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IMPACT OF MINERAL SUPPLEMENTATION AND DEWORMER ON PRODUCTIVE PERFORMANCE OF LACTATING BUFFALOES IN BUNDELKHAND REGION

S.P.S. Somvanshi[1], Shalini[1], Rajeev Singh Chauhan[2]*, N.K. Yadav[1] and Ashok Kushwaha[1]
[1]Banda University of Agriculture & Technology-Krishi Vigyan Kendra, Hamirpur – U.P. 210 505, India
[2]Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya (RVSKVV). Raja Pancham Singh Marg,
Near Akashwani, Gwalior, (M.P.), India
*Corresponding author E-mail: chauhan.rajeev3077@gmail.com
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ABSTRACT

The present study was conducted to demonstrate the effect of liquid mineral mixture supplementation and deworming on the productive performance and economics of lactating buffalo. Demonstration was conducted on 80 buffaloes of nearly at the same lactation stage, milk yield and parity selected from Buffaloes were divided in two group; 80 buffaloes were kept in each group viz. control (T^1) and demonstrated Group (T^2). Two buffaloes of each farmer were selected to maintain similarity in feeding and management practice. Demonstrated Group (T^2) was fed with liquid mineral mixture @ 100 ml/buffalo/day till 90 days of early lactation period and Ivermectin (80 mg) bolus, whereas the control group (T^1) was not supplemented. The data were recorded by the farmers daily in the morning and evening and by the researcher at monthly interval. Analysis of data revealed that supplementation of liquid mineral mixture and Ivermectin bolus increased the milk yield by 1.27 litres / day (22.36 %) in demonstrated group. Similarly, The B: C ratio of mineral mixture supplementation and Ivermectin bolus was observed 1:2.41 under demonstration management practices. These findings may suggest that supplementation of mineral mixture and deworming with ivermectin enhanced the productive performance for getting higher return and sustainable profit from buffalo farming.

Keywords **:** Buffalo, Deworming Mineral mixture and Supplement Feeding.

Introduction

In 2025, India's buffalo sector remains a global leader, has the largest buffalo population in the world and ranks first in milk with buffaloes contributing over 31% of the total milk production, estimated at over 248 million tonnes nationwide. The industry is experiencing robust growth, with a 2.45 % increase in buffalo milk production, Indigenous buffaloes contribute 31.18% of the total milk, while non-descript buffaloes contribute 11.97%. Indigenous buffaloes yield an average of 6.92 kg/day continuing to rise, bolstered by popularity of high-yielding breeds like Murrah. The per capita milk availability in the country is 394 gram/day which is much more than the world average consumption of milk 302 gram/day. Uttar Pradesh is India's top milk-producing state, contributing approximately 15.66% to 16.21% of the national output. The dairy market is expected to grow at a CAGR of 11.21% between 2026-2034. As of 2024-25, production reached 388.15 lakh metric tonnes, showcasing a significant 40% increase since 2016-17(BAHS-2024). Hamirpur district of Uttar Pradesh, is located between 25°58'N latitude to 80°12' E longitude with an altitude of 452 m above mean sea level. It is bounded by Jalaun (Orai), Kanpur, and Fatehpur districts on the north, Jhansi and Jalaun in the west, Banda district in the east, and Mahoba district in the south. The district agro-ecological sub-region, agro-climatic region, and agro-climatic zone fall under Central Plain Zone, Central Plateau and Hill Region, and Bundelkhand zone (U.P-10) respectively. The maximum temperature rises above 47 ºC in summer. There is also intense heat wave during summer. Livestock in Bundelkhand region continues to play a central role in providing livelihood security and coping mechanism to mitigate risks of the resource poor

farmers. However, the development of this key sector has not progressed to the desired extent in comparison to other regions of the country. Considerable potential exists for improving livestock production in the area. Livestock suffer extreme heat stress which affects their performance during this period. Primarily semi-intensive or extensive (grazing), with animals often released for grazing in "Anna Pratha" (leaving livestock free) during dry seasons. Reproductive Issues: High temperatures lead to delayed puberty and reproduction, with buffalo heifers having a first service age of 48–54 months. Inadequate nutrition is one of the factors that frequently limit the full utilization of the productive and reproductive potential of livestock in this region. Heat waves, which are projected to increase under climate change, are directly impacting the livestock. Exposure to high temperature events can cause heat-related losses to livestock farmers. Heat stress affects animals both directly and indirectly. Over time, heat stress can increase vulnerability to reduce productivity. Drought may impact pasture and feed supplies. Lactating buffaloes in the Bundelkhand region face significant productivity challenges due to extreme temperatures, drought, and low-quality fodder, despite being a major source of livelihood. Climate Impact: The region's semi-arid climate (extreme heat up to (48 ºC) in summer, low in winter) severely impacts productivity. Drought reduces the amount of quality forage available to grazing livestock. By considering the above agro-climatic challenges in the region, the availability of fodder (green and dry) does not meet the actual livestock feed and nutritional demand. Poor nutritional quality and scarcity of cattle feed jeopardize livestock health and productivity, and their end-use-product quality such as milk and meat etc. In this regard, there are some important fodder crops which not only provide high fodder yield but also supply additional nutritional components to the livestock. During Kharif season fodder is Sorghum (*Sorghum bicolor* L.) is an outstanding crop. Bajra widely grown kharif crop in dryland: Pearl millet (*Pennisetum glaucum* L.) and Maize (*Zea mays* L.) Cowpea (*Vigna unguiculata L.*) is a quick growing leguminous forage crop. The widely accepted fodder crops in the rabi season are- oat and berseem, while in kharif are maize, sorghum, pearl millet, BN hybrid, dinanath grass and cowpea. Oat *(Avena sativa* L.) is widely grown in the winter season of Northern-India. Berseem *(Trifolium alexandrinum* L.) is most important leguminous fodder crop and also known as King of fodder due its availability up to 6-7 months as green fodder. These crops and their high yielding varieties are essential to combat the climate change and fulfil the basic demand of livestock sector in the Bundelkhand region (Indu *et al*., 2020). To increase the productivity of buffaloes, supplementation of nutrients, which can improve the utilization of poor quality roughages and fulfil the deficiency of nutrients, are essential as the feed utilization. This can be increased by supplementation of critical nutrients in ration (Sampat *et al*., 1995).

Mineral supplementation to the lactating dairy animals increased the milk yield reported by various researchers in their respective study. Wu *et al*., 2001, Gimbi *et al*., 2004, Saxena *et al*., 2008, Sharma *et al*., 2009 and Tiwari *et al*., 2012 Minerals are the essential nutrients bearing a significant role in the animal reproduction, because their excess or deficiency produces detrimental effect on the performance of livestock (Akhtar *et al*., 2009). On mineral supplementation, improvement in reproductive status was reported by many workers Newar *et al*., 1998, Hussain 2001. However, Majority of the feed and fodders given to livestock are deficit in major nutrients all over India (Sharma *et al*., 2008). The deficiency of certain minerals like Calcium, Phosphorus, Copper and Zinc in dairy cattle has been reported under field conditions Prasad *et al*., 2007. Immunological disorders affecting growth, production and reproductive health of animals as per Kumar 2015.

Almost Farmer practice were animals fed on low quality roughages e.g. wheat straw and rice straw which are characteristically low in fermentable nitrogen, mineral, and readily available carbohydrate. These deficiencies result in low animal growth, poor reproduction, long calving interval, and infertility in animals. Parasitic infestation has been considered as one of the major constraint of livestock production. There are two types of parasites, i.e., internal and external of which internal parasites are more devastating for farm animals. Parasitic infestation reduces feed intake remarkably as a consequence growth and production performances of cattle hampered. Parasitism is also responsible for reduced performance such as reduced milk production and reproductive performances. Therefore, the present investigation was conducted to demonstration of liquid mineral mixture supplementation and deworming with ivermectin on productive performance of lactating Buffalo.

Materials and Methods

The present study was conducted under front line demonstration laid out during 2019-20 to 2023-24 in NICRA adopted Villages Manki Khurd & Pachkhura Khurd of District Hamirpur, UP. Lactating buffalo (80) were selected to carry out this study. Lactating

buffaloes of nearly at the same lactation stage, milk yield and parity were selected of 80 farmers. To maintain similarity in feeding and management practices, two buffaloes of each farmer were selected and one buffalo was kept as control (T1) and Climate resilient practice was Supplementation Feeding of mineral and vitamins blend Liquid mixture @ 100 ml /day for period of two months and Parasite Elimination: Deworming removes internal parasites that cause stunted growth, diarrhea, and reduced feed efficiency. Therefore, deworming dose @ single bolus of 03 gm Ivermectin is sufficient for 3month interval and considered as demonstrated group (T2). A training programme was conducted for the farmers before starting the demonstration to educate them for correct method of data recording on different parameters. The daily milk yield was recorded in morning and evening by the farmers in a diary and at monthly interval by the researcher.

Green fodder sources include Berseem during the rabi season (winter) and Sorghum (Chari) or Maize during the kharif season (summer/monsoon). Local grasses and various fodder trees also contribute to the diet. The feeding of 5-6 kg dry fodder, 25-30 kg green fodder and 6-7 kg concentrate per day per buffalo in both groups. The composition of the concentrate for both buffalo groups was similar. The concentrate was offered two times a day just before milking in morning and evening. In demonstrated group (T2) in addition to above 100 ml liquid mineral mixture per buffalo was supplemented continuously from the day one after calving to 90 days and deworming with one bolus (80mg) Ivermectin 5 days after calving. A training programme was conducted for the farmers before starting the demonstration to educate them for correct method of data recording on different parameters. The daily milk yield was recorded in morning and evening by the farmers in a diary and at monthly interval by the researcher. The demonstration was conducted for a period of 90 days.

The data were tabulated and analyzed as per Snedecor and Cochran (1989) Simple statistics like average, standard deviation (SD), coefficient of variation (CV), percentages, percent changes and per unit and t- test was applied to test the significance level between both the groups, changes were utilized to draw meaningful conclusions.

Results and Discussion

Milk production parameters of lactating buffalo in the demonstrated group (T^2) and control group (T^1) have been have been presented in table 1 The results indicate that application of 100 ml liquid feed supplement/d/animal & Ivermectine @ 3 gm bolus as dewormer during trial against endoparasites shows improved health of animals by relieving them from parasitic infestation and further supplementation of mineral mixture strengthens milk production in lactating buffaloes. The mean milk yield under Farmer's Practice (T^1) was 5.35 litres/day/buffalo, whereas under Demonstration Practice (T^2) it was 6.62 litres/day/buffalo. The average increase was 1.27 litres/day/buffalo, representing a 22.36 % improvement. A paired t-test was conducted to evaluate the significance of this difference. The results indicated a statistically significant increase in milk yield under the demonstration practice compared to the farmer's practice ($t = 10.42$, $df = 4$, $p = 0.0005$). The effect size (Cohen's $d = 4.66$) was extremely large, suggesting that the observed improvement was not only statistically significant but also of high practical importance. More milk yield was reported in the group receiving mineral supplementation by Sharma *et al.* (2009) & Gupta *et al*. (2017). According to Mushtaq *et al*. (2020), pre-partum micro-mineral supplementation significantly increases milk yield while also reducing postpartum oxidative stress in dairy cows. Similar results were also reported by Rathore *et al*. (2017) and Kantwa *et al*. (2021) significantly increase milk production in buffalo during supplementing mineral mixture and deworming. The Benefit Cost Ration (2.41) as compared to local check (1.94). Therefore, the cost of fodder, concentrate feed, mineral mixture and Ivermectin bolus have been 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 livestock. Economic analysis of the data showed that [Table-2]. Economics of supplemented area liquid mineral mixture and deworming of lactating buffaloes shows the lower feeding cost of per litre of milk (Rs. 23.26) in treatment group as compared to control group (Rs. 28.78). Gross return from sale of milk (Rs. 373.6 vs 301.3) and net profit per litre of milk was found higher in treatment group (Rs. 19.23) than control group (Rs. 16.83). The benefit-cost ratio was also found higher in treatment group as compared to control (Rs. 2.41 VS 1.94). It was observed that farmers getting Rs. 72.5 additional per day by supplementing mineral mixture and benefit-cost ratio of feeding mineral mixture was 1:5.4.

Table 1 : Performance of Minerals mixture and deworming on the milk production in buffaloes

Year	No. of Farmers T[1]	No of animals T[2]	Milk yield (litre/day/buffalo)		Yield gap (litre/day/buffalo)	% increase in milk yield
			Farmer's Practice (T1)	Demo Practice (T2)		
2019-20	16	16	5.10	6.00	0.9	17.64
2020-21	10	10	5.07	6.40	1.33	20.84
2021-22	16	16	5.4	6.5	1.1	19.63
2022-23	22	22	5.6	7.2	1.6	28.57
2023-24	16	16	5.6	7.0	1.4	25.14
Total/Avg.	**80**	**80**	**5.35**	**6.62**	**1.27**	**22.36**
SEM			1.27	1.27		
SD			0.27	0.27		
P value			<0.0005	<0.0005		
Level of significance P-value			*	*		

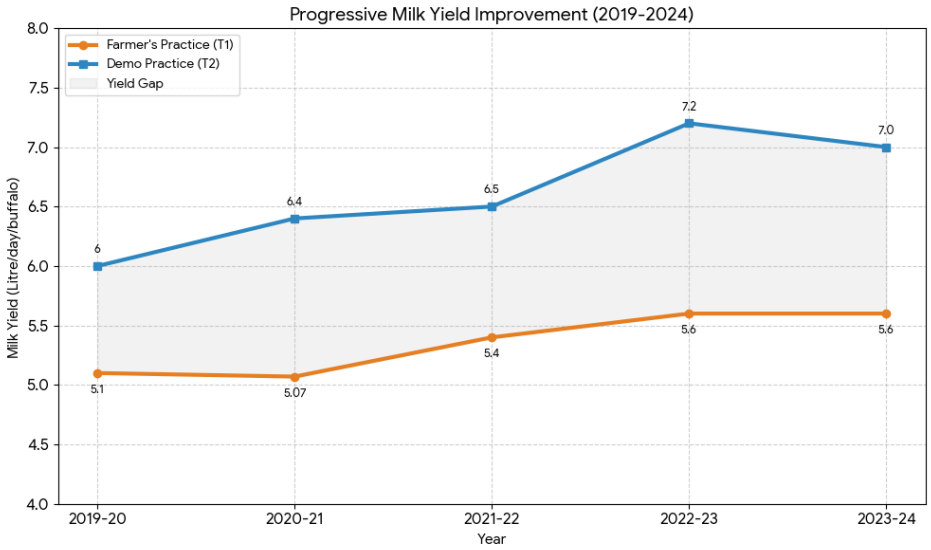
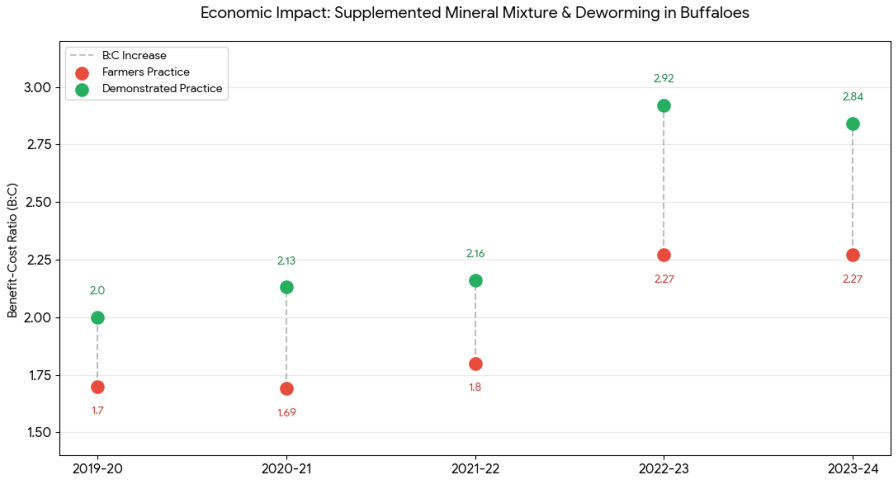


Table 2: Economics of supplemented liquid mineral mixture and deworming in lactating buffaloes

Para meters	Farmers Practice						Demonstrated Practice					
	2019-20	2020-21	2021-22	2022-23	2023-24	Pooled	2019-20	2020-21	2021-22	2022-23	23-24	Pooled
Average milk yield (Lit/day/buffalo)	**5.10**	**5.07**	**5.4**	**5.6**	**5.6**	**5.35**	6.00	6.40	**6.5**	**7.2**	**7.0**	**6.62**
Rearing cost (Rs./day/buffalo)	**150**	**150**	**150**	**160**	**160**	**154**	**150**	**150**	**150**	**160**	**160**	**154**
Average rearing cost per litre of milk production (Rs.)	**29.41**	**29.58**	**27.77**	**28.57**	**28.57**	**28.78**	**25.00**	**23.44**	**23.08**	**22.22**	**22.86**	**23.26**
Gross return (Rs./day/buffalo)	255	253.5	270	364	364	**301.3**	300	320	325	468	455	**373.6**
Net return (Rs./day/buffalo)	105	103.5	120	204	204	**147.3**	150	170	175	308	295	**219.6**
B:C	1.7	1.69	1.8	2.27	2.27	**1.94**	2.0	2.13	2.16	2.92	2.84	**2.41**
Additional milk yield by supplementing area specific mineral mixture and deworming (Lit/day)	-	-	-	-	-	-	**0.9**	**1.33**	**1.1**	**1.6**	**1.4**	**1.27**
Milk yield increase over control (%)	-	-	-	-	-	-	17.64	20.84	19.63	28.57	25.14	**22.36**
Value of additional milk (Rs.)	-	-	-	-	-	-	45	66.5	55	104	91	**72.5**
Cost of liquid mineral mixture supplementation and Ivermectin bolus (Rs./day/buffalo)	-	-	-	-	-	-	12.5	12.5	12.5	14.0	14.0	**13.1**
B:C ratio for supplementing area specific mineral mixture and deworming	-	-	-	-	-	-	**3.62**	**5.32**	**4.41**	**7.42**	**6.52**	**5.45**



Conclusion

It can be concluded from the present study that Supplementation Feeding of mineral and vitamins blend Liquid mixture and deworming to the lactating buffaloes under field conditions not only increases the milk yield, but consequently improving socio-economic conditions. Hence, it is needed to awareness created among the dairy farmers to supplement mineral and vitamins blend liquid mixture and deworming to their animals to get more profit from dairy enterprises. Higher Return on Investment: Enhanced milk production and faster breeding result in higher Net Present Value (NPV) and improved Benefit-Cost (B: C) ratios for dairy farms.

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Conflict of Interest No potential conflict of interest relevant to this article was reported.

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Ethical issues: None

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