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Study on the milk yield and lactation persistency of F4 crosses between Pleven blackhead sheep and the Assaf sheep during different lambing seasons

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Abstract

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The milk yield and lactation persistency of 85 F4 crosses between Pleven blackhead sheep and the Assaf sheep breed were studied based on the performance of 932 controls. It was ascertained that under the conditions of intense production system- a year-round barn breeding and standardized, good quality feeding, the average 180-day-period daily milk yield upon first lactation was 1.584±0.028 kg, and for a 300-day period it was 1.500±0.027 kg. Up to 180th lactation day, the percentage of ewes milked was 82,4, and up to day 300 – 55.3%. No reliable differences in the milk yield ($P > 0.05$) were ascertained upon lambing during 4 periods- March, July, August and September which serves to prove that the cross-breeds may be successfully used for a year-round milk production. The lactation persistency was reliably influenced ($P < 0.001$) by the month of lambing. The lactation peak was reached at the end of the first month post lambing (2.024 kg/d), the milk yield was retained until the end of the second month (97.6% of the maximum) and after that it gradually decreased reaching 63.2% on day 120 and 51.9% of the maximum on day 180. The most stable lactation is reported for the sheep which lambed in the spring- it started at the lowest level of 1.541 kg/d (on day 15 after lambing), reached the peak of 2.112 kg/d at the end of the second month and as of the latter period until the 120th lactation day, it remained higher when compared with that of the other groups. The sheep which lambed in July exhibited the highest dynamics – their lactation started at the highest level (2.442 kg/d), reached its maximum (2.563 kg/d) but until the middle of the second month, the milk yield sharply decreased (1.734 kg/d) and after that it maintained the level of the other groups. The sheep which lambed in August and September had milk yield of respectively 1.723 kg/d and 1.910 kg/d during the first control, the peak was registered at the third control (45th day) and was respectively 2.126 kg/d and 2.110 kg/d for the two months.

Keywords: Pleven blackhead sheep; Assaf crosses; dairy sheep; milk yield; lactation curve; intensive system

Introduction

The dairy sheep breeding whose popularity is expected to increase worldwide (Li et al., 2022) is a traditional sector in Bulgaria. Until the middle of the previous century, the breeds used for milk production were local and, around 1957, they comprised 72.2% of all sheep in Bulgaria (Hinkovski et al., 1984). The main of all local milk breeds is the Pleven blackhead sheep which has over a hundred years of history. It has been created by means of a targeted selection in view of milk productivity on the basis of Tsigai sheep with black heads (Hinkovski et al., 1979).

Various options to increase sheep's milk production in the country have been tried through the years. Hybridization schemes have been elaborated with the purpose of creating a synthetic dairy population in Bulgaria (Hinkovski et al., 1984) with the Pleven blackhead sheep being in the core of almost all schemes (Hinkovski et al., 1979). The reason for that, ac-

cording to the academician Hinkovski (1980), is the ability of the breed to 'enhance the viability and the adaptability of the crosses'. The results of the schemes and methods applied have been divergent (Boykovski et al., 2005), but, as a whole, the milk yield and the cost effectiveness of the national dairy population remain low (Stancheva et al., 2018, 2021; Stankov, 2020; Kalaydzhiev, 2021, Iliev et al., 2022).

In the recent years, new breeds have been introduced in the country in an effort the milk production to be increased and along with being subject to purebred-breeding, they are also included in different crossbreeding schemes with the crosses showing significant differences in both their milk yield and milk content (Ivanova et al., 2015; Ivanova et al., 2011; Ivanova, 2019; Lalaydzhiev, 2021). Miteva (2020), for example, has ascertained that the milk of the ewes from the Pleven blackhead breed contains almost 2 times (87.8%) more fat than that of the Awassi breed, while the protein content is similar – 4.352% and 4.636% respectively.

The abovementioned shows that upon selection schemes determination, it is necessary a detailed analysis of their effects both with reference to the main selection parameters and on the biological qualities of the crosses to be made. One of the factors influencing significantly the milk yield of the ewes for lactation is their ability to maintain a persistent milk yield during the entire lactation period. According to Elvira et al. (2013), the lactation curve of the Lacaune sheep breed and the possibility for its mathematical modelling allow an early identification of ewes with a low milk yield potential and optimization of the profitability of the farms. Another factor aiding the profitability increase of the farms is the application of modern reproductive biotechnologies for a year-round service of ewes (Pollott & Gootwine, 2004; Milan et al., 2011; Ripoll-Bosch et al., 2012; Habeeb & Anne Kutzler, 2021), with the purpose of a year-round sheep's milk production (Stankov, 2020).

Similar to other European countries (Milan et al., 2011, Salary et al., 2018), of all introduced breeds, the relative share of the Assaf breed and its crosses in our country is getting bigger and bigger (Stankov, 2020; Kalaydzhiev, 2021). The aim of the present study is to examine the influence of the month of lambing on the milk yield and the lactation persistency in F4 crosses between the Pleven blackhead sheep and the Assaf sheep breed.

Materials and Methods

The present study was carried out in the sheep farm of Galina Mircheva in the village of Petarnitsa, Pleven region in 2021. The breeding flock of 600 ewes was controlled by the National association for breeding of dairy sheep in Bulgaria. The ewes were reared in stalls, divided into groups in two barns depending on the period of lambing. The feeding and watering were performed in the barns where enough space for the performance of both activities was provided.

The animals were fed *ad libitum* all year round with a whole ration mixture in two major seasonal combinations: I – maize silage (0.500 kg), lucerne haylage (0.900 kg), meadow hay (0.259 kg) and a vitamin premix (0.020 kg); II – maize silage (0.700 kg), lucerne haylage (0.400 kg), lucerne hay (0.400 kg), meadow hay (0.150 kg), sodium bicarbonate (0.020 kg) and a vitamin premix (0.020 kg). The concentrated feed was given individually in a quantity of 0.950 kg per liter of milk.

The animals included in the experiment were 85 ewes which were F4 crosses between the Pleven blackhead sheep and the Assaf sheep. The ewes were at their first lactation, born in the same year (2019) and subdivided into 4 groups, depending on the period of lambing. The milking of the ewes began after the colostrum period- on the sixth day after lambing. The first controls in the groups were performed on the 15th day after lambing as follows: 1st group – 11 March (n-19), 2nd – 19 July (n-10), 3rd – 24 August (n-30), and 4th – 24 September (n-26). After the performance of the first control, all groups were controlled every 15-day period. The groups were subject to control until the last ewe dried off. However, only the controls over groups comprising at least three sheep were included in the data processing.

The winter lambing and spring milking (group 1) is a traditional practice, under the conditions in Bulgaria, which is related to the usual seasonal polycyclicity of the ewes. The summer and autumn lambing which is practiced in the farm for the purpose of a year-round milk production is non-traditional (groups 2-4). Therefore, the animals were hormonally synchronized for heat induction and artificially inseminated.

The milking was performed in a parallel milking hall, 2 x 12, with a central milk line. The ewes were milked twice a day; the morning milking started at 6.00, and the evening one at 16.00. The data were collected during machine milking covering the interval from attaching the teat cups of the milking device until its removal which was controlled by a handler.

The data were statistically processed via a specialized software (SPSS 21, IBM). The following statistical pattern was used:

$$Yijk = \mu + Mi + Gj + Ck + GCjk + GMji + GCMjki + eijk,$$

where M, G and C are fixed effects of respectively the i^{-th} milking (n = morning and evening), j^{-th} group, according to the month of lambing (n = 4), k^{-th} control (n = 20 per lactation, n = 12 – per 180-day period), GC is a random effect of the k^{-th} control in the j^{-th} group, GM is a random effect of the i^{-th} milking in th j^{-th} group, GCM is a random effect of the i^{-th} milking during the k^{-th} control in the j^{-th} group, eijk – residuals. The comparison of the different groups was performed via the LSD method.

Results and Discussion

The data of our study show that when under the conditions of intensive breeding system, the F4 crosses between the Pleven blackhead sheep and the Assaf sheep have high milk yield. The average daily milk yield for the lactation period (300 days) of the ewes included in the experiment was 1.500±0.027 kg (932 controls), and for a reference 180-day lactation – 1.584±0.028 kg (Table 1). The milk yield was almost twice as much as that of the mother breed – 0.714–0.893 l (Petkova et al., 2018), it was also higher than that reported with reference to other dairy breeds and their crosses in Bulgaria (Ivanova et al., 2011; Ivanova et al., 2015; Stancheva et al., 2018, 2021; Ivanova, 2019; Stankov, 2020; Kalaydzhiev, 2021; Iliev et al., 2022). The results obtained are also better than those revealed by Salari et al. (2018) – 1.3±0.5 up to day 170 of the lactation with reference to the Assaf breed fed with a ration including 0.7 kg concentrated feed.

The ewes had a relatively long lactation period. Only 4.9% of the sheep had dropped until the 120th lactation day. 82.3% of the ewes included in the study were milked up to the 180th day, and 55.3% until day 300. When studying the milk yield of the Assaf and the Awassi breeds, Pollott & Gootwine (2004) report a 173-day lactation period for the former and 214-day one for the latter. The milk yield of the animals examined by us for 173 days was 18.0% lower than that announced by the authors (334 kg) with reference to the purebred Assaf in Spain, and the individual variation was 11.6% higher. The coefficient of variation (CV) of the animals studied by us for the first 120 lactation days was 47.5% and it gradually increased to 54.9% for full lactation. The minimum daily milk yield reported for 180-day lactation was 0.050 kg, and the maximum – 4.600 kg.

The milk yield at the morning milking was higher than that during the evening milking at all reported periods, which is probably due to the irregular interval between the two milkings.

The ewes which lambed in July (Table 2) indicated the highest milk yield of all 4 lambing periods examined for a standard 180-day lactation, however, the lambing period was not a reliable source of variation for this parameter (Table 3). The difference in the milk yield of the ewes which lambed in July and those which lambed in March was only 0.016 kg

Table 1. Milk yield (kg) during first lactation of F4 crosses between the Pleven Blackhead sheep and the Assaf sheep for different lactation periods.

Days of lactation	n	Morning			Evening			Control Day		
		Mean	SE	Std. Dev	Mean	SE	Std. Dev	Mean	SE	Std. Dev
120	81	0.946	0.018	0.459	0.767	0.015	0.383	1.713	0.032	0.813
150	76	0.908	0.017	0.456	0.728	0.014	0.384	1.636	0.029	0.812
180	70	0.881	0.016	0.456	0.702	0.013	0.385	1.584	0.028	0.815
210	62	0.872	0.015	0.454	0.693	0.013	0.383	1.565	0.028	0.812
240	56	0.858	0.015	0.457	0.681	0.013	0.385	1.539	0.027	0.817
270	50	0.846	0.015	0.458	0.670	0.013	0.387	1.516	0.027	0.821
300	47	0.838	0.015	0.459	0.662	0.013	0.389	1.500	0.027	0.824

Table 2: Milk yield (kg) for 180-day lactation period of F4 crosses between the Pleven Blackhead sheep and Assaf sheep during first lactation. depending on the month of lambing.

First Control	Lactation Period	Number of Controls	Mean	Std. Err.	Std. Dev.	Min.	Max.
11 March	Morning	208	0.909	0.034	0.487	0000	2.110
	Evening	208	0.705	0.028	0.405	0.050	1.880
	Total	208	1.614	0.058	0.836	0.150	3.560
19 July	Morning	103	0.889	0.049	0.498	0.200	2.550
	Evening	103	0.741	0.044	0.443	0.100	2.000
	Total	103	1.630	0.092	0.932	0.330	4.550
24 August	Morning	283	0.868	0.023	0.389	0.100	2.050
	Evening	283	0.699	0.019	0.325	0.080	1.900
	Total	283	1.567	0.041	0.694	0.180	3.950
24 September	Morning	241	0.869	0.031	0.484	0.050	3.000
	Evening	241	0.689	0.026	0.406	0.000	2.000
	Total	241	1.558	0.056	0.875	0.050	4.600

Table 3. Influence of the month of lambing. the subsequent control and the time of milking on the milk yield (kg) for a 180-day lactation period of F4 crosses between the Pleven Blackhead sheep and the Assaf sheep at first lactation

Factor	Morning		Evening		Control Day	
	F	Sig.	F	Sig.	F	Sig.
Month of lambing	1.190	0.313	1.322	0.266	2.277	0.078
Control	10.826	0.000	16.822	0.000	26.282	0.000
Control in the month of lambing	1.170	0.237	1.313	0.114	2.317	0.000
Milking					65.559	0.000
Milking in the period					0.149	0.999
Period*Control*Milking					0.136	1.000

(0.99%), and with those with the lowest milk yield – those which lambed in September – 0. 072 kg (4.62%). The ascertained above displays that under the conditions of standardized high-quality feeding and a year-round barn rearing, the F4 crosses between the Pleven blackhead sheep and the Assaf sheep may be successfully used for a year-round milk production.

The ewes included in the observation displayed a relatively stable lactation curve (Figure 1) with the subsequent control having a considerable influence on the daily milk yield of the ewes (Table 3). As of day 15 post-lambing until the end of the first month, the average milk yield of the controlled sheep increased by 6.29% and reached its peak. Upon modeling of the lactation curve, Angeles-Hernandez (2021) use data gathered by different authors which clearly show that the lactation peak of the ewes happens during the third or fourth week after lambing and is influenced by the genetic group, feeding, management and other factors. The authors explain the lactation curve dynamics with the development of the alveolar system of the milk gland. Georgiev (1990) indicates that the sheep of the Plaven Blackhead sheep breed reach their highest average milk yield after the first month. Pollot & Gootwine (2004) have found that the lactation peak for the Assaf breed is reached on day 24, and for the Awassi breed- on day 45. A study carried out by Elvira et al. (2013) shows that the lactation peak of the Lacaune breed is on the 34th day on average, from 27 during second to 48 days during first lactation.

The lactation curve of the animals studied by us was stable during the first two months (Figure 1) and at the end of the second month, the daily milk yield was at the level of the first control and was only 2.4% lower than that at the lactation peak. During the third month, the milk yield was 20.9% lower than that during the second one. After that the decrease trend slowed down with the drop form the fourth to the sixth month being by18.1%, 13.0% and 5,7% respectively when compared with the preceding month. 61.9 % of the total milk milked per lactation was obtained up to lactation day 120,

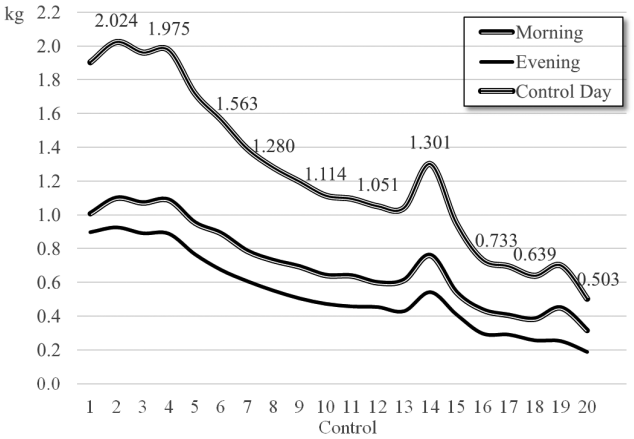

Fig. 1. Averaged lactation curves of F4 crosses between the Pleven Blackhead sheep and the Assaf sheep at first lactation

and up to day 180, until which 86.4% of the ewes continued lactating – 79.9% of the total quantity.

The milk yield curves during the morning and the evening milking were relatively similar but the dynamics during the evening milking was lower.

The lactation curve observed by us was more persistent than that observed by Pollott & Gootwine (2004) for the Assaf breed in Italy. The authors point out that during the first control (on day 20 post-lambing), the average daily milk yield of the sheep was 1.86 kg, during the second (between 30th and 50th day) – it increased to 2.14 kg, but during the next control (between day 50 and 80) it diminished to 1.17 kg at 1.563 kg ascertained by us at the end of the third month. Upon a subsequent control, the milk yield of the Assaf sheep increased to 1.34 kg, and during the next two months it remained at a level of around 1 kg, similarly to the data obtained by us.

Upon study of sheep of the BDSP breed in four subsequent years, Ivanova (2013) has ascertained that the milk yield is the highest during the suckling period which lasts 60±5 days – average daily milk yield – 1.342–1.920 kg, and

at the subsequent controls, the milk yield generally decreases but with a lower intensity. The highest milk yield during the suckling period for the same breed, Stancheva et al (2018), with a subsequent slow decrease of the daily milk yield has been also ascertained by (Stancheva et al., 2018, 2021).

Pollott & Gootwine (2004), judge the lactation persistency by the milk yield decrease from the peak to the middle of the lactation period. We consider that this approach can be used for making comparison between the populations only if they reach their lactation peaks at approximately the same time and upon similar lactation duration. In the respective case, the data reported by the authors (Pollott, & Gootwine, 2004) and those obtained by us are comparable and demonstrate that the animals studied by us exhibit a higher lactation curve persistency – the decrease from the peak to the middle of lactation was 8.52 g per day (for 180-day period), while with reference to the Assaf (Pollott & Gootwine, 2004) it was 11.3 g per day (for a 173-day lactation).

One reason for the equalized milk yield of the ewes for 180-day lactation against the considerable differences at the beginning of the lactation (the first control) – from 11.8% (August–March) to 58.5% (July–March) might be attributed to the significant difference in the milk yield monthly dynamics (the lactation curve dynamics) which is reliably ($P < 0.001$) influenced by the month of lambing. Ruiz et al. (2000) have also ascertained that the month of lambing and the number of the live-born lambs have a reliable influence on the milk yield and the lactation curve.

Regardless of their month of lambing, the animals studied by us displayed a 'typical' lactation curve (Ivanova, 2013), which is characteristic of the intensive production systems (Elvira et al., 2013). When such systems are implemented, the milk yield after lambing increases until it reaches its peak around 3rd–5th week after which it starts a downward trend. The alternative is the so called 'non-typical' lactation curve (Ivanova, 2013) which is inherent in the extensive production systems with 'scarce' conditions (Elvira et al., 2013) and whose milk yield decreases from the beginning until the end of the lactation without marking a distinct peak. Typical lactation curves are observed in the Bulgarian dairy synthetic population (Ivanova & Raycheva, 2008).

The lactation peak of the ewes which lambed in the spring was at the end of the second month (Figure 2) with the milk yield being 37% higher than that during the first control (Table 4). The milk yield increased relatively slowly- with 15.7% from the first towards the second half of the month and with 21.3% from the end of the first to the end of the second lactation month. The lactation decreased slowly during

Table 4. Average daily milk yield (kg) dynamics of F4 crosses between the Pleven Blackhead sheep and the Assaf sheep at first lactation. depending on the month of lambing.

Control	Month of lambing											
	March			July			August			September		
	Morning	Evening	Total	Morning	Evening	Total	Morning	Evening	Total	Morning	Evening	Total
1	0.812	0.729	1.541	1.272	1.170	2.442	0.939	0.784	1.723	1.004	0.906	1.910
2	1.003	0.780	1.783	1.367	1.196	2.563	0.970	0.818	1.788	1.052	0.910	1.962
3	1.052	0.825	1.876	0.914	0.820	1.734	1.144	0.981	2.126	1.171	0.939	2.110
4	1.129	0.983	2.112	1.071	0.876	1.947	1.041	0.850	1.891	1.106	0.845	1.950
5	1.075	0.855	1.929	0.900	0.800	1.700	0.935	0.759	1.694	0.896	0.654	1.550
6	1.008	0.709	1.717	0.969	0.740	1.709	0.882	0.690	1.572	0.697	0.556	1.253
7	0.874	0.679	1.553	0.843	0.642	1.486	0.726	0.597	1.322	0.695	0.510	1.205
8	0.824	0.606	1.429	0.711	0.569	1.280	0.660	0.509	1.169	0.721	0.522	1.243
9	0.814	0.574	1.388	0.443	0.390	0.833	0.841	0.560	1.401	0.670	0.497	1.167
10	0.719	0.496	1.215	0.467	0.309	0.776	0.696	0.539	1.235	0.682	0.548	1.230
11	0.721	0.506	1.227	0.690	0.456	1.146	0.592	0.437	1.029	0.547	0.430	0.977
12	0.627	0.511	1.139	0.715	0.588	1.303	0.513	0.387	0.900	0.533	0.328	0.862
13				0.520	0.415	0.935	0.609	0.369	0.977	0.595	0.375	0.970
14							0.508	0.383	0.892	0.448	0.355	0.803
15							0.272	0.200	0.472	0.480	0.290	0.770
16							0.320	0.196	0.516	0.400	0.233	0.633
17							0.368	0.170	0.538	0.350	0.253	0.603
18							0.372	0.206	0.578	0.348	0.220	0.568
19							0.295	0.150	0.445			
20							0.255	0.125	0.380			

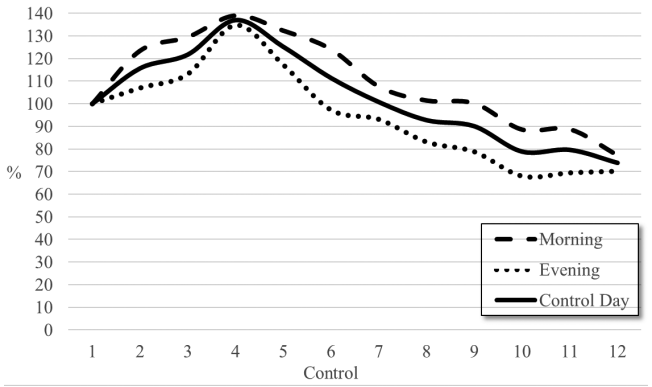

Fig. 2 Lactation curve of F4 crosses between the Pleven Blackhead sheep and the Assaf sheep which lambed in March (% in relation to the first control)

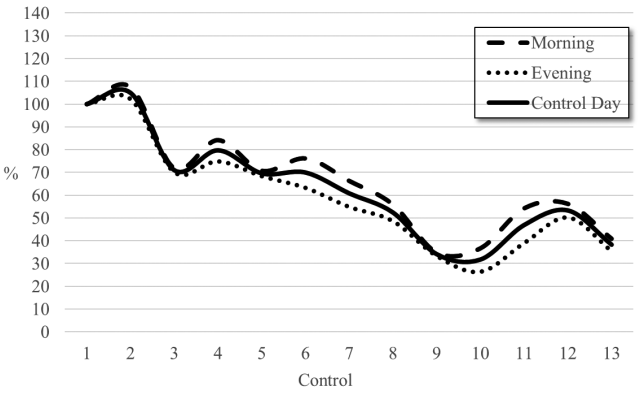

Fig. 3 Lactation curve of F4 crosses between the Pleven blackhead sheep and the Assaf sheep which lambed in July (% in relation to the first control)

the other periods, and on day 120 it was almost at the level displayed during the first control (-6.2%). As from the lactation peak reaching, the most significant decrease was the one until the 90th day – 13.17 g/d. The decrease pace slowed down during the following months, and after the lactation peak, the milk yield fell with 11.38 g/d, 9.97 g/d and 8.11 g/d up to respectively the 120th, 150th and 180th day.

The lactation peak of the ewes which lambed in July was reached at the end of the first month (Figure 3) and the difference with the first control was only 5.0%. Unlike in the case of the ewes which lambed in the spring, the lactation started at a considerably higher level + 58.5% during the first control with the difference from the lactation peak being 21.4%. Pollott & Gootwine (2004) have ascertained a higher milk yield upon summer lambing when compared with lambing during the winter and explain it with the difference in the light day duration. The milk yield of the sheep studied by us, however, sharply decreased after the first month, and during the third control at the end of the second month, it was 20.3% lower than that during the first control and 25.3% lower than the peak milk yield. During the following month the milk yield remained almost at the level of the second lactation month and after that it decreased again. As of the lactation peak until the 90th, 120th and 150th day, the milk yield diminished with almost the same pace – 14.23, 14.26 and 14.89 g/d respectively, but the average decrease up to day 180 was 8.11 g/d due to the milk yield increase from the 6th to the 7th lactation month – with 67.9%.

The lactation peak of the ewes which lambed in August and September was ascertained during the third control – on day 45 post lambing (Figures 4 and 5), and the average peak daily milk yield was practically at the same level. The starting values, however, were different and therefore, the lactation peak milk yield of the ewes which lambed in August was 23.3% higher than that during the first control, and the lactation peak milk yield of those which lambed in September – only 10.5% higher.

The milk yield change of the ewes which lambed in August was too dynamic after its peak. The decrease was the lowest for all groups until the 90th day – 12.31 g/d, while it was the biggest until the 120th day – 15.95 g/d. During the next 15 days the decrease pace slowed down but during the last fifteen days, it accelerated again. As a whole, the total decrease of the milk yield from the lactation peak until day 180 was 13.62 g/d which is 67.9% higher than the milk yield decrease of the ewes which lambed during the spring.

The most significant pace of milk yield decrease was that of the ewes which lambed in September (Figure 5), which can

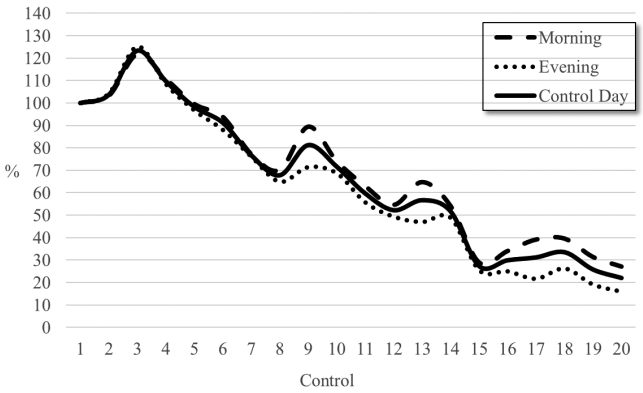

Fig. 4 Lactation curve of F4 crosses between the Pleven Blackhead sheep and the Assaf sheep which lambed in August (% in relation to the first control)

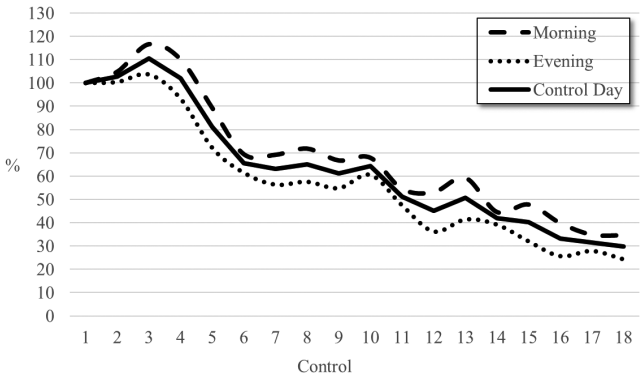

Fig. 5 Lactation curve of F4 crosses between the Pleven Blackhead sheep and the Assaf sheep which lambed in September (% in relation to the first control)

clearly be seen in fig.6 which displays the lactation curves of all 4 ewe groups depending on their period of lambing. The milk yield of the ewes which lambed in September started from a relatively high level (Table 4), reached a peak, comparable to that of the ewes which lambed in March and August, but after the peak it decreased almost by half until the 90th day (-40.6%), with 19.04 g/d. During the next months, the decrease pace slowed down but remained relatively high and, as a whole, until the 180th day, the average decrease after the peak was 14.01 g/d.

The comparison shown in fig.6 clearly displays that the cows which lambed in July had the most dynamic lactation curve whose starting (during the first control) and maximum milk yield were the highest, but obviously, the following summer heat negatively affected the maintenance of high milk yield.

The cows which lambed in the spring exhibited the most persistent lactation curve. It started at the highest lev-

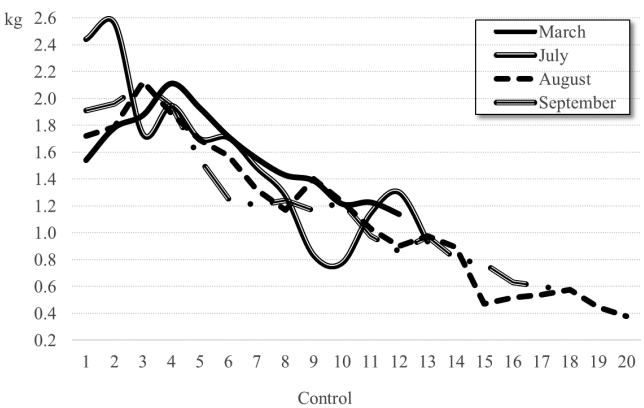

Fig. 6. Lactation curves of F4 crosses between the Pleven Blackhead sheep and the Assaf sheep which lambed in different calendar months

el, reached the peak, which was similar to that of the ewes which lambed in August and September, 15 days later, and from this period until the end of the lactation, the milk yield remained higher in comparison with that of the other groups.

Conclusion

When reared under the conditions of a year-round barn breeding and standardized, high quality feeding, F4 crosses between the Pleven blackhead sheep and the Assaf sheep displayed a high average daily milk yield during their first lactation – 1.584±0.028 kg for 180, and 1.500±0.027 kg for a 300-day lactation period. 82.4% of the ewes were milked until the 180th day of lactation, and 55.3% of them- until the 300th day.

No reliable differences in the milk yield of the ewes which lambed in the 4 periods- March, July, August and September were ascertained, which indicates that the F4 crosses between the Pleven blackhead sheep and the Assaf sheep may be successfully used for a year-round production of milk.

The monthly dynamics of the ewes was reliably influenced ($P < 0.001$) by the month of lambing. The peak was reached at the end of the first month post lambing (2.024 kg/d). The milk yield was retained until the end of the second month (97.6% of the maximum), and after that it gradually decreased to reach 63.2% of the maximum on day 120, and 51.9% on day 180.

The ewes which lambed in the spring displayed the most persistent lactation. It started from the lowest level of 1.541 kg/d on day 15 post lambing, reached its peak (2.112 kg/d) which was similar to that of those animals which lambed in August (2.126 kg/d) and September (2.11 kg/d) 15 days later, and from this period until the 120th lactation day, the milk yield remained higher when compared to that of the other groups. The highest dynamics was observed in the ewes which lambed in July whose lactation started at the highest level (2.442 kg/d) and reached the highest maximum (2.563 kg/d), but until the middle of the second month, the milk yield sharply decreased (1.734 kg/d) and after that it maintained the level of the other groups.

The average daily milk yield dynamics during the lactation period upon morning and evening milking was similar to the closest values displayed by the ewes which lambed in July and August and the biggest differences were displayed by those which lambed in March.

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