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Seasonal Variation of Anestrus Conditions in Buffaloes (*Bubalus bubalis*) in Southern Nepal

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ABSTRACT

The seasonal environmental fluctuation in Southern Nepal is typical with cold and semi-dry to dry winter, rapidly increasing hot and dry spring, very hot and rainy monsoon summer and moderate autumn. July-December and January-June are the active and low breeding months, respectively, for buffaloes. The objective of this study was to show the seasonal variation of anestrus conditions in association with the changes of environment and body condition score (BCS) in buffaloes in Southern Nepal. Round-the-year reproductive data of 226 anestrus buffaloes, of which, 112 with their BCS (poor: <2.5 or good: >2.5), were analyzed. Among the anestrus conditions, the incidence of true anestrus with inactive ovaries was >70% from March to June that peaked (>80%) in April/May and remained ≤50% in August and October-December. During low breeding months, the proportion of anestrus buffaloes with poor BCS was greater (62.9 vs., 37.1%, $p<0.01$) and with good BCS was lesser (33.8 vs., 66.2%, $p<0.01$) as compared to the active breeding months. Similarly, >75% of the anestrus buffaloes with poor BCS showed true anestrus round-the-year. A considerable proportion (37.2-46.2%) of buffaloes with good BCS showed silent estrus (luteal phase) round-the-year. A distinct seasonal variation of anestrus conditions was observed in these buffaloes and the effects of hot and dry environment and poor BCS were associated with higher incidence of true anestrus.

Key words: Environmental factors, body condition score, true anestrus, silent estrus, water buffalo

INTRODUCTION

Poor reproductive performance and seasonal variation in breeding efficiency are the major issues of buffalo production. Anestrus is the major cause of infertility in Nepalese water buffaloes (*Bubalus bubalis*). True anestrus and silent ovulation were reported as the predominant causes of poor reproductive performance in buffaloes in Southern Nepal (Sah and Nakao, 2009). In the present study area of Southern Nepal, the environmental fluctuation is typical with cold and semi-dry to dry winter (December-February), rapidly increasing hot and dry spring (March-May), very hot and rainy monsoon summer (June-August) and moderate autumn (September-November) (Devkota and Bohora, 2009).

July to December and January to June are the active and low breeding months, respectively, of buffaloes in Southern Nepal (Devkota and Bohora, 2009). Changes in seasonal biometeorological factors of photoperiod, ambient temperature and rain fall and related nutritional factors, either

alone or in combination, play significant roles in causing seasonal reproductive pattern in buffaloes (Vale, 2007; Das and Khan, 2010; Perera, 2011). In Nepal, seasonal shortage of feed and fodder production is common during dry months of winter and spring causing poor nutritional supply to animals during these seasons. The nutritional status of animals can be subjectively accessed in terms of their Body Condition Score (BCS) (Edmonson *et al*., 1989). It is well established that reproductive efficiency in dairy cattle is related to the BCS (Markusfeld *et al*., 1997; Moreira *et al*., 2000; Amer, 2008). The phenomenon of higher incidence of ovarian inactivity during summer in Egyptian buffaloes was shown to be associated to poor BCS indicating nutritional cause with poor accessible nutrition in summer (Ali *et al*., 2009). However, round-the-year variation among anestrus problems in water buffaloes that may be associated to seasonal changes of environment and related nutritional factors is not understood precisely. Such information may help to consider when to adopt a specific hormonal treatment or the nutritional supplementations to overcome the problems of anestrus in water buffaloes. Therefore, the objective of this study was to show the seasonal variation of anestrus conditions in association with the changes of environment and BCS in buffaloes in Southern Nepal.

MATERIALS AND METHODS

Study area: The present study area is located in the subtropical zone around 27°34' 60 N latitude and 84°30' 0 E longitude with the altitude of about 150 m from the sea level. Buffalo population here consists of the Indian Murrah breed or their crosses with the indigenous breeds. Seasonal monsoon fodder during rainy months and rice straw hay after October/November is the major feed supply of buffaloes here.

Animals and examinations: In total, 226 buffaloes kept by small-holder farmers that were not detected in estrus for two months after calving or breeding were included in this study. The cases were recorded from April, 2007 to January, 2011 during several infertility camps and farm visits in Chitwan and Nawalparasi districts of Southern Nepal and from the Livestock Farm and Veterinary Teaching Hospital of the Institute of Agriculture and Animals Science, Chitwan. The clinical reproductive examination and diagnosis of anestrus was performed by ultrasound examination (Honda HV-1500, Honda Electronics, Japan) or by transrectal palpation or a combination of both. Based on the presence or absence of Corpus Luteum (CL), graafian follicle and cystic structures in the ovaries, anestrus conditions were categorized into true anestrus with inactive ovaries, silent estrus in the luteal or follicular phase and cystic ovarian condition. The BCS was recorded (range: 1- 5, Ferguson *et al*., 1994) from 112 of the 226 anestrus buffaloes and they were grouped as buffaloes with poor (<2.5) and good (>2.5) BCS.

Statistical analysis: The difference in the proportion of anestrus buffaloes per BCS group during the active and low breeding months was analyzed by Fisher's exact test (JMP 5.1, SAS Institute Inc., Cary, NC, USA).

RESULTS AND DISCUSSION

Monthly variation of different types of anestrus conditions in these buffaloes is shown in Fig. 1. Among the anestrus conditions, the incidence of true anestrus was >70% from March to June that peaked (>80%) in April/May which was ≤50% in August and October-December. All remaining buffaloes, except those with true anestrus and one in November diagnosed with luteal cyst, showed silent estrus.

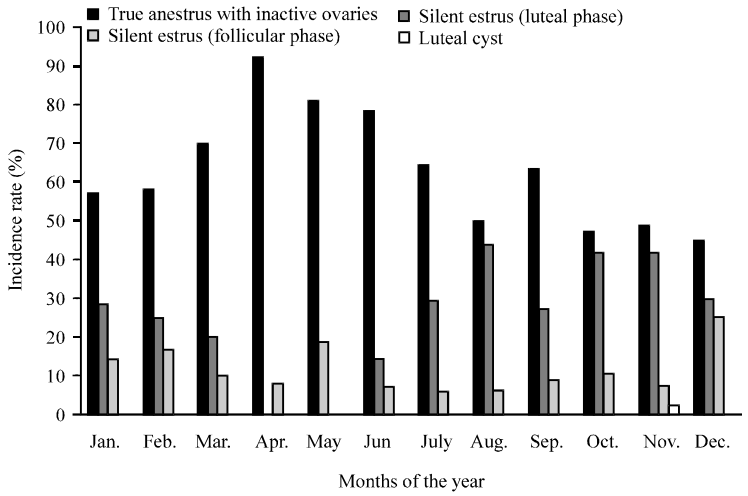

Fig. 1: Monthly variation of different types of anestrus conditions in buffaloes in Southern Nepal

Table 1: Difference between the proportion of anestrus buffaloes per poor (<2.5) or good (>2.5) body condition score (BCS) group during the active breeding months (July-December) and low breeding months (January-June) and its association with the prevalence of different types of anestrus conditions

			Prevalence rate (%) of anestrus conditions			
BCS group (No. of animals)	Breeding months	Proportion of anestrus buffaloes per BCS group	True anestrus	Silent estrus (luteal phase)	Silent estrus (follicular phase	Ovarian cyst (Luteal)
Poor: <2.5 (35)	Active	37.1 (13/35)[a]	76.9 (10/13)	23.1 (3/13)	0.0 (0/13)	0.0 (0/13)
	Low	62.9 (22/35)[b]	95.5 (21/22)	4.50 (1/22)	0.0 (0/22)	0.0 (0/22)
Good: >2.5 (77)	Active	66.2 (51/77)[b]	39.2 (20/51)	37.2 (19/51)	21.6 (11/51)	2.0 (1/51)
	Low	33.8 (26/77)[a]	46.2 (12/26)	46.2 (12/26)	7.6 (2/26)	0.0 (0/26)

Different superscripts in the proportion of anestrus buffaloes per BCS group denote for significant difference ($p<0.01$)

The difference between the proportion of anestrus buffaloes per BCS group during the active and low breeding months and its association with the prevalence of different types of anestrus conditions is presented in Table 1. There was a difference ($p<0.01$) across the active and low breeding months between the proportions of anestrus buffaloes showing poor or good BCS. There were greater ($p<0.01$) proportion of poor BCS buffaloes (22/35 or 62.9% vs., 13/35 or 37.1%) and lesser proportion of good BCS buffaloes (26/77 or 33.8% vs., 51/77 or 66.2%) during low breeding months as compared to the active breeding months. Moreover, >75% of the anestrus buffaloes with poor BCS during low (21/22 or 95.5%) and active (10/13 or 76.8%) breeding months showed true anestrus. A considerable proportion of buffaloes with good BCS showed silent estrus in the luteal phase during both the active (19/51 or 37.2%) and low (12/26 or 46.2%) breeding months, with later months showing slightly higher incidence.

Seasonal shortage of feed and fodder availability was common in this area during the winter and spring months. Among the anestrus conditions in these buffaloes, true anestrus was the major problem followed by silent estrus (luteal phase) throughout the year which was closer to the earlier reports from Nepal (Sah and Nakao, 2009) and from the other countries (El-Wishy, 2007). This is the first study of its kind conducted in Nepalese buffaloes that showed a clear seasonal variation

of anestrus conditions. Seasonal breeding characteristic in subtropical Mediterranean buffaloes does not seem to depend on diet, food availability or metabolic status, but climate and particularly photoperiod play a pivotal role (Barile, 2005) while the seasonality of tropical breeds of buffaloes is mostly dictated by the availability of feed stuff rather than other factors (Presicce, 2007; Vale, 2007; Perera, 2011). Higher environmental temperature increases oxidative stress (Bernabucci *et al*., 2002) and reproductive disorders and oxidant/antioxidant imbalance in buffaloes are related to each other (Ahmed *et al*., 2008). A higher incidence of true anestrus during the spring and early summer months observed in these buffaloes may be associated to the increasing day light and the environmental temperature during these seasons. However, a strong association of true anestrus to poor BCS observed in this study suggested that the effects of dry weather resulting shortage of feed and fodder availability during winter and spring months might have played a major role in causing higher incidence of true anestrus in the following months. It would be important to make further study to understand if the reproductive performance in these buffaloes during the low breeding months can be enhanced by improving nutritional management, or they posses a seasonal breeding characteristics with mixed features of buffaloes from the subtropics and the tropics.

The current data also revealed that among the anestrus buffaloes with good BCS, silent estrus was a common problem round-the-year, although its higher incidence was observed during low breeding months. The later observation is in agreement with the recent review showing silent estrus in dairy buffaloes is more frequent during low breeding season (El-Wishy, 2007). Recently, many veterinarians prefer to use specific hormonal treatment to treat different types of anestrus conditions. The response of hormonal treatment largely depends upon the presence of functional structures, such as CL or the follicle, in the ovary. Clinical reproductive examination is crucial to diagnose the type of anestrus condition. Moreover, it was understood from the present study that monitoring of BCS is also equally important in buffaloes showing anestrus problems. This point was further supported by the reports from other species of animals as well, in which incidences of anestrus and abnormal ovarian cyclicity were correlated negatively with BCS in Zebu cows (Maina *et al*., 2008) and BC could have an important influence on the response of anestrus ewes to out-of-season breeding using hormonal treatment (Madani *et al*., 2009). The current data clearly demonstrated that majority of anestrus buffaloes during spring and early summer months possessed inactive ovaries and there was a strong association of ovarian inactivity with the poor BCS throughout the year. Buffaloes with poor BCS, therefore, may not respond to hormonal treatment and may require enough nutritional supplementation. It was also likely that anestrus buffaloes with good BCS may have a silent cyclicity and hormonal treatment may be the best option for them. It can be suggested that BCS indirectly may reflect the nature of anestrus and its underlying ovarian causes in anestrus buffaloes.

CONCLUSION

In conclusion, there was a distinct seasonal variation among the types of anestrus conditions in buffaloes in Southern Nepal. The effects of hot and dry weather and poor BCS were associated with higher incidence of true anestrus in these buffaloes. This information may contribute to develop different strategies during different seasons in addressing the anestrus problems in dairy buffaloes to increase their round-the-year reproductive efficiency.

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