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FORMATION AND CHARACTERIZATION OF SLOVAK DAIRY COMPOSITE SHEEP BREED: DESCRIPTION OF THE PROCESS: A REVIEW

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ABSTRACT

In the beginning of 1990s, the programme of formation of synthetic population of Slovak Dairy sheep (SD) was launched. Some flocks were involved into performance testing; the establishment of the breed was divided into two periods: first, crosses of local breeds (Improved Valachian, Tsigai and Merino) with improving breeds (Lacaune, East Friesian) of various proportions were formed; second, a close (*inter se*) breeding scheme within the crossbred population was applied. Parents of the next generation were chosen on the basis of breeding values for milk yield and litter size. At present, five thousands female SD individuals are included in the performance testing; 35 % yearling females enter the breeding scheme each year; a total, 50 thousands SD ewes are kept in commercial flocks. Milk and reproduction traits of SD were analyzed using mixed model methodology that included fixed and random effects. In similar way growth traits were analyzed. Milk traits analyses included 20,511 milk records belonging to 11,026 ewes kept in 52 flocks during the period between 1995 and 2015; reproduction traits analyses included 30,034 litter size records belonging to 9,671 ewes kept in 26 flocks during the period between 1997 and 2015. The standardized milk yield (SMY) and average daily milk yield (ADMY) increased more than twice: 79.8 ± 5.36 l (1995) vs. 164.0 ± 2.04 l (2015) and 495.1 ± 33.5 ml (1995) vs. 1035.3 ± 12.8 ml (2015), respectively. In ten percent of the most productive ewes, SMY was equal to 257.6 l, ADMY was equal to 1604 ml and dry matter was equal to 26.6 kg. Fat and protein contents decreased from 7.82 ± 0.101 % (1995) to 7.27 ± 0.040 % (2015) and from 5.83 ± 0.043 % (1995) to 5.69 ± 0.017 % (2015). Ewes of SD have good udder traits. Litter size in top 50 % flocks was above 150 %. Average daily gains from birth to weaning were 0.26 kg (female lambs) and 0.30 kg (male lambs). The population of SD was recognized as a breed in 2017.

Key words: dairy ewes; composite breed; milk traits; reproduction; growth

STATE OF THE ART

Following breeder's goals oriented towards high production, reproduction and functional traits of dairy sheep in Slovakia, the improving programme with intention of forming improved sheep population fitting semi-extensive production system was launched in Slovakia in 1990s. This was programme of forming Slovak Dairy sheep (SD). The breeding scheme was divided into two periods (Margetín and Čapistrák 1994; Margetín *et al.*, 2000 a,b,c). First, crosses of local breeds (Improved Valachian (IV), Tsigai (TS) and Merino (M) with improving specialized breeds (Lacaune (LC), East Friesian (EF) of various proportions were formed in some flocks involved into performance testing. Preliminary evaluations of crossbreds with proportion of LC and EF ranged from 12.5 to 87.5 % were aimed at analyses of milk traits and litter size that are considered the most economically important traits (Apolen *et al.*, 2000; Čapistrák *et al.* 2000, 2002, 2005; Margetín *et al.*, 1993, 1999 a,b). Further analyses showed that the population with good udder shape, of appropriate cistern size and milkability was formed (Čapistrák *et al.*, 2006 a,b; Mačuhová *et al.*, 2008; 2009; Margetín *et al.*, 2005

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b,c; Margetín *et al.*, 2011 a,b; Milerski *et al.*, 2005, 2006; Tančin *et al.*, 2011). Crossbreds with various proportions of LC and EF were also confirmed to be of good growth traits both till and after weaning (Margetín *et al.*, 2004 a,b). In addition, genetic parameters and variance components of udder morphology and milkability traits were preliminary studied (Margetín *et al.* 2005a, 2008).

Second, a close (*inter se*), breeding scheme within the crossbred population was proposed (Margetín *et al.*, 2010, 2011c, 2012b) and applied taking into account results of analyses during the first period of the programme. The aim was to stabilize composite population using *inter se* (i.e. purebred) mating scheme that included dam and sire animals used as parents of the next generation that were selected according to their breeding values for milk and litter size traits. During this period, a lot of analyses were also done. Performance testing data of flocks involved in the programme were used for evaluation. These included analyses of udder morphology and milkability traits, since one goal was to form population of ewes that fit machine milking (Margetín *et al.*, 2013b), have good udder morphology and functional traits (Margetín *et al.*, 2012a; Makovický *et al*., 2013, 2014, 2015a, 2017a), are of appropriate cistern size (Margetín *et al.*, 2011d; Makovický *et al*., 2015b,c) and of minimal mastitis occurrence (Margetín *et al*., 2013a). Growth curves of lambs of various proportions of LC and EF within IV and TS genotypes were compared (Makovický *et al*., 2017b).

In 2016, a complex analysis of SD synthetic population involving period from 1995 to 2015 was done. Mixed model methodology (SAS, ver. 9.2) was employed. When milk yield during milking period (MY), standardized (SMY) and daily milk yield (DMY) as well as fat % (F %), protein % (P %), dry matter % (DM %), free of fat dry matter (DM-F %) and usable dry matter (UDM; kg) were investigated, following fixed effects: flock (52 levels), year (21 levels), parity (3 levels: first, second and third+ parity), litter size (4 levels: one lamb, two, three + lambs born and missing information about number of lambs born), covariates: milking period (in days) and interval between lambing and first test-day measurement (days) and random effect of ewe were considered. A total, 20,511 records that belonged to 11,026 ewes (1.86 records per ewe) entered the model for analyses of MY, SMY, DMY and 18,081 records entered the model for analyses of F %, P %, DM-F % and UDM. When litter size was investigated, the following fixed effects: flock (26 levels), year (19 levels) and age of dam (8 levels, one year old up to eight+ years old) and random effect of ewe were considered. A total, 30,034 litter size records that belonged to 9,671 ewes entered the model.

Study of Margetín (2016) confirmed that improving programme that resulted in acknowledgement of SD sheep with more favourable traits than those of local breeds was fulfilled. During the period of the last 21 years (from 1995 to 2015), SMY increased about twice (from 79.8 l in 1995 to 167.0 l in 2015). Similarly, DMY and production of usable dry matter increased by 109 and 79 %. Most productive flocks reached MY ranging from 170 to 190 l. Top 10 % ewes reached SMY above 250 l, DMY reached more than 1,600 ml and production of usable dry matter was above 26 kg. Average F % and P % slightly decreased (7 and 2.4 %, respectively). Also, ewes of SD population were of good udder morphology and functional udder traits. Prolificacy did not fulfill expectations and was 141.1 %. Nevertheless, it was about 160 % in top flocks. Average daily gain till weaning was about 300 g in male lambs and about 260 g in female lambs. The frequency of ARR allele of the prion gene ranged from 0.711 to 0.789 (Margetín *et al*., 2016).

Results of SD sheep flocks resulted in fact that this population was recognized as a native breed on May 26, 2017. Detailed information about history of breeding this population can be found in the study of Margetín *et al.* (2017). Moreover, the importance of development of this population from social and breeders' point of view is described in the reports of Margetín (2017a,b).

CONCLUSION

Population of Slovak Dairy sheep is fairly large (more than 5 ths. females in performance testing, 35 % yearling females enter mating schemes), so it can be successfully bred in Slovakia in the future. Breeders are satisfied with the level of production and reproduction traits reached (Pavlík *et al*., 2017). With respect to appropriate effective population size, it is important that more than 300 Slovak Dairy sires are produced each year. In the future, not only the numbers of Slovak Dairy population, its production and reproduction traits, but also its exterior traits, including wool characteristics, need to be continuously stabilized (Margetín, 2017c).

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