

ENHANCING MILK YIELD AND QUALITY IN DAIRY COWS THROUGH INCLUSION OF ORANGE-FLESHED FODDER PUMPKIN IN THE DIET

Feruza Varashilova

Student at Samarqand State University of Veterinary Medicine,
Livestock and Biotechnology, Tashkent Branch

Abdimalik Yangiboev

Associate Professor at Tashkent Branch of Samarkand State University of
Veterinary Medicine, Livestock and and Biotechnology, Doctor of Agricultural Sciences

Ilyosjon Kholbutaev

Doctor of Agricultural Sciences, Associate Professor, Tashkent Branch of Samarkand
State University of Veterinary Medicine, Livestock and Biotechnology

Abstract:	Keywords:
This study examines the effects of incorporating orange-fleshed fodder pumpkin into the diet of dairy cows on milk yield, milk composition, and feed efficiency. The research revealed that the pumpkin variety used, due to its high digestibility, rich energy content, and beta-carotene levels, improved overall cow health and lactation performance. Experimental results indicated an increase in milk fat, dry matter, and energy content of milk, as well as better feed conversion efficiency. Economic analysis demonstrated that using this locally available and inexpensive feed source is cost-effective and enhances farm profitability. These findings support the inclusion of orange-fleshed fodder pumpkin as a practical nutritional supplement in dairy cow diets.	Milk production, fodder pumpkin, orange-fleshed variety, dairy cows, diet, feed efficiency.

Introduction

Main Research Findings:

Nowadays, due to the rapid growth of the global population, urban expansion, and the reduction of agricultural land, maintaining a stable increase in milk production has become a pressing issue. In particular, factors such as climate change, stress on animals in large-scale dairy farms, shortages of feed resources, and insufficiently effective veterinary services are disrupting the balance of the milk supply chain. Additionally, in some regions, production does not meet demand, and losses during storage and processing pose a threat to global food security.

Globally, the increasing population, urban expansion, and reduction of arable land have created significant challenges in sustaining dairy production. Additionally, climate change, insufficient veterinary services, and limited access to quality feed reduce the efficiency of dairy operations. In some regions, milk supply does not meet demand due to losses during storage and processing, threatening food security.

In Uzbekistan, small-scale dairy farms often face feed shortages, lack of modern milking technologies, and insufficient availability of high-yielding cow breeds. To overcome these challenges, national programs have focused on improving feed resources, implementing modern feeding techniques, and enhancing the genetic potential of dairy herds. Incorporating nutrient-rich local feed crops, such as orange-fleshed fodder pumpkin, can play a crucial role in increasing milk productivity and maintaining cow health. Orange-Fleshed Fodder Pumpkin (*Cucurbita maxima*) is a rich source of beta-carotene, vitamins A, C, B-complex, easily digestible fibers, and natural sugars. It can serve as a functional feed additive that benefits dairy cow health, immunity, and milk quality.

Previous studies indicate that diets enriched with beta-carotene improve milk yield, reproductive performance, and milk composition, including fat and protein content.

Material and Methods

Objective:

To assess the effect of feeding orange-fleshed fodder pumpkin on the protein-carbohydrate balance in dairy cow diets during autumn-winter, aiming to improve milk yield and prevent metabolic disturbances.

Tasks:

- Determine the optimal pumpkin inclusion level for lactating cows.
- Evaluate milk yield, milk composition, and feed efficiency in experimental groups.
- Assess economic efficiency of pumpkin supplementation.

Methods:

The study followed standard zootechnical procedures. Milk yield and quality were measured at the beginning, middle, and end of the experiment. Milk components, including fat, protein, dry matter, and lactose, were analyzed using a Lactan milk analyzer. Blood parameters (morphology and biochemistry) were examined to assess cow health. Feed analysis followed standardized laboratory procedures for dry matter, protein, energy, fiber, and mineral content. Statistical analysis used arithmetic mean, standard error, and intergroup comparisons for significance. Economic efficiency was calculated based on feed costs, milk yield, and profit margins.

RESULTS AND DISCUSSION

Feed Intake and Nutritional Value

Milk Yield

- Cows supplemented with orange-fleshed fodder pumpkin showed a significant increase in daily milk yield compared to the control group.
- Average milk yield in the experimental group increased by approximately 10–15%, indicating a positive effect of pumpkin supplementation on lactation performance.

Milk Composition

- Milk from cows receiving pumpkin supplementation demonstrated higher fat content (by 0.3–0.5%), protein content (by 0.2–0.4%), and total solids compared to the control group.
- Beta-carotene levels in milk were significantly higher in the experimental group, enhancing the milk's nutritional and functional value.

Cow Health and Body Condition

- The experimental group maintained a better Body Condition Score (BCS), reflecting improved energy balance and general health.
- No adverse effects on cow health were observed, indicating that pumpkin supplementation is safe and well-tolerated.

Digestive Efficiency

- The dietary fiber and natural sugars in pumpkin improved rumen fermentation and nutrient digestibility.
- Improved digestive efficiency likely contributed to increased milk production and better milk composition.

Overall Performance

- Pumpkin supplementation positively affected cow productivity, milk quality, and metabolic status.
- The results suggest that orange-fleshed fodder pumpkin is an effective functional feed additive for enhancing lactation performance in dairy cows.

Literature Review

Beta-carotene and vitamin A-enriched feeds have been shown to improve milk yield and enhance cow health.

Plant fibers improve milk composition, support digestive health, and stabilize gut microbiota. Natural sugars in pumpkin increase dietary energy availability, positively influencing milk production.

Research suggests that incorporating 5–15% of pumpkin (dry matter basis) into the diet significantly increases milk yield.

In the experiment, three groups of cows were fed diets differing in pumpkin inclusion: control (no pumpkin), Group I (5 kg/day), and Group II (7 kg/day per cow). Feed intake and nutritional values for the first 90 days of lactation are presented in Table 1..

Table 1 Feed intake and nutritional value of diets with orange-fleshed fodder pumpkin (kg per cow)

Feed Type	Control	Group I	Group II
Wheat straw	30	30	30
Mixed hay	630	630	630
Maize silage	1620	1350	1170
Alfalfa silage	900	720	720
Fodder pumpkin	-	450	630
Wheat bran	207	207	207
Cottonseed meal	180	180	180
Dry matter (kg)	1818.9	1945	1971.9
Feed units	1287	1314	1341
Metabolizable energy (MJ)	14234.4	16459.2	17485.2
Crude protein (kg)	298.8	301.5	306.9
Digestible protein (kg)	203.4	205.2	209.7
Crude fat (kg)	62.1	73.8	79.2
Crude fiber (kg)	532.8	569.7	587.7
Nitrogen-free extract (kg)	837	891	909
Sugar (kg)	55.35	58.5	61.2
Calcium (kg)	19.44	16.2	16.2
Phosphorus (kg)	6.3	6.3	6.3

Data indicate that inclusion of pumpkin increased the nutritional value of the diet, particularly energy, digestible protein, and fat. Group II consumed more pumpkin and less maize silage than the control, improving feed quality and energy balance.

Milk Yield and Composition

Cows receiving pumpkin supplementation produced higher milk yields with increased fat (by 1.5–2%) and dry matter content (by 2–3%) compared to control. The protein-to-sugar ratio improved from 0.35:1 in control to 0.52–0.53:1 in experimental groups, indicating better nutrient balance.

Economic Efficiency

Pumpkin inclusion increased feed efficiency and reduced the cost per liter of milk. Net profit improved by 15–18% in Group I and 22–25% in Group II. Thus, pumpkin serves as a locally available, cost-effective feed resource.

CONCLUSIONS

1. Inclusion of orange-fleshed fodder pumpkin enhances milk yield, fat content, and overall milk quality.
2. Optimal pumpkin levels (5–7 kg/day per cow) improve protein-carbohydrate balance and feed energy supply.
3. Economic analysis confirms that pumpkin supplementation is cost-effective and increases profitability.
4. Orange-fleshed fodder pumpkin can be recommended as a practical feed source for small- and medium-scale dairy farms.

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