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## Effect of dietary supplementation of hydroponic maize fodder on water intake of sangamneri goat kids

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### Abstract

The experiment entitled "Effect of dietary supplementation of hydroponic maize fodder on water intake of Sangamneri goat kids" conducted at All India Co-ordinated Research Project on Goat Improvement, Department of Animal Husbandry and Dairy Science, MPKV, Rahuri. To direct the entitled experiment thirty male goat kids pertaining Sangamneri goat breed with near about same age and body weight were allotted in treatments groups T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub>, in the corresponding groups in relation to feeding, concentrate feed was replaced by hydroponic maize fodder in amount 0, 20, 40, 60 and 80% respectively, else Soybean straw, Lucerne and Green Maize were fed in equal amount in all the treatment groups. According to the results obtained, the water intake per day per goat (lit) was 0.69, 0.64, 0.62, 0.59, and 0.60 lit for treatment group T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> lit respectively. Treatment groups T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> each consumed 62.10, 57.60, 55.80, 53.10, and 54.00 lit/goat overall during the course of the investigation. In treatment groups T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> the equivalent values for water consumption per 100 kg of body weight were 4.09, 3.55, 3.31, 3.21, and 3.37 lit, respectively. Goats in treatment group control (T<sub>0</sub>) consumed significantly more water than goats in other treatment groups. This difference may be attributable to more dry feeds and more DMI in their diets compared to other treatment groups, which received hydroponic maize fodder. In the present study, average water intake across the treatment groups was generally low, possibly due to the incorporation of hydroponic green maize in their diet.

**Keywords:** Indian mustard, path coefficient analysis

### Introduction

Goats have been referred as "Poor man's cow." In the Ahmednagar district of Maharashtra's "Sangamner" Tehsil, Sangamneri goats are a dual-purpose breed. The breed is also found in adjoining districts like Pune, Solapur, Nashik and Dhule.

Dr. W.F. Gerke from the University of California first looked into hydroponics in the latter part of the 1930s. The name hydroponic is derived from two Greek words, hydro, which means "water," and ponic, which means "working." This hydroponic, sprouted grain, or sprouted fodder is created by growing plants in water or nutrient solution without the use of soil. In a short period of time, hydroponics is developed in a controlled environment. The hydroponic green fodder production, which produces food with adequate fodder yields and excellent value during periods of drought and scarcity. The science shows that, there is great nutritional benefit provided by hydroponic sprouted grain and it is suitable for all livestock including sheep, cattle, goat provides animals with improved growth and overall health.

Hydroponic green fodder is beneficial for soil, water, and time conservation. Only 3% to 5% of the water needed to produce the equivalent amount of feed grown in a field is needed. 1.50 to 3.0 liters of water are required to produce one kilogram of hydroponically grown maize feed. (Naik *et al.*, 2013) [4]. To produce one kilogram of lush green fodder using hydroponics, just two to three liters of water are needed instead of 60 to 80 liters for conventional fodder cultivation. (RKVY, Production of hydroponically grown green feed for environmentally beneficial and long-term milk production).

Fresh green feeds are produced with relatively minimal water consumption, and they do not contribute to soil degradation or overcrowding of crops. Hydroponic sprouting feed offers a significant nutritional advantage that can improve the overall health and performance of young animals while lowering feed costs. As a result, it has been planned for the current study to replace hydroponic fodder for a portion of the concentrate in the goat kids' diet.

### Material and methodology

Thirty Sangamneri male goats of 6-9 month age were kept under five treatments and

six replication using RBD. T<sub>0</sub> (concentrate mixture), T<sub>1</sub>+ (replace 20% concentrate by hydroponic maize), T<sub>2</sub> (replace 40% concentrate by hydroponic maize), T<sub>3</sub> (replace 60% concentrate by hydroponic maize) and T<sub>4</sub> (replace 80% concentrate by hydroponic maize). (Roughages = dry + green) fed to all treatment.

The concentrate mixtures replaced with hydroponic green maize supplied to balance energy and protein to all the groups. Goats were dewormed before starting the feeding trial and fed similar ration for 90 days.

Fresh and clean water was provided thrice to the experimental goats during the course of investigation. Animals were

offered ad lib drinking water by bucket daily at 8.00 a.m. and 1.30 p.m. and 5.30 p.m.

## Result and Discussion

### Dry matter intake (kg) and water intake in experiment goats

Animals' water consumption is influenced by the season, the climate, their physiological state, the kind of food they are provided, and how much dry matter they consume.

The average dry matter and water consumed by goats during an experiment is shown in Table 1

**Table 1:** Average dry matter intake (kg) and water intake in experiment goats under different treatments (lit)

Treatment	Average body weight (kg)	Total Intake (kg)	Intake per 100 kg body weight (kg)	Water intake / day	Total water intake/goat	Water intake /100 kg body weight	DM to water intake ratio
T <sub>0</sub>	16.96 <sup>c</sup>	0.572 <sup>d</sup>	3.37 <sup>b</sup>	0.69 <sup>a</sup>	62.10 <sup>a</sup>	4.09 <sup>a</sup>	1:1.21
T <sub>1</sub>	18.03 <sup>ab</sup>	0.650 <sup>c</sup>	3.60 <sup>ab</sup>	0.64 <sup>ab</sup>	57.60 <sup>ab</sup>	3.55 <sup>b</sup>	1:0.97
T <sub>2</sub>	18.72 <sup>a</sup>	0.719 <sup>a</sup>	3.84 <sup>a</sup>	0.62 <sup>b</sup>	55.80 <sup>b</sup>	3.31 <sup>b</sup>	1:0.86
T <sub>3</sub>	18.32 <sup>ab</sup>	0.692 <sup>b</sup>	3.78 <sup>a</sup>	0.59 <sup>b</sup>	53.10 <sup>b</sup>	3.21 <sup>b</sup>	1:0.85
T <sub>4</sub>	17.82 <sup>b</sup>	0.664 <sup>c</sup>	3.73 <sup>a</sup>	0.60 <sup>b</sup>	54.00 <sup>b</sup>	3.37 <sup>b</sup>	1:0.91
SE.m	0.2540	0.0081	0.1108	0.0197	1.7722	0.1176	-
CD at 5%	0.7491	0.024	0.3270	0.0581	5.2279	0.3471	-

The mean daily average dry matter intake of the kids fed five experimental rations trial is presented in Table 1. The average daily DMI (kg/d) of kids fed rations T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, and T<sub>4</sub> was 0.572, 0.650, 0.719, 0.692 and 0.664, respectively. The average DMI expressed as per cent body weight and per unit metabolic body weight (kg) in kids fed experimental rations T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, and T<sub>4</sub> was 3.37, 3.60, 3.84, 3.78 and 3.73, respectively.

Treatment T<sub>2</sub> had significantly ( $p < 0.05$ ) higher kids' average daily DMI (kg/d) than the other treatment groups, which were T<sub>3</sub>, T<sub>4</sub>, T<sub>1</sub>, and T<sub>0</sub> rations. T<sub>0</sub> had a significantly ( $p < 0.05$ ) lower Intake. Kid's Intake per 100 kg of body weight (kg) was substantially ( $p < 0.05$ ) higher in the T<sub>2</sub> diet and found to be comparable to the T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, and T<sub>4</sub> rations, but the Intake in the T<sub>0</sub> ration was significantly ( $p < 0.05$ ) lower and found to be comparable to the T<sub>1</sub> ration.

The highest DMI was observed in T<sub>2</sub> ration compared to T<sub>0</sub>, T<sub>1</sub>, T<sub>3</sub> and T<sub>4</sub> rations. It could be because the rumen is urged to expel feed more quickly, which results in increased consumption. Similar results were found by Swati *et al.* (2015) [10] that DMI was higher in Haryana male calves fed hydroponic barley fodder at 50 per cent replacement of concentrate mixture. The low DM content of HBF would have a limited effect on Intake of fodder when animals fed T<sub>3</sub> ration having 75 per cent replacement of concentrate mixture with HBF Fazeli *et al.* (2012) [3]. In addition, the very high water content in the fodder made it bulky, which may have limited dry matter. The present result agreement with Bhalariao *et al.* (2019) [11] reported that the feeding of hydroponic maize on the growth performance of Osmanabadi goats. Average daily DM intake was increase in T<sub>3</sub> (929.99 g) followed by T<sub>2</sub> (827.98 g) and T<sub>1</sub> (773.00 g) whereas, DMI was observed as 4.27, 4.42 and 4.74 kg/100kg BW in T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> groups, respectively. The result are also similar with Weldegerima (2015) [7, 8, 9] who reported that the average DM Intake of a growing goat was highest due to the addition of hydroponic maize and barley fodder in T<sub>5</sub> (504.51 g/D) while T<sub>2</sub>, T<sub>1</sub>, T<sub>3</sub> and T<sub>4</sub> values were at par with each other. Intake and live weight change in 17 steers that were fed low-quality

hay and barley sprouts for 70 days were assessed by Tudor *et al.* Cattle consumed 1.9 kg DM/head/day of sprouts (15.4 kg wet weight) and 3.1 kg DM/head/day of poor hay over the first 48 days and gained 1.01 kg DM/head/day.

In treatment groups T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, and T<sub>4</sub>, it was found that the average daily water consumption was 0.69, 0.64, 0.62, 0.59, and 0.60 lit/day, respectively. Treatment groups T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> each consumed 62.10, 57.60, 55.80, 53.10, and 54.00 lit/goat overall during the course of the investigation. In treatment groups T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> the equivalent values for water consumption per 100 kg of body weight were 4.09, 3.55, 3.31, 3.21, and 3.37 lit, respectively. The treatments T<sub>0</sub> and T<sub>1</sub> are discovered to be equal to one another, as are the treatments T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, and T<sub>4</sub>. The differences in average daily water consumption and total daily water intake were statistically significant ( $p < 0.05$ ). The water intake per 100 kg of body weight was also found to be statistically significant. Treatment T<sub>0</sub> shows the highest water intake and being significantly higher ( $p < 0.05$ ) with the rest of the treatments.

The DM to water intake ratio were 1:1.21, 1:0.97, 1:0.86, 1:0.85 and 1:0.91 in treatment groups T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> respectively. In groups participating in successive research periods, the amount of water consumed reduced. Further observation reveals that adding hydroponically grown maize fodder to Sangamneri goat diets resulted in significant changes in water intake. Goats used in experiments use less water when fed hydroponically grown maize.

The present values were comparable with Weldegerima (2015) [7, 8, 9] who investigated on nutritional benefit of feeding HMF and HbF for Konkan Kanyal goats and observed that 401.86, 323.00, 564.70, 440.65, 494.01 and 496.89 ml/day for T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, and T<sub>5</sub>, respectively.

Devender *et al.* (2020) [12] reported that the water intake (l/d) of lambs fed experimental rations T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> were 1.91±0.23, 1.64±0.05 and 1.22±0.14, respectively. The water intake was decreased in 50 per cent and 75 per cent replacement of the concentrate mixture with hydroponic barley fodder and it was significantly ( $p < 0.05$ ) lower in T<sub>3</sub> compared to the control (T<sub>1</sub>) ration.

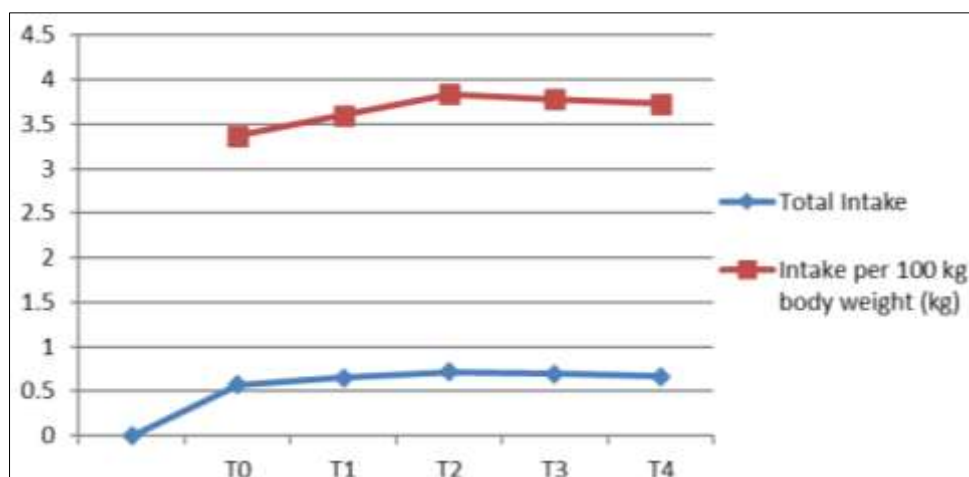


Fig 1: Dry matter intake (kg) in experiment goats

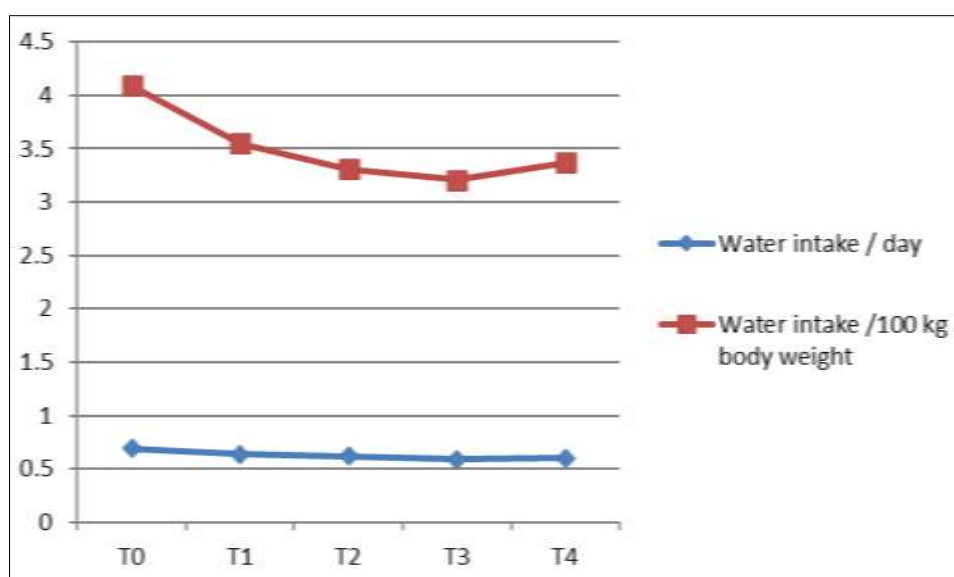


Fig 2: Water intake (lit) in experiment goats

## Summary and Conclusion

### Dry Matter intake

The statistical findings showed that the treatment groups differed from one another considerably. Compared to the other treatment groups, treatment group T<sub>2</sub> daily consumption of dry matter was considerably higher. It might be due to the encouraged faster passage rate out of the rumen leading to increased intake. Thus the 40% hydroponic green maize replacing concentrate mixture fulfills the balanced diet. The intake pattern showed that the entire animal consumed enough feed to help satisfy their appetites.

### Water intake

According to statistics, goats in treatment group T<sub>0</sub> consumed significantly more water than goats in other treatment groups. This difference may be attributable to more dry feeds and more DMI in their diets compared to other treatment groups, which received hydroponic maize fodder. While the observed values for the treatment group's average water consumption (T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>) did not substantially vary. In the present study, average water intake across the treatment groups was generally low, possibly due to the incorporation of hydroponic green maize in their diet.

## Conclusion

Inclusion of hydroponic maize fodder in the goat diet increases dry matter intake and reduces water intake also production of hydroponic maize fodder require less water as compared to conventional maize fodder.

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