

Effect of Mineral Mixture and Common Salt on Milk Production and their Reproductive Performance in Indigenous Cow- an On-Farm Trial (OFT)

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Abstract

An on-farm trial was conducted to assess the effect of mineral mixture and common salt feeding on milk production and reproductive performances of indigenous dairy animals in Pokhran region of Jaisalmer district of Rajasthan during 2018-19. Twenty indigenous dairy animals from ten farmers were selected in their lactation phase and divided in to two groups of 10 animals in each. First treatment group (T) was fed with 55 gm mineral mixture and 30 gm common salt daily till 150 days of lactation. Other control group (C) was kept devoid from additional mineral mixture and common salt feeding which is farmer practice in that particular area. During the study milk production parameters like avg. daily milk yield, peak yield, total milk yield, milk fat %, SNF % and reproductive parameters like days of first post- partum estrus, service period, service per conception, conception rate were compared between treatment and control groups. Results show that there was 11.76 percent increment in milk production found with supplementation of mineral mixture and common salt as compared to farmer practice. It was observed that avg. daily milk yield, peak yield and total 150 days milk yield of lactation period were found significantly ($P \leq 0.05$) higher by 0.6, 1.10 and 90 lit in treatment group as compared to control group, however milk composition parameter such as milk fat and SNF % were differed non-significantly between treatment and control group. It may be concluded in terms of gross return Rs.34200, net return Rs.25320 and B: C ratio was found 3.85 respectively superior in improved practices. Moreover, mineral mixture and common salt fed group had better effect in terms of reproductive efficiency of dairy animals. It is found that first post-partum estrus and conception rate were found significantly ($P \leq 0.05$) shorter and higher respectively in treatment group as compared to control group. It can be concluded from the above on farm trial that continuous feeding of mineral mixture and common salt are beneficial for balancing the ration which leads to improve productivity and reproduction efficiency of indigenous dairy animals.

Keywords: Common Salt, Indigenous cow, Mineral Mixture, Milk Production, Reproduction

Introduction

The farmers and dairy man reared the indigenous dairy animals in arid and semi-arid region of India are generally fed variable quantity of low-quality feed resources like rice straw, pearl millets and wheat straw which are characteristically low in fermentable nitrogen, mineral, and readily available carbohydrate and also non availability of green fodder in India. Even though India ranks first in milk production, accounting for 20 % of world milk production, achieving an annual output of 176.3 million tons during 2018-19 with a growth of 6.65 % as per Economic Survey 2018-19. However, farmers of arid and semi-arid region of India have lack of awareness about scientific balanced feeding and breeding management for dairy animals. Moreover, in other aspect present level of productivity of indigenous cattle in the country is very low. Deficiencies of mineral mixture and common salt resulted in low animal growth, poor reproduction, long calving interval, and infertility in animals. Inadequate nutrition is one of the factors that frequently limit the full utilization of the productive and reproductive potential of livestock in arid region (Ram Niwas *et al.*, 2021). Balanced nutrition for dairy animals is very essential for keeping animal body in good condition and renders them to maintain their optimum production. Amongst all nutrients, minerals and vitamin play a crucial role in metabolism, lactation, reproduction and even for microbial fermentation in rumen (Bhandari *et al.*, 2016). Previously many scientists have been reported that problem of mineral deficiency and metabolic diseases in all categories of dairy livestock due to lower content and low bioavailability of some essential macro and micro mineral in different feedstuffs. The dairy animals depend on forages for their mineral requirements which might not be sufficient for meeting their production and reproduction requirements (Paswan and Sahoo, 2012; Sagar *et al.*, 2018). Sharma *et al.*, 2009 reported that dairy animals with macro- and micro mineral deficiencies were producing milk sub optimally and subsequently showed improved milk production levels post mineral supplementation. Dairy animal depends for their mineral and vitamins requirement on feed and fodders available in arid and semi-arid region. Most of the feed ingredients available for feeding livestock are deficient in one or other mineral. Behera *et al.*, 2012 revealed low animal productivity and impaired reproductive behavior due to mineral deficiency and corrected these ailments through supplementation of various minerals. Incorporation of mineral mixture and common salt in the ration to lactating animals are not practicing in most of the part of country (Gupta *et al.*, 2017; Garg *et al.*, 2008). Deficiency of macro and micro-minerals in the ration of dairy cows adversely affects growth, milk production and reproduction efficiency (Sahoo *et al.*, 2017). It is necessary to supplement these minerals in the ration of dairy cows by formulating area specific mineral mixture, having highly bio-available mineral salts (Madke *et al.*, 2018). It is essential to examine the efficacy of mineral mixture and common salt supplementation to dairy cows in arid region and semi-arid region of Rajasthan state. Therefore, an on-farm trial (OFT) were formulated and conducted with objective to find out the effects of mineral mixture and common salt feeding on the milk production and reproductive efficiency of indigenous dairy animals.

Materials and Methods

Present on-farm trial (OFT) was carried out in Pokhran region of Jaisalmer District of Rajasthan state of India. Ten farmers with two lactating indigenous cows were selected from village Biliya, Gomat in the vicinity of Pokhran region of Rajasthan state (India) and randomly divided into two groups of 10 in each following completely randomized design. All the animals selected were at a comparable stage of lactation i.e., within first month of lactation and were maintained under similar management conditions throughout the trial. First group kept as treatment group (T) was fed additional 55 gm of mineral mixture (of which composition is presented in Table 1) and common salt 30 gm in their daily ration. Other group kept as control (C) where animals were not offered any kind of supplementation with their daily feed. Feeding practices was similar in both the group except feeding of mineral mixture and common salt in treatment group. Feeding of mineral mixture and common salt were started from day one of their calving till 150 days of lactation in treatment group. Data regarding milk production and reproductive parameters were collected. Close observations were made on changes, if any, in milk production and oestrus activity during the whole experiment. Milk production parameters such as daily milk production (lit.), peak yield (lit.), time taken to reach peak yield (Days), milk fat (%), milk SNF (%) and 150 days milk production (lit.) were noted regularly in whole on farm trial period of five months. Milk yield of these animals was recorded by their owners and these values were averaged for fortnightly interval. Analysis of milk sample was done fortnightly to find out composition of the milk. First estrous sign after parturition were observed in all animals during trial period.

Table 1: Composition of mineral mixture

S. No.	Items	Quantity
1	Calcium Percent by mass Max.	20
2	Phosphorus Percent by mass Min.	12
3	Magnesium Percent by mass Min.	5
4	Iron Percent by mass Min.	0.4
5	Iodine Percent by mass Min.	0.026
6	Copper Percent by mass Min.	0.1
7	Manganese Percent by mass Min.	0.12
8	Cobalt Percent by mass Min.	0.012
9	Fluorine Percent by mass Max.	0.07
10	Zinc Percent by mass Min.	0.8
11	Sulphur Percent by mass	1.8-3.0
12	Acid insoluble ash Max.	3
13	Lead mg/kg Max.	20
14	Arsenic mg/kg Max.	7
15	Moisture Percent by mass Max.	5
16	Total Ash in moisture free sample Percent by mass	78-85

Source: Manufactured by Kamdhenu Feeds, Saharanpur, Uttar Pradesh, India

Observation in control and treatment groups pertaining to reproductive parameters such as time taken to reach first estrous (days), service period, service per conception and conception rate (%) were recorded for all indigenous cows. To calculate the Benefit Cost Ratio, the present value of benefits is divided by the present value of costs. Statistical differences by ANOVA procedure (Snedecor and Cochran, 1989) and Duncan's multiple range tests (Duncan, 1995) were used for the analysis of recorded data on various parameters with a test of significance at $P < 0.05$.



Results and Discussion

Milk Production Attributes

Observation recorded during trial for milk production and their compositions are presented in Table 2. During the experiment, it was observed that treated animals were produced significantly ($P \leq 0.05$) higher total 150 days milk yield than the farmers practice group. Beside this, daily average milk yield was found significant ($P \leq 0.05$) higher in treatment group than the farmers practice group. Animals fed with mineral mixture and common salt showed average daily milk yield was 11.76 percent higher as compared to farmer practice. Similarly, Gupta *et al.*, 2017 and Sagar *et al.*, 2018 have also found higher milk yield in mineral supplementation group of dairy animals. Recorded peak milk production in treatment group was also found significantly ($P \leq 0.05$) higher in treatment group; however, time lapse to achieve peak production was found non-significant higher in treatment group. Singh *et al.* (2016) also reported same result of improved milk production in mineral fed dairy animals.

Table 2: Effect of mineral mixture and common salt supplementation on milk production parameters in indigenous cows (Mean± SE)

Particular	Farmer Practice (Control)	Improved Practice (Treatment)
Total Milk Yield for 150 days (lit.) *	765 ± 0.14 ^a	855 ± 1.12 ^b
Average of daily Milk Yield (litre/day)	5.10±0.41	5.70±0.31
Change in milk Production (%)	-	11.76
Peak Milk Yield (lit.) *	8.10 ± 0.62 ^a	9.20 ± 0.39 ^b
Time laps to reach peak yield (days)	58.6 ± 1.02	49.2 ± 0.62
Average Milk Fat (%)	4.10±0.26	4.18±0.23
Average Milk SNF (%)	8.49±0.10	8.62±0.11
Gross Return (Rs) / Cow (5 months)	30600	34200
Net Return (Rs) / Cow (5 months)	21700	25320
Cost of ration (Rs) /Cow (5 months)	8900	8880
Benefit cost ratio	3.43	3.85

*^{a,b} Mean values bearing different superscripts in a row differ significantly ($P < 0.05$)

Improvement in productive efficiency of indigenous cow fed with mineral mixture and common salt was reported by Bhandari *et al.* (2016). It is necessary to supplement these deficient minerals through area specific mineral mixture in the ration of dairy cows for improving productivity and reproduction efficiency. Animals were able to hold her peak yield for longer duration in treatment groups as compared to the farmer practice group. The value is close agreement with those reported by Sahoo *et al.* (2017). Result indicated that feeding of mineral mixture and common salt which comprising micro and macro element could improve milk production potential of indigenous cows due to having positive impact on mammary cell in the udder. These findings are in collaboration with the observations of Tiwari *et al.* (2013) and Rohilla *et al.* (2007). However non- significant difference was found in average percentage of milk fat and percent SNF were observed in both the groups. These findings were fully agreed with result obtained by Verma *et al.* (2009). Further it may be concluded that gross return, net return and B: C ratio in improved practices were 34200, 25320 and 3.85 respectively. Benefit cost ration found higher in treatment groups as compared to farmers practice group during experiment period. It can be interpreted that mineral and common salt feeding may take certain amount of time to express its effects on milk production. Hence, the changes in milk components can be attributed to physiological changes in milk quality over the duration of lactation. Madke *et al.* (2018), Somvanshi *et al.* (2017) and Singh *et al.* (2016) reported similar results supportive to the findings of the present study.

Reproductive Performance Attributes

Parameters such as time taken to come in first heat, number of services per conception, service period, number of conceived animals and conception rate were recorded during field trial for checking reproductive efficiency in indigenous cow. Data for reproductive parameters are displayed in Table 3.

Table 3: Effect of mineral mixture and common salt feeding on reproductive parameters in indigenous cow (Mean ± SE)

Reproductive Parameters	Improved Practice (Treatment)	Farmer Practice (Control)
First Post-Partum estrous (Days) *	48.3 ± 2.43 ^b	64.2 ± 1.53 ^a
AI/conception	1.91 ± 0.59	1.79 ± 1.29
Service Period (Days) *	77.1 ± 1.38 ^b	95.7 ± 1.22 ^a
Cow Conceived	6	4
Conception Rate (%)	60	40

*Means within rows with different superscript are significantly differ ($p < 0.05$)

Indigenous cows fed with mineral mixture and common salt was show first heat sign 15.9 days earlier than the

farmer practice group (64.2 days). Gupta *et al.* (2017) and Mudgal *et al.* (2014) also observed reduction in days to achieve first post-partum estrous in minerals mixture supplemented dairy animals. Likewise, slightly high number of AI per conception was found in treatment group followed by the control group. Further service period in treatment group (77.1 days) was found significantly ($P \leq 0.05$) lower than the farmer practice group (95.7 days) indigenous animal. Sagar *et al.* (2018) and Sahoo *et al.* (2017) also reported that feeding of Minerals mixture and common salt to dairy cattle in their early lactation improves estrus condition as well as induced the ovarian activity and conception in dairy animals. Out of 10 animals from each group 6 and 4 animals were conceived in treatment and control groups respectively during the period of experiment which shows 20% higher in treatment group compared to the farmer practice group. In consistent with the present findings, supplemented with mineral mixture and common salt fed groups improved conception rate in dairy animals (Selvaraju *et al.*, 2009 and Behera *et al.*, 2012).

Conclusion

It can be concluded from the results of the present study that supplementation of mineral mixture and common salt need to be advised for getting optimum production potential, health and higher income returns in terms of milk yield. Moreover, it can reduce the loss which occurs due to minerals deficiencies. Repeat breeding is a major problem in dairy animals and feeding of mineral mixture and common salt could improve their reproductive performance in terms of first post-partum estrous, fertility and higher conception rate. Consequently, with its supplementation farmer can earn more profit from their dairy animals.

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Conflict of Interests

There is no conflict of interest.

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