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EFFECT OF *Pashu chocolate* SUPPLEMENTATION ON PRODUCTION AND REPRODUCTIVE PERFORMANCE OF MILCH BUFFALO UNDER FIELD CONDITIONS OF SEMI ARID REGION

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ABSTRACT

Pashu chocolate is the brand name of the urea molasses mineral block formulated by KVK, Panchmahal by using of urea, molasses, wheat bran, area specific mineral mixture, black salt, etc. for augment milk production and reproductive performance of dairy animals. A study was conducted to find out the efficacy of *Pashu Chocolate* supplementation on productive and reproductive performance of milking buffalo and feed economics at farmers field in semi-arid zone, during the year 2018 to 2019. Twenty, lactating Mehsana breed of buffalo were randomly selected and distributed equally in to two groups ten each in a completely randomized design i.e., T1 (Control) and T2 (*Pashu Chocolate* supplementations). In the feeding schedule of the present study T1animals were given 5 to 6 kg dry roughage (sorghum/pearl millet) with green fodder (20 kg Napier-lucerne) added to 2.5 kg concentrate feed/ day, whereas an ad lib lick of UMMB (Pashu chocolate) was offered in the T2 Group in addition to the feeding schedule of T1 Group. An increase of 24.56% in milk i.e., from 6.23±0.40 to 7.76±0.54 L per day was recorded after comparing the outcomes of the two treatments. This significant ($P<0.05$) increase in milk production indicates a positive impact of *Pashu chocolate* on the performance of milch buffaloes. Supplementation of *Pashu chocolate* as an ad lib lick reduced the postpartum estrus period and service period from 79.7±7.43 and 132.00±13.34 days to 54.3±4.41 and 81.60±7.54 days, respectively. Hence, the findings in the present study indicate beneficial effects of *Pashu chocolate* on productive and reproductive traits of buffaloes in semi-arid climatic conditions.

Keywords: *Bubalus bubalis*, buffaloes, milk production, milk composition, *Pashu Chocolate*, reproductive performance

INTRODUCTION

Animal husbandry in the arid and semi-arid climatic conditions of India has the potential to alleviate poverty through its direct impact on farmer's economy. In practically all regions of the nation, agricultural residues, forages, and mature grass are the primary sources of feeding for livestock dry season of the year. The feeds described here are of poor quality and lacking in many nutrients and are incapable of supporting good production

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/ reproduction levels in milch animals (Khadda *et al*., 2014). The use of these feeds can be made more beneficial when they are fed in conjunction with UMMB whose supplemental value has been proved earlier in ruminants by Singh and Singh, 2003; Khadda *et al*., 2014; Lawania and Khadda, 2017. The use of UMMB is most beneficial during the dry season when only poor-quality dry grasses are available on the pasture for grazing (Bheekee *et al*., 2002). The use of urea molasses mineral block (UMMB) for supplementing crops residues-based diet for livestock feeding is well documented in ruminants (Singh and Singh, 2003; Khadda *et al*., 2014; Lawania and Khadda, 2017). UMMB can be offered throughout the year but is more beneficially utilized during the dry season when animals are reared on low quality forage (Bheekhee *et al*., 2002).

According to Singh and Singh (2003), supplement feeding of UMMB could reduce concentrate mixture by 30 to 40% without affecting animal productivity. However, most of the study was conducted on farm position and very few trails have been conducted in the farmer's field particularly in semi-arid ecology. *Pashu chocolate* is the brand name of the urea molasses mineral block (UMMB) formulated by KVK, Panchmahal by using of urea, molasses, wheat bran, area specific mineral mixture, black salt, etc., for increase production and reproductive performance of milch animals.

Based on the above specifics in view, an experimental study was conducted to find out the efficacy of *Pashu Chocolate* (UMMB) supplementation on nutrient utilization, milk yield and reproductive performance of milch buffalo and determined the cost usefulness of supplements in farmer's field under hot semi-arid conditions.

MATERALS AND METHODS

An OFT was conducted under the banner of ICAR-KVK, Panchmahal, to find out the efficacy of *Pashu Chocolate* (UMMB) supplementation on productive and reproductive performance of milch buffalo under farmer's field in the semi-arid ecosystem of middle Gujarat during 2018 to 2019. Twenty, lactating Mehsana breed of buffalo were randomly selected and distributed equally in to two groups ten each in a completely randomized design i.e., T1 (Control) and T2 (*Pashu Chocolate* supplementations). All animals were reared under traditional feeding and managemental system. Uniformity in lactation period, body weight, milk production and parity were considered when selecting the animals for present study.

During the start of study, the average body weight of selected buffalo was found 385.8 kg and average daily milk yield was 6.15 litres. Buffalo body weights were estimated indirectly before the start and at the end of the experiment by measuring the heart girth with a metric tape measure, as suggested by Sastry *et al.* (1988). Feeding of buffalo in the Control group (T1) consisted of 5 to 6 kg of dry forage, i.e., corn, sorghum, and millet straw with some local dry grasses, and 20 kg of green forage, i.e., hybrid napier and alfalfa with a concentrate mixture of 2.5 kg per day per animal. In the Treatment group (T2), in addition to the above measures, a regular supply of *Pashu chocolate* was offered as a treat throughout the study period, without interruption. Equal quantities of the concentrate mixture were fed twice daily i.e., just before milking time. The *Pashu chocolate* brick was kept in the manger of the animal to allow optimal lick. The *Pashu chocolate* was prepared by the experts of KVK -Panchmahal for the study. The *Pashu chocolate* contained 38%

molasses, 30% wheat bran, 8% *Meda* (wheat floor as binding agent), 10% mineral mixture, 10% urea and 4% black salt. The concentrate mixture and area specific mineral mixture was procured from Panchmahal district co-operative milk producers union Ltd, Godhra. Each block weighed 2 kg, and daily consumption of *Pashu chocolate* was tracked. During the study period, an average of 220 g of *Pashu chocolate* per day was consumed by the experimental animals. Prior to the trial, fenbendazole was used to deworm all the animals to control internal parasites.

The percentage intake of feed per animal per day was also recorded after the animals were fed the feed separately. The drinking water was accessible *ad lib.* The data regarding milk yield and feed intake and *Pashu chocolate* was recorded daily for 150 days. At milking time, samples of each buffalo's milk were continuously obtained and tested for fat, SNF, protein, and total solids. Milk fat was determined by Gerber's method (BIS, 1977), nitrogen content by micro Kjeldahl method, SNF by using ISI formula based on estimation of specific gravity using corrected lactometer reading. The 6% FCM was calculated by the equation of formula (Rice *et al*., 1970): 6% FCM yield (kg) = 0.308x total milk (kg) + 11.54 x total fat (kg). Reproductive traits were also recorded in relation to the onset of post-partum estrus, service time, and services per conception. At the end of the experiment a 3 days digestion trial was conducted. Every day during the trial period, feed and faeces samples were taken from each buffalo, which were kept apart and before being analysed for several proximate principles, the material was bulked, mixed, and ground to pass through a 1 mm screen (AOAC, 1995). The amount of total digestible nutrients and digestible crude protein in feed was determined by the equation (Van Soest, 1982). The significance of the differences between treatment means was assessed using the student-t test after the data were statistically processed in a completely randomized design as per (Snedecor and Cochran 1989).

RESULTS AND DISCUSSIONS

The proximate composition of concentrate and forage consumed by animal during experiment is presented in Table 1. Most of the dry forage available during dry season for feeding was medium quality (6.67 to 7.71% CP and 35.13 to 38.56% CF) and green fodder (10.87% CP and 31.23% CF) was good quality. The concentration available to buffalo was found to be good quality. The concentrate's proximate composition was found to be different to the concentrate mixture from described by Misra *et al* (2006). This may be because different ingredients were used for preparing balance ration to fulfill the animals' nutritional needs. The DM, OM, CP, and CF content in concentrate mixture were 90.46%, 89.82%, 19.18% and 8.65%, respectively. The CP and CF content of *Pashu chocolate* (UMMB) was 42.30% and 4.21%, respectively. The proximate composition of concentrate mixture and forage fed by buffalo were more or less similar to that reported by Singh and Singh (2003); Misra *et al.* (2006); Choudhary and Jat (2008); Khadda *et al.* (2014).

Intake and digestibility of nutrients

The data analysed on nutrients intake and digestibility revealed that the average dry matter using up was recorded 10.62% higher in Treatment group as compared to check (Table 2). The DMI kg/ 100 kg body weight was 2.58±0.41 and 2.79±0.32

kg per day for the Control and Treatment groups, respectively. The results concur with those that were reported by (Singh and Singh, 2003; Madhu and Singh, 2010; Khadda *et al*., 2014). Digestible crude protein intake was 664±22.54 and 753±25.41 g/ day in control and *Pashu chocolate* group, respectively. Feeding of *Pashu chocolate* significantly (P<0.05) enhanced the quality and nutrient density of the basal diet. The quality enhancement of the basal diet due to *Pashu chocolate* supplementation has been well recognized and may vary extensively depending on nature of basal feed and system of feeding (Singh and Singh, 2003; Misra *et al*., 2006). The intake of *Pashu chocolate* (UMMB) ranged from 195 to 270 g with an overall average of 220±13.10 g/ buffalo/ day. This variance results from the unevenness in taste habits of the animals.

Effect of *Pashu chocolate* on yield and composition of milk

The effects of *Pashu chocolate* on milk production and its composition revealed that the initial milk yield was analogous in both groups, but average milk yields were recorded at 6.23 liters/ day in Control group and 7.76 liters/day in *Pashu chocolate* group during study period (Table 3). The results indicated that the buffaloes supplemented with *Pashu chocolate* produced 24.56% more milk compared to control without adversely affecting their body weight and health, which was reflected in their improved body weight. The augment in milk yield was considerably higher (P<0.05) in *Pashu chocolate* group as compared to check. Similarly, it also helped in improving lactometer reading from 28.4±2.3 (Control group) to 30.79±2.35 (*Pashu chocolate* group) in buffaloes being statistically different. The results of this study were similar to those from previous research (Singh and Singh, 2003; Ramesh *et al*., 2009; Khadda *et al*., 2014). A higher availability of crude protein, energy, and area specific minerals in the ration supplemented with Pashu chocolate may account for the increased milk production. Consequently, rumen ammonia content was maintained, improved rumen environment for microorganisms, resulting in an improved digestibility of feed ingredients (Rafiq *et al*., 2000; Tiwari *et al*., 2013). There was a significant improvement in milk fats, SNFs, and proteins in animals fed Pashu chocolate compared to controls. Several other studies have reported similar results (Ramesh *et al*., 2009; Khadda *et al*., 2014; Lawania and Khadda, 2017).

Reproductive performance

The postpartum estrus period, service period and number of services per conception under *Pashu chocolate* and Control groups are given in Table 4. A comparison of the Control and Treatment groups revealed in this study that *Pashu chocolate* ad lib licking showed significant (P<0.05) reduction in postpartum estrus period and service period from 79.7±7.43 and 132.00±13.34 days to 54.3±4.41 and 81.60±7.54 days, respectively in the given semi-arid climatic conditions. A significant (P<0.05) reduction in the number of services per conception was recorded in the treatment group vis a vis the Control group 1.41±0.30 vs 2.80±0.48. *Pashu chocolate* lick also influenced significantly (P<0.05) the postpartum reproductive performance in milch buffalo. The findings of this study showed that Pashu chocolate lick has beneficial effects similar to those observed by Alam *et al*., 2006; Ramesh *et al*., 2009; Khadda *et al*., 2014 who concluded that *Pashu chocolate* increases the intake of straw which in turn augments the reproductive characteristics of cows because of more availability of nitrogen in the *Pashu chocolate*. In another study (Kang *et al*.,

Table 1. Proximate composition of feedstuffs used during the on farm trial (% on DM basis).

Particular	Concentrate mixture	Sorghum stover	Per millet stover	Napier green grass	Lucerne green grass	*Pashu chocolate* (UMMB)
DM	90.46±1.04	90.36±1.11	89.86±1.23	16.20±1.23	22.16±1.31	89.68±0.30
OM	89.82±2.11	90.25±1.65	90.21±1.44	90.68±1.56	85.45±1.82	76.12±2.70
CP	19.18±1.20	7.71±0.45	6.67±0.60	9.12±0.80	18.10±0.64	42.30±2.10
CF	8.65±1.04	36.73±2.05	38.56±1.71	32.12±2.1	19.95±1.67	4.21±0.60
EE	3.08±1.21	1.10±0.29	1.01±0.30	1.34±0.60	2.74±0.49	1.23±0.40
NFE	58.91±2.10	44.71±2.30	43.97±3.10	44.07±2.1	44.66±2.06	28.38±2.26
Total Ash	10.18±0.91	9.75±0.79	9.79±0.50	9.32±0.40	14.55±0.29	23.88±1.76

Table 2. Mean intake of nutrients and their digestibility in lactating buffalo.

Parameter	T1 (Control)	T2 (*Pashu chocolate*)
Initial body weight (kg)	386.9±6.53	384.7±5.42
Final body weight (kg)	401.8^{b}±7.54	411.2^{a}±5.77
Body weight gain in 150 days (kg)	14.9^{b}±2.21	26.5^{a}±1.72
DMI through dry fodder (kg/d)	4.82±0.41	5.46 ±0.62
DMI through green fodder (kg/d)	3.17.06±0.41	3.44±0.59
DMI through concentrate (kg/d)	2.26±0.11	2.26±0.14
DMI through *Pashu chocolate* (g/d)	--	197.30±0.07
Total DMI (kg/d)	10.36^{b}±0.30	11.46^{a}±0.50
DMI / 100 kg live weight	2.58^{b}±0.41	2.79^{a}±0.32
Total CPI (g/d)	1209^{b}±29.15	1371^{a}±44.27
DCP intake (g/d)	664^{b}±22.54	753^{a}±25.41

Group mean with different superscripts differed significantly ($P<0.05$).

Table 3. Effect of *Pashu Chocolate* on yield and composition of buffalo milk.

Particulars	T1 (Control)	T2 (*Pashu chocolate*)
Initial milk yield (l/d)	6.11±0.46	6.18±0.57
Av. milk yield (l/d)	6.23^{b}±0.4	7.75^{a}±0.54
6FCM yield (l /d)	6.51^{b}±0.43	8.46^{a}±0.53
Increase in milk yield (%)	-	24.56
Lactometer reading	28.7^{b}±2.3	30.94^{a}±2.35
Fat %	6.24^{b}±0.07	6.74^{a}±0.10
SNF %	9.27^{b}±0.10	9.69^{a}±0.14
Proteins %	3.54^{b}±0.07	3.96^{a}±0.04
Total solid %	15.51^{b}±0.14	16.43^{a}±0.11

Group mean with different superscripts differed significantly (P<0.05).

Table 4. Reproductive performance of lactating buffalo under different feeding groups.

Particulars	T1 (Control)	T2 (*Pashu chocolate*)
Post-partum oestrus (days)	79.7^{b}±7.43	54.3^{a}±4.41
Service period (days)	132^{b}.00±13.34	81.60^{a}±7.54
No. of services (AI) per conception	2.8^{b}±0.48	1.41^{a}±0.30

Group mean with different superscripts differed significantly (P<0.05).

Table 5. Feed economics of Pashu chocolate supplementations on lactating buffalo.

Particulars	T1 (Control)	T2 (*Pashu Chocolate*)
Av. Milk yield during study period (lit./d)	6.23^{b}	7.75^{a}
Additional increase in milk yield (lit./d)	-	1.52
Total milk production (lit./150days)	934.5^{b}	1162.5^{a}
Av. Feeding cost (Rs./day)	89/-	89/-
Cost of *Pashu chocolate* (Rs./day)	--	5.5/-
Total feeding cost (Rs./day)	89	94.5
Av. Feeding cost/ lit. milk production (Rs.)	14.29^{b}	12.19^{a}
Reduction in cost of milk production/ lit. (%)	-	17.23
Gross return from sale of milk (Rs./day)	280.35^{b}	348.75^{a}
Additional income from *Pashu chocolate* supplementation (Rs./day)	-	68.40
Net return (Rs./day)	191.35^{b}	254.25^{a}
B:C Ratio	3.15	3.69
Additional B:C Ratio from *Pashu chocolate* supplementation	--	12.44

Group mean with different superscripts differed significantly (P<0.05).

2006) the conception rate was found to be better in the buffaloes provided with UMMB licks. Multiple factors play their roles in the improvements observed in reproductive traits after feeding the animals with UMMB. Development and release of the ovum (ovulation) is maintained in milch animals provided with adequate quantities of macro and micro minerals. Phosphorus is an integral part of the energy metabolism whose deficiency causes delayed sexual maturity, anestrus, repeat breeding and irregular estrous cycle (Quayam *et al*., 1988). The intake of minerals, protein and calories can be said to affect the neuro-endocrine axis which manifests as increased efficiency in the reproductive performance of the animals.

Feed economics of *Pashu chocolate*

The expenditure and income components were subjected to a partial budget analysis. Therefore, the cost of *Pashu chocolate*, concentrate mixture and roughage have been measured. Since family members were used in the management of the animals in both groups, therefore, the wage was not taken into account when calculating economics. The costs of *Pashu chocolate,* concentrate mixture and roughage was calculated on according to market rates prevalent during the study period *i.e*., Rs. 50/ block of 2 kg for *Pashu chocolate*, Rs.1600/q. for concentrate mixture, Rs.400/q. for dry fodder and Rs.200/q. for green fodder. The price of milk received by livestock keepers during the study period was taken Rs. 45/ lit. In the control and experiment groups, the average cost of feeding per litre of milk production was found to be Rs. 14.29 and 12.19, respectively, demonstrating that the supplementation of *Pashu chocolate* to the dairy animal significantly reduction the cost of milk production sizably under field conditions (Table 4). The feeding of *Pashu chocolate* with basal diet during the study period revealed that the benefit cost ratio 1:3.69 was calculated, which appears to be quite profitable compared to the conventional manner of feeding.

Based on the present study, it can be concluded that the supplemention of *Pashu chocolate* cost-effectively enhanced the feed efficiency, milk yield, milk composition and reproductive performance of milch buffalo under hot semi-arid ecosystem. All the livestock keepers willingly accepted the technology of using *Pashu chocolate* supplementation and are also willing to continue this practice. *Pashu chocolate* has potential to augment the feasibility of dry season milk supplies, improvement in the reproductive performance of milch buffaloes and increase family incomes. However, it is necessary to raise awareness among dairy farmers about the benefits of *Pashu chocolate* and the availability of *Pashu chocolate* at the village level milk collecting centre or state animal husbandry agency should be ensured.

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