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Effect of vitamin E and selenium supplementation on milk yield of Kankrej cattle

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Abstract
In an attempt to assess the possibilities of improvement in production performance of Kankrej cattle by supplementation of vitamin E and Selenium, an experiment was conducted to investigate the effect of vitamin E and Selenium during transition period in Kankrej cows. A total of 24 cows were selected on the basis of their milk yield, parity and body weight are grouped into four homogenous treatment groups of 6 each. Out of these, one group served as control fed as per NRC (2001) wherein no supplementation was given. Cows in treatment groups, Group-1 vitamin E, Group-2 selenium and Group-3, vitamin E + Selenium supplementation were given daily along with control diet. Average milk yield was found significantly higher in combination supplemented group as compare to other groups.

Keywords: Cattle, Kankrej, milk yield**,** selenium and vitamin E

Introduction
Animal Husbandry and Dairying play an important role in development of India's economy. Animal Husbandry, Dairying and Fisheries sectors play an important role in the national economy and in the socio-economic development of the country. These sectors also play a significant role in supplementing family incomes and generating gainful employment in the rural sector, particularly, among the landless laborers, small and marginal farmers and women, besides providing cheap nutritional food to millions of people. Livestock are the best insurance against the vagaries of nature like drought, famine and other natural calamities. Kankrej takes its name from the name of geographical area i.e. Kank taluka of Banaskantha district in Gujarat. Its synonyms are Wadad or Waged, Vagadia, Talabda, Nagar, Bonnai. The Breeding tract of Kankrej is spreaded in Gujarat (Ahmadabad, Banas Kantha, Kheda, Mahesana, Sabar Kantha and Kutchchh) and Rajasthan (Barmer and Jodhpur). The main uses of Kankrej breed are work i.e. Draught and Transport and food i.e. Milk. Agricultural operations and road transport in village area are mainly carried out by bullocks of this breed. The coat colour of Kankrej varies from silver-grey to iron grey or steel grey. In males fore & hind quarters and hump are slightly darker than the rest of the body. Horns are strong and curved outward and upward in a lyre shaped fashion. They are curved with skin to a longer distance as compared to other breeds. It is heaviest breed of cattle with large pendulous and open ears. The Rabaris, Maldharis, Bharwads, Ahir and Charans are the main communities associated with breeding of the Kankrej. Animals are not tied. They are kept in paddocks of throny bushes near human dwellings. Animals are taken out for grazing. They cover long distances during scarcity periods. In this study the effect of supplementation of vitamin E and Selenium (Se) on production performance of Kankrej cattle in arid zone of Rajasthan was studied. Vitamin E is an important lipid soluble antioxidant in the body. Low vitamin E status in cows will reduce the immune response and likely increase the incidence of certain diseases, especially mastitis. Plasma concentrations of alpha tocopherol or vitamin E decrease dramatically in dairy cows fed stored forages in late gestation and early lactation (Golf and Stabel, 1990). Although the requirement for selenium (Se) is low, feedstuffs produced in many areas are deficient in selenium. Selenium functions in the antioxidant system as a component of the enzyme glutathione peroxidase. Low blood selenium concentrations were related to greater prevalence of intramammary infection in a study involving 32 dairy herds in Pennsylvania (Erskine *et al.*, 1987). It is well known that the functions of vitamin E and selenium are related and that responses in animal health to supplementation of either nutrient can depend on the animal's status of the other nutrient. Supplementing vitamin E during the dry period has reduced the incidence of mastitis in cows fed diets low or marginal in selenium in some studies.

Material and Methods

This chapter describes the materials used and the research methodologies adopted for conducting the present study in order to achieve the above mentioned objectives. The desired information on "Effect of supplementation of vitamin E and Selenium on production performance of Kankrej cattle" was obtained after conducting several experiments in the Cattle Yard, collecting data from the records of Livestock Research Station (L.R.S.), Kodamdesar.

Location and Climatic condition

Geographically L.R.S., Kodamdesar farm is situated at an altitude of 201 meters above the mean sea level in Thar Desert 27 km away from Bikaner city of Rajasthan and its geographical co-ordinates are 28°3'0" North latitude and 73°4'0" East longitude. The climate of the farm is hot desert climate with a very little rain fall and extreme temperatures. In summer temperature can exceed 45°C and during the winter it may deep below freezing. All groups of animal reared under similar climatic conditions.

Selection of animals

Twenty four pregnant Kankrej cows in their late gestation at 21 days before the expected date of calving were selected from L.R.S., Kodamdesar. They were divided into 4 groups of six each. Group-I without any supplementation will act as control. The experimental cows was supplemented individually with vitamin E (Group -II), Selenium (Group-III) and vitamin E and selenium (Group-IV). The data for various observations was recorded from 21 days before the parturition till 30 days of lactation. All cows were free from physiological, anatomical and infectious diseases. Animals were housed in well ventilated and protected shed and were allowed to acclimatize for a period of seven day for experimental feeding.

Experimental feeding

Individual cow was offered green fodder *ab libitium* and 2.5 kg concentrate mixture daily. After calving 1 kg extra concentrate mixture was given for every 2.5 kg milk production. The control group (Group-I) cows were daily receive the basal diet only and the other 3 groups cows were supplemented additionally.

Determination of practical quantity of vitamin E and Selenium

Vitamin E

The USP defines 1IU OF vitamin E as equal to 1mg of α-tocopheryl acetate (NRC 2001) thus, to supplement 2000 IU of vitamin E, 2000mg (equivalent to 2 g) of α-tocopheryl acetate was offered.

Selenium

0.3 mg per kg of DM (NRC, 2001)

Table 1: Supplementation of micronutrients around peripartum period in Kankrej cattle

Groups	No. of animals	Treatment	Dose/Animal/day
Control	6	Nil	Control
Supplemented Vitamin E	6	Vitamin E	2000 IU
Supplemented Selenium	6	Selenium	0.3mg/kg DMI
Supplemented Combination	6	Combination of both	Combination of both

Composition of basal diet

The diets of cows was based on green maize, wheat straw and concentrate mixture with proximate principles have been given in table 2

The proximate composition of concentrate mixture has been presented in table2. Dry roughage, green and concentrate feed offered to control and experimental groups were same. The proximate composition of green maize fed during experimental period was within range values reported by various authors (Radotra, 2003; Malik, 2006 and Mahanta, 2008,) [10, 8]. The proximate composition of wheat straw was also within the range values as reported by Malik, (2006) [8].

Table 2: Proximate analysis of feeds used in intake trial

Nutrients %	Wheat straw	Green maize	Concentrate mixture
DM	91.50	27.80	89
CP	3.20	6.54	20
CF	29.82	27.52	10
EE	0.30	1.27	4.31
Ash	12.31	11.82	4.92

Management of experimental animals

Housing

Animals were housed in a loose housing system. In this system cows were kept loosen in an open paddock of kodamdesar farm throughout the day and night except milking time. There was a provision of open paddock with shelter along one side served the need of animal to rest or retired either during hot winter or rains. The experimental shelter was an individual tying system in a row during milking, feeding and blood collection of experimental animals. Separate watering tank and feeding trough/manger were provided for experimental animals. Concentrate and experimental feed fed at milking time in separate manger. Calves were kept in separate calf pen and allowed to suckle their mother during milking for letdown of milk. Entire shed is surrounded by a boundary wall of 5 feet height. Milking was done in milking barn**.**

Milking

Milking of cows was mainly done by hand milking by milkers twice a daily at 5.00 AM and 4.00 PM at milking parlour. The individual milk yields were recorded in kg at each milking by digital weighing machine.

Details of hand milking

Milking was done by full hand milking. Full hand milking stimulates natural suckling of a calf. It was done by grasping of teat with whole hand and steadily pressing it equally on all sides against the palm with fingers. Maintaining a quick succession of alternate compression and relaxation in which the alternate streams of milk from two teats sound like a continuous stream. It removes milk quicker.

Production parameters

Milk yield: average daily milk yield (kg).

Milk yield

Milking was done twice a daily and milk yield records were maintained throughout the experimental period (30 days after onset of lactation).

Statistical analysis

The data collected during the present investigation were

subjected to statistical analysis by adopting appropriate methods of analysis of variance as described by Snedecor and Cochran (1994) [11]. Wherever, the variance ratio (F-values), were found significant at 5% and 1% level of probability.

The significance of mean difference was tested by Duncan's New Multiple range test (Duncan's range test) as modified by Kramer (1957) [7]

Data were analyzed by general linear model analysis which include the effect of treatment(supplementation of vitamin E,Selenium), days (21,15,7,3 days pre-partum, day of calving and 3,7,15,30 days post partum) as well as interaction between treatment and days for various parameters studied. Statistical analysis was carried out by using SPSS software, version 20.0

Results and Discussion

Daily average milk yield

Daily average milk yield of control and supplemented cows during the lactation period up to 30 days of lactation has been presented in table 3. Daily average milk yield was differed significantly (P<0.01) between groups as well as among groups differed significantly (P<0.01) between different days of lactation period. The interaction effect including group x days was found non- significant. Analysis of variance of average daily milk yield in control and supplemented cows up to 30 days of lactation is presented in table 4.

Milk yield was lower during early lactation which increases with the advancement of lactation. Maximum milk yield was observed in the supplemented combination cows followed by Selenium, vitamin E, and control cows. Similar positive effect of feeding vitamin E and selenium on milk yield has been reported by many scientists. According to Wilde (2006), vitamin E and Zn are effective in prevention of mastitis that occurs predominantly in the first week of lactation, through enhanced antioxidant function and keratinization of the teat canal. Contrary to our results were reported by Bourne et *al*., (2008) [1] and Brozos *et al*., (2009) [2] did not found any beneficial effect of vitamin E and Selenium on the milk yield. Vitamins and minerals have significant milk production of dairy cows (Griffith *et al*., 2007; Bourne *et al*., 2008) [1]. The beneficial effect of supplementation of vitamin E and B-carotene on milk production has been reported by Chawla and Kaur (2004) [3]. These may affect cow resistance to pathogen entry into the mammary gland as well as resistance to post entry.

In this study, we observed that micronutrient supplementation decreased milk somatic cell counts of cows and thus the supplemented cows had lower incidence of clinical mastitis, which subsequently increased the milk production.

Table 3: Mean (±SE) fortnightly Milk yield (Kg/day) in control and supplemented cows

Groups	Days of lactation			overall mean± SE
	0-10	11-20	21-30	
Control	2.32±0.07	3.29±0.39	3.99±0.58	**3.19^{a}±0.28**
Supplemented Vitamin E	2.60±0.04	3.17±0.33	5.37±0.90	3.71^{b}±0.44
Supplemented Selenium	2.24±0.07	4.66±0.55	5.30±0.74	4.06^{bc}±0.43
Supplemented combination	2.43±0.06	4.97±0.42	7.10±1.04	4.83^{c}±0.58
Overall mean± SE	2.40^{a}±0.10	4.02^{b}±0.26	5.43^{c}±0.45	3.95±0.23

Note – Means bearing different superscripts differ significantly.

Table 4: Analysis of variance of milk yield in control and supplemented cow

Source	DF	SS	Mean Sum of squares	F Ratio
Groups	3	25.413	8.471	4.6**
Days	2	111.292	55.646	30.1**
Groups x Days	6	19.931	3.322	1.8
Residual	60	110.915	1.849	

Asterisks indicate level of significance (**P<0.01, *P<0.05)

Conclusion

Maximum milk yield was observed in the supplemented combination cows followed by Selenium, vitamin E, and control cows. Daily average milk yield was differed significantly (P<0.01) between groups as well as among groups differed significantly (P<0.01) between different days of lactation period. The interaction effect including group x days was found non- significant.

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