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Study the Effect of Feeding of Hydroponics Maize Fodder on Nutrient Utilization Efficiency in Gir Cows

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ABSTRACT

A feeding trial of 120 days followed by digestibility trial was undertaken on 16 dairy Gir cows divided in four groups with various levels of hydroponics maize fodder. Highly significant (P<0.01) effect of feeding hydroponics maize fodder was observed on intake of dry matter and digestible crude protein intake, percentage digestible crude protein, percentage total digestible nutrient nutritive ratio and digestibility of dry matter, organic matter, crude Protein, crude fibre and nitrogen free extract whereas, the effect of treatment on digestibility of digestible organic matter intake was observed to be significant (P<0.05). It was concluded that hydroponics fodder has beneficial effect on nutrient utilization efficiency in Gir cows and it can replace the 75% of crude protein of concentrate mixture.

HIGHLIGHTS

- A significant effect was observed on nutrient utilization efficiency in Gir cows.
- In this feeding trail, 75% of the crude protein in the concentrate mixture was replaced via hydroponics.

Keywords: Hydroponics maize fodder, digestibility, Gir cows

Hydroponic fodder production is a technique for germinate fodder seeds such as barley, cowpea, sorghum, wheat, and maize etc. to sprout into a high quality, highly nutritious, disease free animal food in a hygienic environment free of chemicals like insecticides, herbicides, fungicides and artificial growth promoters (Al-Hashmi, 2008; Al-Karaki and Al-Momani, 2011). Hydroponic fodder sprout contains bioactive catalysts (enzymes) which may help in feed digestion (Salo *et al.,* 2019). Moreover, the liquid from sprout is a potential source of nutrients for ruminal microbes (Salo *et al.,* 2019), since sprouts contain above 80% moisture content. Feeding hydroponic fodder sprout to ruminants was reported to improve nutrient digestibility and increase ruminal enzyme activities (Farghaly *et al.,* 2019). It has high Metabolizable energy, crude protein and digestibility (El-Morsy *et al*., 2013). Sprouted grains are rich in enzyme and enzyme rich feeds are generally alkaline in nature, thereby improves the animal's productivity by neutralizing the acidic condition and developing strong immune system (Sneath and Mclntosh, 2003; Shipard, 2005).

MATERIALS AND METHODS

In present investigation, a feeding trial for 120 days was

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conducted on 16 Gir cows, distributed equally in four groups and subjected to different treatments as below—

T_1 - Basal Roughage + Concentrate mixture (Control). T_2 -Basal Roughage + Concentrate mixture + 25% CP of concentrate mixture was supplied through Hydroponics maize green fodder. T_3 - Basal Roughage + Concentrate mixture + 50% CP of concentrate mixture was supplied through Hydroponics maize green fodder. T_4 - Basal Roughage + Concentrate mixture + 75% CP of concentrate mixture was supplied through Hydroponics maize green fodder.

Dry matter consumption

The palatability/dry matter intake of experimental feeds in terms of kg/day, kg/ 100 kg b. wt. and g/kg $W^{0.75}$ were calculated from the figures of the dry matter consumption during experimental period.

Digestibility studies

Digestibility trial was conducted at the end of feeding trial to assess nutrient digestibility, digestible nutrient component and intake of digestible nutrient. Samples of feed offered and their residues left and faeces were analysed for proximate constituents as per AOAC (2000).

Analytical procedures

The statistical analysis of data was done as per Snedecor and Cochran (2005).

RESULTS AND DISCUSSION

The data of average dry matter intake in different treatment groups is presented in Table 1.

Table 1: Average values of Dry Matter Intake in terms of kg/day, kg/100 kg b.wt. and g/kg$W^{0.75}$ in Gir cows

Attributes	Treatments groups				SEM
	T_1	T_2	T_3	T_4	
Kg/day	9.26^{d}	8.99^{c}	8.91^{b}	8.74^{a}	0.123
Kg/100 kg b.wt.	2.37^{d}	2.25^{c}	2.27^{b}	2.23^{a}	0.009
g/kg$W^{0.75}$	105.54^{d}	100.35^{c}	101.28^{b}	99.30^{a}	17.76

Note: Means with different superscripts in a row differ significantly from each other.

The results of statistical analysis of data revealed highly significant (P<0.01) effect of treatment on dry matter intake in Gir cows. Further, the comparison of means revealed significant variations among the groups with significantly high intake in T_1 *i.e.* control and lowest intake in T_4 group i.e. 75% of CP supplied through concentrate mixture were replaced by hydroponics maize green fodder. The data of average organic matter consumption in different treatment groups is presented in Table 2.

Table 2: Average values of Organic Matter Intake in terms of kg/day, kg/100 kg b.wt. and g/kg$W^{0.75}$ in Gir cows

Attributes	Treatments groups				SEM
	T_1	T_2	T_3	T_4	
Kg/day	8.68	8.38	8.38	8.36	0.013
Kg/100 kg b.wt.	2.22	2.14	2.14	2.13	0.001
g/kg$W^{0.75}$	98.96	95.55	95.30	95.04	2.183

The results of statistical analysis of data revealed non-significant effect of treatment on organic matter intake. Fazaeli *et al.* (2011) reported that lower DM intake associated with the feeding of hydroponics green fodder, which may be due the high water content of the hydroponics green fodder that might have made it bulky leading to limited DM intake by the animals. Naik *et al*. (2014) also observed that no significant difference (P>0.05) in the DM intake of cows fed on hydroponics maize fodder than the conventional green fodder. Abd Rahim *et al.* (2015) noted that the dry matter intake of green fodder by feedlot cattle and dairy cattle were low due to its high moisture content. The mean values of digestibility coefficients of dry matter, organic matter, crude protein, crude fibre and nitrogen free extract have been presented in Table 3.

Table 3: Average Digestibility Coefficient of Dry Matter and Gross Nutrients in different treatment groups

Attribute	Treatment groups				SEM
	T_1	T_2	T_3	T_4	
DM	61.18^{a}	61.85^{a}	64.36^{b}	65.30^{b}	0.183
OM	61.29^{a}	66.18^{b}	67^{c}	70.19^{d}	0.077
CP	64.49^{a}	68.17^{b}	69.56^{c}	71.97^{d}	0.129
EE	74.69	74.74	74.80	74.85	0.006
CF	53.41^{a}	55.27^{b}	57.13^{c}	57.68^{d}	0.059
NFE	60.72^{a}	64.14^{a}	64.22^{a}	70.72^{b}	0.728

Note: Means with different superscripts in a row differ significantly from each other.

The results of analysis of variance revealed highly significant (P<0.01) effect of feeding hydroponics maize fodder. While for EE digestibility a non-significant effect was recorded. The improvement in the digestibility coefficients of different nutrients in present study could probably be due to improved gross activity of rumen microflora on inclusion of hydroponics maize fodder in the ration of animals. The results of digestibility of nutrients in different treatment groups recorded in present study are in agreement with the report of Naik *et al.* (2014) observed significantly increase in the digestibility of CP and CF and non-significant increase in the digestibility of DM, OM, EE and NFE in the cows on feeding of hydroponics maize fodder. Similarly, Reddy *et al*. (1988) also observed significant increase in the digestibility of DM, OM, CP, CF, EE and NFE in milch cattle fed on artificial grown fodder. Limba (2015) also observed highly significant (P<0.01) effect in digestibility of DM, OM and Whereas, the effect of treatment on digestibility of CP, CF, NFE were observed to be significant (P<0.05).

Table 4: Effect of hydroponics maize fodder on intake of digestible nutrients Gir cows

Attribute	Treatments groups				SEM
	T_1	T_2	T_3	T_4	
DDMI					
Kg/day	5.60	5.63	5.66	5.72	0.097
Kg/100 kg b.wt.	1.43	1.43	1.44	1.45	0.026
g/kgW$^{0.75}$	63.85	64.10	64.45	65.05	1.149
DOMI					
Kg/day	4.80^{a}	4.90^{a}	5.57^{a}	5.89^{b}	0.170
Kg/100 kg b.wt.	1.22^{a}	1.25^{a}	1.42^{ab}	1.5^{b}	0.042
g/kgW$^{0.75}$	54.65^{a}	55.78^{a}	63.40^{ab}	66.92^{b}	1.899
DCPI					
Kg/day	1.17^{a}	1.22^{b}	1.23^{c}	1.25^{d}	3.92E-05
Kg/100 kg b.wt.	0.29^{a}	0.30^{b}	0.31^{b}	0.31^{b}	9.72E-06
g/kgW$^{0.75}$	13.25^{a}	13.88^{b}	14.08^{bc}	14.22^{c}	0.009
TDNI					
Kg/day	5^{a}	5.26^{ab}	5.32^{ab}	5.32^{b}	0.040
Kg/100 kg b.wt.	1.27^{a}	1.34^{ab}	1.35^{ab}	1.41^{b}	0.002
g/kgW$^{0.75}$	56.92^{a}	59.84^{ab}	60.55^{ab}	62.86^{b}	4.92

Note: Means with different superscripts in a row differ significantly from each other.

The effect of feeding of hydroponics maize fodder on intake of digestibility of EE were found to be non-significant. Jasmine *et al.* (2019) also observed a significant difference among the groups in their digestibility of CP and EE. The intake of digestible nutrients was calculated in terms of DDMI, DOMI, DCPI and TDNI as shown in Table 4.

The statistical analysis of data revealed significant (P<0.05) effect of hydroponics maize fodder on DOMI. The Statistical analysis of the data revealed highly significant (P<0.01) effect of feeding of hydroponics maize fodder on DCPI in different treatment groups. The comparison of means by DNMRT revealed improvement in DCPI with highest intake in animals fed on hydroponics fodder and lowest in control group in all terms. However, mean values of DCPI in $T_{2,}$ T_3 and T_4 group were comparable to each other in all terms. The statistical analysis of data revealed non-significant effect of hydroponics fodder in different treatment groups on DDMI and TDNI. The results of present study find support from the work of Pandey and Pathak (1991) reported that the mean daily intake of CP, DCP and TDN are higher than the maintenance requirement, but lower than the total requirement for maintenance and milk production in lactating crossbred cows fed artificially grown barley fodder. The results are in accordance to the observations made by Reddy *et al.* (1988) observed the intake of DCP and TDN was higher on both artificial grown fodder and NB-21 fodder in milch cows. Reddy *et al*. (1991) suggested there was no significant difference in DCP and TDN intake among the groups of cows fed artificially grown barley fodder. Further, Limba (2015) also observed highly significant (P<0.01) effect of feeding hydroponics maize fodder on intake of dry matter and DCPI, TDNI, %DCP, %TDN, NR and Whereas, the effect of treatment on digestibility of DOMI were observed to be significant (P<0.05). The effect of feeding of hydroponics maize fodder on intake of organic matter, digestibility of DDMI were found to be non-significant.

It was concluded that hydroponics maize fodder has beneficial effect on nutrient utilization in Gir cows and it could also be a practically viable technology that can be used as a part of strategy to be adopted to improve productivity of Gir cows. The overall results indicated that hydroponics maize fodder is very nutritious, improved digestibility and it could replace concentrate mixture up to 75% in Gir cows.

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