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Influence of season, age and postpartum interval on reproductive parameters of norgestomet treated anestrus zebu cattle

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ABSTRACT

The study was conducted on anestrus Zebu cattle randomly assigned either to receive Crestar treatment (n=82: 39 heifers + 43 cows) or to remain untreated (n=24: 12 heifers + 12 cows) for studying the effect of age, postpartum interval and season on their reproductive performance. Reproductive performance was not affected by age of heifers (2.5 - 3.0 vs. 3 - 4 yr.) and postpartum interval (90-120 vs. 150 or more days). The encouraging results of 71 - 100% estrus induction rate; 47 - 72% first service conception rates and 65 - 83% overall conception rates suggested that heifers even at younger age could possibly be induced to estrus with this treatment, provided their physical condition are good; as well as the cows with even shorter postpartum interval. In addition, Crestar effectively induced fertile estrus in anestrus heifers and cows both during the hot as well as the cold months. The mean interval to estrus for heifers during hot season was significantly longer than the cold season suggesting that heifers treated during hot months should be bred according to estrus for better fertility.

Key words: Zebu cattle, norgestomet, anestrus, conception rate, age, season

Progesterone treatments have frequently been used, with eCG, to stimulate estrus and ovulation in anestrus cattle (Smith and Kaltenbach, 1990; Singh *et al.*, 1998). Response to the treatment may be influenced by several factors like stage of the estrous cycle, body condition, calf separation, season and age of the animals (Wiltbank and Gonzaliz-Padilla, 1975; Richards *et al.*, 1988; Odde, 1990).

In SMB treated prepubertal heifers, Rao *et al.* (1986) observed better estrus response and fertility during cooler months than during hot season. Similarly, older heifers (2 years old) exhibited better estrous response to norgestomet than the yearlings (Gonzalez-Padilla *et al.*, 1975). However, scanty information is available regarding influence of the postpartum interval on response to norgestomet treatment in indigenous Zebu cattle. The present experiment was, therefore, designed to determine the effect of season, age and postpartum interval on the norgestomet treatment response of anestrus postpartum Zebu cattle and pubertal heifers.

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MATERIALS AND METHODS

A total of 106 anestrus suckled postpartum (over 90 days) Hariana and Sahiwal cows and pubertal heifers (30-to 48 month old, weighing > 250 kg) were included to study the effectiveness of norgestomet ear implants (Crestar™ ear implants, Intervet International, Boxmeer, The Netherlands). Acyclicity was confirmed by per rectal palpation of the ovaries twice at 10 days' intervals and by basal plasma progesterone concentrations. The trial was conducted at an organized cattle farm around Hisar. The animals were randomly assigned either to receive a 3mg subcutaneous norgestomet ear implant (Crestar; n=82: 39 heifers and 43 postpartum cows), followed immediately by administration of injectable solution containing 3 mg norgestomet and 5 mg estradiol valerate (Crestar injection) or to remain as untreated control (n=24: 12 heifers and 12 postpartum cows). Implants were kept in situ for 10 days and at the time of withdrawal, all treatment group animals also received 500 IU eCG (Folligon, Intervet) intramuscularly.

Animals were treated throughout the year and to record the effect of age, postpartum interval and season. The treated animals were categorized in different groups viz. heifers of 2.5 - 3 years and 3 - 4 years; cows of 90 - 120 days postpartum interval and over 150 days postpartum. Similarly, seasons were categorized as hot (April to September) and cold (October to March). For five days immediately after implant removal, the animals were observed every 6h for signs of estrus. The onset of estrus was recorded as the time when the female was first seen standing to be mounted by another female or a teaser bull, paraded every 6 h. The time of end of estrus was the time when the female was last seen standing for the bull / another female to be mounted. For another one-month period, estrus detection was continued at twice daily frequency. Females were allowed to mate with a fertile bull 12 h after first detected in estrus.

Jugular venous blood samples from 12 heifers and 8 postpartum cows treated with Crestar, and from 4 heifers and 4 postpartum cows of the control group, were collected at periods corresponding to immediately before implant insertion (d-0), on days 3, 9, 10, 11, 12, 17, 24 and 31. Plasma was separated after centrifugation at 1000 x g for 15 min and stored at -20°C until assayed. Plasma progesterone was analyzed using the Coat-A-Count RIA kits (Diagnostic Products Corporation, Los Angeles, USA). Statistical analysis of the data was done using t-test (Snedecor and Cochran, 1968).

RESULTS AND DISCUSSION

The animals in the present study were diagnosed to be non-cycling on the basis of non-palpation of a corpus luteum in either of the ovaries on examination, twice at an interval of 10 days. The plasma progesterone concentrations subsequently confirmed the clinical findings. All the treated animals successfully retained the implants, similar to other reports (Wishart *et al.*, 1977), but contrary to 8% implant losses reported by Tregaskes *et al.* (1994). Generally, very low implant losses (< 1 per cent) have been reported (Kaltenbach, 1980). The placement of implant, ideally near the base of the ear, may be related to these losses (Tregaskes *et al.*, 1994).

None of the control animals exhibited estrus during the experiment. Comparatively, a higher proportion of older heifers were detected in estrus during the 5-days period compared to the younger heifers (100 vs. 85%, Table 1). Although the body score and physical condition of the animals were not specifically looked into the present study, it is perhaps natural to think that the

Table 1. Reproductive parameters in Norgestomet treated and control Zebu cows and heifers in relation to age and postpartum interval

Group/Parameters	n	Induction of estrus (%)	Interval of onset of estrus (h) (Mean±SE)	First service conception rate (%)	Overall conception rate (%)
Heifers (Age 2.5 - 3.0 yr.)					
Treated	21	18* (85.7)	63.22±7.55	72.2	77.8
Control	6	0	-	-	-
Heifers (Age 3 - 4 yr.)					
Treated	18	18 (100)	64.0±6.71	66.7	83.3
Control	6	0	-	-	-
Cows (Postpartum interval 90-120 d)					
Treated	19	17 (89.5)	45.18±4.88	47.1	64.7
Control	6	0	-	-	-
Cows (Postpartum interval ≥ 150 d)					
Treated	24	17 (70.8)	51.53±4.57	52.9	64.7
Control	6	0	-	-	-

* 3 heifers exhibited estrus after 5 days of implant removal, thus not included, ** Including those conceived at 2nd and 3rd inseminations

older animals were comparatively in better physical condition, with body weights more nearer to pubertal size. Gonzalez-Padilla *et al.* (1975) also reported a higher estrus rate by 25 days post-norgestomet withdrawal in 2 years olds compared to yearlings (100 vs 71%) and the effect was attributed to high body weight of the former. The mean interval from implant withdrawal to onset of estrus, first service conception and overall pregnancy rates were not influenced by age. The interval from the end of the treatment to the onset of estrus was somewhat longer in the present study as compared to Brown *et al.* (1988) and Tregaskes *et al.* (1994). Wiltbank *et al.* (1971) found variation in the occurrence of estrus (36.12±18.3 h) following a 9-days progestin treatment. Later on, Woody and Pierce (1974) and Woody and Abenes (1975) reported a range of 1 to 5 days in the interval to estrus in heifers treated with progestogens. First service conception rate and overall pregnancy rate (64.7%) observed in the treated heifers was comparable to similarly treated Taurus heifers (Kazmer *et al.*, 1981).

The estrus induction rates, interval to estrus and conception rates of cows at different postpartum intervals were similar. A high proportion of cows (>70%) exhibited estrus with an overall conception rate of > 64%. Norgestomet treatments have been reported to result in a high percentage (77 to 100%) of cattle showing estrus with first service conception rates ranging from 33 to 60% (Odde, 1990). The results of the present study suggest that the reproductive parameters were not affected by postpartum interval and it would be interesting to treat anestrus cows with still lower postpartum intervals to study efficacy of norgestomet to induce estrus during earlier periods post-calving.

Norgestomet treatment effectively induced fertile estrus in anestrus heifers and cows during hot (April to Sept.) and cold (Oct. to March) seasons. Between seasons, the estrus response was similar for heifers (88 vs. 100%) and cows (82.3 vs. 76.9%). First service conception and overall conception rates were not different between the two seasons for cows as well as for heifers (Table 2). Although, the effect of season was not significant, but in heifers, the effect was discernible in that the estrus response to treatment and first service conception rates were better in the cold than in the hot season. These findings are similar to those reported by Rao *et al.* (1986). However, in the present study, mean interval to estrus during the hot season was significantly longer ($P<0.05$) for heifers (73.0±7.35 h) compared with cold season (40.86±2.66 h). However, the mean interval to estrus for cows between seasons was similar. The longer interval to estrus in heifers during hot season may be the effect of temperature. Jochle (1972) and Randel (1984) indicated that *Bos indicus*

Table 2. Reproductive parameters in Norgestomet treated and control Zebu cows and heifers in relation to season

Group/Parameters	n	Induction of estrus (%)	Interval of onset of estrus (h) (Mean±SE)	First service conception rate (%)	Overall conception rate (%)
Hot Season					
Heifers Treated	25	22 (88.0)	73.0±7.35[a]	59.1	72.7
Heifers Control	6	0	-	-	-
Cows Treated	17	14 (82.3)	48.86±5.55	50	71.4
Cows Control	6	0	-	-	-
Cold Season					
Heifers Treated	14	14 (100)	48.86±2.66[b]	71.4	71.4
Heifers Control	6	0	-	-	-
Cows Treated	26	20 (76.9)	46.80±3.68	45.0	55.0
Cows Control	6	0	-	-	-

Means with different superscripts differ significantly ($P<0.05$)
* 3 heifers exhibited estrus after 5 days of implant removal, thus not included
** Including those conceived at 2nd and 3rd inseminations

cattle may be affected by photo-period and / or temperature changes and the heat stress affects behavioural estrus, ovulation and the estrous cycle (Gangwar *et al.*, 1965). The pre-implant plasma progesterone of all animals (treated and control) were below 0.5ng / ml and the levels were maintained during the period of implant. Post-implant withdrawal, the progesterone values in all treated animals started increasing and highest values were observed from Day 7 to 21 (7.20+0.93 ng/ml). Day 31 value varied according to pregnancy status of animal. Similar progesterone profiles were reported in beef heifers treated with norgestomet ear implants (Tanaka *et al.*, 1995).

It was concluded, norgestomet treatment, with eCG supplementation, could effectively induce fertile estrus in Zebu anestrus heifers and postpartum cattle during different seasons and irrespective of the age or the postpartum interval. Breeding of females according to onset of estrus is advocated for achieving higher fertility in norgestomet treated cattle.

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