EFFECT OF BOVINE SOMATOTROPIN ADMINISTRATION AND WALLOWING ON MILK PRODUCTION, MILK PROTEIN AND FAT CONTENTS IN NILI-RAVI BUFFALOES DURING SUMMER

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ABSTRACT

The present study was conducted with the objective to determine the combine or alone responses of bovine somatotropin and wallowing in summer stressed buffaloes. A total of 60 lactating Nili-Ravi buffaloes of approximately similar age group, body weight and stage of lactation (mid-lactation) were selected during May to August, 2013. All buffaloes were divided into four groups (A, B, C, D). Group A buffaloes were kept in open shed without bovine somatotropin injection, whereas group B were buffaloes kept in open shed along with bovine somatotropin. Group C buffaloes were kept in open shed along with wallowing without bovine somatotropin whereas group D buffaloes were kept in open shed along with wallowing with bovine somatotropin injection. Buffaloes of group C and D were allowed a wallowing period of one hour during day time. Animals of group B and D were injected subcutaneously with 500 mg of bovine somatotropin after every 14 days. The mean milk yield (l/day) in group A, B, C and D was 7.12 ± 0.46, 8.47 ± 0.63, 8.18 ± 0.22 and 9.25 ± 0.18, respectively. Among all groups of buffaloes, the mean (± SE) milk yield varied non-significantly ($P > 0.05$). The mean milk fat percentage in group A, B, C and D buffaloes were 5.22 ± 0.07, 5.39 ± 0.06, 5.25 ± 0.05, 5.49 ± 0.06, respectively. Non-significant difference in fat percentage was observed among different groups of buffaloes. The mean milk protein percentage in group A, B, C and D buffaloes were 2.81 ± 0.03, 2.83 ± 0.05, 2.80 ± 0.05, 2.83 ± 0.05, respectively. Protein percentage differed non-significantly in four groups. It was concluded that the combined effect of bovine somatotropin (bST) and wallowing increased non-significantly the milk yield, fat and protein percentage of milk in Nili-Ravi buffaloes.

Keywords: Somatotropin, Wallowing, Heat stress, Buffaloes

INTRODUCTION

The water buffalo is very much prone to heat stress due to high environmental temperature especially during hot and humid summer season. This heat stress results decreased dry matter intake and lower milk yield (Huber *et al.,* 1994). The hot and humid summer conditions distresses buffaloes

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affecting its temperament and physiological responses. Different types of metabolic modifiers such as somatotropin are used to improve buffalo milk yield, milk components and body weight gain. It has been previously reported that milk yield was increased when buffaloes were treated with bovine somatotropin (Mishra and Shukla, 2004) with no harmfull effect on fertility (Usmani and Athar, 1997). Although use of bovine somatotropin cause heat production in animals (West, 1994), but it also increases heat dissipation (Johnson *et al.,* 1991). Different types of management strategies are required that minimize the effect of heat stress and also maintain milk yield.

In summer season cooling the buffaloes either through wallowing, sprinkling, splashing and showering sufficiently reduces body temperature and improves animal temperament. Provision of water or shade is important for well-being of buffaloes. Buffalo have the habit of wallowing to maintain its body temperature and normal functioning of body organs. In buffaloes, cooling effect can be achieved through wallowing or splashing of water (Rahangdale *et al.,* 2011). During hot weather, evaporative cooling of cows increased dry matter intake and higher milk yield as compared to non-cooled cows (Chen *et al.,* 1993). To the author's knowledge, no information is available regarding the combined use of bovine somatotropin and wallowing on production performance of buffaloes during summer season. It was hypothesized that administration of bovine somatotropin and wallowing alone or in combination will improve production performance in buffaloes during summer season. Therefore, the purpose of this study was to find out the responses of bovine somatotropin along with wallowing in summer stressed buffaloes.

MATERIALS AND METHODS

The present study was carried out at experimental farm, situated between latitude 27^{o} to 34^{o}N and longitude 68^{o} to 75^{o}E. The experimental period was extended from May to August, 2013. The environmental temperature during the experimental period ranged 35-46^{o}C. Buffaloes were kept in open shed (35 × 85 sq feet). A total of 60 lactating Nili-Ravi buffaloes of approximately similar age group (5-8 Years), body weight (400-550 kg) and at mid lactation stage were selected. During the study period animals were given approximately 60 kilogram green fodder along with anmol wanda having 17% CP and 75% TDN (3 kg for maintenance and added with 1 kg for 3 liter milk). Each buffalo was recognized by ear mark. All buffaloes were divided into four groups (A, B, C, D) comprising of 15 buffaloes in one group (n=15). The following four treatments (15 buffaloes per treatment) were given to different groups. Group A buffaloes were kept in open shed without bovine somatotropin injection, while Group B were kept in open shed along with bovine somatotropin. Group C buffaloes were kept in open shed along with wallowing without bovine somatotropin whereas Group D buffaloes were kept in open shed along with wallowing with bovine somatotropin injection.

Buffaloes of group C and D were allowed a wallowing period of one hour (14:00-15:00) during day time. The wallowing was done by taking buffaloes in a canal. Animals of group B and D were injected subcutaneously with 500 mg of bovine somatotropin (Boostin-250, LG Life Science, South Korea) after every 14 days. Group A, C were given placebo of 2 ml normal saline after every 14 days. Daily milk yield (L/day) both during the morning and evening hours

was recorded and weekly average of each animal was calculated. Approximately 100 ml of milk was collected from each buffalo to determine fat and protein percentage. Individual milk samples were collected at weekly interval from two successive milking (morning and evening). These milk samples were cooled immediately after collection. The Gerber method was used to determine fat content in milk (Marshall, 1992). Milk protein contents were determined according to the method described by Davide (1977). The data thus obtained was analyzed statistically by using Z-test (Steel *et al*., 2006).

RESULTS

The mean milk yield (l/day) in group A, B, C and D is shown in Table 1. Among all groups of buffaloes, the mean (± SE) milk yield varied non-significantly ($P > 0.05$). The mean milk fat and protein percentage in group A, B, C and D buffaloes are shown in Table 2. Non-significant difference in fat percentage was observed among different groups of buffaloes. Protein percentage differed non-significantly among four groups.

DISCUSSION

In the present study, the increase in milk yield in response to bovine somatotropin is in agreement with many other studies (Hartnell *et al*., 1991; Gibson *et al*., 1992; Chalupa *et al*., 1996; Huber *et al*., 1997). A 25% increase in milk yield in lactating buffaloes which were given 250 mg recombinant bovine somatotropin fortnightly have been reported by Mishra and Shukla, (2004). The rise in milk yield in response to somatotropin may be due to increased activity of certain enzymes that in turn enhanced the synthesis activity of epithelial cells (Tanwattana *et al*., 2003). In our study, due to the combined effect of bovine somatotropin (bST) and wallowing, milk yield was higher in

Table 1. Mean (±SE) Milk yield in different Groups of Buffaloes.

Parameter	Group A	Group B	Group C	Group D
Milk Yield (liters)	7.12 ± 0.46 [a]	8.47 ± 0.63 [a]	8.18 ± 0.22 [a]	9.25 ± 0.18 [a]

Values sharing similar superscripts differed non-significantly ($P < 0.05$).

Table 2. Mean (±SE) Milk fat and protein contents in different groups of buffaloes.

Parameter	Group A	Group B	Group C	Group D
Fat (%)	5.22 ± 0.07 [a]	5. 39 ± 0.06 [a]	5.25 ± 0.05 [a]	5.49 ± 0.06 [a]
Fat (gram/day)	371	564	492	636
Protein (%)	2.81 ± 0.03 [a]	2.83 ± 0.05 [a]	2. 80 ± 0.05 [a]	2. 83 ± 0.05 [a]
Protein (gram/day)	200	296	262	327

Values sharing different superscripts in a row differed significantly ($P < 0.05$).

group D buffaloes in comparison to group A, B, C. The wallowing induced cooling effect in summer stressed buffaloes as a result of which the feed conversion ratio may be improved resulting in improvement of milk yield. The dry matter intake was increased in summer stressed buffaloes when cooling was provided by roof alteration (Titaporn *et al*., 2012). Herrera and coworkers (1999) also reported improvement in milk production in Holstein cows which were given 500 mg bovine somatotropin (bST) along with evaporative cooling. In the present study the combined effect of bST and wallowing (group D) increased milk yield but the difference was non-significant with other groups (A, B, C) because the effect of heat stress was partially alleviated by wallowing.

Several studies (Johnson *et al*., 1991; Barbano *et al*., 1992; Laurent *et al*., 1992; Herrera *et al*., 1999) have reported no change in milk composition after treatment of animals with bovine somatotropin (bST). By the addition of bovine somatotropin (bST), percentage of fat, yields of fat and protein yields were increased in group B and D buffaloes (P>0.05). Wallowing increased fat, protein yield and decreased protein percentage of milk in comparison to control group (P>0.05). Herrera *et al.* (1999) also reported increase in fat and protein yield in Holstein cows in response to evaporative cooling during summer stress period. Many other studies (Armstrong *et al*., 1988; Chen *et al*., 1993; Armstrong *et al*., 1993) have reported little or no effect of evaporative cooling on percentage of milk components, but components (Fat, protein) yields were increased due to higher milk yield.

CONCLUSION

It is concluded, from the results of the present study, that combined effect of bovine somatotropin (bST) and wallowing do not have any effect on milk yield, fat and protein percentage of milk in Nili-Ravi buffaloes.

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