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Effect of supplementation of fodder cactus (*Opuntia ficus indica*) on dry matter intake and water intake of growing calves

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Abstract

The present study was conducted to determine the effect of fodder cactus (*Opuntia ficus indica*) supplementation on dry matter intake and water intake of growing calves. Twenty growing calves were selected and randomly distributed into four treatment groups, comprising five calves in each group. The feeding trial was conducted for 90 days. The basal ration consisted of dry roughage, green fodder comprising Hybrid Napier and Berseem in equal proportion, and concentrate mixture. Fodder cactus was supplemented at 0, 200, 300 and 400 g/calf/day in T₁, T₂, T₃ and T₄, respectively. Dry matter intake increased with fodder cactus supplementation and was highest in T₃ (2.125 kg/day/calf), followed by T₄ (2.100 kg), T₂ (1.871 kg) and T₁ (1.700 kg). Dry matter intake expressed per 100 kg body weight was also higher in the supplemented groups, with the highest value recorded in T₃ (3.15 kg/100 kg BW). Water intake was highest in T₃ (8.14 L/day/calf), followed by T₄ (7.98 L), T₂ (7.55 L) and T₁ (7.25 L). The corresponding water intake per 100 kg body weight was 11.22, 11.46, 12.06 and 11.81 L in T₁, T₂, T₃ and T₄, respectively. The findings indicated that supplementation of fodder cactus influenced dry matter and water intake of growing calves. Among the tested levels, 300 g fodder cactus/calf/day resulted in the highest dry matter and water intake.

Keywords: Fodder cactus, *Opuntia ficus indica*, dry matter intake, water intake, growing calves, supplementary fodder

1. Introduction

Livestock production plays an important role in the agricultural economy of India by providing milk, employment, income and nutritional security to rural households. However, inadequate availability of quality feed and fodder remains one of the major constraints to livestock production. The problem becomes more serious in dry and semi-arid regions, where seasonal shortages of green fodder and limited water availability restrict the use of conventional fodder crops. Therefore, identifying alternative fodder resources that can withstand adverse climatic conditions is important for maintaining adequate feed availability. Fodder cactus (*Opuntia ficus indica*) is considered a promising alternative forage because of its ability to grow under dry and water-limited conditions. It contains a high proportion of moisture and provides readily available carbohydrates and minerals. Its high water-use efficiency and ability to produce biomass under drought conditions make it particularly useful in regions where conventional green fodder production is difficult. However, its comparatively low protein concentration makes its use as a supplementary feed along with other feed resources more appropriate (Thakuria *et al.*, 2020; Pastorelli *et al.*, 2022) [12, 7]. The nutritional composition of fodder cactus can vary according to cultivar, growing conditions and stage of harvest. Jadhav *et al.* (2022) [6] reported variation in the nutritional quality of different fodder cactus germplasm. Recent studies have also indicated that inclusion of alternative forage resources can influence feed utilization and voluntary water consumption in livestock. Therefore, the present study was undertaken with the objective of determining the effect of fodder cactus supplementation on dry matter intake and water intake of growing calves.

2. Materials and Methods

2.1 Experimental site

The experiment was conducted at the Livestock Instructional Farm, Akola, Maharashtra, under the agro-climatic conditions of the Vidarbha region.

2.2 Experimental animals and design

Twenty growing calves were selected for the study. The

animals were randomly distributed into four treatment groups consisting of five calves in each group. The experiment was conducted using a Randomized Block Design (RBD). The feeding trial was carried out for 90 days from 05 December 2025 to 05 March 2026, excluding the adaptation period.

2.3 Experimental treatments

The dietary treatments were as follows:

Treatment	Treatment Details
T ₁	Dry roughages (ad lib) + 2 Kg green roughages (50% hybrid napier + 50% Berseem/lucerne) concentrate
T ₂	Basal ration + 200 g fodder
T ₃	Basal ration + 300 g fodder
T ₄	Basal ration + 400 g fodder

The basal ration consisted of dry roughage offered ad libitum, 2 kg green fodder comprising Hybrid Napier and Berseem in equal proportion, and concentrate mixture.

2.4 Feeding management

Feed was offered twice daily at 9:00 a.m. and 5:00 p.m. Fodder cactus was supplied to the respective treatment groups according to the specified supplementation level. Water was offered twice daily at 9:30 a.m. and 3:30 p.m. using measured buckets. The quantity of water offered and the quantity remaining were recorded to determine daily water intake.

2.5 General management

The growing calves were groomed every morning and washed on alternate days. The animals were allowed access to the paddock for a short period. Deworming was carried out 15 days before the commencement of the experiment. The health condition of the calves was monitored throughout the experimental period and the animal shed was cleaned regularly.

2.6 Chemical analysis of feed ingredients

Representative samples of the feed ingredients were collected and analysed for proximate constituents. Dry matter (DM), crude protein (CP), crude fibre (CF), ether extract (EE), nitrogen-free extract (NFE) and total ash were

determined according to AOAC (1990) [2]. Crude protein was estimated using the Kjeldahl method, with nitrogen multiplied by 6.25, following BIS IS 7874 Part 1:1975.

2.7 Determination of dry matter intake

Daily dry matter intake was calculated from the quantity of individual feed ingredients consumed and their respective dry matter contents. The total dry matter intake was expressed as kg/day/calf and kg per 100 kg body weight.

2.8 Determination of water intake

Water intake was determined daily by recording the quantity of water offered and the quantity remaining after the specified feeding period. The difference between water offered and water refused was considered the actual water intake. Water intake was expressed as litres/day/calf and litres per 100 kg body weight.

2.9 Statistical analysis

The observations obtained for dry matter intake and water intake were subjected to statistical analysis using the appropriate procedure for Randomized Block Design. Treatment means were compared for significance at the 5 percent level.

3. Results and Discussion

3.1 Proximate composition of feed ingredients

Table 1: The proximate composition of the feed ingredients used during the experimental period is presented.

Feed ingredient	DM (%)	CP (%)	CF (%)	EE (%)	NFE (%)	Ash (%)
Soybean straw	89.98	7.80	40.58	2.35	38.47	10.80
Hybrid Napier	30.04	8.80	29.40	3.91	46.84	11.05
Berseem	20.95	16.80	26.05	4.05	40.60	12.50
Fodder cactus	13.98	9.05	18.80	2.02	45.63	24.50
Concentrate mixture	91.10	19.02	9.60	6.16	61.02	4.20

The chemical composition showed that fodder cactus contained considerably higher moisture and lower dry matter than the conventional dry feed ingredients. Its high moisture content is an important characteristic of cactus forage and may contribute to its usefulness as a succulent fodder source. The observed composition was within the general range reported for *Opuntia* forage by Thakuria *et al.* (2020) [12], Pastorelli *et al.* (2022) [7] and Jadhav *et al.* (2022) [6].

3.2 Dry matter intake

Table 2: The average dry matter intake of growing calves under different treatment groups is presented.

Treatment	DMI (kg/day/calf)	DMI (kg/100 kg BW)
T ₁	1.700	2.63
T ₂	1.871	2.85
T ₃	2.125	3.15
T ₄	2.100	3.12

Dry matter intake increased with supplementation of fodder cactus. The highest dry matter intake was recorded in T₃ (2.125 kg/day/calf), followed by T₄ (2.100 kg), T₂ (1.871 kg) and T₁ (1.700 kg). Similarly, dry matter intake per 100 kg body weight was highest in T₃ (3.15 kg), followed by T₄ (3.12 kg), T₂ (2.85 kg) and T₁ (2.63 kg).

The increased dry matter intake in the supplemented groups may be associated with improved acceptability of the ration and the contribution of cactus to the overall nutrient supply. The succulent nature and readily fermentable carbohydrates present in cactus may also support voluntary consumption of the complete ration. Telgote Madhu (2022) ^[11] reported variation in dry matter intake among calves receiving different dietary treatments. Rajput *et al.* (2025) ^[8] also observed differences in dry matter intake of growing calves fed different forage resources.

The present results indicate that supplementation of fodder cactus at 300 g/calf/day resulted in the highest dry matter intake among the tested levels. Although DMI in T₄ was also higher than the control, it was slightly lower than T₃.

3.3 Water intake

Table 3: The average water intake of growing calves is presented.

Treatment	Average BW (kg)	Water intake (L/day/calf)	Water intake (L/100 kg BW)
T ₁	64.61	7.25	11.22
T ₂	65.83	7.55	11.46
T ₃	67.47	8.14	12.06
T ₄	67.52	7.98	11.81

Water intake differed among the treatment groups. The highest water intake was recorded in T₃ (8.14 L/day/calf), followed by T₄ (7.98 L), T₂ (7.55 L) and T₁ (7.25 L). Water intake per 100 kg body weight followed a similar trend, with the highest value in T₃ (12.06 L), followed by T₄ (11.81 L), T₂ (11.46 L) and T₁ (11.22 L).

The variation in water intake may be related to differences in dry matter consumption and nutrient intake among the treatment groups. Water requirement of growing calves is influenced by feed composition, dry matter intake, environmental temperature and physiological requirements. The higher water intake observed in T₃ may therefore be associated with its greater dry matter intake.

Shelar (2004) ^[9] reported variation in water intake among calves receiving different dietary treatments, although the differences were not statistically significant in that study. Sonone *et al.* (2018) ^[10] also reported differences in water intake among crossbred calves fed soybean straw-based diets. The present findings indicate that supplementation of fodder cactus influenced voluntary water intake, with the highest intake observed at 300 g/calf/day.

4. Conclusion

Based on the findings of the present study, supplementation of fodder cactus (*Opuntia ficus indica*) influenced dry matter intake and water intake of growing calves. Dry matter intake increased from 1.700 kg/day/calf in the control group to 2.125 kg/day/calf at 300 g cactus supplementation. Similarly, water intake increased from 7.25 to 8.14 L/day/calf. Among the supplementation levels evaluated, 300 g fodder cactus/calf/day (T₃) recorded the highest dry matter intake and water intake. Therefore, fodder cactus can be considered a useful supplementary fodder resource for

improving feed and water intake of growing calves, particularly under conditions of seasonal fodder scarcity.

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