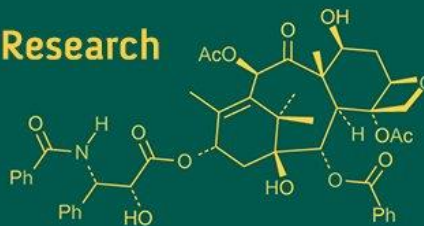


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Economics of hydroponic maize fodder based Total Mixed Ration (TMR) in Deccani Lambs

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Abstract

The present investigation was conducted to study the cost structure of Deccani lambs fed hydroponic maize fodder-based total mixed ration (TMR) during an experimental period of 110 days. A total of 24 Deccani lambs were randomly allotted to four treatment groups, with six lambs in each group. The experimental groups consisted of T₀ (control), T₁, T₂ and T₃. The average age of the lambs was six months, and the average body weights were 25.38kg, 24.88 kg, 24.68 and 25.44 kg for T₀, T₁, T₂ and T₃ groups, respectively. Treatment T₀ contained zero percent hydroponic maize whereas T₁, T₂ and T₃ diets contained 20%, 40% and 60% hydroponic maize, respectively, in the total mixed ration. The results indicated that replacement of concentrate mixture with hydroponic maize fodder up to 40% in TMR influenced the economics of feeding among the treatment groups. The highest benefits cost ratio was recorded in (1: 1.09), indicating better economic efficiency of the diet.

Keywords: Deccani lambs, hydroponic maize fodder, total mixed ration, cost structure

Introduction

Hydroponic green fodder plays a significant role in conserving soil, water and time. It requires only about 3-5 percent of the total water normally used for producing an equivalent quantity of forage under field conditions. For example, producing one kilogram of hydroponically grown maize fodder needs only 1.50 to 3.0 Liters of water (Naik *et al.*, 2013) [4]. In contrast conventional fodder production typically requires 60-80 liters of water to obtain one kilogram of fresh green fodder. Thus, Hydroponics drastically reduces water consumption and offers an environmentally sustainable alternative for fodder production. Feed cost contributes to more than 60% of total production expenses in livestock farming. Now days reducing this cost, without affecting animal performance is one of the biggest challenges for farmers. Hydroponic maize is fast growing nutrient rich fodder that can be produced in 7-10 days with less land and water. Fresh hydroponic fodder is produced with minimal water use and without causing soil degradation or contributing to crop overcrowding. Moreover, the system eliminates the need for herbicides, pesticides and large quantities of chemical fertilizer, making it an eco-friendly and sustainable option for livestock feed production, particularly for supporting milk yield and overall animal performance. Using Hydroponic maize in a Total Mixed Ration allows partial replacement of costly concentrates while keeping the required digestible crude protein (16-18%) and total digestible nutrient (60-70%) for healthy growth. This approach is low-cost, sustainable and reduces feed wastage.

There is a great nutritional benefit provided by hydroponic sprouted fodder to optimize the general health and performance of young animals while minimizing the feed cost. Therefore, the present study evaluates the "Economics of hydroponic maize fodder based total mixed ration (TMR) in Deccani Lambs".

Materials and Methods

Twenty-four Deccani Ram lambs of 6-9 month age were selected from AICRP on Network Project on Sheep Improvement (Deccani Farm Based Unit) and Department of Animal Husbandry and Dairy Science, MPKV, Rahuri on the basis nearness to age and body weight. Selected experimental lambs were divided into four groups (six lambs in each group) Experiment was conducted for a period of 110 days.

The experimental groups consisted of T₀ (control), T₁, T₂ and T₃. The average age of the lambs was six months, and the average body weights were 25.38 kg, 24.88 kg, 24.68 kg and 25.44 kg for T₀, T₁, T₂ and T₃ groups, respectively.

Treatments

Details of allotment of treatments in feeding trials

Groups	Diets
T ₀	Roughage (dry and green) + concentrate mixture
T ₁	Roughage (dry and green) + hydroponically grown green maize fodder replacing 20% concentrate on DM basis
T ₂	Roughage (dry and green) + hydroponically grown green maize fodder replacing 40% concentrate on DM basis
T ₃	Roughage (dry and green) + hydroponically grown green maize fodder replacing 60% concentrate on DM basis

Results and Discussion

The present investigation evaluated the economic assessment as input cost and return obtained from feeding hydroponic maize fodder on the growth performance of Deccani lambs. The average total weight gain (kg/lamb) for 90 days experiment was for treatment groups T₀, T₁, T₂ and T₃ as 5.36, 6.85, 7.78 and 5.62 kg/lamb, respectively. The total sales returns were as Rs. 9222, 9519, 9738 and 9318 and the average total cost was Rs. 9035.49, 8940.45, 8924.97 and 9099.39 Production cost per kg body weight gain Rs. 265.20, 215.54, 195.50 and 261.10. For treatment group T₀, T₁, T₂ and T₃ respectively. Production cost per kg body weight gain T₂ (Rs. 195.50) was lower than other treatment groups T₀ (265.20). The benefit-cost ratio is 1.02, 1.07, 1.09 and 1.02 for treatment groups T₀, T₁, T₂ and T₃, respectively.

The results showed that the hydroponically produced maize fodder fed group, substituting 20, 40 and 60 percent concentrate mixture, had lower overall production costs and lower costs per kg of body weight growth than the control fed on concentrate mixture together with dry and green roughage (TMR). Additionally, the T₂ group had the lowest production cost per kilogram of body weight growth (i.e. Rs. 195.50).

Growing lambs lower production costs per kilograms of weight increase were consistent with the findings of Naik *et al.* (2014) ^[4], who studied the effects of feeding hydroponically produced maize fodder on lactating cows' good digestion and milk output. There was a higher net profit of Rs. 12.67 per cow/d on feeding HMF. They conclude that giving HMF to lactating cows improved nutrient digestibility and milk production, resulting in a rise in net profit.

Additionally comparable to the studies and concepts by Naik *et al.* (2014) ^[4] additionally, in comparison to treatment group T₀, treatment group T₂, the benefit-cost ratio is larger (1.13) (1.08). Due to its larger net profit and lower overall cost when compared to the other treatment groups, treatment group T₂ has a higher benefit-cost ratio.

Additionally, Bhalerao *et al.* (2019) ^[1], who studied the Effect of Feeding HMF on the Growth Performance of Osmanabadi goats and fed treatment appropriately, observed a similar outcome. T₃ was determined to have the lowest overall cost of feeding per kilogramme of body weight growth, followed by T₁ and T₂. In comparison to the T₁ and T₂ treatments, the 40% hydroponic maize fodder fed treatment (T₃) produced better and more preferable outcomes.

Table 1: Economics of feeding of experimental Deccani Lambs

Particulars	T ₀	T ₁	T ₂	T ₃
Initial weight (kg)	25.38	24.88	24.68	25.44
Final weight (kg)	30.74	31.73	32.46	31.06
Total gain (kg)	5.36	6.85	7.78	5.62
Cost of dry roughage (Rs)/kg	1.20	1.20	1.20	1.20
Cost of green roughages (Rs)/kg				
Lucerne	2.50	2.50	2.50	2.50
Green maize	2.20	2.20	2.20	2.20
Cost of Hydroponic Maize (Rs)/kg	3.80	3.80	3.80	3.80
Cost of concentrate mixture (Rs)/kg	46.12	48.20	51.00	59.22
Total dry roughage consume (kg)	178.92	177.95	173.36	166.80
Total green roughage consume (kg)				
Lucerne	74.89	72.36	74.70	69.17
Green maize	165.92	159.08	164.65	151.51
Total Hydroponic Maize consume (kg)	0	138.36	290.75	415.99
Total concentrate mixture consume (kg)	168.30	156.40	142.43	110.05
Total cost of dry roughage consume (kg)	214.70	213.54	208.03	200.16
Total cost of green roughage consume (kg)				
Lucerne	187.23	180.90	186.75	172.93
Green maize	365.02	349.98	362.23	333.32
Total cost of Hydroponic Maize consume (kg)	0	575.77	1104.85	1580.76
Total cost of concentrate mixture consume (kg)	7761.99	7538.48	7263.93	6517.16
Total feed cost (Rs)	8528.94	8858.67	9125.79	8804.33
Feed cost per Lamb	1421.49	1476.45	1520.97	1467.39
Initial cost of lamb @ 300 Rs/kg live weight	7614	7464	7404	7632
Total cost (feed cost per animal + initial cost of lamb)	9035.49	8940.45	8924.97	9099.39
Final return of lamb @ 300Rs/kg live weight	9222	9519	9738	9318
Feed cost/kg body weight gain (Rs)	265.20	215.54	195.50	261.10
B:C ratio	1:1.02	1:1.07	1:1.09	1:1.02

The result provided by Jemimah *et al.* (2020) ^[3] and the current finding are comparable. When fed to Tellicherry crossbred female kids, hydroponically grown maize fodder can be substituted for concentrate at levels of 25 and 50 percent to increase weight gain while also lowering production costs per kilogramme of live weight gain.

The present findings are corroborated with the observation reported by Bhalerao (2023) ^[1], who observed that hydroponically grown maize fodder can effectively be substituted for concentrate at levels of 20, 40, 60 and 80 percent in Sangamneri goats. Their study indicates that to increase weight gain while such substitution helps to increase simultaneously lowering the production cost per kilogramme of live weight gain in T₂ group (i.e. Rs. 174.42) and the benefit-cost ratio was highest in T₂ (i.e. 1:1.13) in compared to control group T₀.

Conclusion

The feed cost to get one kilogram body weight gain was decreased by 26.28% when the concentrate ingredients in a TMR were replaced by hydroponic maize fodder at 40% level.

Based on the present investigation, it is recommended that the concentrate mixture could replace with maize hydroponic base TMR at a 40% level in the ratio of growing lambs is beneficial for better growth performance and economic profitability of Deccani lambs.

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