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REPRODUCTIVE PERFORMANCE OF RED CHITTAGONG CATTLE IN A NUCLEUS HERD

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Abstract

The present study was undertaken to estimate the performance of some reproductive traits of Red Chittagong Cattle (RCC) is an important indigenous Farm Animal Genetic Resource of Bangladesh having some efficient reproductive capabilities. The effect of parity on these traits was also studied. The study was conducted in the nucleus herd of RCC Project at Bangladesh Agricultural University (BAU) dairy farm taking data from 2005 to 2008. The traits considered for this study were age at sexual maturity, age at first calving, number of service per conception, conception rate, calving interval, post partum heat period, gestation length and service period of RCC cows. The mean (±SE) values of the said traits are 28.75 ± 1.26 months, 40.93 ± 1.74 months, 1.55 ± 0.08, 78.91 ± 2.82 %, 14.42 ± 0.33 months, 127.71 ± 7.02 days, 282.11 ± 0.58 days and 151.72 ± 6.83 days, respectively. All the traits studied did not differ significantly (P>0.05) between different parities.

Key words: RCC, Nucleus herd, Reproductive traits

Introduction

In dairy industry, reproductive efficiency of cow is inseparably associated with the profitability. Although data on reproductive performances of exotic and crossbred cows are abundantly available but they are very limited in case of indigenous cattle, because indigenous cattle has not yet been reared under close monitoring system. Indigenous cattle are reared scatteredly in the rural farmers' house as because very difficult to get information due to poor awareness of the farmers. A comprehensive study on reproductive traits of indigenous cattle is essential for improving the breeding efficiency and to formulate selection and breeding strategy. It is also an important tool of a breeder to evaluate the factors affecting the reproductive traits of indigenous cattle of Bangladesh. Red Chittagong Cattle (RCC) is one of such promising variety of indigenous cattle of Bangladesh having some superb reproductive efficiency due to their regular breeding potentiality (Habib *et al.*, 2003). These cattle are only found in Chittagong and its peripheral regions and reported to have been declining their number due to indiscriminate breeding with poor indigenous, exotic and crossbred cattle since last three and a half decades (Hossain *et al.*, 2006). Now-a-days government and some non-government organizations are paying attention on this potential

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type of indigenous cattle. Considering the above facts and circumstances the present study was conducted with a view to know the reproductive potential of RCC maintained under farm condition of Bangladesh.

Materials and Methods

Source of data

The data used in this study were collected from the nucleus herd of the USDA funded RCC project at Bangladesh Agricultural University, Mymensingh during the period from 2005-2008.

Feeding and management

The animals of RCC nucleus herd were provided with three different kinds of feeds such as concentrate, green grass and straw where straw was the basal diet added with urea and molasses. Animals were stall fed throughout the year. They were grazed at seldom due to lack of facility. Urea-molasses-straw or some times only molasses-straw were provided *ad libitum* throughout the year. Green forages like german, sorghum, maize and roadside grasses were provided with limited amount due to scarcity. Concentrate mixture (wheat bran, rice polish, corn powder, oil cake, soybean meal, di-calcium phosphate, salt and vitamin-mineral premix) was supplied once a day in the morning at the rate of 600 g/lactating cow, 500 g/pregnant cow and 400 g/dry cow and heifers. Regular vaccination (against FMD and Anthrax disease), deworming (according to incidence on faecal sample examination) and medicare were also performed whenever needed.

Traits considered for the study

Traits included for this study were age at sexual maturity, age at first calving, number of services per conception, conception rate, calving interval, post partum heat period, gestation length and service period.

Age at puberty (AP): The length of time between the date of birth and the date of showing first heat in life of an individual is termed as AP. This trait is positively correlated with the generation interval and has an economic value to the breeders because farmers always expect calf earlier from a heifer that is related to the age at sexual maturity of an individual.

Age at first calving (AFC): The AFC is the age of an individual when first give birth newborn in life.

Number of services per conception (NSPC): It refers to how many services are required for a successful conception of an individual and is calculated by dividing the number of conceptions with the number of inseminations. The lower the number of services for each conception, the higher the reproductive efficiency of the cow or breeding programme.

Conception rate (CR): It represents the ratio of number of conceptions to number of services and is expressed as percentage.

Calving interval (CI): The CI refers to the time elapses between two successive calving. This trait is very much important to the breeders because the lowest the calving interval the highest the lifetime calf production.

Post partum heat period (PPHP): It is the time between the date of calving to the date of first subsequent estrous. This period is required for resumption of ovarian activity and uterine involution. This trait to refers the reproductive efficiency of an individual because the shortest the post-partum heat period the highest the calf production in their lifespan.

Gestation length (GL): The GL is the period between the date of fertile service and the date of calving. This period is almost invariable within individual in a breed or type.

Service period (SP): The SP is the interval from calving to the subsequent conception. It has obvious economic importance to a dairyman because a longer service period increases the calving interval, hence positively correlated resulting in a reduced life time production. Therefore, service period = calving interval – gestation length, however service period ≥ post partum heat period.

Data analysis and statistical model

Simple means and standard errors for the traits studied were estimated using SPSS-11.5 (statistical packages for social science) computer package program. To find out the level of significance for the effect of calving parity, least significant difference (LSD) procedure using SPSS was performed.

The mathematical model used was as follows:

$$Y_{ij} = \mu + P_i + e_{ij}$$

Where, Y_{ij} = Dependent variables (AP, AFC, NSPC, CR, CI, PPHP, GL and SP);

μ = Population mean;

P_i = Effect of i^{th} lactation number (where i = 1, 2, 3………); and

e_{ij} = Random error associated with Y_{ij} observation.

Results and Discussion

Age at puberty (AP)

The AP of RCC heifers in the nucleus herd is presented in Table 1. In the present study the AP was much lesser than the published findings by Hasnath (1974) who reported AP to be 39.5 months for RCC. Other authors also reported higher values ranging from 32.5 to 42.45 months for non-descript Deshi/Indigenous cows (Majid *et al.*, 1995 and Ali *et al.*, 2006), 39.23 ± 4.31 and 35.1 ± 9.24 months for Pabna and Sahiwal × Pabna crosses cows (Hoque *et al.*, 1999). But in case of Friesian × Pabna crosses the value was 25.53 ± 5.59 months reported by Hoque *et al.* (1999) which is shorter than the present study. Singh *et al.* (2002) reported 35.6 ± 0.53 months for Deoni cattle in India which is also higher than RCC. The variation between RCC and other breeds might obviously be due to differences nutrition, body condition score (BSC), management, environment and different genotypes. It was also evident that temperate breeds come into maturity at an earlier age than the breeds of tropical environment.

Age at first calving (AFC)

Table 1 also shows that the AFC of RCC in the nucleus herd was found to be 40.93 ± 1.74 months. Relatively longer AFC (45.7 ± 0.52 to 54.0 months) was found by the studies of Singh *et al.* (2002) for Deoni cattle by Gaur *et al.* (2002) for Ongole also known as "*Nellore*" and by Mwacharo *et al.* (2002) for Kenyan small native indigenous cattle named East African Shorthorn Zebu cattle. A number of previous works indicated that management factors especially nutrition determines pre-pubertal growth rates and reproductive development (Negussie *et al.*, 1998; Masama *et al.*, 2003). The better-managed and well-fed heifers grew faster, received service earlier and resulted in more economic benefit in terms of more milk and calves produced during the lifetime of the animal.

Table 1. Reproductive traits of RCC in the nucleus herd at BAU

Trait	Number of observations	Mean ± SE
Age at puberty (month)	32	28.75 ± 1.261
Age at first calving (month)	26	40.93 ± 1.735
Number of service per conception	100	1.54 ± 0.090
Conception rate (%)	100	79.12 ± 2.822
Calving interval (month)	62	14.36 ± 0.290
Post partum heat period (day)	70	126.23 ± 6.610
Gestation length (day)	88	282.14 ± 0.560
Service period (day)	64	151.72 ± 6.826

Number of services per conception (NSPC)

The mean NSPC observed in this study (Table 1) is closely in agreement with the findings of Ahmed and Islam (1987) for RCC (1.57 ± 0.53) and Khan *et al.* (1999) for Pabna deshi cows (1.57 ± 0.07). Comparatively lower NSPC (1.2 to 1.36 ± 0.067) was found by Habib *et al.* (2003), Alam *et al.* (1994) and Das (2008) for RCC and 1.16± 0.37 for indigenous cow (Ali *et al.*, 2006). Jabber and Ali (1988); Majid *et al.* (1995); Sultana and Bhuiyan (1997); Ahmed and Islam (1987) and Alam *et al.* (1994) reported higher values of NSPC ranged between 1.6±0.86 to 1.78 ± 0.22 for non descript indigenous cows in their studies. Gaur *et al.* (2002) found 1.9 inseminations per conception for Ongole cattle which is also higher than that in RCC. Table 2 shows that NSPC was not significantly (P>0.05) affected by different parities. Non-significant effect of parity on NSPC was reported by Mekonnen and Goshu (1987), Asseged and Birhanu (2004) and Habib *et al*. (2003) which agreed well with this study. But the result is in contrast with the result of Yifat *et al.* (2009) and Goshu *et al.* (2007) who found significant effect (P<0.05) of parity on NSPC for Friesian cows in Ethiopia. NSPC depends on cow itself and other factors related to management and nutrition of cow. Likewise, Shiferaw *et al.* (2003) found that cows with reproductive disorders required more services per conception and had longer intervals from calving to first service and also to conception. Proper and accurate heat detection is a key to efficient reproduction and four to five checks each day to determine the onset of true standing heat gives a better idea on when to inseminate. Although not significant, Tadesse and Zelalem (2003) also noted a decrease in the NSPC required for cows supplemented high level of protein.

Table 2. Reproductive traits of RCC affected by different parities

Trait	Parity / Lactation order							Sig.
	0	1st	2nd	3rd	4th	5th	6th	
NSPC	1.71±0.23 (21)	1.28±0.14 (18)	1.58±0.19 (19)	1.59±0.21 (17)	1.59±0.21 (17)	1.38±0.26 (8)	-	NS
CR (%)	74.76±6.7 (21)	87.96±5.52 (18)	76.75±6.58 (19)	76.96±7.06 (17)	76.96±7.06 (17)	85.42±9.68 (8)	-	NS
CI (m)	-	14.62±0.34 (16)	13.62±0.57 (13)	13.9±0.59 (13)	15.05±0.71 (15)	14.57±1.98 (5)	-	NS
PPHP (d)	-	145.18±11.79 (17)	127.83±18.68 (12)	105.36±14.27 (14)	133.75±13.88 (16)	118.89±18.63 (9)	74.5±2.5 (2)	NS
GL (d)	-	283.35± 1.41 (20)	283.0±1.17 (17)	279.63±1.1 (16)	281.79±1.14 (14)	283.33±1.47 (15)	280.17±1.74 (6)	NS
SP (d)	-	155.56±10.506 (16)	160.09±21.314 (11)	148.58±16.11 (12)	156.93±14.63 (15)	132.30±17.28 (10)	-	NS

NS = Non significant (P>0.05); Figures in the parenthesis indicate the number of observations

Conception rate (CR)

The CR (%) of RCC found from the nucleus herd of RCC was 79.12 ± 2.822. Das (2008) in her study found 65.78 ± 4.47 % CR for in the same herd of RCC which is much lower than the present study. Gaur *et al*. (2002) in their study found CR as 54% for cows and 46% for heifers for Ongole cattle which is also much inferior to RCC. The CR depends on different genetic and non-genetic factors as reproductive health of the cow, semen quality, time of insemination, efficiency of inseminator etc. Rodriguez and Hernandez (1992); Das *et al.* (1990) found significant variations in CR on different time of insemination after the first sign of estrus. Alam and Ghosh (1988) reported that conception rate of the cows significantly differed in different seasons. The CR of cows markedly reduced when a higher temperature prevails for two days before insemination to 4-6 days after insemination (Gwazdauskas *et al.*, 1975). Higher temperature and relative humidity (Zakari *et al.*, 1981) and poor management affect on fertility of cattle. Table 2 shows that CR has no significant effect (P>0.05) on different parities. The result is consistent with others (Miah *et al*., 2004; Bhagat and Gokhale, 1999 and Xu Fengxum, 1997). However, Hoque *et al.* (2002) reported significant effect

(P<0.05) of parity on CR. They obtained highest CR for cows in zero parity (heifer) which is not supported by the present study.

Calving interval (CI)

The CI of this study (Table 1) closely agrees with the findings of Ghose *et al*. (1977) for RCC, Alam *et al.* (1994) and Sultana and Bhuiyan (1997) for non descript deshi, Munim *et al*. (2006) for Friesian × Local crosses and Singh *et al*. (2002) for Indian Deoni cows (ranged between 14.33 to 14.97 months). Comparatively shorter CI ranged between 11.56 to 13.71 months were found by Hoque *et al*. (1999) for Friesian × Pabna crosses, Habib *et al.* (2003) for RCC, Munim *et al*. (2006) for Local, RCC and Jersey × Local crosses and Ali *et al.* (2006) for indigenous cow. But comparatively longer CI (from 15.27 to 17.87 months) were found in the studies by Hasnath (1974) for RCC, Majid *et al*. (1995), Hossain and Routledge (1982) and Ghose *et al*. (1977) for non descript deshi, Hossain and Routledge (1982), Ghose *et al*. (1977) and Hoque *et al.* (1999) for Pabna cows, Hoque *et al.* (1999) for Sahiwal × Pabna crosses, Gaur *et al*. (2002) for Ongole, and Munim *et al*. (2006) for Sahiwal × Local, Friesian × Local and Sahiwal × Friesian crosses. The variations of CI among the observation of different researchers might have resulted due to different genotype, herd, sample size, feeding regime, general and reproductive management, disease condition, postpartum estrous period, days open etc. The length of gestation and service period are the two main components of calving interval. Since gestation period in cow is more or less consistent, service period constitutes nearly all of the variation in calving interval; the only way to reduce the calving interval in cattle would be through an early conception within biological limits. Selection for calving interval is practically equivalent to selecting for service period (Zafar *et al*., 2008). Table 2 shows that CI did not differ significantly (P>0.05) according to calving parity which is coincided by the study of Yohannes *et al.* (2001) and Habib *et al*. (2003) who also found non-significant effect of parity on CI but is contradicted by the results of Wilson *et al.* (1987); Munim *et al*. (2006) and Goshu *et al.* (2007) who found highly significant effect (P<0.001) of parity on CI in cows of different genetic groups.

Post partum heat period (PPHP)

Table 1 shows the mean PPHP of RCC in the nucleus herd which is nearly consistent with the study of Majid *et al*. (1995) who found PPHP of 120.04 ± 7.84 days for non-descript deshi cows. Alam *et al*. (1994) and Ali *et al*. (2006) found relatively shorter PPHP (57 days for RCC, 103.64 ± 6.61 days for Pabna cows and 112.76 ± 34.58 days for indigenous cow) in their studies. On the contrary, Rahman *et al*. (2001) and Roy (1999) found relatively longer PPHP (141.3 ± 88.36 days for non descript deshi and 160.72 ± 80.26 days for Pabna cows, respectively) than in RCC. The effect of low level of nutrition on extended postpartum period due to weight loss was noted by Gebreegziabher *et al.* (2005). They also added that heavier cows at calving and cows that gained weight during the first three months of postpartum were in a positive energy balance, which enabled them to return to normal estrous cycles. Moreover, Tadesse and Zelalem (2003) reported that increasing the level of protein supplementation from low (2 kg/day) to high (4 kg/day) reduced the post partum interval from 159 to 100 days. Table 2 shows that PPHP did not affect significantly (P>0.05) on different calving parity. The result is consonance with the results of El-Keraby and Aboul-Ela (1982) and Morrow *et al.* (1966) who stated that parity did not affect any of the other postpartum intervals. However, others have reported differences due to parity in the interval to first postpartum estrous (Buch *et al*., 1955 and Badaway *et al*., 1973).

Gestation length (GL)

The average GL of RCC in the nucleus herd was found to be 282.11 ± 0.579 days. The result is in consistent with the results of Hossain and Routledge (1982) for Pabna and non-descript deshi cows and Khan *et al.* (1999) for RCC who found GL ranged between 281 ± 10 to 283.69 ± 11.2 days. Although GL is more or less a constant feature within a given species (Agyemang and Nkhonjera 1990) but relatively shorter GL was prevailed from the studies of Majid *et al*. (1995), Sultana and Bhuiyan (1997), Rahman *et al*. (2001) and Ali *et al*. (2006) for non descript deshi/indigenous cows and Singh *et al*. (2002) for Indian Deoni cows who reported GL between 273.48 ± 2.3 to 278.55 ± 2.63 days. Slightly longer gestation period (between 283.08 ± 0.49 to 287 ± 3.46 days) was found by the studies of Ghose *et al*. (1977) for Pabna cows, Habib *et al*. (2003) for RCC and Munim *et al*. (2006) for RCC, local indigenous and other different crossbreds. GL was not significantly (P>0.05) affected by different order of calvings (Table 2). The results are in accordance with the results of Negussie *et al*. (1998) and Yifat *et al*. (2009) who found absence of significant effect of parity on GL. In contrast, Munim *et al*. (2006), Kohli and Suri (1957) and Goswami and Bhattacharya (1963) reported significant effect (P<0.05) of parity on GL.

Service period (SP)

The mean SP of RCC found from this study is 151.72 ± 6.83 day which nearly coincided with the result of Zafar *et al*. (2008) who found a SP of 159 ± 1.56 days for Sahiwal cows. Comparatively shorter SP was reported (135 ± 0.86 days) by Yifat *et al.* (2009) for crossbred dairy cattle in Ethiopia. Higher values of SP (188.1 ± 106.678 to 309.0 ± 182.96 days) for Local, Friesian, Sahiwal and their crosses were reported by Rahman *et al.* (2001). Another group of authors who also found longer SP than the present study are Gaur *et al.* (2002) for Ongole cattle (203 ± 12.2 days), Sing *et al.* (2002) for Deoni cattle (170.0 ± 7.0 days), Goshu *et al.* (2007) for Friesian cattle (177 ± 5.4 days). The effect of calving parity on SP did not differ significantly (P>0.05) (Table 2). The result is in agreement with many other authors (Mekonnen and Goshu 1987; Yohannes *et al.*, 2001 and Gifawosen *et al.*, 2003) who reported a non significant effect of SP on parity. But the result is not in agreement with the results found by Yifat *et al.* (2009) (P<0.01); Zafar *et al.* (2008) (P<0.01); Goshu *et al.* (2007) (P<0.001) and Ahmad (1999) who found significant difference of SP among calving parities. The ideal service period for Zebu cattle is not apparent from the literatures. General guidelines are available such as delaying service period until mobilization of body reserves ceases (Bourchier, 1981). As a thumb rule, a cow is preferably bred during third estrous after calving in most dairy herds. With a lactation length of 300 days, this allows a rest of about 60-65 days prior to carry subsequent pregnancy. From a practical management point of view, a range of 60-90 days service period should be feasible. Brahmstaedt and Schonmuth (1983) suggested that service period in cattle should not be less than 40 days. The variations of SP among different researchers might be due to different breed, herd, sample size, efficiency of heat detection, management etc. Several scientists suggested that differences in management might have accounted for the observed differences on SP (Masama *et al.*, 2003; Shiferaw *et al*., 2003 and Lyimo *et al.*, 2004).

Conclusions

From the results of this study it may be concluded that proper feeding, management, heat detection and timely insemination is necessary for improvement of reproductive traits of RCC. Therefore, there is still need for more research for a genetic improvement program of RCC in farmers herd in order to make smallholder dairy farming more profitable at the subsistence farming conditions of Bangladesh.

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