NEU PRESS

REPVAS
RESEARCH & PRACTICE in VETERINARY & ANIMAL SCIENCE

Volume: 2 Issue: 1 Year: 2025 Research Article ISSN: 3023-6681

Evaluation of Fertility Parameters and Nutrition-Fertility Relationship in Dairy Cattle Farms in Ereğli District of Konya Province

Ayşe SARI[1*], Ramazan AYAŞ[2], Muhammet Hanifi SELVİ[3]

1 Necmettin Erbakan University, Faculty of Veterinary Medicine, Department of Reproduction and Artificial Insemination, Konya, Türkiye

2 Necmettin Erbakan University, Faculty of Veterinary Medicine, Department of Animal Nutrition and Nutritional Diseases, Konya, Türkiye

3 Necmettin Erbakan University, Faculty of Veterinary Medicine, Department of Animal Sciences, Konya, Türkiye

Article Info

Article History

Received: 25.05.2024
Accepted: 16.10.2024
Online First: 04.12.2024
Published:

Keywords:
Animal nutrition,
Dairy cattle breeding,
Reproductive parameters

ABSTRACT

In this study, 49 dairy farms (total cow number: 2234) in Ereğli district of Konya province were surveyed using a face-to-face questionnaire to obtain information about the dairy farms animal nutrition, care, and reproductive efficiency of dairy farms. The research material consisted of the data obtained from breeders through the questionnaire. The mean values of the calving interval and number of days open were 374.73 (days), and 95.61 (days), and the number of artificial inseminations and natural mating per pregnancy were 2.27 and 1.7 respectively. In our study, the mean duration of the first postpartum estrus was found to be 44.30 days and 71.42% of the dairy farms had estrous between 20-45 days. It was observed that 95.9% of the dairy cattle owners thought that the energy level of the ration, 85.7% of the protein level of the ration, and 73.5% of the vitamin-mineral supplementation were effective on fertility. It was observed that only 10.2% of dairy cattle owners used pasture for nutritional purposes and 89.8% of those who used pasture thought that pasture was inadequate. It is also observed that the breeders in the region are aware of the nutritional conditions. It is also observed that the dairy farmers in the area are aware of the nutritional conditions. In conclusion, it is observed that the dairy cattle farms in the Ereğli district of Konya province are not effective in terms of the reproductive parameters evaluated in the study. Also, these results regarding grazing clearly show that grazing is insufficient in terms of animal nutrition.

To cite this article:

Sarı, A., Ayaş, R. & Selvi M.H. (2025). Evaluation of Fertility Parameters and Nutrition-Fertility Relationship in Dairy Cattle Farms in Ereğli District of Konya Province. *Research and Practice in Veterinary and Animal Science (REPVAS), 2 (1), 34-48.*
https://doi.org/10.69990/REPVAS.2025.2.1.4

***Corresponding Author:** Ayşe Sarı, *ayse.sari@erbakan.edu.tr*

INTRODUCTION

The profitability of dairy cattle farms is directly related to milk yields. Milk yield levels are affected by many cow-related factors such as the genetic structure of the animal, calving age, dry period, service period (days open), or calving interval (Akbulut and Haussmann, 2011). Many of these factors are directly related to reproductive efficiency and fertility parameters. In order to maintain profitability in dairy farms, it is necessary to have one calf per year from a cow (Pekçok and Aksu, 2015; Xu et al., 2000). Therefore, the profitability of dairy cattle farms can only be improved by optimizing fertility parameters (Yılmaz and Sarıözkan, 2020).

The importance of reproductive parameters, which include reproductive characteristics as well as yield characteristics of animals, should not be ignored in order to gain economically in an enterprise. Within physiological and economic limits, it is necessary to maintain reproductive parameters on herd basis in appropriate periods and at appropriate rates. Among these parameters, age at first insemination and first calving, service period, calving interval, first postpartum estrus interval and estrus time determination rate, conception interval and rate at first postpartum insemination, artificial insemination index, total pregnancy rate are generally taken into consideration (Sönmez, 2012).

The age range of heifers suitable for mating or insemination is associated with body weight. It is reported that the age of first calving should be at the age with the most appropriate body weight in order to reduce feed costs in the breeding of heifers and to avoid loss of fertile period time (Akins, 2016). The increase in body weight may vary depending on genetics, breed characteristics or whether the heifers are individually large or small (Hoffman, 2007). For this reason, Van Amburgh and Meyer (2005) suggested evaluating the age at first insemination or first calving based on the heifers having gained a certain percentage of their mature body weight. It is stated that heifers should have gained 55% and 94% of their body weight for first insemination and first calving age, respectively, in order to maximize milk yield (Van Amburgh and Meyer, 2005).

The service period is defined as the period from the birth of the animal until the animal becomes pregnant again. It has been reported that the most appropriate service period in terms of fertility parameters should not exceed 60-90 days. In addition, this period was reported to be 120 days for cows with high milk yield (Ata, 2013; Sönmez, 2012).

The calving interval is defined as the time between two births. The ideal value is reported to be 365 days, but this interval is often reported to be as long as 390 days. The first estrus after calving should be detectable within the first 40 days after calving, while the first insemination or natural mating time after calving should be on the 60th day in healthy cows (Ata, 2013). In order to ensure fertility parameters after calving, it is reported that the estrus detection rate should be at least 80% in the first 60 days and the conception rate should be at least 60% in the first insemination after calving (Sönmez, 2012).

The number of artificial inseminations/natural mating required for each pregnancy to occur in the herd is defined as the artificial insemination index (Kaya et al., 1998). In natural mating, 1.2-1.3 mating for each pregnancy is considered normal in terms of fertility parameters. However, in the case of artificial insemination, this ratio should not be higher than 1.65 inseminations for each pregnancy (Akins, 2016). The pregnancy rate can be calculated separately for each insemination or it can be calculated as the total pregnancy rate with the sum of all inseminations performed in that year. It is calculated as the ratio of the total number of inseminations performed in a given period to the total

number of cows and/or heifers conceived after insemination. The total pregnancy rate should be at least 50% (Dinç and Kutlu, 2015; Parkinson and Barrett, 2009).

Nutrition is one of the factors that affect the proper range of fertility parameters. There is an important relationship between nutrition and fertility. If ruminants are not fed a balanced and adequate diet, fertility may be impaired. Basically, energy level, protein level, fat level, vitamin-mineral level, mycotoxins and anti-nutritional factors in the ration affect fertility.

The energy level of the ration is one of the most important factors affecting fertility. If there is not enough energy in the ration to meet the animal's life and yield requirements, a negative energy balance (NEB) is formed. It has been reported that postpartum uterine involution is delayed, the reconception period is prolonged, the number of inseminations per pregnancy increases, oocyte quality decreases, and infertility may occur in cattle with NEB (Spicer et al., 1990; Yoshida et al., 2007). If the energy level of the ration is higher than the requirement, cows will develop adiposity. As a result of obesity, the body condition score of cows increases. It has been reported that animals with excessive body condition scores, especially in the dry period, rapidly weaken after parturition and their gestation periods are prolonged. (Michael et al., 2019).

If the ration protein level is insufficient, there may be irregularities in the estrous cycle in cattle (Yolcu, 2024). In addition, protein deficiency affects reproductive hormones such as IGF1, estradiol 17β and progesterone and may cause negative effects on ovarian functions (Hayati et al., 2021). In studies, it was reported that the number of inseminations per pregnancy and the service period increased when the ration protein level was high (Rhoads et al., 2006; Sonderman and Larson, 1989). In addition, barley, which is an important feedstuff in closing the shortage of concentrate feed (Oral and Veziroğlu, 2023), can cause acidosis as a result of incorrect ratios used in nutrition, and this situation can also negatively affect fertility.

Deficiency or excess of minerals and vitamins also affect fertility. If calcium deficiency is taken into consideration, it causes a decrease in uterine muscle contractions after birth, delays uterine involution and negatively affects fertility. It has been reported that manganese deficiency causes an irregular estrous cycle, suboestrus, an increase in ovarian cysts and a decrease in fertility (Yolcu, 2024).

The storage of feedstuffs used for nutritional purposes under the right conditions is also very important for the quality of the feedstuffs and therefore the correct nutrition. During transportation and storage of feed, physical factors such as humidity, temperature, or chemical factors such as carbon dioxide and oxygen can cause mold to form and release mycotoxins (Bryden, 2012; Frisvad, 1995). Aflatoxin, fumonisin, ochratoxin, trichothecene, and zearalenone are examples of mycotoxins found in feed (Liu and Applegate, 2020). Maize is used as an important feed source due to its high yield and adaptability (Yerlikaya and Soylu). Mycotoxins such as zearalenone can also be formed in corn silage before or after harvest (during silage making) after some fungal contamination (Richard et al., 2007). It has been reported that these mycotoxins can adversely affect fertility by directly affecting the reproductive system or indirectly affecting other organs and systems (Diekman and Green, 1992).

Some nanoparticles and heavy metals accumulated in water ponds or agricultural lands directly or indirectly affect fertility (Sarı et al., 2023; Verma et al., 2018). The contamination of water resources with heavy metals and especially the use of contaminated water in animal husbandry is a critical environmental problem that negatively affects animal health (Özyiğit, 2021). In addition to nanoparticles and heavy metals in water and feed used in animal nutrition, there may be excessive amounts of nitrate in some cases (Ayaş, 2024). While excessive nitrate intake by ruminants causes

sudden death, low nitrate intake negatively affects both milk yield and fertility (Davison et al., 1964). Fertility problems can also occur in pasture-fed animals. The main reason for this situation is the deterioration of existing pastures due to overgrazing and lack of necessary breeding work over time, and the inability of the animals to meet the nutrient requirements necessary for reproduction and productivity (Armağan and Işık, 2022).

This study aimed to investigate dairy cattle farms in Ereğli district of Konya province in terms of some fertility parameters and nutritional conditions and to evaluate the relationship between fertility and nutrition.

MATERIALS and METHODS

This study was carried out by face-to-face interviews with the 49 owners of dairy cattle farms in Ereğli district of Konya province for a period of 1-3 months. The main material of the study consists of the answers given to the survey questions. There were a total of 2234 cows in all 49 farms, and a total of 35 bulls in 16 farms within these farms. The breeds in the farms were distributed as Holstein (100%), Simmental (48.97%), Holstein-Simmental cross (26.53%) and other breeds (14.28%), respectively.

The first estrus time after calving and the first insemination/mating age were obtained with the information provided by the breeders as an average. The service period was obtained by asking the breeders about the time from calving to the time the cows became pregnant. The calving interval was obtained by adding the pregnancy period to the time from calving to the time they became pregnant, again according to the information provided by the breeders. The obtained data were obtained as the average of all animals on the farm, not as individual data. The number of artificial inseminations/matings required for each pregnancy in the herd was obtained by asking the breeders how many artificial inseminations/matings a cow had to become pregnant and they were asked to state the average.

In dairy cattle farms in Ereğli district, calving interval, service period, first insemination age and the number of insemination/mating per pregnancy and first postpartum estrus values were considered as basic fertility criteria and the target values of these criteria were accepted as ≤390, ≤90, ≥Body Weight 55%, ≤1.65, ≤40, respectively.

In determining the number of farms, the principle of Yamane and Esin (2006) that at least 3% of the sample volume or 10% of the sample volume as stated by Cochran (1977) is sufficient was taken into consideration. In addition, it is also reported that the sample volume increases its ability to better represent the main population as the number of units increases (Sümbüloğlu and Sümbüloğlu, 2017). Dairy farms were randomly selected. The obtained data were analyzed by frequency analysis in SPSS 21.0 statistical program, and numerical and proportional values were obtained (Düzgüneş et al., 1983; Selvi, 2024).

RESULTS

In line with the answers to the questionnaire questions directed to 49 dairy cattle farms in Ereğli district of Konya province, data such as gender, age, education level, age of the owner, farm structure, total number of cattle, distribution of cattle breeds, number of heifers, number of lactating cows, number of pregnant cows, average daily milk yield were evaluated and presented in Table 1.

Table 1. Data on dairy cattle farms

		N	%
Age of owner	21-45	21	42,85
	46-60	22	44,89
	61-74	6	12,24
Gender of owner	Male	45	91,8
	Female	4	8,2
Education level of owner	Literate	3	6,1
	Primary school	28	57,1
	Highschool	10	20,4
	University	6	12,2
	Postgraduate	2	4,1
Number of workers	1-3	47	95,9
	4-5	2	4,1
Age of farms	1-9	12	24,49
	10-19	14	28,57
	20-29	16	32,65
	30-39	3	6,12
	40-44	4	8,16
Type of farm	Open	6	12,2
	Semi-open	43	87,8
Total cattle number	0-19	19	38,77
	20-30	9	18,36
	31-45	7	14,28
	46-90	9	18,36
	91-300	5	10,20
Number of lactating cows	0-15	24	48,97
	16-35	16	32,65
	36-150	9	18,36
Number of heifers	0-10	31	64,58
	11-22	11	22,91
	23-100	6	12,50
Number of pregnant cows	0-20	36	76,59
	21-54	11	23,40
Breeds found in farms (%)			
Holstein		49	100
Simmental		24	48,97
Crossbreed (HoxSim)		13	26,53
Other breeds		7	14,28
Proportional distribution of breeds	Cow number		
Holstein	1589	49	71,12
Simental	285	24	12,75
Crossbreed	213	13	9,53
Other breeds	138	7	6,17
Total	2234	49	100
Daily milk average	0-23	26	53,06
	24-28	18	36,73
	29-51	5	10,20
Lactation period	0-280	10	20,40
	281-320	30	61,22
	321-420	9	18,36
Gestation period	270-280	40	81,63
	281-290	9	18,36

N: Number of dairy cattle farms

When Table 1 is analyzed, among the 49 dairy cattle farms, the age of the farm's owner was observed to be between 46-60 years old with a rate of 44.89%, the gender of the farm's owner was male

with a rate of 91.8%, and the educational status of the farm's owners was observed as primary school graduate with a rate of 57.1%.

The age of the enterprise was found to be mostly in the range of 1-18 years with 51.02%. It was observed that out of 49 dairy cattle farms, 43 were semi-open (87.8%) and 6 were open (12.2%). The total number of cattle was determined as 2234. Of the cattle in the dairy cattle farms, 1589 were Holstein (71.12%), 285 were Simmental (12.75%), 213 were Simmental-Holstein cross (9.53%) and 138 were other breeds (6.17%). While the average daily milk of the dairy cattle farms was between 16-23 liters with a rate of 53.06%, it was observed that only 10.20% of the dairy cattle farms had an average daily milk of 29 liters or more. The average lactation period was calculated as 299.37±6.57 and it was determined that 61.22% of the dairy cattle farms lactated for 281-320 days.

In Table 2, data on reproductive parameters such as calving interval, first estrus period after postpartum, days open, age at first insemination, artificial insemination index, as well as the number of cows per bull and which of the conception methods were more preferred were analyzed.

Table 2. Fertility parameters on dairy cattle farms

Fertility Parameters	N	% of farms	
First postpartum estrus	35	71,42	0-45days
	8	16,32	46-60 days
	6	12,24	61-150 days
Calving interval	9	18,36	300-350 days
	33	67,34	351-400 days
	4	8,16	401-450 days
	3	6,12	451-500 days
Days open	32	65,30	0-94 days
	12	24,48	95-134 days
	5	10,20	135-200 days
First insemination age			
10-13 months	2	4,5	
14-17 months	29	65,9	
18+ months	13	29,5	
First mating age	2	11,8	10-13 months
	12	70,6	14-17 months
	3	17,6	18+ months
No. AI/cow	27	62,79	1-2
	16	37,20	3-5
No. NM/cow	8	50	1-1,9
	8	50	2-3
Breeding method	32	65,3	Artificial Insemination (AI)
	4	8,2	Natural Mating (NM)
	13	26,5	Both of two
No. of cows per bull	16	32,65	7,28 cow

N: Number of dairy cattle farms, NM: Natural mating, AI: Artificial insemination.

It was observed that the calving interval value was between 351-400 days in 67.34% of the dairy cattle farms. When it was requested that the days open should not exceed 90 days, it was determined that it was between 0-94 days in 65.30% of the enterprises. As for the age of first artificial insemination (AI) and first natural mating (NM), it was determined that 65.9% and 70.6% of the owners preferred animals that reached the age of 14-17 months, respectively.

Among the methods used to pregnancy, it was determined that 65.3% of the owners preferred only artificial insemination, 8.2% preferred only natural mating, and 26.5% preferred both artificial insemination and natural mating. When the owners who preferred both methods were asked why they preferred both methods, 66.7% of the dairy cattle farms stated that it was for the guarantee of pregnancy. While 50% of the dairy cattle farms that preferred both methods preferred artificial insemination first, 50% stated that they preferred natural mating first. It was observed that 57.1% of the owners thought that there was a difference between artificial insemination and natural mating in terms of pregnancy success. Of the owners who thought that there was a difference, 65.4% stated that natural mating was more successful, but they reported that they preferred artificial insemination to prevent blood affinity between them. Among the enterprises, only 16 enterprises had bulls. While the average number of bulls per farm was 2.18, the average number of cows per bull was 7.28.

It was found that the animals were removed from the herd after 1-4 lactations in 20.40%, after 5-8 lactations in 46.93% and after 9-11 lactations in 32.65% of the dairy farms. It was observed that 33.3% of the dairy cattle farms preferred to use straw for insemination on the recommendation of their veterinarians and 17.8% of the dairy cattle farms preferred it according to the structure of the animals they breed. It was observed that only 6.8% of the dairy farms used sexed semen. It was observed that the time of first estrus observed after birth was within the desired range of 20-45 days in 71.42% of the dairy farms. The number of natural mating per pregnancy (no. NM/cow) was 1-1.9 matings in 50% of the dairy farms and 2-3 matings in the other 50% of the dairy farms. The number of artificial inseminations per pregnancy (no. AI/cow) was between 1-2 inseminations in 62.79% of the dairy farms. While the mean number of natural mating per pregnancy was 1.70±0.14, the mean number of AI was 2.27±0.94. It was clearly observed that both the number of natural matings and the number of artificial inseminations were not among the normal values in terms of fertility parameters. Nevertheless, 73.5% of the owners were satisfied with the pregnancy rates. 67.3% of the owners stated that they did not use hormones. It was found that 50% of those who used hormones did so for treatment purposes, 25% for synchronization purposes and 25% for both synchronization and treatment purposes.

In response to the question “What could be the reason for fertility problems in cows?” presented in Table 3, 28.6% of the breeders stated that the only reason was feeding. In total, 79.4% of the breeders thought that feeding affected reproduction. In our survey, 70.8% of the breeders answered yes to the question: ‘Do you think you feed your animals enough?’ 43% of the breeders receive technical support in ration preparation. Also, 52.4% of the breeders who receive technical support prefer private consultants. According to our survey, 61.2% of the breeders feed their animals with different rations in different physiological periods. In addition, 95.9% of the breeders believe that the ration energy level affects fertility, and 85.7% believe that the ration protein level affects fertility. While 73.5% of the breeders believe that the ration vitamin and mineral level affects fertility, only 67.3% add vitamin and mineral premix to the ration. 93.9% of the breeders think that feed storage conditions will affect feed quality. Only 10.2% of the breeders use pastures for animal feeding, and 89.8% reported that pastures are insufficient in terms of animal nutrition.

Table 3. Questions and answers about nutrition on dairy cattle farms

Questions and answers about nutrition	N	%
Technical support for ration preparation		
Yes	21	42,9
No	28	57,1
Total	49	100
The same ration for all cattle		
Yes	19	38,8
No	30	61,2
Total	49	100
Effect of ration energy level to reproduction		
Yes	47	95,9
No	2	4,1
Total	49	100
Effect of ration protein level to reproduction		
Yes	42	85,7
No	6	12,2
Total	48	100
Addition of vitamin and mineral to ration		
Yes	33	67,3
No	15	30,6
Total	48	100
Ration change during reproductive period		
Yes	3	6,1
No	46	93,9
Total	49	100
Effect of feed storage conditions to feed quality		
Yes	46	93,9
No	3	6,1
Total	49	100
Effect of mycotoxins to reproduction		
Yes	45	91,8
No	3	6,1
Undecided	1	2
Total	49	100
Sufficient of nutrition		
Yes	34	70,8
No	14	29,2
Total	48	100
Go out to pasture		
Yes	5	10,2
No	44	89,8
Total	49	100
Sufficient of pasture		
Yes	5	10,2
No	44	89,8
Total	49	100
Addition to pasture		
Yes	4	80
No	1	20
Total	5	100

N: Number of dairy cattle farms

DISCUSSIONS

In dairy cattle farms, factors such as the genetic structure of the herd, appropriate herd management, adequacy of care, and nutrition conditions are among the important factors in terms of the economic limits that can be achieved. Therefore, these factors also affect the reproductive parameters of the herd (Inchaisri et al., 2010). Deviation of fertility parameters from target values is reported to lead to financial losses (Sarıözkan et al., 2012).

There is an important relationship between nutrition and fertility in ruminant animals. As a result of our questionnaire study, 28.6% of the farmers stated that the only reason for the fertility problem in cows was nutrition, while 50.8% stated that there were other reasons in addition to nutrition. In total, 79.4% of the farmers think that nutrition affects reproduction.

If ruminants are not fed a balanced and adequate diet, fertility may be disrupted. In the survey we performed, 70.8% of the farmers answered yes to the question 'do you think you feed your animals sufficiently', while 29.2% answered no.

Basically, energy level, protein level, fat level, vitamin-mineral level, mycotoxins and anti-nutritional factors in the ration affect fertility. Therefore, ration preparation is a very important issue and technical support should be obtained. According to our survey, 43% of farmers receive technical support for feed formulation, while 57% do not. Of those who receive technical support, 52.4% prefer private consultants, 23.8% feed dealers, 14.3% veterinarians and 9.5% neighboring dairy farms.

Animals have different nutritional needs at different physiological stages. Different rations should be prepared to meet these needs. Feeding animals with a single ration results in feeding some animals more than necessary and others less than necessary. This situation has a negative effect on fertility. According to our survey, 61.2% of the farmers feed their animals with different rations in different physiological periods, while 38.8% feed their animals with a single ration. Feeding animals with a single ration has advantages in terms of work. However, it can negatively affect both milk yield and fertility.

Ration energy level is one of the most important factors affecting fertility. Excessive ration energy level negatively affects fertility through adiposity. If the ration energy level is lower than necessary, it negatively affects fertility through negative energy balance (NEB) (Michael et al., 2019). According to our survey, 95.9% of the farmers think that ration energy level affects fertility, while 4.1% think that ration energy level does not affect fertility.

The protein content of the diet is another factor affecting fertility. When protein is deficient in the diet, irregularities in the estrous cycle may occur and fertility is adversely affected (Yolcu, 2024). Excess protein in the diet increases blood ammonia concentration and negatively affects fertility (Sonderman and Larson, 1989). According to our survey, 85.7% of owners believe that dietary protein level affects fertility, while 12.3% believe that dietary protein level does not affect fertility.

Mineral and vitamin deficiencies or excesses in ruminant diets affect fertility. According to our survey, 73.5% of farmers reported that dietary vitamin and mineral levels affect fertility, 18.4% reported that dietary vitamin and mineral levels do not affect fertility and 8.2% were undecided. While 67.3% of farmers added additional vitamin and mineral premixes to their rations, 30.6% did not add vitamin and mineral premixes and 2% reported that they sometimes added them. Although 73.5% of farmers believe

that vitamin and mineral levels in rations affect fertility, the fact that 67.3% of them add additional vitamin and mineral premixes to their rations may be due to economic problems in animal husbandry.

Mycotoxins that may occur after poor storage of feeds used in animal nutrition may affect fertility (Liu and Applegate, 2020). According to our survey, 93.9% of the farmers think that storage conditions will affect feed quality, while 6.1% think that they will not. 91.8% of the farmers stated that mold and toxins affect reproduction, 6.1% stated that mold and toxins do not affect reproduction, and 2% were undecided. In response to the question “Do you feed feed with mold to animals?” 89.8% of the farmers answered no, while 10.2% answered yes.

Pasture nutrition is very important in livestock production. It both reduces feed costs and has animal health benefits. However, fertility problems can also occur in pasture-fed animals. The main reason for this situation is the deterioration of existing pastures due to overgrazing and lack of necessary breeding work over time and the inability of animals to meet the nutrient needs for reproduction and productivity (Armağan and Işık, 2022). According to our survey, 10.2% of the farmers use pasture while 89.8% do not use pasture. In response to the question "Are the pastures sufficient in terms of animal nutrition", 89.8% of the farmers stated that the pastures are insufficient in terms of nutrition and additional nutrition is required. Among the farmers who feed their animals in the pasture, 80% of them use additional supplements to the pasture. These results clearly show that pastures are insufficient in terms of animal nutrition.

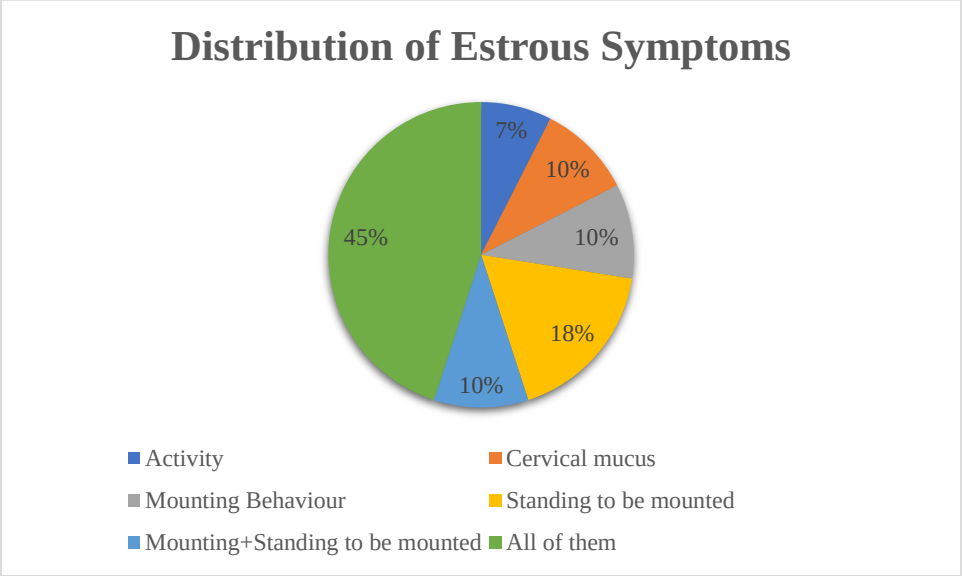
In response to the question "Are there any feeds that you add or remove from the ration to increase the pregnancy rate of cows", 93.9% of the farmers stated that they have not made any changes and 6.1% stated that they have made changes. To increase fertility, there are farmers who add carrots to the ration, add vitamin-mineral premix, add vetch, increase ration energy level and decrease ration alfa-alfa level. However, no clear success has been achieved.

The average calving interval obtained in the questionnaire study was 374.73 from 49 dairy cattle farms. It was determined that 67.34% of the dairy cattle farms were between 351-400 days. The average calving intervals obtained by Akman et al. (2011), İnci et al. (2007), Şahin and Ulutaş (2010), Yılmaz and Sarıözkan (2020) were 388.5, 383.1, 411.2, and 369.9 respectively. The average calving interval obtained in our study is similar to the researchers, but it was observed that the reproductive parameters exceeded the targeted 365 days.

As a result of the survey, the duration of days open was found to be 95.61 days. Considering that the target value should not exceed 90 days, the days open are not within the target range. However, considering other studies, it is reported that the average number of days open of active dairy farms in the survey study conducted by Yılmaz and Sarıözkan (2020) was 82.9 days, and the number of days open in the studies conducted by İnci et al. (2007) and Şahin and Ulutaş (2010) was 135.8 and 99.5 days, respectively. Therefore, the value of days open we obtained is shorter compared to the dairy farms of Polatlı and Altınova. In our study, it was observed that the average duration of the first postpartum estrus was 44.30 days and 71.42% of the dairy cattle farms were between 20-45 days. Considering that the target value should not exceed 40 days and the service period is shorter compared to the dairy cattle farms in other regions, it is concluded that the dairy cattle farms in Ereğli district are doing well in the postpartum estrus follow-up and the follow-up of the postpartum process. In the study conducted by Şahin and Ulutaş (2010), the average age at first insemination was reported to be around 18 months. This situation is similar to the fact that dairy farms in Ereğli district prefer 14-18 months as the age of first mating/insemination. Yılmaz and Sarıözkan (2020) stated that the semi-open type of 3 dairy cattle farms, which they found to be effective in their survey study, can increase the efficiency in terms of

reproductive parameters. In the survey we conducted in Ereğli district, although 87.8% of the 49 dairy cattle farms were semi-open, it was observed that the average of artificial insemination per pregnancy was 2.27 and the average of natural mating per pregnancy was 1.7. Both parameters are not within the target values. The pregnancy rate can also be influenced by various factors such as the correct timing of insemination and regular estrus monitoring. Considering the estrous symptoms and distributions shown in the Figure observed by the breeders in our study, it can be assumed that the breeders are relatively aware.

Figure Distribution of estrous symptoms observed in dairy cattle farms



CONCLUSION

In conclusion, it was found that dairy cattle farms in Ereğli district of Konya province were not effective in terms of reproductive parameters evaluated in the study. Since some parameters are close to the target values, it is assumed that adequate conditions are provided in terms of prenatal and postnatal care and necessary follow-ups are carried out. It is also observed that the breeders in the region are aware of the nutritional conditions. However, it is believed that the desired pregnancy rates can be achieved by improving the nutritional conditions. These results on grazing clearly show that pastures are inadequate in terms of animal nutrition. It is believed that the presented survey study will be useful for researchers as it carries information about regional data of Ereğli district of Konya province.

Ethical Statement

This study is not based on the any master's/doctoral thesis.

This article was not produced by developing and partially modifying the content of the paper presented orally at any symposium, and no full text was published.

Ethics Committee Approval

28/03/2024 dated and 2024/063 numbered was given by Selçuk University, Faculty of Veterinary Medicine Experimental Animal Production and Research Center Local Ethics Committee

Funding

The researchers did not receive funding from any institution or organization for this research.

Conflict of Interest

All authors declare that they have no conflicts of interest.

Author Contributions

Research Design (CRediT 1) Author 1 (%33,3) – Author 2 (%33,3) – Author 3 (%33,3)
Data Collection (CRediT 2) Author 1 (%45) – Author 2 (%55)
Research - Data analysis - Validation (CRediT 3-4-6-11) Author 1 (%33,3) – Author 2 (%33,3) – Author 3 (%33,3)
Writing the Article (CRediT 12-13) Author 1 (%40) – Author 2 (%40) – Author 3 (%20)
Revision and Improvement of the Text (CRediT 14) Author 1 (%40) – Author 2 (%40) – Author 3 (%20)

REFERENCES

Akbulut, Ö., & Haussmann, H. (2011). Buzağılama aralığının süt verim özelliklerine etkisi. *Atatürk Üniversitesi Ziraat Fakültesi Dergisi, 25*(1), 1-13.

Akins, M. S. (2016). Dairy heifer development and nutrition management. *Veterinary Clinics: Food Animal Practice, 32*(2), 303-317.

Akman, N., Ulutaş, Z., Efil, H., & Biçer, S. (2011). Gelemen tarim işletmesinde yetiştirilen Siyah-Alaca sürüsünde süt ve döl verimi özellikleri. *Atatürk Üniversitesi Ziraat Fakültesi Dergisi, 32*(2), 173-179.

Armağan, M., & Işık, M. İ. (2022). Karapınar (Konya) tuzcul alanlarındaki kuraklığa dayanıklı, mera islahında kullanılabilecek bitkiler. *Ereğli Tarım Bilimleri Dergisi, 2* (2), 67-74.

Ata, A. (2013). Sütçü sığırlarda döl verimi ölçütlerinin güncel yorumu. *Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi, 1*(1), 30-41.

Ayaş, R. (2024). Nitrate toxication in ruminants. *A View Of Agriculture From An Academic Perspective,* 143-156.

Bryden, W. L. (2012). Mycotoxin contamination of the feed supply chain: Implications for animal productivity and feed security. *Animal Feed Science and Technology, 173*(1-2), 134-158.

Cochran, W. G. (1977). *Sampling techniques. 3rd edition, John Wiley & Sons, New York.*

Davison, K., Hansel, W., Krook, L., McEntee, K., & Wright, M. (1964). Nitrate toxicity in dairy heifers. I. Effects on reproduction, growth, lactation, and vitamin A nutrition. *Journal of dairy science, 47*(10), 1065-1073.

Diekman, M. A., & Green, M. L. (1992). *Mycotoxins and reproduction in domestic livestock. Journal of animal science, 70*(5), 1615-1627.

Dinç, D. A., & Kutlu, M. (2015). Süt ineklerinde reprodüktif performans parametreleri. *Turkiye Klinikleri J Vet Sci Obstet Gynecol-Special Topics, 1*(1), 17-31.

Düzgüneş, O., Kesici, T., & Gürbüz, F. (1983). *İstatistik metotları I, Ankara Üniversitesi Ziraat Fakültesi Yayınları No: 861. Ders Kitabı,* 229.

Frisvad, J. C. (1995). Mycotoxins and mycotoxigenic fungi in storage. *Stored grain ecosystems,* 251-288.

Hayati, R., Panjono, P., & Irawan, A. (2021). Estrous signs and progesterone profile of ongole grade cows synchronized at different ages fed different level of dietary crude protein. *Tropical Animal Science Journal, 44*(1), 16-23.

Hoffman, P. (2007). Innovations in dairy replacement heifer management. Department of Dairy Science. *Western Dairy Management Conference, March 7-9, Reno, NV,* p 1-13.

Inchaisri, C., Jorritsma, R., Vos, P. L., Van der Weijden, G., & Hogeveen, H. (2010). Economic consequences of reproductive performance in dairy cattle. *Theriogenology, 74*(5), 835-846.

İnci, S., Kaygısız, A., Efe, E., & Baş, S. (2007). Altınova tarım işletmesinde yetiştirilen esmer sığırların süt ve döl verim özellikleri. *Journal of Agricultural Sciences, 13*(03), 203-212.

Kaya, A., Yaylak, E., & Önenç, A. (1998). Süt sığırcılığında düzenli üreme ve önemi. *Hayvansal Üretim, 38*(1), 8-17.

Liu, J., & Applegate, T. (2020). Zearalenone (ZEN) in livestock and poultry: dose, toxicokinetics, toxicity and estrogenicity. *Toxins, 12*(6), 377.

Michael, J., Baruselli, P. S., & Campanile, G. (2019). Influence of nutrition, body condition, and metabolic status on reproduction in female beef cattle: A review. *Theriogenology,* 125, 277-284.

Oral, E., & Veziroğlu, B. (2023). Van ilinde çiftçi şartlarında bazı arpa çeşitlerinin (Hordeum vulgare L.) verim ve verim unsurlarının belirlenmesi üzerine bir araştırma. *Ereğli Tarim Bilimleri Dergisi, 3*(2), 51.

Özyiğit, İ. İ. (2021). Tarım topraklarında ağır metaller; kökenleri, yayılışları ve etkileri. *Ereğli Tarım Bilimleri Dergisi, 1*(1), 46-72.

Parkinson, T., & Barrett, D. (2009). Veterinary control of herd fertility. *In Arthur's Veterinary Reproduction & Obstetrics, 9th Edition* (pp. 517-558). WB Saunders.

Pekçok, D., & Aksu, E. H. (2015). Sığırlarda östrus senkronizasyonu ile birlikte kullanılan döl tutma oranını etkileyen faktörler. *Atatürk Üniversitesi Veteriner Bilimleri Dergisi, 10*(3), 205-210.

Rhoads, M., Rhoads, R., Gilbert, R., Toole, R., & Butler, W. (2006). Detrimental effects of high plasma urea nitrogen levels on viability of embryos from lactating dairy cows. *Animal reproduction science, 91*(1-2), 1-10.

Richard, E., Heutte, N., Sage et al. (2007). Toxigenic fungi and mycotoxins in mature corn silage. *Food and Chemical Toxicology, 45*(12), 2420-2425.

Sarı, A., Sarı, M. M., & Durmaz, E. Ö. (2023). Genotoxic effects of nanoparticles on gamete cells and their potential risks for next generations. *In Nanotechnology in Reproduction* (pp. 101).

Sarıözkan, S., Aral, Y., Murat, H., Aydın, E., & Sarıözkan, S. (2012). Süt sığırcılığı işletmelerinde fertilite bozukluklarından kaynaklanan finansal kayıpların hesaplanması. *Ankara Üniv Vet Fak Derg, 59*(1), 55-60.

Selvi, M. H. (2024). The use of statistics in veterinary sciences and the test methods used. *Research and Practice in Veterinary and Animal Science (REPVAS), 1*(1), 43-50.

Sonderman, J. P., & Larson, L. (1989). Effect of dietary protein and exogenous gonadotropin-releasing hormone on circulating progesterone concentrations and performance of Holstein cows. *Journal of dairy science, 72*(8), 2179-2183.

Sönmez, M. (2012). Reprodüksiyon suni tohumlama ve androloji ders notları. *Fırat Üniversitesi Veteriner Fakültesi, Elazığ, Turkey*, 204-206.

Spicer, L., Tucker, W., & Adams, G. (1990). Insulin-like growth factor-I in dairy cows: relationships among energy balance, body condition, ovarian activity, and estrous behavior. *Journal of dairy science, 73(*4), 929-937.

Sümbüloğlu, K., & Sümbüloğlu, V. (2017). *Biyoistatistik. Hatipoğlu Yayınları*.

Şahin, A., & Ulutaş, Z. (2010). Polatlı tarım işletmesinde yetiştirilen siyah alaca ineklerde süt ve döl verim özellikleri. *Anadolu Tarım Bilimleri Dergisi, 25*(3), 202-212.

Van Amburgh, M., & Meyer, M. (2005). Target growth and nutrient requirements of post-weaned dairy heifers. *Proc. Dairy Calves and Heifers Conference*.

Verma, R., Vijayalakshmy, K., & Chaudhiry, V. (2018). Detrimental impacts of heavy metals on animal reproduction: A review. *J Entomol Zool Stud, 6*(6), 27-30.

Xu, Z., Burton, L., McDougall, S., & Jolly, P. (2000). Treatment of noncyclic lactating dairy cows with progesterone and estradiol or with progesterone, GnRH, prostaglandin F2α and estradiol. *Journal of dairy science, 83*(3), 464-470.

Yamane, T., & Esin, A. (2006). Temel örnekleme yöntemleri. *Literatür Yayıncılık*.

Yerlikaya, S. D., & Soylu, S. (2022). Karapınar koşullarında şeker mısır (Zea mays L. saccharata) çeşitlerinin taze koçan ve hasıl verimlerinin belirlenmesi. *Ereğli Tarım Bilimleri Dergisi, 2*(2), 81-89.

Yılmaz, H., & Sarıözkan, S. (2020). Kayseri ili Yahyalı ilçesi süt sığırcılık işletmelerinde suni tohumlama uygulamaları ve başarıyı etkileyen faktörler. *Erciyes Üniversitesi Veteriner Fakültesi Dergisi, 17*(2), 95-102.

Yolcu, K. (2024). Süt ineklerinde beslenmenin fertilite ile ilişkisi. *Osmaniye Korkut Ata Üniversitesi Fen Bilimleri Enstitüsü Dergisi, 7*(1), 378-398.

Yoshida, K., Murao, K., Imachi, et al. (2007). Pancreatic glucokinase is activated by insulin-like growth factor-I. *Endocrinology, 148*(6), 2904-2913.