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EFFECT OF ZINC AND VITAMIN E SUPPLEMENTATION ON PRODUCTION PERFORMANCE OF LACTATING BUFFALOES

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ABSTRACT

The trial involved twenty four early lactating Murrah buffaloes randomly selected and divided into four groups T_0, T_1, T_2 and T_3 comprising six animals in each group. The experimental Group T_0 received basal ration containing concentrate mixture, paragrass and paddy straw, Group T_1 received basal ration + 40 ppm zinc/animal/day, Group T_2 received basal ration + vitamin E 1000 IU/animal/day and Group T_3 received basal ration with combination of zinc 40 ppm + vitamin E 1000 IU for 13 weeks trial period. The average dry matter intake of buffaloes from various Experimental groups was comparable. The average milk yield and FCM yield of Group T_3 was significantly (P<0.01) higher than Group T_0 and T_1, however, difference between T_2 and T_3 was comparable. The feed efficiency in terms of DM intake/kg FCM yield was significantly (P<0.01) better in Group T_3 than Group T_0 and T_1. The average milk composition was not affected by the feed treatment. The milk somatic cell count was significantly (P<0.05) lowered in all Supplemented group. Thus, it is concluded that the supplementation of zinc 40 ppm and vitamin E 1000 IU and their combination found to be beneficial for increasing milk production and improving milk quality in term of lower somatic cell count and such supplementation is cost effective and beneficial for dairy farmers. More benefits were recorded in combination of zinc and vitamin E Supplemented group than the unsupplemented or only zinc Supplemented groups.

Keywords: *Bubalus bubalis*, buffaloes, zinc, vitamin E, milk yield, Somatic Cell Count

INTRODUCTION

Zinc and vitamin E play important role in nutrition of animal. They reduce the incidence of intra-mammary infections; reduce clinical mastitis cases and lower somatic cell counts (SCC) in dairy cows (Weiss, 2002). Zinc is important for the regular function of cell growth, cell replication, skin integrity, cell-mediated immunity, bone formation and generalized host defence mechanism. Vitamin E plays an important role in the maintenance of membrane integrity in almost all cells of the body against toxic oxygen free radical (Qureshi *et al*., 2010). Many dairy buffalo rations contain less than adequate vitamin E and zinc which resulted in deficiency symptoms like night blindness,

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parakeratosis, and reproductive failure (Garg *et al*., 2002). It is also reported that due to deficiency of zinc and vitamin E milk production is affected and need to be supplemented in ration to overcome its deficiency (Chandra *et al*., 2015).

Keeping this view in mind, the present study was proposed to assess the effect of zinc and vitamin E supplementation in the ration of lactating buffaloes on the production performance of buffaloes.

MATERIALS AND METHODS

Twenty-four lactating Murrah buffaloes were randomly selected and divided into four groups *viz*. T_0 (Control), T_1, T_2 and T_3 of six each. Group T_0 served as control and received concentrate mixture routinely used on the farm. Group T_1 received concentrate mixture supplemented with zinc 40 ppm/day/animal. Group T_2 received concentrate mixture supplemented with vitamin E 1000 IU/day/animal. Group T_3 received concentrated mixture supplemented with zinc 40 ppm/day/animal plus vitamin E 1000 IU/day/animal. The trial lasted for 13 weeks. The concentrate mixture was prepared as per BIS (Type II) standards.

The present experiment was conducted on Murrah buffaloes at buffalo farm, Goregaon, Mumbai and in the Department of Animal Nutrition, Mumbai Veterinary College, Parel, Mumbai. This farm has standard housing, feeding and management practices with standard health care.

During trial period, the observation pertaining to daily milk yield, feed intake and weekly milk composition were recorded for all the experimental groups. The milk composition was studied in terms of milk protein, fat, total solids and SNF at weekly interval. The weekly efficiency of feed utilization was calculated in terms of DM, TDN and DCP intake per kg FCM yield. The somatic cell count of milk was determined at fortnightly interval. The economics of milk production was also studied.

Analysis of feed, fodders, and milk samples

The analysis for proximate principles was undertaken as per AOAC. (2005) and calcium and phosphorus estimation were done as per Talapatra *et al*. (1940) in the laboratory of Department of Animal Nutrition, Mumbai Veterinary College, Mumbai.

The Composition of milk was studied with the help of Milkoscan (Auto analyser). The fat corrected (7%) milk yield was calculated by using following formula given by Raafat and Saleh (1962).

7 % FCM (Kg) = (0.265 X milk yield in kg)+(10.5 X fat yield in kg)

Statistical analysis

Observations of various parameters recorded during experimental period were tabulated and data were statistically analyzed as per Snedecor and Cochran (1994) by using Complete Randomized Design.

RESULTS AND DISCUSSIONS

The average chemical composition (% DMB) of concentrate mixture, paragrass and paddy straw is given in Table 1.

The overall performance of buffaloes from both the experimental groups is presented in Table 2. The average dry matter intake of buffaloes from various experimental groups was comparable. The non-significant effect on dry matter intake in the experimental group due to supplementation of 40 ppm zinc, 1000 IU vitamin E and/or their combination in the ration may be attributed to no change in the palatability of the ration in the treatment groups due to supplementation. The results of the present study are in agreement with the work of Phondba *et al*. (2012) who experimented in the cows with supplementation of zinc and vitamin E in the diet reported no significant effect on DMI, which varied from 10.74 to 14.62 kg/day in the Experimental groups. Pal (2013) experimented on Murrah pregnant buffaloes in advance stage supplementing vitamin A (100000 IU), vitamin E (2000 IU), copper (20 ppm), Zinc (80 ppm) and their combination in the ration and found no significant difference in DMI between Control and the Supplemented groups i.e. control (13.15±0.85), vitamin E (13.56±0.53), zinc (12.98±0.71) and combination (13.49±0.49).

The average milk yield and FCM yield of Group T_3 was significantly (P<0.01) higher than Group T_0 and T_1, however, difference between T_2 and T_3 was comparable. This indicated that zinc and vitamin E combine supplementation has positive effect on daily FCM yield. The similar results were reported by Chandra *et al.* (2015) who noted a significant increase (P≤0.01) in milk yield and FCM yield mainly in combination group supplemented with dietary vitamin E and zinc in Sahiwal dairy cows. Similarly, Mutoni *et al.* (2012) observed better milk production in zinc, copper, vitamin E Supplemented group in dairy cows compare to Control groups. Sobhanirad *et al.* (2010) reported significantly increased FCM yield in zinc methionine Supplemented group in dairy cows compare to control whereas in present study only zinc Supplemented group did not show significant effect.

The feed efficiency in terms of DM intake /kg FCM yield was significantly (P<0.01) better in Group T_2 and T_3 than Group T_0. However, difference between T_2 and T_3 was non-significant. Contrary to the present finding, Pagdhune *et al.* (2018) reported no significant effect on DMI (kg)/kg FCM on supplementation of vitamin E in the ration of lactating buffaloes.

The average milk composition in terms of milk fat, protein, lactose, total solids, and solid not fat percentage was not affected by the feed treatment. Similar observations were reported by Pal (2013) who studied on buffaloes in advance stage of pregnancy supplementing vitamin A (100000 IU), vitamin E (2000 IU), copper (20 ppm), zinc (80 ppm) and their combination in the ration and found no significant difference in milk protein, fat and solid not fat percentage between experimental groups. Chandra *et al.* (2015) conducted trial in the Sahiwal cows with supplementation of zinc and vitamin E in the diet and reported no significant effect on milk protein, fat, SNF and total solids percentage among the Experimental groups.

The milk somatic cell count was significantly (P<0.05) lowered in all Supplemented group. This indicated that the Treatment group supplemented with zinc 40 ppm/animal/day, vitamin E 1000 IU/animal/day and their combination had a significantly lower milk somatic cell count than Non-supplemented group, however, difference among Treatment groups was non-significant. These results may be attributed to the role of zinc in the utilization of vitamin A which maintain the integrity of epithelium in mammary tissue. The conversion of beta carotene to vitamin A takes place in intestinal tissue in the presence of alcohol dehydrogenase, zinc containing enzyme (Chhabra and Arora, 1987). From above it may be

Table 1. Average chemical composition (% DMB) of concentrate mixture, para grass and paddy straw.

Nutrient %	Concentrate mixture	Paragrass	Paddy straw
Moisture	10	70.02	7.57
Organic matter	96.30	89.77	86.95
Crude protein	17.74	9.98	3.50
Ether extract	3.48	2.93	1.72
Crude fibre	12.5	24.59	30.36
Nitrogen free extract	62.58	52.38	51.37
Total ash	3.70	10.12	13.05
Calcium	1.15	0.25	0.41
Phosphorus	0.41	0.21	0.18

Table 2. Overall performances of buffaloes from various experimental groups.

Parameters	T_0	T_1	T_2	T_3	Result of 'CRD' test
Dry matter intake (kg)	15.82	15.86	15.87	15.88	NS
Milk yield (kg)	9.04^{a}	9.31^{ab}	9.61^{bc}	9.70^{c}	**
FCM yield (kg)	9.55^{a}	9.83^{ab}	10.16^{bc}	10.25^{c}	**
DM intake /kg FCM	1.66^{a}	1.62^{ab}	1.57^{bc}	1.55^{c}	**
Milk protein %	3.112	3.113	3.101	3.136	NS
Milk fat %	7.533	7.537	7.538	7.541	NS
Milk SNF %	8.337	8.340	8.341	8.341	NS
Total solid %	16.769	16.776	16.778	16.782	NS
Lactose %	4.39	4.41	4.38	4.46	NS
SCC ($\times 10^5$ / ml of milk)	2.88^{a}	1.78^{b}	1.64^{b}	1.61^{b}	*

Note- The means having different superscript in the same row differ significantly.

NS = Non significant; **P≤0.01; *P≤0.05.

inferred that zinc, vitamin E and zinc plus vitamin E combine supplementation has positive effect in milk quality by lowering somatic cell count which is marker of udder infection. The similar results were reported by Phondba *et al*. (2012) who observed a significantly (P≤0.05) higher milk somatic cell count in Control group compare to Treatment group supplemented with zinc and vitamin E in the ration of dairy cows.

CONCLUSION

Thus, it is concluded that the supplementation of zinc 40 ppm and vitamin E 1000 IU and their combination found to be beneficial for increasing milk production and improving milk quality in term of lower somatic cell count. Such supplementation is cost effective and beneficial for dairy farmers. More benefits were recorded in combination of zinc and vitamin E Supplemented group than the Non-supplemented or only zinc Supplemented groups.

REFERENCES

AOAC. 2005. *Official Method of Analysis*, 18th ed. Association of Official Analytical Chemists, Collegiate Press, Washington DC., USA.

Chandra, G., A. Aggarwal, A.K. Singh and M. Kumar. 2015. Effect of vitamin E and zinc supplementation on milk yield, milk composition, and udder health in Sahiwal cows. *Anim. Nutr. Feed Techn*., **15**(1): 67-78. DOI: 10.5958/0974-181X.2015.00008.6

Chhabra, A. and S.P. Arora. 1987. Effect of dietary zinc on the conversion of b-carotene to vitamin A in crossbreed calves. *Indian J. Dairy Sci*., **40**: 322.

Garg, M.R., B.M. Bhanderi and P.L. Sherasia. 2002. Trace minerals status of feeds and fodders in Junagadh district of Gujarat. *Indian J. Dairy Sci*., **55**: 154-158. Available on: https://www.dairyknowledge.in/sites/default/files/trace_min_status_junagadh-ijds5532002.pdf

Mutoni, G., S. Prasad, K. De, S. Pal, J. Mukherjee, S. Kapila and A.K. Dan. 2012. Effect of supplementation of vitamin E, copper and zinc around peripartum on udder health, milk yield and composition of Sahiwal cows. *Livestock Research for Rural Development*, **24**(12).

Pagdhune, A.G., B.N. Ramteke, G.M. Gadegaonkar and S.D. Jagadale. 2018. Effect of supplementing selenium yeast and vitamin E on performance of lactating buffaloes. *International Journal of Livestock Research*, **9**(5): 160-167. DOI: 10.5455/ijlr.20181224115121

Pal, S. 2013. *Effect of vitamin A, E, copper and zinc supplementation on production performance and non-specific immune function of peripartum buffaloes*. Ph.D. Dissertation, National Dairy Research Institute, Karnal, India.

Phondba, B.T. 2012. *Influence of zinc and vitamin E supplementation to periparaturient cows on immunity, incidence of mastitis and productive performance*. Ph.D. Dissertation, National Dairy Research Institute, Karnal, India.

Qureshi, M.S., A. Mushtaq, S. Khan, G. Habib and Z.A. Swati. 2010. Variation in milk fatty acid composition with body condition in dairy buffaloes (*Bubalus bubalis*). *Asian*

Austral. J. Anim., **23**(3): 340-346. DOI: 10.5713/ajas.2010.90479

Raafat, M.S. and M.E. Saleh. 1962. The efficiency of feed utilization with buffaloes and dairy cattle, p. 25-37. *In Proceeding of 2nd Animal Production Conference*, Cairo, Egypt.

Snedecor, G.W. and W.G. Cochran. 1994. *Statistical Methods*, 8th ed. Iowa State University Press, Iowa, USA.

Sobhanirad, S., D. Carlson and R.B. Kashani. 2010. Effect of zinc methionine or zinc sulfate supplementation on milk production and composition of milk in lactating dairy cows. *Biol. Trace Elem. Res*., **136**(1): 48-54. DOI: 10.1007/s12011-009-8526-3

Talapatra, S.K., S.C. Ray and K.C. Sen. 1940. The analysis of mineral constituents in biological materials. 1. Estimation of phosphorus, chlorine, calcium, magnesium, sodium and potassium in food-stuffs. *Indian J. Vet. Sci*., **10**: 243-258.

Weiss, W.P. 2002. Relationship of mineral and vitamin supplement with mastitis and milk quality. *In International Mastitis Council Annual Meeting Proceeding*, Orland Florida, USA.