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Effect of fenugreek seed supplementation on lactation performance of Surti buffaloes

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ABSTRACT

The present experiment was aimed to evaluate the effect of fenugreek seed (FS) supplementation on lactation performance of buffaloes. Eighteen lactating Surti buffaloes were divided into 3 homogenous groups and offered with basal diet along with supplementation of overnight soaked fenugreek seed @ 0 (CON), 1.5 (FEN-1.5) and 3.0% (FEN–3.0) of total diet for 10 weeks. The daily milk yield from animals was recorded. At the end of experiment, milk samples were subjected for their constituent analysis followed by sensory evaluation. Cost of milk production was also worked out. Supplementation of FS resulted into an improvement in milk production, which was more evident at lower dose (FEN-1.5). The constituent composition of milk did not exhibit any alterations among different dietary groups. However, sensory attributes like flavour and palatability of milk showed an encouraging trend in supplemented groups. Cost of milk production was comparable across the groups. The present finding concluded that supplementation of fenugreek seeds (1.5%) in the ration of Surti buffaloes improved the milk yield with favourable impact on its sensory qualities.

Key words: Galactagogue, Milk quality, Milk yield, Surti buffalo, *Trigonella foenum-graecum*

Applications of feed additives from phytogenic origin are regarded as one of the promising contender for the sustainable animal production. They are gaining momentum and attention in public and scientific domain due to progression of drug resistance and environmental issues by the use of chemical and synthetic feed supplements (Seal *et al*. 2013). They have a variety of phytochemicals which have optimistic effect on animal production and health (Choubey *et al.* 2016). They have been well proven for their potential to mitigate enteric methane (Choubey *et al.* 2014). In this regard, fenugreek (*Trigonella foenum-graecum* L.) also known as *methi* is a frequently used home remedy for digestive disorders and has been well praised in available literature and Ayurveda for its galactopoietic activities (Mohanty *et al.* 2014). It is native to Indian subcontinent and has been a component of many Indian recipes and medicinal formulations (Mathur and Choudhry 2009, Mirzaei *et al.* 2011). It has been well acclaimed for its various medicinal (anti-inflammatory, antioxidant, metabolic modifier) virtues (Wani and Kumar 2016). It has proved its potential to improve the lactation performance of different dairy farm animal models in terms of quality and quantity (Al-Shaikh *et al.* 1999, Shah and Mir 2004, Samia *et al.* 2012). However, there is scanty of reports for its application in buffaloes (*Bubalus bubalis*) species for the aforesaid purpose. In the backdrop of the above views, present experiment was intended to evaluate the impact of fenugreek seed supplementation at graded levels on milk yield and quality along with cost of production.

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MATERIALS AND METHODS

The present experiment was carried out at a Livestock Research Station of Navsari Agricultural Universality, Navsari (Gujarat). The experiment was carried out during 15 April to 30 June 2016.

From an elite herd of Surti buffalos maintained at farm, 18 lactating animals (350.06±17.60 kg body weight; 2.88±0.45 parity; 55.52±8.61 day of lactation) were selected and divided into 3 homogenous groups considering their milk yield, live body weight, parity and stage of lactation. All the animals were housed in a well ventilated shed with concrete floor possessing appropriate facility of feeding and watering. The first group was offered with basal diet without any supplementation (CON), while the other 2 groups were supplemented with fenugreek seed @ 1.5 (FEN-1.5) and 3.0 (FEN-3.0) of total feed. The basal diet consisted of concentrate mixture, green (Napier hybrid) and dry fodder (paddy straw). The concentrate mixture (maize 9, cotton seed meal (extracted) 3.5, rice polish 10, deoiled rice bran 47, rapeseed meal 10, rice flake bran 5, molasses 11, sugar booster 0.5, urea 1, mineral mixture 2 and salt 1, part/100) was prepared and also procured commercially. The components of basal diet were analyzed for their chemical composition (AOAC 2005) and fed to meet the requirement

of animals for corresponding milk production (ICAR 2013). The required amount of fenugreek seeds were taken in a bucket and soaked with water (1:1.5) overnight (16 h). These soaked fenugreek seeds were supplemented to the animals along with concentrate mixture. To prevent any development of off flavour of FS in milk, only lower doses (1.5 and 3.0%) of supplementation have been circumscribed. Moreover, lower doses of supplements will support its economic viability at field level and adoption by farmers.

Milk yield, constituent, sensory evaluation and cost of production: Animals were milked twice daily at 07:00 and 14:00 h through hand milking by skilled milkers. Milk yield was recorded each time and summed up to arrive at daily milk yield. Towards the end of experiment, milk samples from individual animals were collected for two consecutive days and subjected to automatic milk analyzer to analyze its constituent (solid not fat, fat, protein and lactose) content. Apart from this, milk samples were also evaluated for their sensory attributes. Milk samples were heated on electric heater to the boiling and cooled to room temperature. These samples were evaluated for their appearance, flavour and palatability through a hedonic scale ranging from 1 (extremely poor) to 8 (excellent) by 12 panelists comprising of teaching and non-teaching staff of college. The existing market price of different feed components and milk were applied to work out the cost of milk production.

Statistical analysis: The data obtained were analyzed by applying one-way ANOVA with the post hoc Duncan's multiple comparison test using statistical package for the social sciences (SPSS, version 20.0, Chicago, USA). Statistical significance between means of different group was separated using LSD as per standard method (Snedecor and Cochran 1994). The effects were considered to be significant at $P<0.05$ and declared as trend at $0.05<P<0.10$.

RESULTS AND DISCUSSION

The chemical composition of feed, fodder and supplement used during experimental is presented in Table 1. The different nutrient composition of concentrate mixture, green and dry fodder was within the normal range as reported by Ranjhan (1991) for Indian feeds and fodders. Being a member of Leguminosae family, fenugreek seed contained good amount of protein (27.42%) and fair fat content (4.11%). A comparable chemical composition of fenugreek seeds have been also reported by Wani and Kumar (2016).

Lactation characteristics and milk yield: The selected buffaloes were uniformly partitioned into homogenous group as depicted by comparable ($P>0.05$) values for their body weight, parity, stage of lactation and initial milk yield (Table 2). With the progress of experiment, there appeared an improvement in the daily milk yield due to supplementation of soaked fenugreek seeds at both the dosage level (Table 2). However, this improvement ($P<0.05$) was more pronounced at supplementation dose of 1.5%, which accomplished its statistical significance after the third fortnight of experimental period. The control group displayed a gradual drop in milk yield, which was well prevented through fenugreek supplementation (FEN-1.5). Overall, fenugreek supplementation helped the animals to maintain a higher pace of milk production resulting into better average yield in FEN-1.5. Fenugreek seeds contain a fair amount of steroidal saponnin which may improve the nutrient absorption by altering the mucosal permeability of intestine (Pandian *et al.* 2002). Their milk promoting effect mediates through optimistic alterations in the endocrine system by improving the level of growth hormone (Alamer and Basiouni 2005), thyroid stimulating hormone and prolactin (Samia *et al.* 2012). These seeds posses, an oestrogen like substance which is also supposed to accomplish its galactagogue role (Tiran 2003). Likewise, a similar pattern of improvement in milk production due to fenugreek supplementation has been previously reported by several authors in different ruminant models (Alamer and Basiouni 2005, Samia *et al.* 2012, Balgees *et al.* 2013).

Table 1. Chemical composition (% dry matter basis) of feed, fodder and supplement

Particular	Concentrate mixture	Green fodder†	Dry fodder†	Fenugreek seed
Organic matter	89.94	90.65	88.96	88.67
Crude protein	20.24	7.86	3.67	27.42
Ether extract	2.66	3.11	1.35	4.11
Total carbohydrate	67.04	79.68	83.94	56.14
Neutral detergent fibre	29.56	56.85	77.86	18.62
Acid detergent fibre	14.33	34.25	48.35	4.38
Hemi cellulose	15.23	22.6	29.51	14.24

†Napier hybrid and paddy straw were used as green and dry fodder, respectively.

Table 2. Lactation characteristics and milk yield in Surti buffaloes supplemented with soaked fenugreek seed

Particular	Dietary groups			P value
	CON	FEN-1.5	FEN-3.0	
Body weight (kg)	343.20±28.10	340.00±27.1	351.30±21.3	0.911
Parity (No.)	2.83±0.79	2.67±0.61	2.83±0.79	0.898
Stage of lactation (days)	58.83±13.65	60.00±9.85	52.17±8.86	0.816
Daily milk yield (kg)				
Period (fortnight)				
I	3.98±0.15	3.85±0.20	3.96±0.29	0.708
II	4.08±0.13	4.20±0.21	4.16±0.31	0.407
III	3.75±0.23	4.07±0.18	3.89±0.37	0.156
IV	3.44^{a}±0.28	4.13^{b}±0.24	3.75^{ab}±0.39	0.045
V	3.35^{a}±0.27	4.00^{b}±0.21	3.58^{ab}±0.44	0.044
Average	3.72^{a}±0.20	4.05^{b}±0.22	3.87^{ab}±0.34	0.049
Change in milk yield	-0.63^{a}±0.15	0.15^{b}±0.22	-0.38^{ab}±0.30	0.036

^{ab}Values in a row bearing different superscript differ significantly ($P<0.05$).

They have also proved their worth as component of herbal preparation to improve the lactation performance and health of dairy animals (Mirzaei *et al.* 2011). Degirmencioglu *et al.* (2016) found an improvement in milk yield (670 g/day) through supplementation of grounded FS (50 g/kg in concentrate) in Anatolian water buffaloes. In contrast to above findings, Shah and Mir (2004) did not observe any alteration in milk yield, which was attributed to their short term (3 weeks) of experiment.

Milk composition and sensory attributes: The data pertaining to milk composition and its sensory evaluation are presented in Table 3. Some of the prior studies, suspect that a higher dose supplementation of any herbal supplement having distinct aroma or taste may impart off flavour to milk (Randby *et al.* 1999).

Thus a sensory evaluation was carried out to determine the organoleptic acceptability of milk. The different constituents of milk i.e. fat, solid not fat, protein and lactose did not exhibit any alterations due to dietary supplementation of soaked fenugreek seeds at either of doses. Several reports of non responsive impact of fenugreek seed supplementation in dairy animals have been evident from available literature (Shah and Mir 2004, Abo El-Nor *et al.* 2007, Degirmencioglu *et al.* 2016). However, Balgees *et al.* (2013) suggested a drop in milk fat of goats due to FS supplementation at very higher doses. Interestingly, there appeared a positive trend in flavour (P=0.060) and palatability (P=0.073) of boiled milk indicating the positive impact of FS supplementation on milk characteristics. This consequence may be justified on the basis of strong antioxidant effect of FS (Wani and Kumarbn 2016), which might have prevented the oxidative loss of milk fat during heating resulting into better flavour and palatability. Also, FS supplementation was associated with some of desirable alterations in fatty acid profile of milk (Shah and Mir 2004) and hence the sensory attributes.

Economics of milk production: The cost of different components of diet was comparable across the group while that of FS was higher (P<0.01) in treatment groups due to supplementation (Table 4). Overall cost of total diet remained comparable (P>0.05) among different dietary groups. Due to increased milk production, return through sale of milk was higher in FEN-1.5. However, profit over feed cost and with respect to control was not able to reach the level of significance due to an analogous rise in feed cost. Similarly, economics of milk production (₹/kg milk or profits) did not elucidate any difference among group.

From the present experiment, it may be concluded that supplementation of overnight soaked FS (1.5%) in lactating Surti buffaloes improves the milk production without affecting its composition and cost of production. Additionally, it has got optimistic trends for improvement in sensory traits of milk.

Table 3. Nutrient composition and sensory attributes of milk from Surti buffaloes supplemented with soaked fenugreek seed

Period (Fortnight)	Dietary groups			P value
	CON	FEN-1.5	FEN-3.0	
	Milk composition			
Fat (%)	8.21±0.86	8.19±0.86	7.72±0.77	0.697
Density	31.94±1.40	32.99±0.88	33.01±0.51	0.452
SNF (%)	9.95±0.37	10.24±0.13	10.10±0.20	0.453
Protein (%)	4.19±0.21	4.33±0.16	4.44±0.25	0.442
Lactose (%)	5.10±0.17	5.15±0.18	5.15±0.07	0.806
	Sensory evaluation			
Appearance	6.74±0.09	7.06±0.08	7.24±0.09	0.133
Flavour	6.51±0.09	6.76±0.05	6.80±0.13	0.060
Palatability	6.47±0.11	6.80±0.11	6.84±0.16	0.073

Table 4. Economics of milk production in Surti buffaloes supplemented with soaked fenugreek seed

Particular	Dietary groups			P value
	CON	FEN-1.5	FEN-3.0	
Conc. (₹)	45.75±2.42	45.93±2.77	41.91±2.55	0.313
Fenugreek (₹)	0.00^{a}±0.00	9.18^{b}±0.73	18.88^{c}±1.69	0.00
Dry fodder (₹)	48.03±4.56	42.90±5.00	46.70±6.32	0.531
Green fodder (₹)	15.00±0.00	15.00±0.00	15.00±0.00	0.244
Total feed (₹)	108.77±6.16	113.02±7.53	122.49±8.84	0.244
Milk (₹)	185.93±8.12	202.38±9.14	193.40±9.06	0.122
Milk production cost (₹/kg)	29.72±1.66	28.32±1.48	32.22±2.30	0.236
Profit (₹)				
Over feed cost	77.15±6.09	89.36±7.03	70.91±7.77	0.147
with respect to CON	0.00±6.09	12.21±7.03	–6.24±7.77	0.147
Benefit cost ratio	1.71±0.05	1.79±0.05	1.55±0.07	0.156

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