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THE EFFECT OF FEEDING ON MILK PRODUCTIVITY IN DAIRY COWS

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Abstract:
This study investigates the impact of different feeding strategies on milk productivity and composition in dairy cows. Three feeding regimens were compared: a conventional diet (control group), Total Mixed Ration (TMR), and a phase-specific diet. The results indicate that both TMR and phase-specific diets significantly increased milk yield, protein, and fat content compared to the control group. Additionally, feed efficiency and body condition scores were higher in the experimental groups. The findings suggest that optimized, tailored feeding strategies can enhance milk production, quality, and overall cow health, offering valuable insights for dairy farming practices.

Keywords: Dairy Cows, Milk Productivity, Feeding Strategies, Total Mixed Ration (TMR), Milk Composition, Protein Content, Fat Conten, Feed Efficiency, Body Condition Score, Dairy Farming Practices, Nutritional Management.

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Introduction

Milk productivity in dairy cows is one of the most critical factors influencing the profitability and sustainability of dairy farming. Nutrition plays a fundamental role in optimizing milk yield and ensuring the health and longevity of dairy cows. Proper feeding strategies not only enhance milk quality and quantity but also reduce environmental impacts and improve animal welfare.

This article aims to explore the relationship between feeding practices and milk productivity in dairy cows. By combining a detailed review of existing literature and experimental data, the research focuses on identifying effective nutritional strategies that maximize milk yield while maintaining cow health. The study also highlights research methodologies used to evaluate the impact of feeding on productivity, offering a comprehensive view of the subject.

Literature Review

The relationship between feeding practices and milk productivity in dairy cows has been extensively studied, with research emphasizing the critical role of nutrition in maintaining optimal lactation performance. Studies indicate that a balanced diet, incorporating macronutrients such as carbohydrates, proteins, and fats, alongside essential micronutrients, directly influences milk yield and composition [4].

One of the foundational theories in dairy nutrition highlights the importance of the energy-protein balance. According to Johnson and Miller [2], energy deficiencies during lactation reduce milk production, while excess energy leads to metabolic disorders. Similarly, inadequate protein intake results in lower milk protein content, demonstrating a clear link between nutrient availability and milk quality.

Research also underscores the significance of feeding strategies such as Total Mixed Rations (TMR) and phase feeding. Total Mixed Rations ensure that cows receive a consistent and balanced supply of nutrients in every bite, improving feed efficiency and minimizing fluctuations in milk yield [3]. On the other hand, phase feeding, which adjusts dietary composition based on lactation stages, optimizes nutrient utilization and supports long-term productivity [1].

However, gaps remain in understanding the interplay between environmental factors, individual cow physiology, and feed quality. For instance, climate variations can affect forage availability and nutrient density, necessitating region-

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specific feeding models. Moreover, recent advances in precision feeding technologies, such as automated feeders and nutrient tracking systems, have yet to be fully explored in academic literature.

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Research Methodology

This study employs a mixed-methods approach to investigate the effect of feeding practices on milk productivity in dairy cows. The methodology integrates experimental trials, field observations, and statistical analysis to ensure robust and reliable results.

Study Design

The research was conducted on 60 lactating Holstein-Friesian cows divided into three groups, each subjected to different feeding regimens:

1. Control Group: Fed with a conventional diet based on forage and concentrates.

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2. Experimental Group A: Fed with a Total Mixed Ration (TMR) optimized for protein and energy balance.
3. Experimental Group B: Fed with a phase-specific diet tailored to the cows' lactation stages.

Data Collection

Data was collected over a 90-day period, focusing on the following parameters:
Milk Yield: Measured daily using automated milk meters.
Milk Composition: Analyzed weekly for fat, protein, and lactose content using infrared spectroscopy.
Feed Intake: Monitored through digital feeders to calculate dry matter intake (DMI).
Body Condition Score (BCS): Evaluated monthly to assess the cows' physical condition.

Statistical Analysis

The collected data was analyzed using statistical software (e.g., SPSS or R). The following methods were applied:
1. Analysis of Variance (ANOVA): To compare milk yield and composition across feeding groups.
2. Correlation Analysis: To assess relationships between feed intake, body condition, and milk productivity.
3. Regression Models: To predict milk yield based on dietary factors and physiological variables.

Ethical Considerations

The study adhered to ethical guidelines for animal research, ensuring humane treatment and minimizing stress. All procedures were approved by the institutional animal care and use committee.

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Findings and Discussion

Milk Yield and Composition

The results from the three feeding regimens demonstrated significant differences in milk yield and composition. The control group, receiving the conventional diet, produced an average of 24 liters of milk per day. In contrast, cows in Experimental Group A (fed with Total Mixed Ration, TMR) showed a 15% increase in milk yield, averaging 27.6 liters per day. The cows in Experimental Group B, which were fed according to a phase-specific diet, demonstrated an even greater improvement, yielding an average of 29 liters per day.

Regarding milk composition, Experimental Group A and Experimental Group B showed higher levels of protein and fat content compared to the control group. On average, milk from the experimental groups contained 3.5% protein and 4.8% fat, while the control group produced milk with 3.2% protein and 4.5% fat. These results align with the hypothesis that balanced nutrition, tailored to the cow's lactation needs, improves both milk yield and quality.

Feed Intake and Efficiency

Feed intake was monitored to assess the efficiency of different feeding strategies. The cows in the TMR group exhibited higher feed efficiency, with a dry matter intake (DMI) of 19 kg per day compared to 17.5 kg per day in the control group. However, the cows in Experimental Group B had the highest feed efficiency, with a DMI of 20 kg per day. These findings indicate that phase-specific feeding, tailored to the nutritional needs of cows at different lactation stages, contributes to better feed utilization and improved milk production.

Body Condition and Health

Body condition scoring (BCS) revealed that cows in Experimental Group B maintained a more consistent body condition throughout the study period. The average BCS score in this group was 3.5, indicating optimal health and energy reserves for lactation. In contrast, cows in the control group and Experimental Group A had lower average BCS scores (3.2 and 3.3, respectively), suggesting that their nutritional strategies were less effective in maintaining body condition during lactation.

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Comparison with Previous Studies

The results of this study are consistent with previous research on the effect of feeding practices on dairy cow productivity. For example, studies by [3] and [1] also demonstrated that Total Mixed Ration feeding improves milk yield and quality compared to conventional feeding methods. Furthermore, the benefits of phase-specific feeding observed in this study support findings by Johnson and Miller (2019) [2], who suggested that adjusting diets according to lactation stages can optimize both feed utilization and milk production.

Implications for Dairy Farming

Feed consumption during the first 90 days of lactation for cows in the experimental group fed with Stafintov variety pumpkin (average per head)

Feeds and their nutritional value	Guruhlar		
	Nazorat	I tajriba	II tajriba
Wheat straw	354	354	354
Various grass hays	545,9	545,9	545,9
Corn silage	1342,6	1342,6	1342,6
Alfalfa hay	907,3	907,3	907,3
Squash (Stafintov)	600	900	1200
Wheat bran	265,5	265,5	265,5
Cotton meal	94,4	94,4	94,4

The findings of this study emphasize the importance of providing balanced, tailored nutrition to dairy cows. Feeding strategies such as Total Mixed Ration (TMR) and phase-specific diets not only increase milk yield but also improve milk composition and feed efficiency. This has significant implications for dairy farmers, as adopting these feeding practices can lead to higher productivity and better economic outcomes. Moreover, maintaining optimal body condition through proper feeding reduces the risk of metabolic disorders, ensuring the long-term health and performance of dairy cows.

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Table 1: Comparison of Milk Yield and Composition by Feeding Regimen

Feeding Regimen	Milk Yileld (kg/day)	Milk protein (%)	Milk Fat (%)	Dry Mattet intake (kg/day)	Body Condition Score
Control Goup (Conventional diet)	14,3	3,2	4,5	6,5	3,2
1-Experimental Group (TMR)	17,6	3,5	4,8	7,0	3,3
2-Experimental Group (Phase Specific diet)	19,8	3,5	4,8	8,5	3,5

Conclusion and Recommendations

Conclusion

According to the results of the scientific study, the cows of the control group, which received 6 kg of Stafintov pumpkin per head per day, produced an average of 14.3 kg of milk per day. The cows of the first experimental group, which consumed 10 kg of Stafintov pumpkin, produced 17.6 kg of milk per day. The dairy cows of the second experimental group, which consumed 13 kilograms of Stafintov pumpkin, produced 19.8 kg of milk. If we compare these results, the cows of the second experimental group with the highest indicators produced 5.5 kg and 2.2 kg more products than the cows of the control and first experimental groups, respectively, or 27.7% and 11.1%. This study clearly demonstrates the significant impact of feeding practices on milk productivity and overall health in dairy cows. The findings highlight that optimized feeding strategies, particularly the use of Total Mixed Rations (TMR) and phase-specific diets, contribute to a marked improvement in both milk yield and milk composition. Furthermore, these feeding regimens were associated with higher feed efficiency and better maintenance of body condition, which are essential for sustaining milk production throughout lactation.

The results align with existing literature, supporting the hypothesis that nutrition directly influences lactation performance and the long-term productivity of dairy cows. By providing a balanced diet that meets the cows' energy, protein, and

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micronutrient needs, dairy farmers can maximize milk yield, enhance milk quality, and improve the overall health and welfare of their animals.

Recommendations

1. Adoption of Total Mixed Ration (TMR) Systems: Dairy farmers are encouraged to implement Total Mixed Ration systems, as these diets ensure that cows receive a consistent and balanced nutrient intake throughout the day, leading to improved milk yield and quality.
2. Phase-Specific Feeding Programs: Given the benefits observed in Experimental Group B, phase-specific feeding should be further explored and adopted. Adjusting the diet according to lactation stages ensures that cows receive optimal nutrition at critical times, improving both feed efficiency and overall health.
3. Precision Feeding Technologies: The integration of precision feeding technologies, such as automated feeders and nutrient monitoring systems, can further enhance feeding accuracy and reduce feed waste. These technologies allow farmers to monitor nutrient intake more closely and adjust feeding regimens as needed.
4. Further Research: While this study provides valuable insights, further research is needed to explore the long-term effects of different feeding strategies on cow health and productivity, especially under varying environmental conditions. Additionally, research on the economic viability of implementing advanced feeding systems in different dairy farming contexts should be prioritized.
5. Based on the results of this study, we recommend adding 13 kg of Stafintov pumpkin per head per day to the diet of cows from small cattle farms in order to maintain high milk productivity during the winter period and to meet the cows' demand for carbohydrate foods.

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