l to z – $P < 0.05$

results. Our study showed that the breed has been adapted successfully and, under good nutrition and breeding conditions, could realize its full productive potential in the conditions in Bulgaria.

Conclusions

The weight development of the Ile de France breed adapted to Bulgaria was characterized by mean live weight: at birth – 4.564 kg, 15.049 kg at 30 days, 24.137 kg at 70 days, 54.750 kg at 9 months and 70.465 kg at 2 years.

The average daily gain rates gradually decreased from 0.349 kg in the first month after birth, to 0.228 kg to 70 days, and 0.153 kg in the period from 70 days to 9 months of age.

An average 94.98% sheep conception rate was found, ranging from 92.89% on the 6th lamb to 97.68% on the 4th lamb.

The animals with the highest fertility (1,720 lambs from the sheep) presented the animals of the 4th Lamb ($P < 0.001$), with an average of 1,581 lambs of the sheep sampled.

References

- Dimitrov, Il.** (1978 a). Characteristics of selection signs of the Ile-de-France breed, bred in Bulgaria, I. Fertility, weight development and meat properties of lambs, *Animal Sciences*, 4, 58-67.
- Dimitrov, Il.** (1978 b). Characteristics of selection signs of the Ile-de-France breed, bred in Bulgaria, II. Live weight and wool-yielding, *Animal Sciences*, 5, 41-48.
- Dimitrov, Il.** (1988). Development of a specialized synthetic line and use of the Ile-de-France breed for improving the meat properties of lambs. Dissertation.
- Dimitrov, Il.** (1991). Introduction of indices in sheep selection by fertility and by breeding for meat, *Animal Sciences*, 1-4, 36-39.
- Dimitrov, Il., & Kaleva, St.** (1987). Analysis of live weight and fertility signs of the Ile-de-France breed, *Animal Sciences*, 10, 3-9.
- Dimitrov, Il., Georgieva, E., & Ivanov, I.** (1982). Phenotypic parameters of basic productivity qualities of sheep from the Ile-de-France breed, bred in the Institute of Cattle and Sheep Breeding – Stara Zagora. *Animal Sciences*, 3, 20-26.
- Dimitrov, Il., Slavov, R., & Achkakanova – Dimitrova Ev.** (2013). Farm manual „45 years of the Ile-de-France breed in Bulgaria”, Stara Zagora.
- Dimitrov, Il., Slavov, R., & Achkakanova – Dimitrova Ev.** (2014). Farm manual „How to raise sheep from the Ile-de-France breed in Bulgaria”, Stara Zagora.
- Dimitrov, Il., Stankov, Iv., Slavov, R., & Achkakanova – Dimitrova, Ev.** (2011). Selection program for breeding the Ile-de-France, Stara Zagora.
- Ivanova, T., & Raicheva, E.** (2017). Analysis of the live weight and the gain of lambs from the flock of Ile de France breed according to genealogical lines. *Zhivotnovadni Nauki*, 54(2), 3-9 (Bg).
- Laleva, St.** (1996). Reproductive ability of sheep from different productivity directions, Dissertation, Stara Zagora.
- Laleva, St., Slavova, P., Popova, J., Boykovska, G., & Krastanov, Zh.** (2006). Study of fertility and live weight in lambs from the breeds Mouton Sharole, Ile de France, Thracian fine-fleece breed and her crosses. International science conference – Stara Zagora, 1-2 June 2006, II, Veterinary medicine, *Livestock Breeding*, 384-387.
- Marinova, P.** (1976). Study on the variability of the main breeding characteristics of sheep and goats with Ile de France breeds, Dissertation, Sofia.
- Metodiev, N., & Raicheva, E.** (2008). Study on fertility of sheep breed Ile de France. Proceedings of the scientific conference “Traditions and Modernity in veterinary medicine”, *University of Forestry*, Sofia, 48-54 (Bg).
- Metodiev, N., Todorov, N., & Raicheva, E.** (2010). Sexual activity and use of non-hormonal methods for synchronization of fertility and increasing litter size of ewes from the Ile de France breed. *Zhivotnovadni Nauki*, 47(3), 15-23 (Bg).
- Raicheva, E., & Ivanova, T.** (2005). Effect of lambing, type of birth and sex on the live weight and the gain of Ile de France lambs. *Journal of Animal Science*, 5, 222-226 (Bg).
- Raicheva, E., & Ivanova, T.** (2010). Live weight and gain at sheep from Ile-de-France breed according to some factors. *Zhivotnovadni Nauki*, 47(5), 10-15.
- Slavov, R.** (2007). Opportunities for improvement of sheep from the North-eastern Bulgarian fine-fleece breed – Dobrudjan type. PhD Dissertation, Stara Zagora.
- Tyankov, Sv., Dimitrov, Il., Stankov, Iv., Slavov, R., & Panayotov, D.** (2003). Sheep farming with goat breeding, Stara Zagora, 408-410.