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Long term use of bovine somatotropic (bST) on reproduction and health of Nili-Ravi buffaloes

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Abstract

The study was conducted to determine the effect of long term use of bovine somatotropic hormone (bST) on days to first oestrus post-partum, number of services per conception, pregnancy rate, lactation length, dry period and calving interval for a period of three years, from 2004 to 2007. Thirty Nili-Ravi lactating buffaloes with approximately similar milk yields and stage of lactation were selected and randomly allocated to two treatments, A and B, with 15 animals in each group. Group A served as control while animals in group B were given injections of bovine somatotropic hormone (250 mg intramuscular per animal) at intervals of 14 days over a period of three years. The calving interval, dry period and lactation length were shorter by 71, 63.9 and 7 days, respectively, in the treated compared with the control group. The days to first oestrus post-partum, service period and services per conception were 160 ± 56.9 *vs*.98.2 ± 76.4 days, 207.0 ± 85.0 *vs*. 115.1 ± 107.0 days and 1.47 ± 1.1 *vs*. 1.31 ± 0.5 in group A *vs.* B, respectively. Statistically, differences were significant for post-partum oestrous and service period but for services per conception the difference was non-significant. Prevalence of mastitis was significantly higher in the treated animals while differences in body weights of the animals in the groups were not significant.

Keywords: Growth hormone, reproductive parameters, body weight, dairy buffaloes
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Introduction

There is a rapid increase in the human population particularly in developing countries. The demand and supply gap for food is increasing with time. To narrow this gap, multi-dimensional approaches are being carried out. Proponents of a new type of technology – biotechnology- claim that it will supply more food at less cost to meet this growing demand. One of the major agriculture related products of biotechnology research is bovine somatotropin (bST). Naturally produced by a cow's pituitary gland, bST is one of the hormones involved in normal growth, development of mammary gland and normal milk production (Murphy, 1998). There is not sufficient data regarding the effect of bST on productive and reproductive performance in buffaloes. Usmani *et al.* (1991) have suggested that research should be planned to determine the effect of bST on buffaloes before its commercialization in Pakistan. The study was thus conducted to ascertain the effect of the long-term use of the bovine somatotropic hormone on the reproductive performance and health status of Nili–Ravi buffaloes over a period of three years.

Materials and Methods

Thirty multiparous lactating Nili-Ravi buffaloes with a similar level of milk production were selected. The animals were kept at the Livestock Experimental Station, Bahadurnagar, Okara and randomly divided into two groups, i.e., groups A and B with 15 animals in each group. Group A was kept as control, while B was injected with a recombinant bovine somatotropic hormone (bST) with the trade name, Boostin -250. The dose level was 250 mg intramuscular per animal, and injections were given at fortnightly intervals after 60 days post-partum for 256 days. All 30 animals remained within their original treatments for the three years of the study. The nutritional requirements of experimental animals were met through available green fodder at 10% of body weight (50 - 55 kg), while the production requirements were met through a concentrate supplement containing 170.9 g crude protein/kg and 9.2 MJ metabolisable energy (ME)/kg (Table 1). The concentrate was given to meet the requirements of milk containing 6.0% butterfat. The samples of feed and green fodder were collected at fortnightly intervals and the proximate analysis according to AOAC (1995) was performed on the feed.

Table 1 Ingredient and chemical composition of the concentrate component of the diet

	Composition
Ingredients	
Maize grains (%)	10
Rice polishing (%)	8
Wheat bran (%)	22
Cotton seed cake (%)	14
Canola meal (%)	10
Maize gluten meal (%)	22
Molasses (%)	12
Mineral mixture* (%)	2
Total	**100**
Chemical Composition	
Crude protein (g/kg)	170.9
Crude fibre (g/kg)	112.0
Ether extract (g/kg)	42.0
Dry matter (g/kg)	896.1
Metabolisable energy (MJ/kg DM)	9.2

Mineral mixture contained (per kilogram): 708 g dicalcium phosphate; 86.4 g magnesium sulphate; 189 sodium chloride; 8.9 g ferrous sulphate; 4.9 g manganese sulphate; 2.2 g zinc sulphate; 0.3 g copper sulphate; 87.7 mg potassium iodide; 8.9 mg cobalt chloride; 15 mg sodium selenate.

For calculating reproductive performance in the two groups, parameters such as days to first oestrus post-partum, service period, number of services per conception, lactation length, dry period and calving interval were recorded. Heat was detected using vasectomized bulls in the morning and evening. The observations on the onset of oestrous were recorded followed by artificial insemination. The number of services per pregnancy was recorded for each animal. The body weights of the experimental animals were recorded at monthly intervals using a weighbridge. For health control all management measures were maintained throughout the experimental period. A strict vaccination schedule was followed against contagious diseases (hemorrhagic septicaemia and foot-and-mouth disease) according to the farm routine. Data regarding metabolic diseases, infectious diseases and the incidence of mastitis were collected and the number of animals with any type of health problem was recorded. Data obtained were statistically analyzed using t- test at significance level ($P < 0.05$) using Minitab (Steel *et al.*, 1997).

Results and Discussion

The reproductive parameters studied during the trial are summarized in Table 2. There was a significant decrease ($P < 0.05$) in the number of days to first oestrus post-partum and service period in the treated group (B) compared to the control (A). However, the difference was not significant in services per conception. The calving interval of the treated group was shorter ($P > 0.05$) than that in the control, while gestation period remained unaffected. The results of the present study corresponded with the results of Starbuck *et al.* (2006) who reported that, in dairy cows, the treatment with rbST improved conception rates but had no effect on retention of pregnancy. The results suggested that bST had a beneficial effect on reproductive parameters. Similarly, Silvia *et al.* (2002) and Dohoo *et al.* (2003) found no adverse effect of bST on reproductive parameters in dairy cows. The length of the lactation tended to be shorter for the treated (B) than the control (A) group but the difference was not significant ($P > 0.05$). These results suggested that bST with good management practices has positive effects on productive traits in buffaloes.

The results of the study agree with those of Bauman (1992) and Jones (2000) who reported that rbST treatment with good management had no negative effect on productive and fertility traits in cattle. The dry period tended ($P > 0.05$) to be shorter in the treated group that in the control. Thomas *et al.* (1990), in a study on dairy herds, concluded that rbST had no adverse effect on productive and fertility traits in cattle. A shorter calving interval was observed in the treated group but the difference was not significant ($P > 0.05$). Calving interval that optimizes economic return varies with a number of management and economic factors, but a major component is the magnitude of milk response and lactation length. It can be deduced that an increased

milk response is desired with an increased lactation length and calving interval while the economic losses due to shorter lactation yield can be minimized in dairy animals with a shorter calving interval.

Table 2 Mean values of different reproductive parameters

Parameters	Treatments	Lactation 1	Lactation 2	Lactation 3	Means
Post-partum oestrus (days)	A	145 ± 115	175 ± 62	-	160 ± 57
	B	139 ± 137	104 ± 96	52 ± 32	98 ± 76
Service period (days)	A	175 ± 46	239 ± 61	-	207 ± 85
	B	156 ± 141	127 ± 104	63 ± 36	115 ± 107
Services /conception (days)	A	1.73 ± 0.123	1.21 ± 0.42	-	1.47 ± 1.11
	B	1.26 ± 0.59	1.46 ± 1.13	1.2 ± 0.4	1.31 ± 0.51
Lactation length (days)	A	264 ± 4	275 ± 51	-	260± 47
	B	259 ± 34	256 ± 41	251 ± 6	253 ± 37
Dry period (days)	A	246 ± 136	-	-	246 ± 136.0
	B	204 ± 108	160.0 ± 71	-	182 ± 95
Calving interval (days)	A	506 ± 130	-	-	506 ± 130
	B	460 ± 136	410 ± 96	-	435 ± 120

The overall mean body weights of treatment groups (Table 3) were statistically not significant though the weights of the treated group tended to be higher than that of the control. The results of this study correspond with results of Srinivasa-Rao & Ranganadham (2000) and Jorge *et al.* (2002) who found that body weights were not affected (P >0.05) by supplementation of bovine somatotropin. On the other hand, in a study conducted by Huber *et al.* (1997) nST injections enhanced body weights by up to 37% in cows injected for four consecutive lactations.

Table 3 Body weights (kg) of experimental animals during the study period

Groups	Initial body eight	Final body weight	Overall means	Level of significance
Control-A	542 ± 34.1	533 ± 29.5	538 ± 31.7	P >0.05
Treated-B	544 ± 47.5	554 ± 42.2	549 ± 44.5	P >0.05

During the study period there was no incidence of any metabolic or infectious disease in the experimental or control groups. The annual mean prevalence for mastitis during the trial period for groups A and B was 4.67 ± 1.56 *vs.* 7.33 ± 3.06, respectively. The increase in the incidence of mastitis was 2.66 units higher in the treated than in the control group. The results are supported by the findings of Dohoo *et al.* (2003) who reported that the recombinant bovine somatotropic hormone increased the risk of clinical mastitis significantly by approximately 25%. This may be due to reduced resistance and thereby increased sickness and suffering in dairy cows by bST treatment (Kronfeld, 1990).

Conclusion

Results of the study indicate that the calving interval and dry period were shorter in treated animals than in the controls. There was a positive effect of bST on reproductive parameters such as post-partum oestrous, service period and services per conceptions. However, it had a negative effect on health parameters with reference to mastitis which increased with the use of the bST hormone.

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