EFFECT OF STRATEGIC NUTRIENT SUPPLEMENTATION ON THE REPRODUCTIVE PERFORMANCE OF ANOESTRUS BUFFALOES IN THE MALWA REGION OF MADHYA PRADESH

Nagendra Patil, R.K. Jain* and Vishal Mudgal

ABSTRACT

In the Malwa region of Madhya Pradesh reproductive failure (anoestrus) is a major problem in buffaloes under field conditions due to under feeding and nonavailability of balanced ration. To find out the nutritional causes behind anoestrus, thirty anoestrus buffaloes {10 heifers (average body wt. 262.80 ± 22.51 kg) + 20 buffaloes (average body wt. 461 ± 10.83 kg, milk yield 7.62 ± 0.48 litre/h/d)} that had normal genitalia were selected randomly from ten villages of Indore district. Average daily feed intake of each animal was recorded and proximate principles, major (Ca and P) and trace elements (Fe, Zn, Mn, Cu and Co) in available feedstuffs were determined to find out nutrient availability. Deficiency of various nutrients was calculated by comparing with the standard requirements of the animals. A strategic nutrient supplement containing deficient nutrients was formulated on the basis of nutrient deficiency observed in rations of buffaloes of Indore district and a supplementation study was carried out in the same thirty affected anoestrus buffaloes by dividing them into two groups of 15 (five heifers + 10 buffaloes) in each. One of them served as control (un-supplemented), while the other was supplemented with the strategic nutrient supplement (treatment). This supplementation study was continued for a period of two months, during which each individual animal was regularly examined for onset of estrus and artificially inseminated. After two months of the last artificial insemination, pregnancy diagnosis of each animal was carried out per rectally to find out the conception status. Onset of estrous (12 vs. 4) and conception rate (10 vs. 3) were higher in the animals of supplemented group and an additional advantage in the form of improvement ($P<0.05$) in the body weight of heifers of the treated group was also observed. On the basis of above findings it may be concluded that strategic nutrient supplementation not only improved the reproductive performance of the anestrous buffalo heifers and lactating buffaloes, but it also improved the growth performance of the heifers.

Keywords: nutrient, supplement, anoestrus, buffaloes, Malwa

INTRODUCTION

Reproductive failure of dairy animals is a major area of concern nowadays all over India, for it causes a huge economic loss to dairy owners. Among the various factors affecting it, nutrition is one of the most important though it receives less attention than it deserves. For normal development and activity of reproductive organs, feeding of a balanced ration is of utmost importance because

Department of Animal Nutrition, College of Veterinary Science and Animal Husbandry, Mhow (Madhya Pradesh) 453 446 M.P.P.C.V.V., Jabalpur, India, E-mail: drrkjainvet@gmail.com

most field cases of reduced fertility or sterility are of nutritional origin. The interaction between nutrition and reproduction needs particular attention in India to overcome nutritional inadequacies either in terms of quantitative or qualitative nutrient deficiencies/ imbalances.

In the Malwa region of Madhya Pradesh, buffaloes make a significant contribution as dairy animals. Nutritional deficiencies cause several infertility conditions in buffaloes and the highest (50.26%) prevalence was observed for anoestrus, while cases of repeat breeder, metritis, pyometra and prolapse were only about (25.69%) among the common field cases of Malwa region of Madhya Pradesh (Shukla *et al*., 2007). Thus anoestrus remains a major condition which constitutes about half of reproductive problems occurring in buffaloes. Farmers follow traditional feeding practices. Usually cotton seed cake is the only concentrate source fed to lactating animals along with straw (wheat/ masoor/ gram/ soybean), and mineral supplementation is rarely practiced by farmers (Mudgal *et al*., 2003). On the basis of these findings, a study was planned first to find out the nutritional status of the dairy buffaloes of Indore district affected with anestrous and after getting its deficiency picture, implementing strategic nutrient supplementation to overcome the problem.

MATERIALS AND METHODS

Thirty buffaloes {10 heifers (average body wt. 262.80 ± 22.51 g) + 20 buffaloes (average body wt. 461 ± 10.83 kg , milk yield 7.62 ± 0.48 litre/h/d)}with normal genitalia (by per rectal examination) and without any clinical infection, showing anoestrus were selected randomly from 10 villages (Borkhedi, Harsola, Kevti, Piplihamalhar, Umaria, Panda, Rau, Rangwasa, Sonvay and Bhaslai) around Veterinary College, Mhow of Indore District. Body weights (kg) of the animals were determined by recording the length (inch) and girth (inch) of each animal and then putting them in Shaeffer's formula (Sastry *et al*., 1982). Feed offered and residue left of each animal was weighed with the help of spring balance at both feeding times (morning and evening) for three consecutive days. Then average feed intake of each animal was calculated. The representative samples of each feed were subjected to proximate analysis (AOAC, 1995), Ca and P (Talpatra *et al.*, 1940) and trace mineral estimations by atomic absorption spectrophotometer.

Milk yield (litre) of each lactating animal was measured during milking (morning and evening) for three consecutive days. After that average milk yield was calculated. Availability of DM, DCP, TDN, major elements (Ca and P), trace elements (Fe, Cu, Mn, Zn and Co) for each animal was calculated on the basis of chemical composition of feedstuffs and their intake. Selenium, carotene and vitamin E intake were worked out using values given in the literature. Finally, the nutrient availability of individual animal was compared with the standard nutrient requirements calculated for the specific body weight and productivity of each individual animal with the help of feeding standards (Kearl, 1982) and thus the deficiencies/ excess of each specific nutrient was worked out. As per the deficiency status of the nutrients, a strategic nutrient supplement was prepared using SoyaDe Oiled Cake (for protein and energy), sodium dihydrogen orthophosphate dihydrate (for P), zinc oxide (for Zn), copper sulphate (for Cu) and vitamin supplement (for vitamin A and E) were used. The amounts of specific supplement added in the normal routine diet of heifers or buffaloes are

presented in Table 3. Measured amounts of trace minerals were supplemented by placing them in gelatin capsules.

The supplementation study was carried out in same thirty anoestrus heifers and buffaloes by dividing them into two groups having five heifers and 10 buffaloes in each, the control animals were offered the same diet which was being routinely followed by the farmer, while each animal of the treatment group was supplemented with a specific amount of supplement (Table 3) in addition to the normal control diet. Deworming of each animal was done before starting the supplementation and other management practices remained same for both the groups like proper hygienic and ventilated housing with clean drinking water available *ad-libitum*. This supplementation study was continued for a period of two months, during which individual animal of both the groups were regularly examined for onset of oestrus and artificially inseminated. After two months of the last artificial insemination, pregnancy diagnosis of each animal was done per-rectally to find out the conception rate. The data were analyzed as per the standard statistical methods described by Snedecor and Cochran (1994) for mean, standard error and paired 't' test.

RESULTS AND DISCUSSION

The chemical composition of specific feed ingredients being consumed by the animals has been presented in Table 1. The feeds being offered to the animals were mainly the agricultural by-products including wheat straw, gram straw, masoor straw, soybean straw and wheat bran, while the cake was only cotton seed cake, while at some places concentrate mixtures was also being used.

In Table 2, the availability of different nutrients to the animals was worked out and compared with the standard requirement and hence the excess or deficiency of each specific nutrient has been presented. As compared to the standard requirements (Kearl, 1982), availability of DM was about 4-6% less, which may be associated with the deficiency of TDN too. Similar findings was also been reported by Mudgal *et al.* (2003) and Tiwary *et al.* (2007). Between the groups deficiency of major nutrients was observed in heifers for digestible crude protein, which was only about 48% to that of the requirements, while buffaloes were observed with only limited deficiency (11%), which may be associated with the supply of concentrate to the lactating buffaloes. Similar observations were also recorded by earlier workers (Sinha, 1982; Sohal *et al.,* 1982; Mudgal *et al.,* 2003 and Tiwary *et al.,* 2007). The lower levels of energy and /or protein may be associated with the ovarian inactivity and anoestrus (Wiltbank *et al*., 1965) as negative energy balance depresses the ovarian activity by inhibiting pulsatile LH release (Butler and Smith, 1989).

When the major minerals were compared, calcium was shown to be the element supplied in excess (33 to 283%) to the requirement, which may be due to supply of higher amounts of leguminous straws in their ration. Leguminous straw reduces the availability of phosphorus on one hand and over supplies calcium on other hand, as leguminous straws have a wider Ca: P ratio and a fair deficiency of element phosphorus. Phosphorus is necessary for normal energy and phospholipid metabolism as well as normal skeletal development and its severe deficiency may delay the onset of puberty, cause postpartum anoestrus. and increase incidence of cystic follicles because of inactive ovaries, and moderate and low conception rates (Pugh *et al.,* 1985). Many other workers also have found lower levels of inorganic phosphorus in serum of anoestrus

Table 1. Macro and micro nutrient contents of feedstuffs (DM basis).

Feedstuffs	Wheat straw	Gram straw	Masoor straw	Soybean straw	Wheat bran	Cotton Seed cake	Concentrate mixture
CP (%)	3.95±0.22	6.24±0.24	6.52±0.32	6.14±0.34	13.99±0.52	22.60±0.42	16.16±2.70
EE (%)	0.99±0.06	0.63±0.50	1.50±0.11	0.80±0.06	3.45±0.11	10.22±0.64	3.50±0.18
CF (%)	33.08±0.69	39.16±0.74	36.91±0.82	41.77±1.48	9.99±0.92	27.15±1.72	15.19±1.36
NFE (%)	50.31±0.66	45.95±1.20	46.21±0.87	45.52±1.74	68.71±1.63	35.75±1.15	49.29±2.51
TA (%)	11.64±0.64	7.98±0.34	8.84±0.30	6.59±0.38	4.51±0.74	4.25±0.22	13.98±1.79
AIA (%)	5.84±0.16	2.44±0.15	4.17±0.23	0.69±0.06	0.48±0.10	0.18±0.02	6.08±1.48
Ca (%)	0.23±0.02	1.54±0.08	1.46±0.07	0.94±0.04	0.21±0.01	0.22±0.01	0.32±0.05
P (%)	0.06±0.01	0.04±0.00	0.05±0.00	0.24±0.015	0.61±0.05	0.51±0.02	0.17±0.02
Fe (ppm)	414.76±6.47	364.14±12.8	605.28±8.05	461.99±62.70	298.51±15.23	275.24±16.96	258.45±5.94
Zn(ppm)	13.48±1.12	8.41±0.28	23.24±1.92	26.43±1.37	63.40±8.19	41.64±3.03	28.83±2.49
Mn (ppm)	39.81±1.18	15.68±0.85	87.07±7.35	67.63±2.38	71.37±3.22	15.80±0.56	18.82±1.37
Cu (ppm)	7.91±0.36	4.36±0.29	4.86±0.41	10.01±0.70	11.68±1.16	10.12±0.80	2.66±0.32
Co (ppm)	0.16±0.03	0.72±0.06	0.71±0.06	0.18±0.02	0.69±0.17	0.55±0.05	0.86±0.05

Table 2. Daily requirements and availability of nutrients in anoestrus buffaloes.

Parameters	Requirements for 300kg Body wt.	Availability for 262.80± 22.51 Body wt.	Deficiency / Excess (%)	Requirements for 500 kg Body Wt and 8 lits / day production (7% fat)	Availability For 461±10.83 kg Body weight	Deficiency / Excess (%)
	Heifers			Buffaloes		
DMI (Kg)	5.99	5.75±0.43	4 (-)	12	11.33±0.47	6 (-)
DCP (g)	374	179.32±21.80	52 (-)	772	684.69±39.97	11 (-)
TDN Kg)	3.55	2.83±0.21	20(-)	7.28	6.06±0.26	17 (-)
Ca (g)	15	57.38±8.92	283 (+)	46.4	61.93±6.39	33 (+)
P (g)	12	8.16±1.28	32 (-)	35.8	24.41±2.15	31 (-)
Fe (mg)	299.5	2779.56±252.64	828 (+)	600	3801.73±239.87	534 (+)
Zn (mg)	179	118.24±13.74	34 (-)	480	294.24±21.01	39 (-)
Mn (mg)	239.6	353.96±38.74	48 (+)	480	396.24±24.83	17 (-)
Cu (mg)	59.9	44.61±3.22	26 (-)	120	91.40±4.09	24 (-)
Co (mg)	0.59	2.45±0.51	315 (+)	1.20	4.68±0.38	290 (+)
Se (mg)	0.6-1.8	0.78±0.06	Adequate	1.2-3.6	2.4	Adequate
Vit A (IU)	12000	5717.81±45	52 (-)	21000	11418.95±0.20	46 (-)
Vit E (IU)	15	9.49±1.54	38 (-)	15	57.96±4.98	286 (+)

heifers /buffaloes than cyclic animals (Naidu and Rao, 1982; Kumar *et al*., 1992 and Dutta *et al*., 2001).

Among trace elements, the supply of iron and cobalt remained on the plus side, while zinc and copper remained deficient, and Mn was deficient only in buffaloes but not in heifers. The presence of zinc is highly essential for certain enzymatic activities related to reproduction and indirectly it may act through the pituitary to influence the release of gonadotropic hormones or directly through complexing with specific ligands in gonads (Miller, 1979). Deficiency of copper may also be reflected on reproductive behavior as well as performance of animals. Inactive ovaries, delayed oestrus and early embryonic death have been reported to occur due to deficiency of copper (Hidiroglou, 1979 and Singh and Vadnere, 1987).

Due to practice of supply supplying little green feed by farmers, vitamin A remained the most deficient among the animals, and vitamin A is very important for maintaining the health status of epithelial tissue of the reproductive tract. The deficiency of vitamin E was only observed in heifers but not in lactating buffaloes and may be due to lack of concentrate in the ration of heifers. . The negative impact of insufficient vitamin E has been observed on ovulation rates (Harrison *et al*., 1984) and postpartum activities (Arechiga *et al*., 1994) of animals.

On the basis of multiple deficiencies observed in buffalo heifers and lactating buffaloes, two separate strategic nutrient supplements were prepared (Table 3)

Table 3. Ingredient composition of the supplements used for anestrous buffaloes (Quantity / day).

Ingredients	Heifers	Buffaloes
Soya De Oiled Cake	550 g	250 g
Sodium di hydrogen ortho phosphate di hydrate	-	50 g
Zinc oxide	60 mg	224 mg
Copper sulfate	10 mg	90 mg
Vitamin supplement*	1 ml	1 ml

* Each ml contains Vitamin A 12000 IU and vitamin E 48mg.

Table 4. Effect of strategic nutrient supplementation on reproductive performance of anoestrus buffaloes.

Groups of animals	Total animals	No of animals exhibited estrus	Success (%)	No of animals conceived	Success (%)
Heifers					
Control	5	1	20	1	20
Treatment	5	4	80	3	60
Buffaloes					
Control	10	3	30	2	20
Treatment	10	8	80	7	70

and supplemented in the diet of affected animals. The effect of their supplementation has been presented in Table 4. After supplementation of strategic nutrients, 80% of the heifers and lactating buffaloes showed the signs of estrus, while 60% of the heifers and 70% of the lactating buffaloes conceived. The rate of onset of estrous for the control group remained 20% for heifers and 30% for buffaloes, while only 20% of the animals conceived. A significant improvement ($P<0.05$) in body weight of treated heifers was also observed as compared to the controls. Similar results have also been observed by several scientists (Baruah *et al.*, 2000; Lall *et al.*, 2000; Nayyar *et al.*, 2003; Koley and Biswas 2004 and Sharma *et al.*, 2007).

On the basis of above findings it may be concluded that strategic nutrient supplementation not only improved the reproductive performance of the anestrous buffalo heifers and lactating buffaloes, but it also improved the growth performance of the heifers.

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