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Studies on age at puberty, service period, gestation period and calving interval in Vrindavani, Tharparkar cattle and Murrah buffalo

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Abstract

The study was conducted to estimate the optimum age at puberty, service period, gestation period and calving interval in Vrindavani cattle, Tharparkar and Murrah buffaloes. The study was conducted at the cattle and buffalo farm, livestock production and management section, Indian Veterinary Research Institute from 2011 to 2015. Age at puberty of Vrindavani, Tharparkar and Murrah buffalo was 576.06, 616.56 and 722.33 days, respectively, mean service period was 121.26 days, 118.34 days and 131.12 days, gestation period were found to be 279.68 days, 286.8 days and 315.72 days and calving interval was found to be 398.14, 407.05 and 435.61 days respectively. All the observations were within the range.

Keywords: Puberty, service period, calving interval, vrindavani, tharparkar and murrah

1. Introduction

Reproduction is an important consideration in the economics of cattle production. In the absence of regular breeding and calving at the appropriate time, cattle rearing will not be profitable. A healthy calf each year is the usual goal. This is possible only by increasing the reproductive efficiency of the animals. Successful reproduction encompasses the ability to mate, the capacity to conceive and to nourish the embryo and deliver the viable young ones at the end of a normal gestation period. In fact, interruption in this chain of events leads to failure of the cow either to conceive or the embryo to die or to have a premature delivery of the fetus. The reproductive efficiency is a complex phenomenon controlled by genetic and non-genetic factors, the non-genetic factors being climate (Balamurugan *et al.*, 2017a), nutrition (Balamurugan *et al.*, 2017b), and level of management. The reproductive efficiency varies not only between species and breeds but also among the animals within the same breed. Even the best feeding and management cannot coax performance beyond the genetic limit of an inferior animal. Improving the genetic merits of livestock populations is important at all levels of management. A sound breeding programme is a necessary part of the total animal production system.

Age at puberty, Service period, gestation period and calving interval have significant role on life time performance of dairy animals. Optimum Service period reduces calving interval of a cow and there by helps in genetic gain per unit of time and increases the life time production of the cows. Gestation period is constant and species specific trait. Slight variation occurs between or within breeds due to fetal, maternal and environmental factors. A regular and shorter calving interval is a key future of a rapid multiplication of outstanding genetic material through proper breeding plans. Information regarding these traits of dairy cow under farm conditions is easily available. Age at puberty may define as the age or time at which the generative organs become functional and reproduction may occur. It is characterized by appearance of estrus and ovulation. Cattle attain puberty at 7 to 18 months. The average age of puberty for heifers on recommended levels of nutrition is 10 to 12 months for dairy breeds (Hafez, 2007). Under good feeding a heifer attains puberty approximately at 66 per cent of adult body size. Crossbred heifers attained puberty earlier than the native breed heifers. Buffalo usually attain puberty when they reach about 60% of their adult body weight (250 to 400) kg, but the age at which they attain puberty can be highly variable, ranging from 18 to 46 months (Jainudeen and Hafez, 1993). The factors that influence this are genotype, nutrition, management and climate (Balamurugan *et al.*, 2016). It could be attained under optimized conditions at 15 to 18 months in river buffalo and 21 to 24 months in swamp buffalo (Borghese, 2005). Calving to conception interval or service

Period, it is the period between date of calving to date of successful conception. The optimum service period helps the animal to recover from the stress of calving and also to get back the reproductive organs back to normal for cattle the optimum service period is 60-90 days (Balamurugan *et al.*, 2018a). If the service period is too prolonged the calving interval prolonged, less number of calving will be obtained in her life time and ultimately less life time production. If the service period is too short, the animal will become weak and persistency of milk production is poor due to immediate pregnancy. Calving to conception interval (CCI) also referred to as "Days Open" in some record keeping schemes is the period of time between parturition and conception and is nearly always inversely related to estrus detection. This reproductive parameter is influenced by the estrus detection rate, conception rate, VWP and culling. Calving to conception interval plus gestation length, in turn, results in the calving interval. Calving to conception interval can be adversely affected by lameness. Gestation period, it can be defined as the time from fertilization to parturition. The cow's age is the key environmental factor influencing gestation length. Gestation length (GL) is shorter in heifers than in older cows (Przysucha and Grodzki, 2009). High temperatures in the summer lead to shortening of gestation length (McClintock *et al.*, 2003). High milk yield prolongs gestation, as suggested by a positive genetic correlation between GL and milk production levels (Silva *et al.*, 1992). Both longer and shorter gestation periods contribute to a higher number of stillbirths (Norman *et al.*, 2009). GL varies among breeds with *Bos indicus* females tending to have longer gestation lengths (290-300 days) than *Bos Taurus* females (generally, 280- 285 days) (Velefilho *et al.*, 1986; Randel, 1990). This is influenced by species of the animal, breed of the animal, age of the animal and sex of the fetus. Calving interval is defined as the-period between two successive calving. It is more, profitable to have one calf yearly in cattle and at least one calf for every 18 months in buffaloes. If the calving interval is more, the total number of calvings in her life time and also total life time production of milk decrease. This is sometimes also called the "days open", period and is the part of the calving interval that can be shortened by improved herd management. The "days open" period should not exceed 80-85 days if a calving interval of 12 months is to be achieved (Peters, 1984). This requires re-establishment of ovarian activity soon after calving and high conception rates. The duration of this period is influenced by nutrition (Balamurugan *et al.*, 2018b) season, milk yield, parity (Buck *et al.*, 1975), suckling and uterine involution. When reporting "optimal" reproductive outcomes, measurements are based on a 12 to 13-month calving interval, which has been found to realistically be the most suitable for maximizing profit and milk production (Nebel *et al.*, 1998). As calving interval increases, days in milk increases and lifetime milk yield decreases (Nebel *et al.*, 1998). Some studies have shown that estrus synchronization offers one of the best alternatives for decreasing calving intervals (Balamurugan *et al.*, 2017c). So present investigation under reports was an attempt to estimate age at puberty, Service period, calving interval and gestation period of vrindavani cattle (Haryana× Holstein Friesian/ Brown swiss/ Jersey), tharparkar and murrah buffaloes from the year of 2011 to 2015 at ICAR- Indian Veterinary Research Institute, LPM dairy farm section.

2. Materials and Methods

2.1. Place of Study

The present study was conducted at the cattle and buffalo farm, LPM section, ICAR- Indian Veterinary Research Institute, Izatnagar, and Bareilly- 243122.

2.2. Experimental Design

Data of breeding records of 367 vrindavani, 132 tharparkar cattle and 135 murrah buffaloes were analyzed over 2011 to 2015 year.

2.3. Following parameter were studied

Age at puberty, service period, calving interval and gestation period

3. Results and discussion

The present study was conducted to calculate the mean value of age at puberty, service period, calving interval and gestation period of vrindavani, tharparkar and murrah and the results are depicted in graphs and table 1.

3.1. Age at puberty

The observation was made on 175 vrindavani, 55 tharparkar and 43 murrah animals. Age at puberty of vrindavani, tharparkar and murrah buffalo was 576.06 ± 6.26 , 616.56 ± 17.55 and 722.33 ± 19.95 days, respectively (Figure 1, Table 1). Hafez (2007) reported that age at puberty for dairy cattle varies from 300 days to 720 days. The mean values of age at puberty in present study were within the range reported by Hafez (2007). Hafez (2007) and noakes (2009) reported that age at puberty for buffaloes varied from 450 to 1080 days (15 to 36 months) and 630 to 720 days (21 to 24 months), respectively. Age at puberty is influenced by the factors like inherent potency of the breed, environment and nutrition.

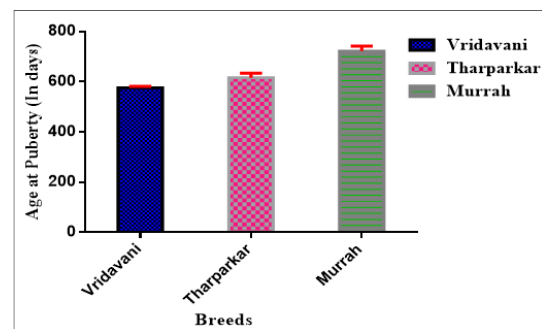


Fig 1: Age at puberty in vrindavani, tharparkar cattle and murrah buffalo

3.2. Service period

The observation was made on 280 vrindavani, 85 tharparkar and 92 murrah animals. The mean service period was 121.26 ± 3.10 days, 118.34 ± 5.04 days and 131.12 ± 6.24 days for vrindavani, tharparkar and murrah buffalo, respectively (Figure 2, Table 1). Earlier workers reported that the service period of crossbred cattle ranged from 122.00 ± 24.31 days (Hussain *et al.*, 2012) and 121.60 ± 16.74 days (Kumar *et al.*, 2015). The mean service period in present study was in accordance with the reported by above workers. The mean service period for tharparkar cattle was reported to be 136 days (Annual report, NDRI, 2013), 252 ± 13.5 days (Panneerselvam *et al.*, 1990) and 222 days Kumar (1982a). The variation in service period might be due to number of observation and parity of calving. The service period of murrah buffalo was reported to be 137.03 ± 6.50 (Banik *et al.*,

2003), 146.28 ± 5.58 (Jamuna *et al.*, 2015), 225.0 ± 5.5 (Thiruvankadan *et al.*, 2014) and 288.27 ± 7.38 days (Kohi *et al.*, 1960). The mean service period in the present study was in accordance with the values reported by (Banik *et al.*, 2003), but, lower than the reports of others (Jamuna *et al.*, 2015; Thiruvankadan *et al.*, 2014 and Kohi *et al.*, 1960). This might be due to variations in number of observations. Service period is influenced by parity of calving and periparturient complications such as dystocia, retained fetal membranes and uterine prolapse. This was also influenced by season of calving, size of the herd or number of observations.

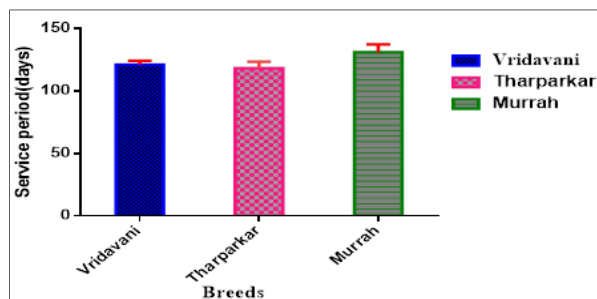


Fig 2: Service period in vridavani, tharparkar cattle and murrah buffalo

3.3. Gestation period

The observation was made on 177 vridavani, 42 tharparkar and 70 murrah animals. In the present study mean gestation period of vridavani, tharparkar and murrah buffalo were found to be 279.68 ± 0.39 days, 286.8 ± 1.92 days and 315.72 ± 2.02 days, respectively (Figure 3, Table 1). The mean value of gestation period of crossbred cows was reported to range from 269 to 295 days (Asaduzzaman and Miah 2004; Acharya, 1989 and Hussain *et al.*, 2012). The observation in the present study was in accordance with these reports. Present study showed that the gestation period of tharparkar was 286.8 days. Earlier workers reported that the mean gestation period of tharparkar cattle varied from 276 days to 274 days (Panneerselvam *et al.*, 1990 and Annual report, NDRI, 2013) which is lower than the observed value in our study. This variation in the gestation period might be due to the variation in number of observations. Present report showed the gestation period of murrah buffalo was 315.72 ± 2.02 days. The mean gestation period was reported to range from 307 days to 311 days (Basu *et al.*, 1982; Banik *et al.*, 2003; Singh *et al.*, 1983 and (annual reports NDRI, 2013) The observations on gestation period in the present study was also in accordance with the above reports. Gestation period is influenced by species of the animal, breed of the animal, age of the animal and sex of the fetus.

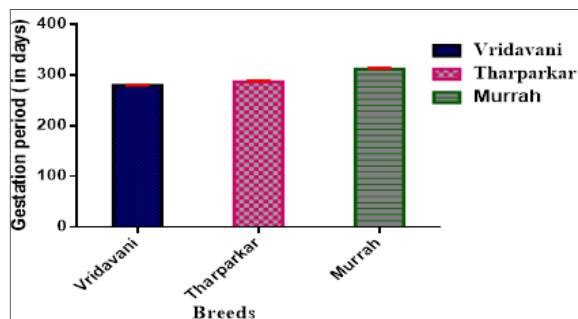


Fig 3: Gestation period in vridavani, tharparkar cattle and murrah buffalo

3.4. Calving interval

The observation was made on 177 vridavani, 42 tharparkar and 70 murrah animals. In the present study, the calving interval of vridavani, tharparkar and murrah buffalo was found to be 398.14 ± 3.78 , 407.05 ± 8.75 and 435.61 ± 6.87 days, respectively (Figure 4, Table 1). Earlier workers reported that the mean calving interval of crossbred cattle ranged from 393.68 ± 1.64 days (Hussain *et al.*, 2012), 396.37 ± 22.96 days (Kumar *et al.*, 2015), 421 ± 20 days (Bhatnagar *et al.*, 1981), 423.75 ± 8.24 days (Rafique *et al.*, 1999) and 424 ± 77 days (Rao & Taneja 1980). The mean calving interval in present study was in consonance with the values reported by (Hussain *et al.*, 2012) and (Kumar *et al.*, 2015). Furthermore, our study showed lower mean calving interval than reported by (Bhatnagar *et al.*, 1981), (Rafique *et al.*, 1999) and (Rao & Taneja 1980). The variation in calving interval might be due to variation in number of observations, genetic inheritance of the breeds and changing in the geoclimatic conditions. The mean calving interval for tharparkar cattle was reported to be 528 ± 13.7 days (Panneerselvam *et al.*, 1990), 440 ± 5.7 days (Yadv *et al.*, 1994), 431 ± 5.0 days (Yadv *et al.*, 1995), 414.9 ± 11.4 days (Basu *et al.*, 1982) and 410 days (Annual report, NDRI, 2013). The calving interval for tharparkar cattle recorded in the study was in accordance with the earlier Reportsbasu *et al* 1982) and NDRI, annual reports 2013). However, it is less than that the reported by Panneerselvam *et al.* (1990), Yadav *et al.* (1994) and Yadav *et al.* (1995). This might be due to the variation in number of observation, parity of calving and agroclimatic condition of the calving. The mean calving interval for Murrah buffalo was reported to be 432.93 ± 11.56 days (Banik *et al.*, 2003), 532.8 ± 5.5 days (Thiruvankadan *et al.*, 2014), 486.96 days (Jain *et al.*, 1982) and 419 days (Annual report, NDRI, 2013). Calving interval observed in the present study was in agreement with Banik *et al.* (2003); however, it was lower than the reports of Thiruvankadan *et al.* (2014) and Jain *et al.* (1982). Calving interval is influenced by season of the calving, parity of calving, genetic makeup of the animals, different agroclimatic condition and good hygienic managerial condition.

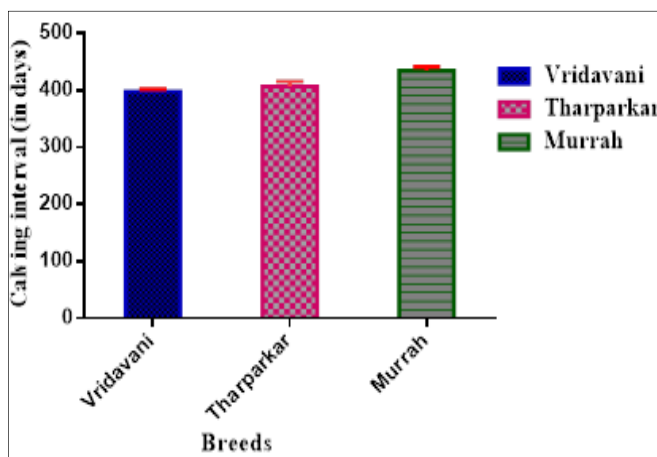


Fig 4: Calving interval in vridavani, tharparkar cattle and murrah buffalo

Table 1: Age at puberty, service period, calving interval and gestation period in Vrindavani, Tharparkar and Murrah buffalo

Reproductive traits	Vrindavani	Tharparkar	Murrah
Age at puberty(in days)	576.06 ± 6.26 (n= 175)	616.56 ± 17.55 (n= 55)	722.33 ± 19.95 (n= 43)
Service period (in days)	121.26 ± 3.10 (n= 503)	118.34 ± 5.04 (n= 132)	131.12 ± 6.24 (n= 189)
Calving interval (in days)	398.14 ± 3.78 (n= 305)	407.05 ± 8.75 (n=67)	435.61 ± 6.87 (n=142)
Gestation period (in days)	279.68 ± 0.39 (n= 305)	286.8 ± 1.92 (n=67)	315.72 ± 2.02 (n=142)

n= Number of observations

4. Conclusion

The mean age at puberty of vrindavani, tharparkar and murrah buffalo was 576.06±6.26 days, 616.56 ±17.55 days and 722.33±19.95 days, respectively The mean service period was 121.26±3.10 days, 118.34 ± 5.04 and 131.12±6.24 days for vrindavani, tharparkar and murrah buffalo respectively, In the present study, the calving interval of vrindavani, tharparkar and murrah buffalo was found to be 398.14 ± 3.78, 407.05± 8.75 and 435.61±6.87 days, respectively In the present study, mean gestation period of vrindavani, tharparkar and murrah buffalo were found to be 279.68 ± 0.39 days, 286.8 ± 1.92 days and 315.72 ± 2.02 days.

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