The Haryana Veterinarian (March, 2024) **63(SI),** 123-125 ISSN 0033-4359 (P) **Short Communication**

AREA SPECIFIC MINERAL MIXTURE'S (ASMM) IMPACT ON BUFFALOES' PRODUCTIVE AND REPRODUCTIVE PERFORMANCE: A FIELD STUDY

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SUMMARY

Two field-level studies were carried out in 2018-19 and 2019-20 to evaluate the impact of ASMM on buffalo reproduction and productivity. In a single trial, forty buffaloes in the late gestational phase were chosen, and these animals were split into two groups, each with twenty buffaloes. The second group (Treatment) received 50 gm ASMM/animal/day of supplementation for a month, while the first group (Control or Farmer Practice) received no supplements at all. During the two trials, the control and treatment groups' milk yield and reproduction-related parameters namely, the number of days until the first post-partum oestrus, the service per conception, the service period, and the conception rate were compared. The average daily milk yield, conception rate, and service per conception did not differ significantly between the groups during the first trial (2018-19), but the first days taken to the first post-partum oestrus and the service period were significantly ($P \leq 0.05$) lower in the group that received mineral supplements than in the control group. In contrast, the group that received mineral supplements during the second trial (2019-20) had a significantly ($P \leq 0.05$) higher milk yield and a significantly ($P \leq 0.05$) shorter service period and first post-partum estrus than the control group. For both conception rate and service per conception in the second trial, there was no statistically significant. Upon combining all the data from the two distinct trails, it was discovered that the buffaloes in the mineral supplemented group had considerably better reproductive and productive outcomes. Based on the current field study, it was determined that adding ASMM to buffalo diets enhanced the animals' ability to reproduce and produce.

Keywords: Buffaloes, Milk Production, ASMM, Reproduction, Arid Zone

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It was explained and quoted by Mahida *et al.* (2018) that dairying in India has been a prominent supplementary enterprise and a regular source of income for farmers. Buffaloes are vital to the livelihood of millions of small and marginal farmers in the nation. They contribute 76.19 million tonnes of milk (or 49% of the total milk produced) and 1.61 million tonnes of meat (or 23%) to Indian cuisine each year (DAHDF, 2016). Buffalo has so crucial in Indian dairy farming. India remained the world's largest milk producer, with anticipated milk output of 187.7 million tonnes, up almost 6% from the previous year (FICCI, 2020). However, because of low fertility, the productivity per animal is still lower than that of the majority of the world's top producing nations. In Rajasthan's arid region, livestock is the main source of revenue. However, the low reproductive and productive performance of dairy animals primarily buffaloes due to issues such anoestrous behaviour, recurrent breeding, silent heat, low conception rate, etc. increases the cost of production. Because the performance of animal reproductive and production is primarily impacted by the supplementation of mineral mixtures, maintaining the proper balance of nutrients is essential for keeping animals in good physical condition and at their maximum output potential. The immune system, metabolism, reproduction, and lactation are all maintained by the minerals, which are essential for fertility. Gouda *et al.* (2017) found a direct or indirect relationship between minerals and the reproductive and productive health of animals. Gupta *et al.* (2005) discovered that mineral imbalances and deficiencies during the periparturient phase led to metabolic disorders. Either macro or micro nutritional factors may interfere with the successful establishment of pregnancy (Boland, 2003). The reproductive tract of a freshly calved, lactating dairy cow is less able to support early embryo development than that of a heifer according to the Rizos *et al.* (2010), this finding may account for the lower conception rates. According to Beevar's 2006 report, oestrus in ruminants is a physiological reproductive process that uses micronutrients, minerals, and vitamins to synthesize hormones and other biomolecules. In an integrated way, minerals play a significant part in how hormones and enzymes function at the cellular level (Virmani *et al.*, 2011). The most significant extra factors that impact the hormonal balance and cellular enzymes during an animal's reproductive and productive cycles are minerals, specifically calcium, phosphorus, copper, zinc, cobalt, and magnesium. The lower content and low bioavailability of some essential macro and micro minerals in various

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locally available feedstuffs have been reported by many workers as problems and economic setbacks to the dairy industry due to mineral deficiencies and metabolic diseases in livestock. The only practical solution to these problems is the supplementation of area-specific mineral mixtures, a practice that is not followed in most of Rajasthan's arid zone. A primary deficiency in trace minerals may arise from the body consuming insufficient amounts of minerals, whereas a secondary deficiency may arise from other dietary factors interfering with the body's absorption and metabolism (Verma *et al.*, 2017). Supplementing cattle (Mohapatra *et al.*, 2012; Puvarajan and Vijayarajan, 2013) and buffalo (Singh *et al.*, 2014) with an area-specific mineral mixture containing Ca, P, Cu, Zn, and Mn resulted in increased expression of oestrus symptoms and increased conception rate. But these kinds of studies are mainly lacking in Rajasthan's arid zone, particularly with regard to the buffaloes. Therefore, assessing the impact of ASMM on buffaloes' reproductive and production capabilities was the goal of this study.

MATERIALS AND METHODS

The current experimental study was carried out in Rajasthan, India's Sri Ganganagar district. Forty late gestation Murrah buffaloes were identified in each trial by villages from the Padampur block. The animals were between the third and fourth lactation, roughly. They were kept in clean, well-ventilated sheds with the appropriate hygiene. Total mixed ration (TMR) was prepared and fed to the animals in four equal portions in the morning, noon, evening and night-time through prompt bunk management. Water was available to all animals at will during the experiment. Every buffalo animal was split up into two groups, each consisting of twenty buffalo. To the treatment group (T), 50 gm of ASMM/animal/day a supplement especially created for Rajasthan's arid zone was added.

Table 1. Composition of Area Specific Mineral Mixture (Arid Zone)

Sr. No.	Items	Quantity (%)
1.	Calcium	22.50
2.	Phosphorous	14.00
3.	Sulphur	3.45
4.	Copper	0.05
5.	Zinc	0.60
6.	Cobalt	0.013
7.	Iodine	0.026
8.	Florine	0.078
9.	Acid insoluble ash (AIA)	2.50

A mineral mixture specific to the area was added from the first day of their calving until the end of one month. For a month, milk yield data was gathered. The two groups' buffalo animals' reproductive characteristics were noted and observed. Using IBM® SPSS® statistical software packages version 22, the data on productive and reproductive performance was analyzed for statistical differences using analysis of variance (Snedecor and Cochran, 1994). The relationship between the control and treatment groups for the conception rate was investigated using the Chi-square test of independence.

RESULTS AND DISCUSSION

Productive Performance

In the first trial (2018-19), there was no significant difference in the average daily milk yield; however, in the second trial (2019-20), the daily milk yield of the mineral supplemented group was significantly higher than that of the control group ($P \leq 0.05$). The group that received mineral supplements produced noticeably more milk than the control group when the data pertaining to milk yield from the two separate trials was combined. More milk yield was reported in the group receiving mineral supplementation by Gupta *et al.* (2017). According to Mushtaq *et al.* (2020), pre-partum micro-mineral supplementation significantly ($P \leq 0.05$) increases milk yield while also reducing postpartum oxidative stress in dairy cows.

Reproductive Performance

In the initial (2018-19) and subsequent (2019-20) trials, there was no discernible variation in the number of service hours per conception. However, the first post-partum oestrous and service period days were significantly impacted ($P \leq 0.05$) and were found to be shorter in the mineral supplemented group than in the control group in both trials. To investigate the relationship between the control and treatment groups for the conception rate, the chi-square test of independence was used. Throughout the trial, there were non-significant variations in the conception rates between the treatment and control groups. After combining all the data from the two distinct trails, the buffaloes' reproductive performance was significantly ($P \leq 0.05$) better in the group that received mineral supplements. Supplementing with a mineral mixture specific to a given area improved buffalo reproduction and productivity. The current studies' findings concur with those of Kumar *et al.* (2012), who claimed that supplementation enhances buffaloes' ability to reproduce. Similar findings were reported by Peepar *et al.* (2022), who found that in post-partum anoestrus cattle, a 1% mineral mixture may induce 50% of oestrus and increase conception rates by up to 50%. Buffaloes' reproductive efficiency was enhanced by ASMM supplementation, and 70% of them exhibited normal cyclicity (Annual Reports,

Table 2. Productive and Reproductive Performance of Buffaloes

Parameters	Trail- 1 (n=20)		Trail- 2 (n=20)		Pooled Data (n=40)	
	Control	Treatment	Control	Treatment	Control	Treatment
Daily Milk Yield (lit.)	5.61±0.11	5.86±0.10	5.40±0.09[a]	5.74±0.09[b]	5.50±0.07[a]	5.80±0.07[b]
First Post-Partum Estrous (Days)	89.65±1.27[a]	79.25±1.34[b]	91.30±1.01[a]	78.95±0.81[b]	90.47±1.01[a]	79.10±0.85[b]
Service/conception (No.)	2.25±0.21	1.90±0.16	2.35±0.19	1.95±0.15	2.30±0.14[a]	1.92±0.10[b]
Service Period (Days)	127.45±1.54[a]	119.20±0.71[b]	125.75±1.40[a]	120.55±0.48[b]	126.60±1.04[a]	119.87±0.44[b]
Animals Conceived (No.)	11	14	12	15	23	29
Conception Rate (%)	55	70	60	75	57.5	72.5

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

DARE, 2008-2009).

CONCLUSION

Days to first postpartum oestrus and service period days had a significant impact and were found to be significantly shorter in the mineral supplemented group compared to the control group in both trials. However, there was no significant difference observed for service per conception or conception rate. Therefore, it is possible to draw the conclusion from the current study that supplementing buffaloes with an area-specific mineral mixture at a rate of 50 g/animal/d improved their performance in terms of reproduction and production. Such studies are still urgently needed in Rajasthan's arid zone, particularly with regard to buffaloes, as results are still inconsistent due to regional and area-specific variations.

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