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Full Length Research Paper

Postpartum interval of Darfurian cows: Influences of breed, BCS, parity and season

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The present study was designed to determine the length of postpartum interval (PPI) of some local Sudanese cows in South Darfur State namely Fellata, Kenana and cross bred cows (Kenana × Friesian). Furthermore the influence of body condition score (BCS) and parity on PPI was also investigated. In experiment 1 a total of 59 dairy cows that gave birth were employed to determine the length of PPI. The parity range of these cows was 1 to 5. Their BCS range was 2.5 to 4.The cows were grouped according to their breed into three groups. Group I was Kenana (n = 21), group II was Fellata (n = 17) and group III was cross-bred (n = 21).The PPI was recorded as the time elapse from parturition to the appearance of the first oestrous postpartum. The pure local cows of Fellata and Kenana had a significantly (p<0.001) longer PPI compared to cross- bred cows. The mean length of PPI of Kenana, Fellata and cross-bred cows were 286.9 ± 35.3, 246.3 ± 26.6 and 122.0 ±14.9 days respectively. No difference (p>0.05) in the PPI were found between Kenana and Fellata cows. Slight negative relation (R = 0.2) between BCS and the PPI was observed and parity did not influence PPI (R = 0.005), Experiment II was designed to study the influences of season on the PPI of the above mentioned cows. The PPI was compared among three groups of cows that gave birth in three different seasons. Group I was 18 cows that gave birth in summer (Kenana = 7, Fellata = 4 and cross-bred =7). Group II was 19 cows that gave birth in autumn (Kenana = 9, Fellata = 6 and cross-bred = 4) and group III was 31 cows gave birth in winter (Kenana = 13, Fellata = 11 and cross-bred = 7). The BCS and parity of these cows were similar to those of the above experiments. The results of this experiment showed that PPI of cross-bred cows was significantly ((p<0.001) shorter in summer. No difference (p>0.05) in the PPI of cross-bred cows that gave birth in autumn and winter was found. Neither the PPI of Kenana nor that of Fellata cows were influenced by the season (P>0.05). It is concluded that the Kenana and Fellata cows have a similarly long PPI that would not be influenced by season whereas the cross-bred cows have a short PPI which is influenced by summer only. Additionally BCS has slight influence on the PPI while parity has no effect on it.

Keywords: Cow, postpartum, breed, BCS, parity, season.

INTRODUCTION

In South Darfur State of the Sudan there are different breeds of cattle that belong to the zebu cattle (*Bous indicus*). The famous breeds are Fellata cattle breed, Kenana cattle breed and cross-bred cattle (Kenana Friesian). The Fellata cattle breed is owned by the following tribes: Fellata, Banihalpa, Targam, Brigid and Dago. This breed is white in color which is different from the color of the Fellata cows in other parts of Africa. This breed is large in size and produces more milk compared to other Darfurian cattle. The Kenana breed is originally reared in the Central Sudan and it is known as a dairy breed because it produces good amount of milk. This breed is introduced to South Darfur State in 1964 by Elgazala Gawazat Research Center to improve the local Darfurian cattle. The cross-bred dairy cows were produced by crossing of Kenana cows bred in Darfur State with imported Friesian bulls. This crossing is done to increase the milk production. The population of the three breeds is very small and their milk production does not meet the demand for milk and milk by products.

There are many constrains that limit the increment of the dairy breeds population. Among these constrains the

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lack of information concerning their reproduction performance, particularly the postpartum interval to first oestrsus (PPI). The PPI is known to influence the calving interval (CI) an consequently it influences the reproduction of the cow (Short et al., 1990; Williams, 1990), The cow must have an optimal calving interval (CI) of about 365 days to increase its life, produce more calves, and produce more milk (Galina and Arthur 1989). The ideal CI for dairy cattle production is 365 days. This ideal CI can not be achieved unless the PPI to first oestrus is reduced.

The zebu cattle have a long PPI (Osman and Eladin, 1971). The Fellata and Kenana breed belong to this group and the cross-bred cows have a blood from the Kenana. Sparse information about the PPI to first oestrus in dairy cows in the Sudan is available (El Zubeir, 2003; Elhag, 2003; El Zubeir and Elsheikh, 2004; Esheikh and Ahmed, 2005). The information available is only for cross-bred dairy cows and unfortunately the PPI of the pure local dairy cows is not authenticated in the Sudan. Therefore the objective of the current study were to record and compare the length of the PPI of the Fellata, Kenana and cross-bred dairy cows in South Darfur state. Furthermore, the influence of BCS, parity and season on the PPI were also investigated.

MATERIALS AND METHODS

Study area

This study was done in Nyala City which is the capital of South Darfur State of Western Sudan, it lies within the area between latitude 12º: 03º 25¯ N and longitute 24º: 53º 091¯ E, with 671 m above the sea.

Climate

South Darfur State has three different climates. Semi desert climate with average rain fall of about 100 - 300mm/year. Poor Savanna climate with average rain fall of about 300-600mm/year. Rich Savanna climate with average rain fall of about 600 - 900mm/ year.

There are three distinct seasons through out the year. The hot dry summer season from March to June, rainy season from July to October, and winter season from November to February.

Temperature measurement

The mean temperature during winter is (32.3ºC maximum, 13ºC minimum), during summer is (38ºC maximum, 21.4ºC minimum) and during autumn is (34.3ºC maximum, 17.9ºC minimum).

Animals

In this study three local dairy breeds of cows native to South Darfur State were employed (n = 137 cows). These breeds were, Kenana breed, (n = 50), Fellata breed (n = 36) and cross- bred, Kenana × Friesian (n = 49). The BCS of these cows ranged between 2.5 to 4, according to the scale described by Wildman et al (1982). Their parity range was 1 to 5.

Management and feeding

The Kenana and Fellata cows were kept under semi closed system of management. During the day the cows were allowed to graze on the surroundings from 10:00 am and flocked back at 4: 00 pm. They were fed rouphages and concentrate mixture which is composed of Sorghum (Sorghum Vulgare vr Fetarita) 38%, ground nut cake 30% wheat bran 33% and Sodium chloride 2%. The cow was fed 3 to 4 kg concentrate once a day in the afternoon during the milking period.

The cross-bred cows were kept in farm and were offered roughages in the farm. They were fed from the same concentrate mixture at a rate of 5kg / cow in the morning and 5 kg/cow in the afternoon.

After parturition, the new-born calves were left with their dams for 7 days and thereafter they were left to suckle their mothers twice a day in the morning and in the afternoon.

Housing

The animals were kept in an open shaded yards. The open shaded yards were constructed mainly from local materials. The pens were made from wooden bars and the roof was from locally made wooden sheets. The floor was covered with sand. The pregnant animals were kept in separate yards.

Milking

The cows were milked manually twice daily. The average daily milk production during the first 90 days postpartum was 3 - 5 lb/day for Fellata breed, 10 - 12 lb/day for Kenana breed and 20 - 30 lb for cross- bred cows. The length of the lactation period ranged between 6 to 7 months.

Heat detection

All the cows in the herds were checked for oestrus signs by visual observations by well trained herdsmen three times a day postpartum, early in the morning at 7:00 am, in the mid day at 12:00 and at 6:00pm for at least 30 min. The cow is recorded in heat when it becomes restless, licks the perineum of other cows, jumps on other cows, allow other cows or bull to mount her, it bellows and there is a transparent clear mucous drops from her vulvae. The cow is considered, in a full response when it stands to be mounted by the bull and mating was completed (Arthur et al., 1998).

Health control

Routine vaccination against the common major diseases hemorrhagic septicemia (HS), black quarter (BQ), anthrax and contagious bovine pleuropneumonia (CBPP), was done once yearly. Routine testing for brucellosis was done yearly under the control of the Regional Veterinary Research Lab. Routine mastitis testing was done for the suspected cows. The udder was washed with water and after milking the teats of the udder were immersed in a suitable antiseptic solution. During the last week prepartum the pregnant cows were treated with local intramamary antibiotic to reduce the incidence of mastitis during the dry period. The cows were drenched Anizole-100 suspension 10 mg/ kg b.w. (Anglian Nutrition Products Company United Kingdom) to control internal parasites. The shades were routinely sprayed with acaricidal drugs.

Experimental design

Experiment –I

This experiment was a simple factorial design to compare the PPI

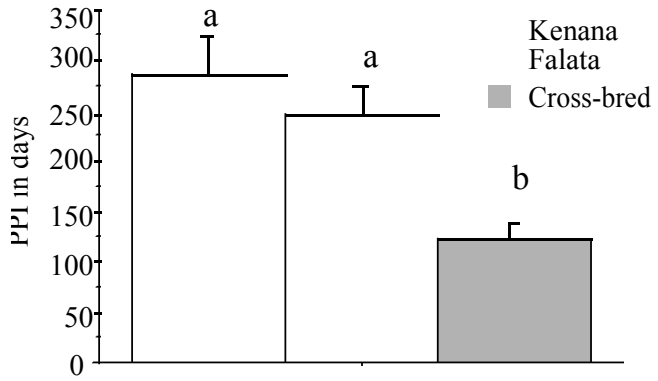

Figure1. Postpartum interval in three different dairy breeds bred in South Darfur state. [a, b] Values differed at p<0.001.

of three Sudanese breeds of cattle native to South Darfur State. The length of the PPI was studied by visual observations. A total of 59 cows that calved during January 2003 to April 2004 were selected according to the scale of the BCS after calving. The cows with BCS below 2.5 were excluded. The general range of the BCS for the cows used in this experiment was 2.5 to 4 with parity range 1 to 5. The cows were grouped into three groups according to their breed, Kenana (n = 21), Fellata (n = 17) and cross-bred cows (n = 21). The length of the PPI was calculated from the day of parturition until the appearance of the signs of the first oestrus postpartum. Furthermore, the influences of BCS and parity on the PPI were investigated.

Experiment –II

This experiment was a 3×3 factorial design to study the effect of season of calving on the length of the PPI of some local cows native to South Darfur State (same breeds as in experiment I). The total number of cows used in this experiment was 78 cows, they were grouped into three groups according to the breed, Kenana (n = 29) cow, Fellata (n = 21) cow and cross - bred cow (n = 28). Each group was further sub grouped according to the season of parturition. The cows that calved in summer season were 25 (Kenana cows = 7, Fellata cows = 4 and cross bred cows = 14). The cows that calved in winter season were 31 (Kenana = 13, Fellata = 11 and cross-bred = 7). The cows that calved in autumn season were 22 (Kenana =9, Fellata = 6 and cross-bred = 7). The used cows in this experiment have BCS that ranged between 2.5 to 4 after parturition. The length of the PPI was calculated from the day of parturition until the appearance of the signs of the first oestrus postpartum.

Statistical analysis

Data are means ± SE. The data were subjected to ANOVA followed by Fisher's protected least significant difference. Differences at probability of P<0.05 were considered statistically significant. The relation between the BCS and the PPI, and parity and PPI were blotted using the regression blot.

RESULTS

Experiment 1

As shown in Figure 1 breed significantly (P <0.001) affect the length of the PPI. The cross-bred cows had a shorter PPI (122.00 ± 14.9 days) compared to the Kenana cows (286.9 ± 35.3 days) and the Fellata cows (246.26 ± 26.6 days). No significant difference (p>0.05) was observed between the Kenana and the Fellata cows. The results also showed a slight negative relation bet-ween the BCS and the length of the PPI (R = 0.2). When the BCS increases, the length of the PPI decreases (Figure 2). Additionally the results showed that parity has no influence (R = 0.005) on the PPI, however when the number of parities increases the PPI decreases (Figure 3).

Experiment -II

As shown in Figure 4 the season significantly influences the PPI of cross-bred cows (P<0.00I) and it has slight effect on the PPI of Kenana, and Fellata cows. The cross-bred cows in summer expressed a significantly (P<0.0 I) short PPI compared to winter and autumn. The length of the PPI of cross-bred cows during winter, sum-mer and autumn were 153.1 ± 17.5 days; 46.14 ± 5.1 days and 160.5 ± 29 days respectively. The length of the PPI of Kenana cows during winter, summer and autumn were 276.4 ± 46.9 days, 214.60.0 days, 223.5 ± 31.6 days, respectively. The length of the PPI of Fellata cows during winter, summer and autumn were 286.5 ± 38.7 days, 200.8 ± 30.4 days and 223.2 ± 22.9 days res-pectively.

DISCUSSION

It has now become evident that the reproductive performance has been decreasing in the high yielding cows. A large number of studies have indicated that milk yield and genetic merits for milk production are negatively associated with fertility traits (Campos et al., 1997; Hoekstra et al., 1984; Pryce et al., 1997) . Moreover, the reproductive function during the early postpartum period is reduced in animals with high genetic merit or high milk yield (Beam and Butler, 1997; Snijers et al., 2001). Although it is well known that the temperate dairy cows produce large amount of milk compared to the zebu cows, the length of their PPI is shorter than that of zebu cows. In the current study the cross-bred dairy cows used were produced by crossing of Friesian with Kenana to increase the genetic merits for milk production. Results from the present study has provided an evidence that the cross-bred dairy cows having Friesian blood have a shorter PPI compared to the *B. indicus* cows namely Kenana and Fellata cows native to Sudan. Although the two pure native breeds of cows used in the current study produce less milk than the cross-bred cows used, their reproductive function during early postpartum is slow than that of the cross-bred cows. It seems that the negative relation between increasing genetic merit and the reproductive function during early postpartum in the previous studies takes place only when selection for improvement

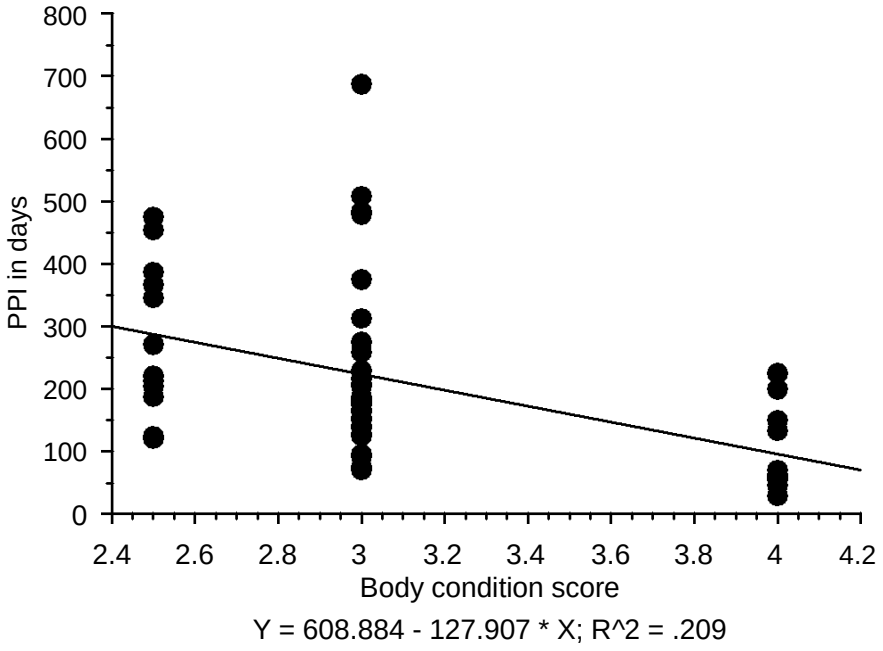

Figure 2. The relation between the BCS and the length of the PPI.

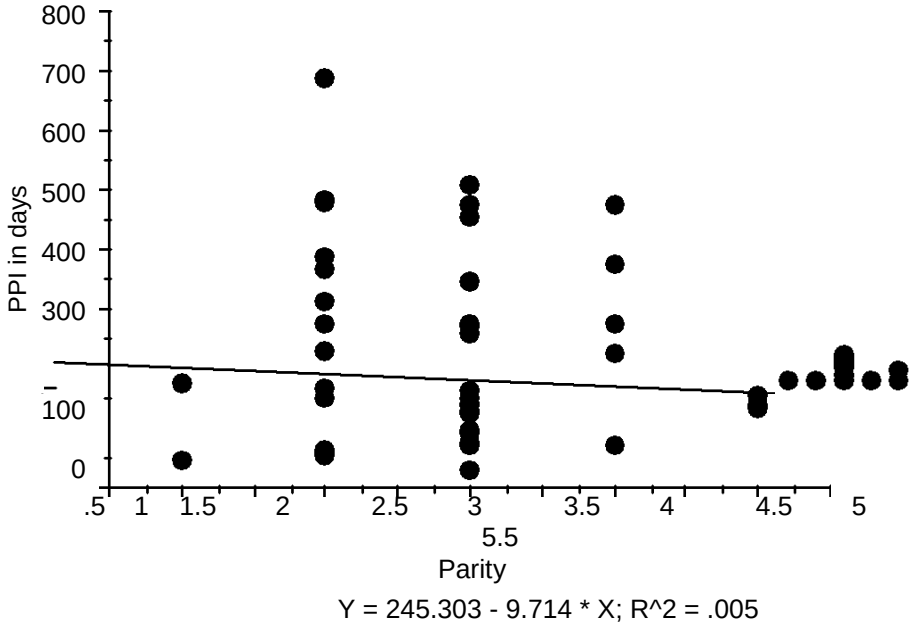

Figure 3. The relation between parity and the length of the PPI.

is carried out within the same breed. The results of the present study has shown that upgrading of zebu cows with Friesian, to increase their genetic merit for milk yield, reduced the PPI and did not increase it. Accordingly we interpreted the existence of a genetic factor, in temperate cows not related to milk yield, which reduces PPI.

It has been proposed that the reproductive performance is influenced by the negative energy balance during early lactation (Staple et al., 1990; Beam and Butlers, 1997). Owing to the difference between dietary energy intake and requirement for milk production, dairy cows experience a period of negative energy balance during early lactation (Peters and Riley, 1982). This results in mobilization of body fat reserve. The negative energy ba-

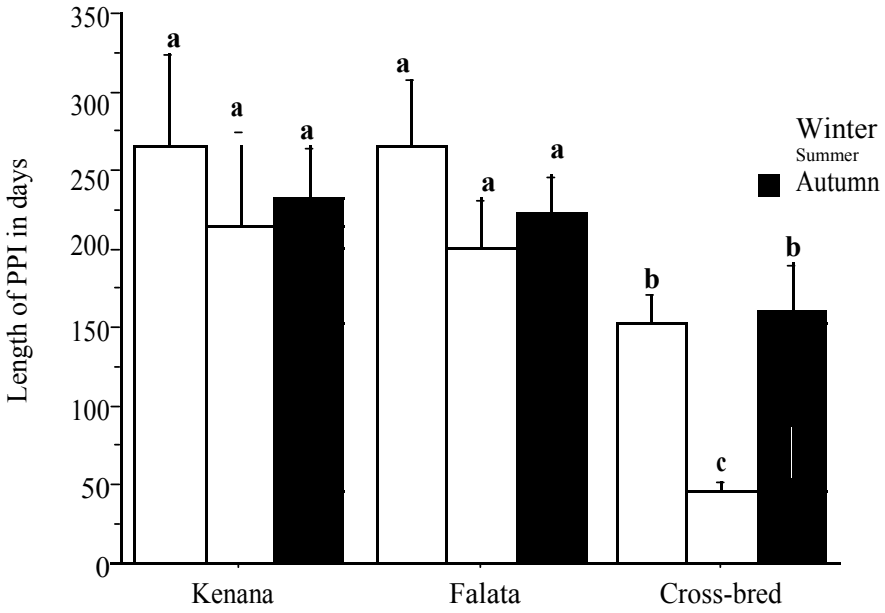

Figure 4. The effect of season on the length of PPI of the Kenana, Fellata and Cross-bred dairy cows native to South Darfur state. [a,b,c] Values differed at p<0.001.

lance is normally related to the milk yield (Butler and Smith, 1989; Beam and Butler, 1997).

Several studies have shown that the negative energy balance status influences functional characteristic of ovarian follicular development during early postpartum period and therefore affects the resumption of oestrous cycles, interval from calving to the first ovulation and subsequent fertility (Staples et al., 1990; Lucy et al., 1992; Beam and Butlers, 1997; Kruip et al., 1998). The negative energy balance that leads to mobilization of body fat reserve is associated with changes in BCS score. The cows that loose more fat will have a less BCS. The results of the current study showed that there is a slight negative relation between the length of the PPI and the BCS. That is to say the cows that their BCS decreases during early postpartum will express a longer PPI compared to the cows that their BCS remains stable. However, other studies have reported that the PPI to first estrus in not related to energy balance of the cow (Villa-Godoy et al., 1988; Snijders et al., 2001) . The difference between these studies and the present study was probably due to differences in metabolic hormone profile which is known to influence the resumption of oestrous cycle during early postpartum (Suleiman, 2005).

Postpartum ovulation occurred earlier in cows that had calved more than twice compared to cows that calved twice or less (Eduvie, 1985). The primparous cows took longer time to return to first oestrus postpartum than did pluriparous cows (Mukasa et al., 1991). The shortest time taken for occurrence of first oestrus was reported to be at the 3rd to the 4th calving, the moderate period was at the 5th to the 6th calving and the longest time taken was at 9th to the 10th calving (Elhag, 2003). The findings of the present study indicated that the parity has no effect on the length of the PPI of dairy cows native to South Darfur State. These findings disagree with the above mentioned studies. This difference may be due to the range of parity used in the present study which was between the 1st to the 5th calving, where that of the above studies extended to the l0th calving. Additionally, the cattle owners in South Darfur State used to breed their heifers at the age of 3 years or above, consequently the age at 1st calving will be different from that of cows used in the above studies. The age at 1st calving of the cows in the above mentioned studies was about 2.5 years.

Seasonal changes in temperature and photoperiod are known to influence the timing of recrudescence of the first oestrous postpartum (Hafez, 1993). Along postpartum period was reported in cows that delivered in winter and early spring than those delivered in autumn and summer (Peter and Riley, 1982). The same authors reported a long PPI in cows calved in spring compared to cows calved in autumn. Furthermore, Peter and Riley reported that expression of the first postpartum oestrus during winter is lower than it is expression in summer. In the current study the pure local cows namely Kenana and Fellata cows showed similar PPI among all seasons. However, the cross-bred dairy cows in the current study expressed a shorter PPI during summer compared to winter and autumn. The findings of the cross-bred cows agree with the above mentioned studies. Minor discrepancies may occur between the findings of this study and the above mentioned studies because in South Darfur State there are only three seasons during the year of which winter is very short and not well pronounced and there is no spring. These differences (namely breeds and

seasons differences) may also act individually or cooperatively to make the length of the PPI of the pure local cows looks similar in all seasons of the year.

Conclusions

- The Kenana and Fellata cows have a similarly long PPI whereas the cross-bred cows have a short PPI.
- The PPI of the pure local cows is not influenced by season and that of cross-bred cows is shorter during summer.
- BCS has slight influence on the PPI while parity has no effect on it.

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