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Journal of Dairy, Veterinary & Animal Research

Research Article

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The effect of liquid feeding period on the growth performance of calves

Abstract

In this research, health records of calves born in a private dairy cattle farms with a capacity of 400 dairy cows in Ereğli between October 2020 and October 2021 were evaluated. The data determined in the 70 days from birth to weaning of the calves were recorded individually. The birth and weaning weights of the calves were measured at monthly intervals with a sensitive electronic scale up to 100 kilograms. Calves were barned in individual calf hutches and roughage and concentrate feed were offered separately and freely in front of them. Calves received colostrum from their mothers for 3 days. For 70 days, they were fed totally 6 litres of milk twice a day. Commercial calf growth feed with 18% crude protein and 2800 Kcal/kg ME energy was purchased and high quality alfalfa grass produced in the farm was used in calf feeding. Health observations of the calves were made by the technician by scoring cough, nasal discharge, condition of eyes and ears and faeces according to the results of the health observations. The controls and treatments of the calves were carried out according to the health observation scores and the treatment recommended by the veterinarian. During the study period, respiratory tract infection, umbilical cord infections and diarrhoea were determined as the diseases detected in the farm.

In the farm, 11,64% of the calves were treated for health problems such as respiratory tract infection, umbilical cord inflammation, enteritis and diarrhoea. In this study, the fact that the sick calves have a lower weaning weight of 3 kg compared to healthy calves and the treatment costs reveal the importance of prevention programmes instead of treatment for the profitability of the daily farms.

Keywords: calf, liquid feeding, disease, growth.

Volume 13 Issue 2 - 2024

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Received: July 15, 2024 | **Published:** August 02, 2024

Introduction

The fundamental aim of calf feeding systems is to provide optimal conditions that promote healthy growth, development, and anticipated milk yield. Health is a crucial aspect emphasized throughout every stage of animal life. Calves endeavor to develop their immune systems after birth. The diseases they encounter during this process can contribute to strengthening their immune systems by stimulating them. However, an excessive disease incidence can weaken the immune system and cause calves vulnerable. Hence, health-focused rearing programs are designed, and protective methods and protocols are implemented to mitigate losses. Calf diseases encountered in cattle farming operations can lead to deviations from economic production levels both at the operational and national levels, suppressing genetic potential and resulting in production losses. Additionally, these diseases affect farm economics not only due to medication costs but also because of their long-term impact on animal performance.

Diseases can cause economic losses to farm owners. Expenses on medication, veterinary interventions, lost animals, and reduced yields can diminish farm profitability. Healthy calves require fewer medical interventions and may result in lower economic losses. When animals fall ill, they may divert energy from growth and development to combat disease agents, leading to decreased performance and increased risk of calf mortality (Stanton et al., 2012; Windeyer et al., 2014).

Protocols and practices employed in calf rearing on farms also influence calf health, development, and performance. Diseases can adversely affect the overall welfare of animals. Pain, discomfort, loss of appetite, and stress can reduce calf welfare, leading to long-term health problems and reduced productivity. Therefore, it is expected that each farm develops solutions tailored to its own conditions, especially targeting critical periods. Calves experience rapid growth and development from birth. Healthy growth and development are crucial for reaching adulthood and efficiently participating in production. Hence, prevention and effective treatment of diseases in calves are of paramount importance.

The liquid feeding period in calves poses a more risky phase due to the immaturity of their immune systems and their monogastric nature. Health issues during this period can significantly affect the overall health and growth performance of calves.[1,2]

Diseases during the liquid feeding period in calves can arise due to various factors. These diseases are often observed in the first few weeks after birth when the immune system of the calves is not yet fully developed, making them more vulnerable. During the liquid feeding period in calves, conditions such as loss of appetite, weakness, dehydration, slow growth rate, respiratory distress, fever, and diarrhea can occur due to environmental, nutritional, and infectious factors. One or a combination of these factors can lead to the emergence of diseases during the liquid feeding period in calves.[2]

In this study, health records of calves born on a private dairy farm with a capacity of 400 milking cows between October 2020 and October 2021 were evaluated. During the period of record-keeping on the farm, 16 stillbirths occurred. Data collected over the 70 days from birth to weaning of the calves were recorded individually.

Materials and methods

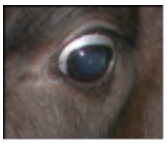
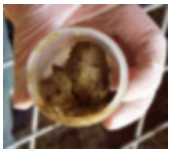
Health records of calves born on a private dairy farm with a capacity of 400 milking cows in Ereğli between October 2020 and October 2021 were evaluated. During the period of record-keeping

on the farm, 16 stillbirths occurred. Data collected over the 70 days from birth to weaning of the calves were recorded individually. Birth weights and weaning weights of the calves were measured using a precise electronic scale available on the farm, up to 100 kilograms, at monthly intervals.

Calves were housed in individual calf hutches and provided with free access to roughage and concentrate feed separately. Calves received colostrum from their mothers for 3 days. They were fed twice daily with 6 litres of milk per day for 70 days. A commercial calf growth feed with 18% crude protein and 2800 Kcal/kg ME energy content was purchased for calf feeding on the farm, along with high-quality alfalfa hay produced on the farm.

Health observations of the calves were conducted by the farm technician based on the health observation scoring criteria given in Table 1, considering coughing, nasal discharge, condition of the eyes and ears, and fecal scores. Based on the health observation scores of the calves, checks and treatments were initiated according to the treatment recommended by the farm veterinarian. Respiratory tract infections, navel infections, and diarrhea were identified as diseases detected on the farm during the study. The scoring criteria used for health observation of the calves (coughing, nasal discharge, condition of the eyes and ears, and fecal scores) are provided in Table 1.

Table 1 Scoring criteria used in health observation of calves

	Calf health observation chart			
	0	**1**	**2**	**3**
Body temparature	32-38	38-39	39	≥39
Cough	none	rare	intermitant	peristant
Nasal Discharge	 Normal	 Small amount of unilateral purulent discharge	 Bilateral purulent or excessive discharge	 Excessive amount of catarrhal discharge
Eyes	 Normal	 A small amount of mucosal discharge	 Moderate serosal discharge on one side	 Severe catarrhal inflammation
Eyes	 Normal	 Ear twitching or head shaking	 Minimal unilateral falls	 Head down or both ears low
Feces	 Normal	 Semi-formed pasty consistency	 Watery but stays on the base	 Very watery and flows under the base

In the study, a one-way analysis of variance (ANOVA) using the SPSS program was conducted to determine whether there was a statistically significant difference between the mean values of birth weight, weaning weight, total weight gain, and daily live weight gain of the groups that experienced disease during the liquid feeding period and those that did not.

Results and discussion

In the farm, 11.64% of the calves received treatment due to health problems such as respiratory tract infections, umbilical cord inflammation, enteritis, and diarrhea. The distribution of the number of diseases according to calf birth weights is provided in Table 2.

It's evident from Table 2 that the highest number of sick calves were born in the weight range of 36-40 kg. However, it was observed that female calves born on the farm had an average live weight of 39.28 ± 0.328 kg, with the median value (Median or Middle Value; the value that falls in the middle when all values in the dataset are arranged in ascending order) and mode (the most frequently occurring value in the dataset) being 40 kg. The averages ranged from 21 kg to 54 kg.

Table 2 Disease incidence according to calf birth weights

Calf birth weight groups (kg)	Incidence of disease %
30	11,76
31-35	17,65
36-40	38,24
41-45	20,59
46>	11,76

Citation: Göncü S, Sucak MG. The effect of liquid feeding period on the growth performance of calves. *J Dairy Vet Anim Res.* 2024;13(2):71–74. DOI: 10.15406/jdvar.2024.13.00352

The highest incidence of disease in calves (Figure 1) is reported during the summer and autumn seasons. Seasonal variations (rainfall, extreme cold, and excessive heat) induce stress in calves, thereby lowering their immune system and consequently reducing resistance to diseases,[1-3] reported that the overall disease rate in calves was 73.6%, while the average mortality rate was 13.3% when considering stillbirths and 9.6% when not considering them. They also noted that the highest mortality rate was 10.4% during the winter season. [3]Reported a statistically significant relationship between calf breed and disease and mortality rates. They stated that 68.6% of Simmental breed calves had been ill at least once, with 54.9% recovering and 13.7% resulting in death. Küçükoflaz and Sarıözkan [3] also reported that disease and mortality rates in Simmental breed calves were significantly higher, at 11.7% and 6.5%, respectively, compared to Holstein calves.

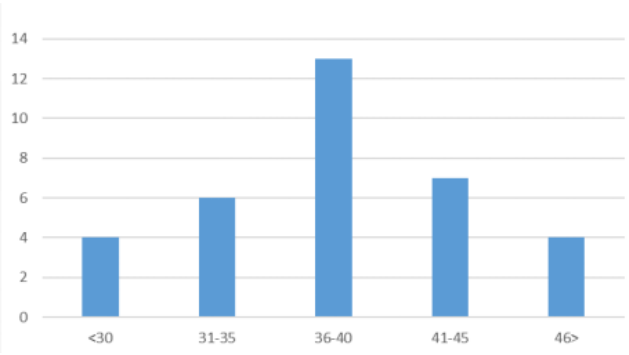


Figure 1 Distribution of diseases according to calf birth weights.

Yıldırım and Koçak (2019) reported a higher mortality rate in Simmental calves (12.6%) compared to Holstein calves (8.2%). Maternal age is an important factor in calf disease and mortality rates[4–7] John et al., 2019). Adaptation to regional conditions and the high levels of colostrum immunoglobulins (IGs) in older dams, as well as the reduced occurrence of birth problems, can be considered influential factors in maternal age.

Sellers[8] noted differences in immunoglobulin levels in calves, with 41% having Ig levels below 1000 mg/dL. Although colostrum delays the development of active immune response in calves, it is crucial for protecting them from diseases during the neonatal period[9,10] Consumption of quality colostrum in the first few hours after birth plays a significant role in calf health.[11]

Timely consumption of sufficient quantity and quality of colostrum orally contributes to the development of natural (passive) immunity in calves.The performance analysis results of calves that experienced and did not experience diseases are summarized in Table 3.

Table 3 Performance analysis results of calves with and without disease

Disease condition		N	Mean	Std. Error	Minimum	Maximum
Birth weights (kg)	No	258	39,41	,33	21,00	54,00
	Yes	34	38,24	,92	30,00	50,00
	Average	292	39,28	,31	21,00	54,00
Significany			0,222			
Weaning weights (kg)	No	258	82,53	,52	55,00	112,00
	Yes	34	79,53	1,51	67,00	95,00
	Average	292	82,18	,49	55,00	112,00
Significany			,052			
Daily Live Weight Gain (DLWG	No	258	,634	,01	,38	1,03
	Yes	34	,607	,02	,32	,79
	Average	292	,631	,01	,32	1,03
Significany			,167			

While no statistically significant differences were found in birth weights (kg) between calves that experienced and did not experience diseases, significant differences were observed in weaning values ($p < 0.052$).

Looking at Figure 2, which shows the birth weights of calves that experienced and did not experience diseases, it is evident that the birth weights are 38.24 kg and 39.41 kg (Figure 2), with a difference of 3 kg between those that experienced diseases and those that did not.

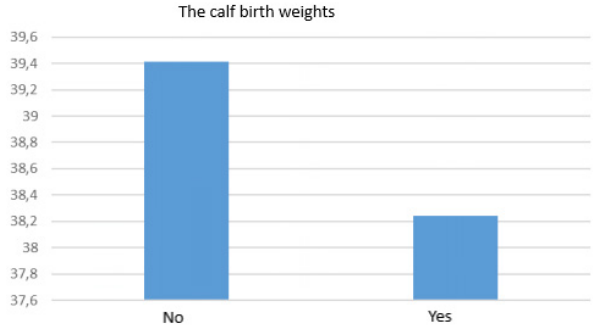


Figure 2 The calf birth weights by disease status.

Upon examining Figure 3, which illustrates the weaning weights of calves that experienced and did not experience diseases, it is determined that the weights are 79.53 kg and 82.53 kg, respectively. The difference indicates that calves that experienced diseases Figure 3. completed the process with a weight 3 kg lower than those that did not.

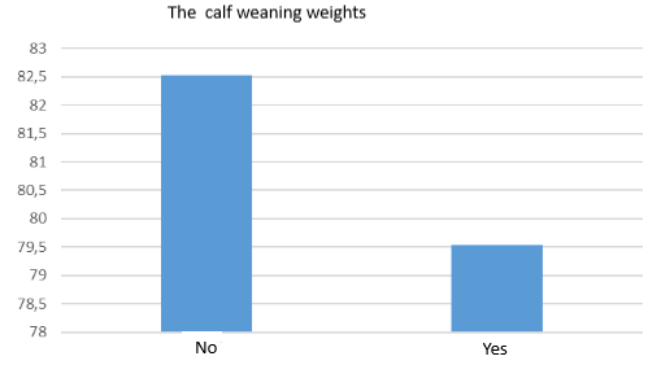


Figure 3 The calf weaning weights by disease status.

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Upon examining Figure 4, which illustrates the daily weight gains of calves that experienced and did not experience diseases, it is determined that the weight gains are 0.607 kg and 0.634 kg, respectively.

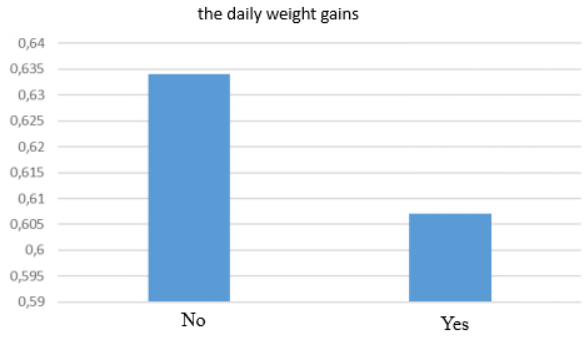

Figure 4 The calf daily weight gains comparisons.

Tandoğan[12] conducted a study on calves born and raised healthy in a farm, reporting that the largest expense was feed cost (47.8%), followed by labour cost (26.9%). Günlü[13] reported in their study on dairy farms in Afyon that their major expenses were feed (58.5%) and labour (15.7%). However, in the case of sick calves, additional expenses include labour, veterinary services, medication, and bedding costs, and in the case of calf mortality, additional expenses such as labour, veterinary services, medication, and the cost of the deceased calf are added, thereby increasing costs. Therefore, instead of treatment after the calf becomes ill, it is necessary to minimize calf losses through herd health protection protocols.

In farms, identifying the factors causing diseases, colostrum management,[11] biosecurity practices, timely and correct vaccinations, attention to animal welfare practices,[14] and taking necessary precautions during seasonal transitions can make a significant difference in reducing calf losses and hence expenses.

Conclusion

Productivity in animal husbandry causes significant losses, especially due to calf mortality and diseases during the liquid feeding period. In addition to basic biosecurity rules, each operation must create and follow a protocol tailored to its own conditions, taking into account critical periods that may vary by season. Factors such as the sensitivity of the breed used in operations, the ages of cows in the herd, colostrum quality, and the method and management of colostrum use create significant differences among operations.

This study highlights the importance of preventive programs over treatment for the profitability of operations, considering that calves that become ill have a lower weight deficit from milk, around 3 kg, compared to healthy calves, and taking into account treatment costs. In terms of productivity in animal husbandry, following health protection programs, maintaining regular and reliable records, vaccination, and segregation based on monitoring and testing, and taking necessary precautions are important for protecting calves from diseases.

Acknowledgments

None

Funding

None.

Conflict of interest

The authors declare that there are no conflicts of interest.

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DOI: 10.15406/jdvar.2024.13.00352