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**Dr. J Sai Kiran**  
 Subject Matter Specialist,  
 Department of Livestock  
 Production and Management,  
 KVK, Mamnoon, Warangal,  
 Telangana, India

**Dr. N Rajanna**  
 Programme Coordinator and  
 Head, Department of  
 Livestock Production and  
 Management, KVK, Mamnoon,  
 Warangal, Telangana, India

**Dr. J Shashank**  
 Subject Matter Specialist,  
 Department of Veterinary  
 Medicine, KVK, Mamnoon,  
 Warangal, Telangana, India

**Dr G Ganesh**  
 Subject Matter Specialist,  
 Department of Aquaculture,  
 KVK, Mamnoon, Warangal,  
 Telangana, India

**Dr A Raju**  
 Subject Matter Specialist,  
 Department of Entomology,  
 KVK, Mamnoon, Warangal,  
 Telangana, India

**CH Soumya**  
 Subject Matter Specialist,  
 Department of Agronomy,  
 KVK, Mamnoon, Warangal,  
 Telangana, India

**R Arunjyoti**  
 Subject Matter Specialist,  
 Department of Home Science,  
 KVK, Mamnoon, Warangal,  
 Telangana, India

**Corresponding Author:**  
**Dr. J Sai Kiran**  
 Subject Matter Specialist,  
 Department of Livestock  
 Production and Management,  
 KVK, Mamnoon, Warangal,  
 Telangana, India

## A field study on supplementation of area specific mineral mixture (ASMM) on milk yield and composition of dairy animals

**Dr. J Sai Kiran, Dr. N Rajanna, Dr. J Shashank, Dr G Ganesh, Dr A Raju, CH Soumya and R Arunjyoti**

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### Abstract

A study was conducted in selected villages of Warangal district aimed to evaluate the impact of area-specific mineral mixture supplementation on dairy animal production. The study was carried out for three continuous years. Thirty dairy animals were randomly chosen from five adopted villages (Malkapally, Battupally, Gavicherla, Mamnoon, and Singaram), evenly divided into two groups of fifteen. During a 90-day lactation period, the treatment group was supplied with a daily supplement of 50 g of area-specific mineral mixture, while the control group animals were not fed any area specific mineral mixture. Data analysis revealed that the mineral supplementation increased milk yield by 1.05 liters per day (16.65%) compared to the control group. Economic indicators such as gross returns, net returns, and the Benefit-Cost (B:C) ratio were notably higher in the treatment group. These findings suggest that continuous feeding of area-specific mineral mixture has enhanced the production performance of dairy animals, thereby recommending its ongoing use.

**Keywords:** Area specific mineral mixture, milk yield, production, B:C ratio

### Introduction

India's milk production has grown remarkably over the past decade, with a Compound Annual Growth Rate (CAGR) of 6 percent. This surge is evident from the increase in production from 187.30 million tonnes in 2018-19 to 230.58 million tonnes in 2022-23. Further as per the FAO Dairy Market Review (2023) milk production of India is estimated to reach 236.35 million tonnes in 2023-24 registering a growth of 2.5% over the last year beating the world average growth rate. This growth is significantly higher than the global milk production growth rate of 1.3 percent in 2023 over the previous year, highlighting India's robust development in this sector [14]. This abundance not only supports the nutritional needs of India's vast population but also underscores the efficiency and productivity of the Indian dairy industry. Mineral deficiency and metabolic diseases are common among livestock due to insufficient and poorly bioavailable essential macro and micro minerals. More than 90% of mineral deficiencies in livestock exist at subclinical levels, leading to reduced productivity and impaired behaviour. Addressing these issues through mineral supplementation is crucial, yet the practice of supplementing various mineral mixtures and vitamins remains limited [1]. Minerals play a crucial role in animal production and reproduction, as their deficiency or excess can significantly impact livestock productivity [2]. However, feed and fodder provided to livestock across India are generally deficient in essential nutrients [3]. In developing countries like India, animals are often fed agricultural by-products and low-quality crop residues, which are low in nutritive value and digestibility [4]. Mineral deficiency diseases in dairy animals have been documented due to insufficient essential micro and macro minerals in various feedstuffs. Regular supplementation of mineral mixtures in the diet of dairy animals has been shown to enhance milk yield [5]. This study aims to investigate the impact of area-specific mineral mixture supplementation on the milk yield of dairy animals over a 90-day period.

## Materials and Methods

The present study was carried out for three continuous years by Krishi Vigyan Kendra, Mamnoor as on-farm trials from 2021-22, 2022-23 & 2023-24 to assess the impact of area-specific mineral mixture supplementation on the productive performance of dairy animals in adopted villages. Malkapally, Battupally, Gavicherla, Mamnoor, and Singaram. Thirty lactating animals similar in lactation stage, milk yield, and parity, were selected from these villages for an year. To ensure consistency in feeding and management practices, two milking animals from each farmer were chosen, with one designated as the treatment (T) and the other as the control (C). Animals in the control group were fed 25-30 kg of green fodder, 4-5 kg of paddy straw, and a concentrate mixture of 1.5 kg/day, without any area-specific mineral mixture. In contrast, animals in the treatment group received the same diet along with an additional 50 grams/day of area-specific mineral mixture for three months. This mineral mixture included calcium (18.5%), phosphorus (10.6%), zinc (0.65%), copper (0.28%), manganese (0.36%), and salt (25%). Ad libitum drinking water was provided. Daily data on various parameters were recorded by the owners and weekly by researchers. Three years data with respect to milk yield, Fat (%), data was pooled and subjected to statistical analysis.

## Results and Discussion

### Milk parameters

The observations recorded on milk yield and composition are summarized in Table 1. The average daily milk yield was significantly higher in the treatment group ( $7.46 \pm 1.37$  liters) compared to the control group ( $6.39 \pm 1.16$  liters). Similarly, peak milk production in the treatment group ( $8.50 \pm 0.14$  liters) was significantly greater ( $p < 0.05$ ) than in the control group ( $7.44 \pm 0.26$  liters). Over the 90-day period, the total milk yield was also higher in the treatment group ( $671.1 \pm 0.85$  liters) than in the control group ( $578.8 \pm 2.75$  liters). These findings align with those of [6], which reported a daily milk yield of 9.88 liters in the treatment group, higher than the control group's yield of 9.72 liters per day. On average, milk yield per day increased by 1.05 liters. These results are consistent with [7, 8, 9, 10], which also reported increased milk yield due to area-specific mineral supplementation. The percentage change in milk production was 16.64%, similar to the findings of [5], which reported a 25% increase in milk production with area-specific mineral mixture supplementation in field trials. Additionally, [11] noted that mineral mixture supplementation at TANUVAS resulted in a one-liter increase in milk production.

Furthermore, the average percentage of milk fat was higher in the treatment group ( $6.1 \pm 0.26\%$ ) compared to the control group ( $5.7 \pm 0.23\%$ ). These results are consistent with [12] and [13].

**Table 1:** Pooled Data of 3 years on Milk yield & its composition (2021-22, 2022-23 & 2023-24)

Milk yield parameter	2021		2022		2023		Average	
	T <sub>1</sub>	Control	T <sub>2</sub>	Control	T <sub>3</sub>	Control	Treatments	Control
Average daily milk yield (lit/day)	7.50±1.40	6.45±1.20	7.32±1.30	6.25±1.10	7.57±1.42	6.49±1.25	7.46 ±1.37	6.39 ±1.16
Peak milk yield (lit.)	8.68± 0.16	7.59±0.30	8.21±0.12	7.14±0.20	8.63±0.16	7.59±0.30	8.50±0.14	7.44±0.26
Total milk yield for 90 days (lit)	675.3±0.85	580.8±1.15	658.10.85	562.5±1.18	685.3±0.87	590.8±1.18	671.1±0.85	578±2.75
Milk fat (%)	6.1±0.30	5.7±0.23	5.9±0.30	5.7±0.22	6.3±0.20	5.9±0.26	6.1±0.26	5.7±0.23
SNF (%)	9.11±0.69	8.98 ±0.81	9.01±0.52	8.63±0.76	9.13±0.69	8.18±0.37	9.08±0.63	8.59±0.64

### Economic parameters

The economic analysis of the data (Table 2) demonstrated that area-specific mineral mixture supplementation increased milk yield by 16.64% in the treatment group. Over a ninety-day period, gross returns from milk sales were higher for the treatment group (Rs. 32,429) compared to the control group (Rs. 25,152). Additionally, net profit per

animal was significantly greater in the treatment group (Rs. 22,594) than in the control group (Rs. 15,506). The benefit-cost ratio was also higher in the treatment group (3.42) compared to the control group (2.). Furthermore, farmers observed an additional profit of Rs. 5 per animal per day by supplementing with the mineral mixture.

**Table 2:** Pooled Data of 3 years of Economics Analysis on supplementing area specific mineral mixture in dairy animals

Particular	2021		2022		2023		Average	
	T	Control	T <sub>2</sub>	Control	T <sub>3</sub>	Control	Treatments	Control
Gross cost (Rs.)	9850	9698	9845	9700	9810	9540	9835	9646
Gross returns (Rs.)	33,750	29,025	32700	22800	30,838	23,632	32,429	25,152
Net returns (Rs.)	23,900	19,327	22855	13100	21,028	14,092	22,594	15,506
B:C ratio	3.4	2.9	3.3	2.35	3.14	2.47		
Additional milk yield by supplementing mineral mixture (lit)	1.0	-	1.07	-	1.08	-	1.05	
Milk yield increases over control (%)	16.2	-	17.12	-	16.64	-	16.65	
Value of additional milk (Rs./day)	50	-	50.75	-	50.80	-	50.51	
Cost of area specific mineral mixture supplementation (Rs./day)	2.5	-	2.5	-	3.0	-	2.6	

### Conclusion

The study's findings indicate that adding area specific mineral mixture to the diet of milking animals enhances productivity and results in a favourable benefit-cost ratio. Therefore, it is recommended to educate farmers on the scientifically balanced feeding of their milking animals

using area-specific mineral mixtures to maximize productivity and profitability in dairy farming.

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