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Short Communications

Evaluation of production and reproduction traits in Vrindavani cattle

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Crossbreeding experiments at cattle and buffalo farm at Indian Veterinary Research Institute, Izatnagar (UP) are being carried out since 1970 by mating Hariana females with Holstein Friesian, Brown Swiss and Jersey males. Consequently number of half breds and three fourth breds from two exotic breeds were produced. The promising grades, FH (Holstein Friesian-Hariana), FBH (Holstein Friesian-Brown Swiss-Hariana) and FJH (Holstein Friesian- Jersey-Hariana) had been bred interse followed by rigorous selection, and their performances were tested. The performance of these three crossbred populations revealed that these crosses were having similar performance and hence recommended inter-breeding and intense selection among these crossbred irrespective of the grades. Finally, the synthetic crossbred population has been named 'Vrindavani' having exotic inheritance between 50 and 75% and Hariana inheritance between 50 and 25%. The present study was undertaken to evaluate the production and reproduction performance traits in Vrindavani cattle.

The lactation records of Vrindavani cattle maintained at Indian Veterinary Research Institute, Izatnagar over a period of 9 years (2000–2008) were analysed to evaluate the production and reproduction performance of Vrindavani cows. The production performance traits included in this study were lactation milk yield, 305 days or less milk yield, lactation length, dry period, peak yield, days to attain peak yield. The reproduction performance traits included in this study were: age at first calving, post partum interval to estrus, service period, gestation period, calving interval and number of inseminations per successful conception. The season of birth/ calving was classified in three seasons, rainy (July to September), winter (October to February) summer (March to June). The year of birth/calving was classified in 3 periods (3 year each). The records of the cows of up to ninth lactation were included in investigation and cows of sixth and above lactation were pooled in a single sub class of lactation order. The influence of non genetic factors on different traits was studied by least squares analysis of variance for unequal and non orthogonal data as prescribed by Harvey (1990). The paternal half-sib correlation method was used to estimate heritability of different traits using first lactation production and reproduction records of animals. The phenotypic, genetic and environmental trends were estimated for first lactation 305 days or less milk yield, first lactation milk yield, age at first calving and first calving interval. The genetic trends were estimated as described by Smith (1962).

The overall least squares means for production traits viz. 305 days or less milk yield, lactation milk yield, lactation length, average lactation yield, peak yield and days to attain peak for pooled data over the lactation were 3047.4±33.8 kg, 3219.7±41.0 kg, 337.7±2.2 days, 9.5±0.1 kg, 16.5±0.1 kg and 52.7±1.9 days, respectively (Table 1). Parmer *et al.* (2000) reported higher estimate of lactation milk yield (3411.0±225.8 kg), 305 days or less milk yield (3143.2±176.3 kg), peak yield (18.0±1.0 kg) and lactation length (341.3±17.6) in three breed cross-bred cows. Thakur and Singh (2001) reported lower estimate of 300 days milk yield (2110.5±32.7 kg), lactation milk yield (2202.7±35.2 kg), average daily milk yield (7.4±0.1 kg) and lactation length (302.1±3.8 days) in Jersey × Red Sindhi crossbred cows. Chacko (2005) reported lower lactation length (279.±1.0 days) and lactation milk yield (2435.0±24.2 kg) in Sunandani cows. Shubha Lakshmi *et al.* (2009) reported lower estimate of lactation milk yield (2864.3 kg), 305 MY (2593.8 kg) peak yield (13.3 kg) but almost similar estimate of lactation length (329.0 days) in HF × Sahiwal cows. Dutt *et al.* (1998) reported lower estimates of lactation milk yield (1925±123.2 kg to 2414±94.4 kg) and peak yield (11.57 to 13.81 kg) in different grades same crossbred population. The effect of season and period of calving had a significant influence on all the production traits. The days to attain peak was longest (60.56±2.33 days) with highest peak yield (17.2±0.2 kg) during 2006–08 indicating for improved persistency of milk production during recent period. The effect of parity was

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one of the most important non-genetic factors significantly (P<0.01) affected all production performance (except lactation length). The least squares means for 305 days or less milk yield and lactation milk yield were minimum (2744.3±45.7 & 2966.3±55.0 kg respectively) during first lactation and the 305 days or less milk yield and lactation milk yield increased consistently up to fourth parity where it was recorded as 3300.8±76.9 and 3487.3±94.8 kg, respectively (Table 1). Further the 305 days or less milk yield and lactation milk yield reduced in subsequent lactations. The peak yield and average lactation yield was lowest (14.0±0.2 and 8.1±0.1 kg) during first lactation and the cows attained the peak yield in longest duration of days to attain peak (64.0±2.5 days) indicating for least persistency during first lactation. The peak yield and average lactation yield was highest (18.0±0.3 and 10.3±0.2 kg) during fourth lactation whereas the days to attain peak was shortest (42.4±5.3 days) during fifth lactation. The longest lactation length, dry period and days to attain peak yield in first lactation cows may be due to the fact that the first calvers has to fulfill the physiological demands for growth, production and maintenance.

The overall least squares means for gestation period, post partum interval to estrus, service period, calving interval, dry period and number of inseminations for successful conception for pooled data over the lactations were 277.6±0.4 days, 89.5±2.1 days, 149.5±4.5 days, 425.9±4.8 days, 99.6±5.7 days and 2.6±0.1, respectively (Table 1). Parmer *et al*. (2000) reported lower estimates of service period (122.6±16.4 days) and calving interval (393.0±15.72 days) in 3-breed crossbred cows. Thakur and Singh (2001) reported higher estimates of dry period (130.6±8.1 days) but closer calving interval (432.8±8.5 days) in Jersey × Red Sindhi crossbred cows. Similar to our findings, Chacko (2005) found that age at calving, service period and calving interval was 32.2±0.1 months, 148.2±3.0 and 424.5±3.3 days respectively. The overall least squares mean for age at first calving (AFC) was 1012.1±9.3 days. Vrade *et al.* (2004) also reported similar findings with average age at first calving 1005.8±17.0days in Jersey × Gaolao and Tharparker crossbred cows. Parmer *et al.* (2000) reported lower estimate of age at first calving (31.9 months) in crossbred cows. Duc and Taneja (1984) reported higher estimate of age at first calving of 1052±16 days in Jersey × Hariana crosses. The season of calving/birth had significant impact on all the reproduction performances under study (Table 1). The effect of period of calving/birth significantly influenced the age at first calving, gestation period, post partum interval to estrus, dry period and number of insemination for successful conception whereas period of calving had no significant effect on calving interval and dry period. The parity was one of the most important non-genetic factor had highly significant effect on post partum interval to estrus, service period and number of inseminations per successful conception. The effect of parity was significant effect on calving interval whereas it's impact was not significant on gestation period and dry period. The least squares means for post partum interval to estrus, service period and calving interval were longest (100.1±2.6,

Table 1. Least squares means for production and reproduction performance across different lactations in Vrindavani cattle

Production traits	305 days milk yield (kg)	Lactation milk yield (kg)	Lactation length (days)	Average lactation yield (kg)	Peak yield (kg)	Days to attain peak (days)
Overall	3047.4±33.8(938)	3219.7±41.0(913)	337.7±2.2(923)	9.5±0.1(923)	16.5±0.1(1005)	52.7±1.9(1005)
Parity						
1	2744.3^{c}±45.7 (304)	2966.3^{c}±55.0(305)	344.3±3.0(310)	8.1^{d}±0.1(312)	14.0^{c}±0.2(329)	64.0^{a}±2.5(326)
2	3028.4^{b}±51.7(236)	3221.1^{b}±63.6(223)	343.7±3.5(226)	9.4^{c}±0.1(226)	16.4^{b}±0.2(250)	51.3^{b}±2.9(255)
3	3168.3^{ab}±63.9(156)	3351.1^{ab}±77.5(153)	335.8±4.3(154)	10.0^{ab}±0.1(153)	17.3^{ab}±0.2(166)	54.3^{c}±3.6(166)
4	3300.8^{a}±76.9(105)	3487.3^{a}±94.8(100)	344.0±5.2(102)	10.3^{a}±0.2(101)	18.0^{a}±0.3(112)	54.1^{c}±4.3(113)
5	3070.6^{ab}±97.3(66)	3156.4^{bc}±119.6(63)	328.5±6.5(65)	9.5^{bc}±0.2(63)	16.8^{b}±0.4(75)	42.4^{d}±5.3(75)
6	2971.1^{b}±94.0(71)	3136.0^{bc}±114.8(69)	329.8±6.5(66)	9.5^{abc}±0.2(68)	16.7^{b}±0.4(73)	50.3^{b}±5.4(71)
Reproduction traits	Gestation period (days)	Post partum interval to estrus (days)	Service period (days)	Calving interval (days)	Dry period (days)	Insemination per conception
Overall	277.6±0.40(1061)	89.5±2.1(908)	149.5±4.5(907)	425.9±4.8(793)	99.6±5.7(618)	2.6±0.1(1153)
Parity						
1	276.1±0.5(293)	100.1^{a}±2.6(317)	173.3^{a}±5.6(310)	447.8^{a}±6.1(252)	119.1±7.0(216)	2.4^{bc}±0.1(335)
2	277.5±0.5(278)	85.6^{b}±3.08(228)	158.0^{ab}±6.5(233)	433.8^{ab}±6.8(206)	99.3±8.3(151)	3.2^{a}±0.1(305)
3	276.9±0.6(183)	84.8^{b}±3.8(151)	153.5^{bc}±8.2(147)	426.0^{b}±8.7(129)	110.9±10.0(106)	2.8^{ab}±0.2(202)
4	278.2±0.7(132)	89.0^{b}±4.6(96)	145.2^{bc}±9.9(96)	425.3^{b}±10.1(92)	99.0±12.2(69)	2.9^{a}±0.2(133)
5	278.5±0.9(84)	87.5^{b}±5.8(61)	129.1^{c}±12.2(64)	410.1^{c}±12.5(60)	85.7±16.7(37)	2.7^{ab}±0.3(87)
6	278.2±0.9(91)	89.8^{b}±6.1(55)	137.8^{bc}±12.9(57)	412.5^{c}±13.2(54)	83.6±16.1(39)	1.9^{c}±0.3(91)

Least squares means with different superscripts in a column differ significantly at P<0.05; figures in parentheses are the number of animals.

173.3±5.6, 447.8±6.1 days, respectively) during first lactation, indicating for poor reproductive efficiency among the cows of first parity. The service period and calving intervals were shortest (129.1±12.2, 410.10±1 days) during fifth lactation whereas the post partum interval to estrus was shortest (84.8±3.8 days) among the cows of second lactation order (Table 1). The number of insemination required per successful conception was highest (3.2±0.1) during second lactation whereas it was lowest (1.9±0.3) during sixth and above lactation.

The estimates of heritability for first lactation production traits *i.e.* first lactation 305 days or less milk yield, first lactation milk yield, first lactation length, first lactation peak yield and days to attain the peak during first lactation were estimated to be 0.07±0.05, 0.06±0.05, 0.10±0.03, 0.02±0.09 and 0.13±0.12, respectively. The estimate of heritability for age at first calving was 0.20±0.16. The estimates of heritabilities for first lactation reproduction traits *i.e.* first gestation period, first post partum interval to estrus, first service period, first calving interval, first dry period and number of inseminations required for successful conception of heifers were 0.30±0.20, 0.03±0.05, 0.08±0.10, 0.06±0.08, 0.04±0.06 and 0.15±0.23, respectively. All the estimates of heritability under present investigation were low and nonsignificantly different from zero. The phenotypic, genetic and environmental trends for first lactation 305 days or less milk yield were 126.12, 6.12 and 120, respectively. Whereas, the phenotypic, genetic and environmental trends for first lactation milk yield were estimated to be 135.2, 7.55 and 127.65, respectively. For age at first calving, the genetic trend was 3.23 and phenotypic trend of 22.52 with an environmental trend of 19.29 days/year. For first calving interval, the genetic trend was –1.03 days/year whereas phenotypic trend was of –4.3 days/year with an environmental trend of –3.27 days/year.

SUMMARY

The estimate of age at first calving, first lactation 305 days or less milk yield, average lactation yield and calving interval was 1012.1±9.3 days, 3047.4±33.8 kg, 9.5±0.1 kg and 425.9±4.8 days, respectively. The estimates of heritability of most of the production and reproduction traits of *Vrindavani* cattle were found lowing, indicate the scope of further improvement in these traits through selection was minimum. The phenotypic, genetic and environmental trends for first lactation 305 days or less milk yield were 126.12 kg/year, 6.12 kg/year and 120 kg/year, respectively.

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