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Effect of hydroponically and conventionally grown maize fodder feeding on dry matter intake and growth performance of calves

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Abstract

Present experiment was conducted to evaluate the feeding value of hydroponically grown maize and conventionally grown maize fodder over calves. The experiment was conducted on Instructional Livestock Farm, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during the year 2018 for a period of 90 days. Twenty crossbred calves were divided into five groups as per treatments on the basis of nearness to the age and weigh of calves. The daily DM intake was affected significantly over the experimental period. The crossbred calves from T₅ groups consumed more DM than that of T₁, T₂, T₃ and T₄ groups. The average daily intake was 2.40, 2.53, 2.64, 2.55 and 2.70 kg/day/calves in T₁, T₂, T₃, T₄ and T₅ groups respectively.

All the crossbred calves exhibited satisfactory growth rate, the average daily body weight gain was 0.213, 0.260, 0.324, 0.266 and 0.361 kg per day in T₁, T₂, T₃, T₄ and T₅ treatment respectively. Growth rate was higher in feeding in crossbred calves fed on hydroponic green maize than other groups.

Keywords: Hydroponic green maize, conventional green maize, crossbred calves, dry matter intake, growth performance

Introduction

Growth is fundamental and common feature of all living being. Every animal is endowed at birth with certain capacity for growth and production. These inherited characters can be exploited to proper feeding and management to obtain adequate growth. Crossbred calves grow faster as compare to indigenous cattle. There is continuous growth of animal from birth to young stage. Low productivity of animals is accounted with underfeeding, Lack of quality feed and poor management. This adverse nutritional condition leads ultimately to stunted growth.

The increase in the livestock population along with the intensive rearing system has resulted in increased demands for feeds and fodder in the country. Green fodder is an essential component of the animal ration; otherwise the productive and reproductive performance of the dairy animals is adversely affected. Therefore, quality green fodder should be fed regularly to the dairy animals. Adequate nutrition is important for body maintenance, growth and reproduction of animals. The major constraints in production of green fodder by dairy owners are unavailability of land for fodder cultivation due to small land holding size, scarcity of water or saline water, labour required for cultivation. Due to the above constraints in the conventional method of fodder cultivation, hydroponic technology is introduced as an alternative to grow fodder for farm animals (Naik *et al.* 2013)^[6].

Material and Method

The investigation was carried out at livestock instructional farm located at Akola, which is one of the districts of 'Vidarbha' region in Maharashtra state. The environmental condition is one of the most dominant factors. It is therefore, necessary to describe the topographical and climatological situation of the place. Experiment was carried out for 90 days. Green maize was cultivated by hydroponic method and conventional method. A hydroponic unit was setup at livestock instructional farm. Daily requirement of hydroponic maize fodder for experimental animals was obtained by rotational soaking and sprouting of maize seed. Average 6 kg hydroponic maize fodder was produced from 1 kg maize seeds on 8th day. Twenty crossbred calves were selected. The calves were divided into five groups. Thus, each group was consisted of four calves for the study.

Preparation of experimental feed as per treatments

T1: Feeding of Green maize, dry roughages (Ad.lib) tur straw and concentrate mixture as per requirement.

T2: Feeding of dry roughages (Ad.lib) tur straw with concentrate mixture and green roughages (30% green maize of field condition with 70% green fodder).

T3: Feeding of dry roughages (Ad.lib) tur straw with concentrate mixture and green roughages (30% hydroponic green maize of controlled condition with 70% green fodder).

T4: Feeding of dry roughages (Ad.lib) tur straw with concentrate mixture and green roughages (40% green maize of field condition with 60% green fodder).

T5: Feeding of dry roughages (Ad.lib) tur straw with concentrate mixture and green roughages (40% hydroponic green maize of controlled condition with 60% green fodder)

The daily feed intake per animal was recorded by providing feed as per treatment during morning and afternoon and subtracting the residue of the feed left in the next day morning. The record of each animal was kept separately and daily DM intake was calculated.

Weekly body weight

The body weight of experimental animals was recorded at the start of experiment for 3 consecutive days and then at weekly interval. The weight was taken in morning hours in between 8 to 9 a. m. before watering and feeding of crossbred calves on weighing balance.

Body measurement

Along with weight gains, the following linear body measurements were also taken at the end of each period for knowing the increment in growth of experimental crossbred calves.

Chest girth

It was recorded as a circumference of chest measured just behind the elbow point passing through the wither point.

Height at wither point

It was recorded as the perpendicular between the ground level and the point of wither. While measuring the height the calves was made to stand easily on four legs on leveled ground.

Body length

It was recorded as the straight line distance between the point of shoulder to pin-bone.

Result and Discussion

Effect on Overall feed and Daily dry matter Intake

It is observed from Table 1 and 2, that, average feed intake/100 kg body weight was significantly lower in treatment T1 (3.7 kg) compared to T2 (3.80 kg), T3 (4.05 kg), T4 (3.93 kg) and T5 (4.00 kg). The average daily feed intake was lower in T1 (3.62 kg) group than that of T2, T3, T4 and

T5 i.e. 3.80 kg, 4.24 kg, 3.98 kg, and 4.29 kg respectively. Thus, this trend clearly indicated that the hydroponic green maize increases the feed intake of the experimental crossbred calves. The present results obtained were nearer to the result obtained by Reddy *et al.* (1988) ^[10], Pandey & Pathak (1991) ^[9], Tudor *et al.* (2003) ^[12], Fazaeli *et al.* (2011) ^[2], Muhammad *et al.* (2013) ^[5] and Naik *et al.* (2014) ^[7]. The mean daily DM intake of crossbred calves in four different treatments is presented in Table 2. The value of daily DM intake kg body weight of the treatment group T1, T2, T3, T4 and T5 were 2.40, 2.53, 2.64, 2.55 and 2.70 kg respectively. The daily DM intake through roughages and concentrate with hydroponic green maize was significantly given in superior.

Effect on body weight gain

It was observed from Table 3, that there was significant difference in weight gain under different treatments. The average final weight gain was highest in T5 followed by T3, T4, T2 and T1 significantly lowest weight gain was recorded in T1 treatment. It was clear from table-6 that feeding of hydroponic green maize was beneficial without any adverse effect on body weight gain. The average body weight gain per day per calf was 0.213, 0.260, 0.324, 0.266, and 0.361 kg in treatment T1, T2, T3, T4 and T5 respectively. The average body weight gain per day per calf in treatment T5 was higher over other treatments. The present confirm by Pandey & Pathak (1991) ^[9], Tudor *et al.* (2003) ^[12].

Effect on body measurements

It was revealed from Table 4 that the gain in body length was 7.00, 9.00, 11.50, 10.00 and 12.75 cm in T1, T2, T3, T4 and T5 respectively. This revealed that the gain in length was significantly highest in T5 and lowest in T1 treatment. The present values are nearer to the values reported by the past research worker Bhagat Renuka (2016) ^[1], Padalkar (1998) ^[8] and Jabber *et al.* (2012) ^[3].

The mean gain in body height at wither point was found to be 9.00, 9.75, 13.25, 10.00 and 15.25 cm for the treatments T1, T2, T3, T4, and T5 respectively. The variation among different treatment groups was found to be statistically significant. The present results obtained were nearer to the result obtained by Pandey and Pathak (1991) ^[9], Tudor *et al.* (2003) ^[12], Kalyani Sarap and Chavan (2012) ^[4], Swati *et al.* (2015) ^[11] and Bhagat Renuka (2016) ^[1].

The initial chest girth varies with wider degree between treatments being 115.85, 116.425, 116.00, 134.325, and 115.9 cm under T1, T2, T3, T4 and T5 groups respectively, which reached of a level to 125.85, 128.425, 130, 129.825 and 132.5 cm at the end of the trial. As a result, the total gain in chest girth of the calves over the experimental period worked out to 10.00, 12.00, 14.00, 13.00 and 16.6 cm under T1, T2, T3, T4 and T5 groups respectively. This means maximum gain in chest girth of the calves was obtained as a resulting of feeding of calves in T5 treatment. The overall total gain in chest girth over the experimental period was significantly higher in T5 groups (16.6 cm) over T1, T2, T3 and T4 groups. The present values are nearer to the values reported by the past research worker Bhagat Renuka (2016) ^[1].

Table 1: Effect of hydroponically and conventionally grown Maize fodder feeding on overall intake of different feed stuffs under different groups

(kg\day\calf) Treatments	Average body weight (kg)	Daily feed intake (kg)	Daily feed intake 100 kg body weight
T ₁	77.5	3.62	3.7
T ₂	77.75	3.80	3.80
T ₃	78.75	4.24	4.05
T ₄	77.25	3.98	3.93
T ₅	76.75	4.29	4.00
F test	-	Sig	-
SE (m)	-	0.13	-
CD@ 5%	-	0.39	-

Table 2: Effect of hydroponically and conventionally grown Maize fodder feeding on daily dry matter intake of different feed stuffs under different groups (kg\day\calf)

Treatments	Average body weight (kg)	Daily dry matter intake (kg)	Daily dry matter intake 100 kg body weight
T ₁	95.5	2.40	2.51
T ₂	99.75	2.53	2.53
T ₃	101.25	2.64	2.52
T ₄	104.5	2.55	2.51
T ₅	107	2.70	2.52
F test: Sig			
S.E(M)± : 0.06			
CD at 5%: 0.18			

Table 3: Effect of hydroponically and conventionally grown Maize fodder feeding on body weight gains of crossbred calves under different treatments (kg)

Treatments	Initial body weight (kg)	Final body weight (kg)	Total gain in Body weight (kg)/calf	Average body weight gain per day (kg)/calf
T ₁	77.5	95.5	18	0.213
T ₂	77.75	99.75	22	0.260
T ₃	77.25	104.5	27.25	0.324
T ₄	78.75	101.25	22.5	0.266
T ₅	76.75	107	30.25	0.361
F-test	-	Sig	Sig	Sig
S.E(m)±	-	0.23	0.64	0.0010
CD @ 5%	-	0.69	1.92	0.0032

Table 4: Effect of hydroponically and conventionally grown Maize fodder feeding on body measurements of calves (cm)

Treatments	Total gain in body length(cm)	Total gain in body height(cm)	Total gain in chest girth(cm)
T ₁	7	9	10.00
T ₂	9	9.75	12.00
T ₃	11.5	13.25	14.00
T ₄	10	10.00	13.00
T ₅	12.75	15.25	16.6
F-test	Sig	Sig	Sig
S.E(m)±	0.15	0.55	0.15
CD @ 5%	0.48	1.65	0.45

Conclusion

Maximum growth rate (weight gain) was obtained in treatment (T₅) dry roughages (Ad.lib) tur straw with concentrate mixture and green roughages (40% hydroponic green maize of controlled condition with 60% green fodder) in the crossbred calves. Body measurement (chest girth, body length and body height) of crossbred calves which received 40 per cent hydroponic green maize fodder (T₅) showed growth statistically significant effect over other treatments. Economic point of view the cost of feed stuff with hydroponic green maize is greater than control group since the gain in B.W. brings higher returns to the farmers. It is concluded that growing crossbred calves can be efficiently raised on feeding hydroponic green maize fodder as evident from the increased dry matter intake which was resulted into significantly more body weight gain and also improving the health of the experimental crossbred calves.

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