*Indian Journal of Animal Sciences* **84** (3): 302–305, March 2014/Article

# Effect of urea molasses minerals block on nutrient utilization, milk production and reproductive performance of crossbred cattle under semi arid ecosystem

B S KHADDA[1], KANAK LATA[2], RAJ KUMAR[3], J K JADAV[4] and A K RAI[5]

*Krishi Vigyan Kendra- Panchmahals (CIAH), Vejalpur, Godhra, Gujarat 389 340 India*

Received: 7 October 2013; Accepted: 30 November 2013

ABSTRACT

A trial was conducted to evaluate the effect of UMMB on overall performance of crossbred cattle and economics at KVK- Panchmahals under the semi- arid condition of Gujarat, India, during the year 2012–13. Lactating HF crossbred cows (20) were divided into groups $T_1$ (control) and $T_2$ (UMMB) of 10 cows in each. The feeding of selected animals in group ($T_1$) was consisted of 5–6 kg dry fodder and 25 kg green fodder with 2.5 kg /day/animal concentrate mixture. In group $T_2$, in addition to the above, a regular supply of UMMB as a lick was offered during the period of study without interruption. Supplementation of UMMB significantly improved the basal diet. UMMB supplemented cows produced 31.42% more milk with significantly higher milk yield in the animals of UMMB group as compared to control without any adverse affect on health of the animals. The postpartum oestrus period and service period reduced significantly in UMMB group than the control group. Reduction in cost of milk production/ litre was recorded 21.66% in crossbred cows supplemented with UMMB. Based on observations, it can be concluded that the feeding of UMMB improved the feed efficiency, milk production and composition and reproductive performance of crossbred cows under hot semi-arid ecosystem.

**Key words**: Crossbred cows, Milk composition, Milk production, Reproductive performance, UMMB

India is predominantly an agrarian society and dairy animals are one of the prime sources of the rural economy, where the livestock feeding sources are crops residues, forage and grasses which are not sufficient to fulfil the nutritional requirements for productive and reproductive performance of dairy animals. Singh and Singh (2003) documented the importance of urea molasses minerals block as supplement for livestock. Keeping the above facts in view, the efficacy of UMMB on livestock and scarcity of findings on such aspects under field conditions, an attempt was made to evaluate the effect of UMMB on overall performance of crossbred cattle and economics under hot semi-arid conditions of western India.

## MATERIALS AND METHODS

A trial was conducted during 2012–13 in the banner of KVK- Panchmahals in the semi arid ecosystem of middle Gujarat. Lactating Holstein Friesian crossbred cows (20) were divided into 2 groups of 10 cows each in groups $T_1$ (control) and $T_2$ (UMMB supplementations). All animals were managed under farmers own traditional system of feeding and management. The animals were selected nearly at the same lactation stage, body weight, milk yield and parity. The average body weight of selected crossbred cows was 353.50 kg and average daily milk yield was 8.6 litre/ day at the start of the experiment. The body weights of cows were estimated before the initiation and at the end of the experiment indirectly by measuring heart girth of the cows using a metric tape (Sastry *et al.* 1988). The feeding of animals in control group (T1) consisted of 5–6 kg dry fodder, viz. maize, sorghum and pearl millet stover with some quantity of local dry grasses and 25 kg green fodder i.e. hybrid napier and lucerne with 2.5 kg/day/animal concentrate mixture. The animals were fed feed separately and percentage intake / head / day was also recorded. The drinking water was offered *ad lib.* The concentrate mixture contained barley 20%, maize 20%, mustard cake 20%, cotton seed cake 15%, boiled rice bran 12%, rice polish 10%, mineral mixture 2% and common salt 1%. Equal quantities of the concentrate mixture was offered twice daily i.e. just before milking in the morning and evening. In the $T_2$ treatment group in addition to the above, a regular supply of urea molasses minerals block as a lick was offered during the whole period of study, without interruption. The UMMB was kept in front of the animals in the manger to allow optimum intake. The UMMB was prepared by the KVK experts at the KVK-Panchmahals for the feeding trial. The UMMB contained molasses 38%, wheat bran 30%, cement 10%, mineral mixture 10%, urea 10% and common salt 2%. The weight of each block was 2 kg and consumption of UMMB was monitored daily. The average consumption

Present address: [1,3–5]Subject Matter Specialist ([1] khadda74 @gmail.com, [3] rajhortches@gmail.com [4]jksmskvk@gmail.com, [5]ajayrai74@gmail.com), [2]Programme coordinator (kanak1966 @redif.com).

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

| Particular | Concentrate mixture | Sorghum stover | Per millet stover | Mixed dry grasses | Napier green grass | Lucerne green grass | UMMB |
|---|---|---|---|---|---|---|---|
| DM | 90.60±1.07 | 90.25±1.07 | 89.97±1.3 | 88.65±1.35 | 16.20±1.23 | 22.16±1.31 | 89.62±0.30 |
| OM | 88.96±2.11 | 91.23±1.90 | 90.18±1.7 | 90.70±1.90 | 90.68±1.56 | 85.45±1.82 | 76.12±2.70 |
| CP | 18.98±1.30 | 5.11±0.70 | 6.47±0.80 | 7.37±0.60 | 9.12±0.80 | 18.10±0.64 | 42.58±2.10 |
| CF | 8.52±1.020 | 29.73±2.11 | 33.56±1.9 | 37.3±1.80 | 32.12±2.1 | 19.95±1.67 | 4.26±0.60 |
| EE | 3.19±1.220 | 1.09±0.30 | 0.91±0.40 | 1.96±0.60 | 1.34±0.60 | 2.74±0.49 | 1.23±0.40 |
| NFE | 58.27±2.87 | 55.30±2.51 | 49.25±3.1 | 55.93±2.3 | 44.07±2.1 | 44.66±2.06 | 28.05±2.31 |
| Total ash | 11.04±0.90 | 8.77±0.70 | 9.82±0.60 | 9.30±0.23 | 9.32±0.40 | 14.55±0.29 | 23.88±1.76 |

of UMMB by the experimental animals was 250 g/day during the study period. All the animals were dewormed by fenbendazole for control of internal parasites before the start of the experiment. The data recording of experiment trial was carried out for 150 days. The milk was recorded daily at morning and evening milking. The intake of feed and UMMB was recorded daily. Samples of milk were taken constantly at milking time from each cows and analyzed for fat, SNF, protein, and total solid. Milk fat was determined by Gerber's method (BIS 1977), nitrogen content by micro Kjeldahl method, SNF by ISI formula based on estimation of specific gravity using corrected lactometer reading and 4% FCM was calculated by the equation of formula (Gaines 1928). Reproductive performance with reference to onset of post-partum estrus, service period and services per conception were also recoded. A 7-day digestion trial was conducted at the end of the experiment. The each cow was kept in separate pen and feed and faecal samples were collected daily throughout the trial period and bulked, mixed and grinded to pass through a 1 mm screen before the analysis for different proximate principles (AOAC 1995). Digestible crude protein and total digestible nutrient of feed was estimated by using the equation reported by Van Soest (1982). The data were analysed statistically in a completely randomized design and the significances of the difference between treatments means was determined by using the student-t test (Snedecor and Cochran 1989).

## RESULTS AND DISCUSSION

Proximate composition of feed and fodder offered to experimental cows is presented in Table 1. Most of the dry fodder available for feeding during dry season was found of medium quality and green fodder of good quality. The DM and OM content of basal roughage and green forages were similar to that of reported by Misra *et al.* (2006). Concentrate mixture offered to experimental animals was of good quality. The proximate composition of the concentrate mixture was different to the mixture reported by Misra *et al. (*2006).This might be due to mixing of various ingredients in different proportion to meet the nutritional requirement of the animals. The CP and CF contents of UMMB were 42.58 and 4.26%, respectively. More or less similar CP and CF of UMMB were also reported by Singh and Singh (2003) and Misra *et al.* (2006).

*Intake and digestibility of nutrients:* The average dry matter consumption was 11.75% higher in UMMB supplemented group as compared to control (Table 2). The findings are in agreement with those reported by Singh and Singh (2003) and Madhu and Singh (2010). Digestible crude protein intake was 623±23.74 and 728±27.31 g/ day in control and UMMB group, respectively. Supplementation of UMMB significantly (P<0.05) improved the quality and nutrient density of the basal diet. Improvement of the basal diet due to UMMB supplementation is well established and may vary widely depending on nature of basal feed and feeding system (Singh and Singh 2003, Misra *et al.* 2006). The intake of UMMB ranged from 200 to 350 g with an overall average of 250±0.50 g/ cow/day. This variation is due to the variability in taste habits of the animals.

*Effect of UMMB on yield and composition of milk:* The initial milk yield was similar in both groups (Table 3) but average milk yield recorded during the study period was

Table 2. Effect of UMMB supplementation on nutrient utilization in lactating crossbred cattle

| Parameter | T-1 (control) | T-2 (UMMB) | CD at 5% |
|---|---|---|---|
| Initial body weight (kg) | 355±10.75 | 352±10.50 | – |
| Final body weight (kg) | 367±12.50 | 378±6.25 | 6.82 |
| Body weight gain in 150 days (kg) | $12^{b}$±1.07 | $26^{a}$±3.21 | 2.39 |
| DMI through dry fodder (kg/d) | 4.62±0.5 | 5.34±0.7 | 0.369 |
| DMI through green fodder (kg/d) | $3.25^{b}$±0.31 | $3.49^{a}$±0.95 | 0.270 |
| DMI through concentrate (kg/d) | 2.25±0.15 | 2.25±0.21 | – |
| DMI through UMMB (g/d) | – | 225±0.05 | – |
| Total DMI (kg/d) | $10.12^{b}$±0.36 | $11.31^{a}$±0.58 | 0.411 |
| DMI / 100 kg live weight | $2.75^{b}$±0.42 | $2.99^{a}$±0.38 | 0.397 |
| Total CPI (g/d) | $1137^{b}$±62.19 | $1325^{a}$±68.26 | 83.27 |
| DCP intake (g/d) | $623^{b}$±23.74 | $728^{a}$±27.31 | 0.609 |
| TDN intake (kg/d) | $5.80^{b}$±0.22 | $6.52^{a}$±0.19 | 0.692 |

Group mean with different superscripts differed significantly (P<0.05); CD, critical difference.

8.75±0.5 and 11.50±0.62 litre /day in control and UMMB group, respectively. The results indicated that the cows supplemented with UMMB produced 31.42% more milk as compared to control without any adverse affect on the body weight and health of the animals, which was apparent from the improved body weight of the cows during the study period. The increase in milk yield was significantly higher (P<0.05) in UMMB group as compared to control. Similar effects of UMMB supplementation on milk production were also reported by Singh and Singh (2003) and Misra *et al.* (2006) in field trials. The increase in milk production may be attributed to higher availability of crude protein, energy and area specific minerals in the ration supplemented with UMMB which led to a subsequent maintenance of rumen ammonia content and an improved rumen environment for micro-organisms and increased digestibility of the ration (Rafiq *et al.* 2000, Tiwari *et al.* 2013). The average lactometer reading of milk was higher in UMMB group as compared to the control. These results were in agreement with earlier reports by Ramesh *et al*. (2009). Fat and SNF components of milk in animals fed with UMMB improved considerably as compared to control (Table 3). Similar result was also reported by (Ramesh *et al.* 2009).

*Reproductive performance:* The postpartum oestrus period, service period and number of services per conception under UMMB and control groups are given in Table 4. The mean duration of postpartum oestrus period and service period was reduced significantly in UMMB group than when compared to the control group under hot semi-arid ecosystem condition. The services per conception was also significantly (P<0.05) higher in non- supplemented group than the supplemented group. The average number of service per conceptions in UMMB and control group was recorded 1.37±0.40 and 3.6±1.22, respectively. The results showed that supplementation of UMMB in the diet significantly (P<0.05) influenced the postpartum reproductive performance in crossbred cows. Our results corroborated with the findings of Alam *et al.* (2006) and Ramesh *et al*. (2009) who reported that UMMB supplementation has a positive effect on reproductive performance of cows maintained on straw based diets due to supply of nitrogen resulting in more intake and utilization of straw. Kang *et al.* (2006) also recorded higher conception rate in buffaloes supplemented with UMMB than non-supplemented group. Improvement in reproductive efficiency in these cows supplemented with UMMB containing calcium, phosphorus, iodine, zinc, copper, sulphur, fluorine, lead, arsenic and silica are attributed to various factors. Minerals have a beneficial role on endocrine system and play an important role in resumption of follicular growth and fertility in dairy cows. Phosphorus is associated with energy metabolism and its deficiency results in delayed sexual maturity, anestrus, repeat breeding and irregular estrous cycle (Quayam *et al.* 1988). Hence, the improvement in reproductive efficiency in the present study may be attributed to the beneficial action of supplemented minerals, crude protein and energy on the neuro-endocrine axis and reproductive functions.

*Economics of UMMB:* A partial budget analysis measures was used in those items of expenditure and incomes. The cost of roughage, concentrate mixture and UMMB were considered. The cost of labour was not considered for calculation because it was same in both groups as family members were used in management of

Table 3. Effect of UMMB on yield and composition of milk of crossbred cattle

| Particulars | T-1 (control) | T-2 (UMMB) | CD at 5% |
|---|---|---|---|
| Initial milk yield (l/d) | 8.60±0.46 | 8.58±0.57 | 0.52 |
| Av. milk yield (l/d) | $8.75^{b}$±0.49 | $11.5^{a}$±0.58 | 0.48 |
| 4 FCM yield (l /d) | $7.99^{b}$±0.41 | $10.42^{a}$±0.56 | 0.21 |
| Lactometer reading | $28.2^{b}$±2.2 | $30.60^{a}$±2.45 | 1.47 |
| Fat % | $3.42^{b}$±0.08 | $3.75^{a}$±0.09 | 0.28 |
| SNF % | 9.10±0.15 | 9.35±0. 21 | 0.61 |
| Proteins % | 3.04±0.06 | 3.36±0.04 | 0.48 |
| Total solid % | 12.52±0.21 | 13.10±0.19 | 0.72 |

Group mean with different superscripts differed significantly (P<0.05); CD, critical difference.

Table 4. Effect on UMMB on reproductive performance of crossbred cattle

| Particulars | T-1 (control) | T-2 (UMMB) | CD at 5% |
|---|---|---|---|
| No. of cow | 10 | 10 | — |
| Post-partum oestrus (days) | $132.6^{b}$±17.54 | $81.9^{a}$±11.66 | 3.74 |
| Service period (days) | $169.4^{b}$±11.7 | $117.9^{a}$±8.50 | 2.26 |
| No. of services (AI) per conception | $3.6^{b}$±1.22 | $1.37^{a}$±0.20 | 1.35 |

Group mean with different superscripts differed significantly (P<0.05). CD, critical difference.

Table 5. Economics of UMMB feeding on crossbred cattle

| Particulars | T-1 (control) | T-2 (UMMB) |
|---|---|---|
| Av. milk yield (l/d) | $8.75^{b}$ | $11.5^{a}$ |
| Additional increase in milk yield (l/d) | – | 2.75 |
| Total milk production (l/150 days) | $1312.5^{b}$ | $1725^{a}$ |
| Av. feeding cost ₹ (150 days) | 13050/- | 13350/- |
| Cost of UMMB (₹) | — | 750/- |
| Total variable cost (₹) | 13050/- | 14100/- |
| Av. feeding cost/lit. milk production (₹) | $9.94^{b}$ | $8.17^{a}$ |
| Gross return from sale of milk (₹) | $26250^{b}$ | $34500^{a}$ |
| Net return (₹) | $13200^{b}$ | $20400^{a}$ |
| B: C ratio | $2.01^{b}$ | $2.44^{a}$ |
| Additional B: C ratio from UMMB | — | 11 |

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

livestock. The costs of dry fodder, green fodder, concentrate mixture and UMMB was calculated on basis of market rate prevalent during the study period *i.e.* @ ₹300/q for dry fodder, ₹ 100/q for green fodder, Rs 1,100/q for concentrate mixture and ₹ 20/kg for UMMB. Selling price of milk received by farmers during experimental period was taken ₹ 20/litre. The recurring cost which included feeding and income from sale of milk are presented in Table 5. Our results revealed that 21.66% reduction in cost milk production/litre in crossbred cows was due to the supplementation of UMMB under of hot semi-arid ecosystem. The supplementation of UMMB during experimental period indicated that benefit cost ratio 1: 2.44 was recorded, which appears to be very lucrative over traditional system of feeding. Significantly higher net return and benefit-cost ratio was also recorded in crossbred cows (Misra *et al.* 2006) maintained on roughage based diet due to UMMB supplementation under small holder condition.

Based on observations, it can be concluded that the supplementary feeding of urea molasses minerals block economically improved the feed efficiency, milk production, milk composition and reproductive performance of crossbred cows under hot semi-arid ecosystem. All the farmers readily accepted the practice of using UMMB supplementation and are also willing to continue. UMMB has potential to increase the viability, dry season milk supplies, improvement in the reproductive performance of dairy animals and increase household incomes. However, awareness needs to be created among the dairy farmers about the usefulness of UMMB and availability of blocks should be ensured at the village level milk collection centre or state animal husbandry department.

## ACKNOWLEDGEMENT

The authors are thankful to the Director, CIAH, Bikaner for encouragement and providing facilities and are also thankful to Dr Sanjay Singh, Principal Scientist, Department of Veterinary Gynaecology and Obstetrics, IVRI, Bareilly for valuable suggestions and comments in this article.

## REFERENCES

Alam M G S, UI-Azam M S and Khan M J. 2006. Supplementation with urea and molasses and body weight, milk yield and onset of ovarian cyclicity in cows. *Journal of Reproduction and Development* **52**: 529–35.

AOAC. 1995. *Official Methods of Analysis*. 16th edn. Association of Official Analytical Chemists, Washington DC.

BIS. 1977. *Determination of fat percentage by Gerber method. ISI: 1224* (Part-1), Bureau of Indian Standards, Manak Bhawan, New Delhi.

Gaines W C 1928. *The Energy Basis of Measuring Milk Yields in Dairy Cows.* University of Illinois Agricultural Exepriment Station Bulletin: 308.

Kang R S, Nanda A S and Brar P S. 2005. Effect of urea molasses multinutrient blocks supplementary feeding on therapeutic efficacy of hormonal treatment in anestrus buffaloes. *Indian Journal of Animal Sciences* **75**: 1261–65.

Madhu M and Singh G P. 2010. Effect of supplementing urea molasses minerals block on the milk yield and Methane production in lactating cattle on different plane of nutrition. *Indian Journal of Animal Nutrition* **27** (2): 96–102.

Misra A K, Subha Reddy G and Ramkrishna Y S. 2006. Participatory on farm evaluation of urea molasses mineral block as a supplement to crossbred cows for dry season feeding in rain fed agro system of India. *Livestock Research for Rural Development* **18** (2): 1–11.

Quayam S A, Devanathan T G and Pattabiraman S R. 1988. Studies on the influence of mineral, biochemical and hematological concentration at 5 days postpartum on the occurrence of post partum estrus in buffaloes. *Indian Veterinary Journal* **65**: 236–38.

Ramesh B K, Thirumalesh T and Suresh B N. 2009. Effect of feeding of urea mineral molasses block on milk production, milk composition and onset of estrus in dairy animals. *Indian Journal of Animal Nutrition* **26**(4): 322–26.

Rafiq K, Mosofa M, Awal M A and Hossai M M. 2000. Effect of medicated block licks on the performance of indigenous dairy cows of Bangladesh. *Asian-Australian Journal of Animals Science* **13**: 774–80.

Tiwari R,Sharma M C and Singh B P. 2013. Awareness and impact of area specific mineral mixture technology in field situation. *Indian Journal of Animal Sciences* **83** (4): 435–37.

Sastry N S R, Thomas C K and Singh R A. 1988. *Farm Management and Poultry Production*. 5th edn. Vikas Publishing House, Delhi, India.

Singh P R and Singh M. 2003. Effect of UMMB supplementation on milk production in buffaloes and cows: an on farm trial. *Indian Journal of Animal Nutrition* **20**(10): 1–5.

Snedecor G W and Cochran W G. 1989. *Statistical Methods.* 8th edn. Iowa state University Press, Ames, Iowa.

Van Soest P J. 1982. *Nutritional Ecology of the Ruminants*. O & B Books, Carvallis.