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Reproductive Performance and Repeatability Estimation of Some Traits of Crossbred Cows in Savar Dairy Farm

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Abstract

The study was conducted on 244 crossbred cows of CCBS Savar, Dhaka to evaluate the effect of different genetic groups on their lifetime performance of various reproductive traits using twenty years data. Data were accumulated from a prescribed data sheet maintained by Central Cattle Breeding Station, Dhaka. Genetic groups for this experiment were (LF), (LJ), (LH x F), (LF x LF) and (LJ x LJ). The studied parameters were age at puberty, service per conception, post-partum heat period, calving interval, total number of calving in lifetime. ANOVA showed that genetic groups had a significant effect on age at puberty, post-partum heat period, total number of calving in lifetime and calving interval (P<0.05). From result it was found that earliest age at puberty were in L x F (749.27±99.01), service per conception, post-partum heat period was lower in L x F (1.60±0.19 and (145.75±94.44 days respectively). Calving interval was lower in L x J (411.18±136.87 days) and almost similar results were obtained for L x F (432.26±96.26 days). Total number of calving in lifetime were observed higher in (LH x F) with mean of 1468.30±198.58 days.

Keywords: Calving interval, Crossbred dairy cows, Lifetime reproductive traits, Performance, Repeatability

Introduction

Dairying is a biological efficient system that converts large quantities of inedible roughage to milk, the most nutritious food known to man. Milk is renowned as an ñalmost completeò as well as natural nutritious food for all mammals including human being (Debnath *et al*. 2014). It is a more efficient and intensive system in term of nutrient and protein production for human. The present population of cattle, goat, and buffalo is about 23.935 million, 25.93 million, and 1.78 million, respectively (DLS, 2017). Livestock Departmentôs available statistics show that the domestic production of milk and meat are 9.28, and 7.15, million tons in the fiscal year 2017 against the demand of 14.865 and 7.154, million tons in 2016-17 fiscal year, respectively (DLS, 2017). The main characteristics of zebu cattle are smaller in size, slow growth rate as compared to exotic breeds; but their adaptability is very high in terms of disease resistance, hot - humid climatic stress and adverse nutritional conditions. The resistance to diseases and climatic stress exhibited by particular breed are important consideration. The genetic potential for milk production is important (Khan, 1999). In most countries within Asiatic region dairy development is accorded the highest priority in livestock programs. During this century innumerable attempts have been made in order to improve the milk production potentialities of Zebu cattle through crossbreeding with Bostaurus breeds (Peterson, 1991). Bostaurus types usually fail to produce adequately and often even to survive, in the face of the multiple challenge of climatic stress, new diseases, parasites and nutritional insufficiency. So, it is clear that a well defined appropriate approach should be devised to change in both genotype and environment simultaneously or a selection within the Local types needs to be pursued under the local environmental conditions (FAO, 2008), because of provision of right genotype in right environment being important factor for .the expression of full genetic potentiality. In order to improve production potentials the breeders have two alternatives, either by introducing high performing Bostaurus cattle from the temperate zones or by introducing exotic germplasm to low performing Bosindicus stock. Although there is opinions that selection from within the indicusstock is preferable for sustainable improvement in a given environment. A scientific cattle breeding program was undertaken by the Lord Linlithgow (the then British Viceroy for India) since 1935 - 1936 to upgrade the small sized Zebu cattle of the undivided Bengal with Hariana bulls (Ali *et al.,* 1998). The adverse environmental condition directly affects the reproductive performance which in turn, hampers total productivity of the crossbred animals. Reproduction performance of these crossbred cattle was evaluated in different times by many investigators (Bhuiyan and Sultana, 1994). Knowledge of selection, breeding system and management practices are essential to increase the productivity of cattle. Improvement of dairy cattle by genetic principle is the single factor for developing cattle population in general. The term "repeatability" introduced by (Lush, 1945) is to signify correlation among repeated expressions of a given trait for the same individual. Repeatability may be regarded as the fraction of the variance that is attributable to permanent differences between individuals and useful for those traits which are expressed several times during an animal's lifetime (Mahadevan, 1958).The amount of progress that could be made in selection is partially limited by the repeatability because it gives the upper limits of heritability. Selection for a trait which is low in heritability will make little progress and selection for a trait; which is highly heritable, will make more progress. This could have a significant bearing on the choosing of best genotype (s) for a particular trait in a given environment. Such experiments have not been under taken in this country to a large extent or have been done very little. Considering the above facts the study was undertaken to find out superior animals suitable for future use of lifetime potential in different genetic groups of cows and to estimate repeatability in some traits of dairy cattle of Bangladesh.

Materials and Methods

Data pertinent to this research work were collected from the prescribed data sheet as maintained at Central Cattle Breeding Station (CCBS), Savar, Dhaka. Records on a total of 244 cows were picked up and the cows were maintained on usual ration and identical management in the farm of years 20..The animals under study constituted five crossbred genetic groups such as Local x Friesian (L xF), Local x Jersey (L x J), (Local x Hariana) x Friesian (L x H) x F, [(Local x Friesian) x (Local x Friesian) (L x F) x (L x F)] and(Local x Jersey) x (Local x Jersey) (LJ x LJ) considered as genetic group 1, 2, 3, 4 and 5 respectively for the study. The cows from each genetic group with reasonably sufficiently long productive life were considered rationally in this study. Milking animals at CCBS were usually culled when they are no longer able to produce calves because of senility. This data collecting and analytical procedure considered as materials and methods for this research work. Traits Considered for present study were age at puberty (AAP), number of services per conception (NSPC), post-partum heat period (PPHP), calving interval (CI) and number of calving/parity completed in lifetime (CCL) and repeatability estimates were obtained on Postpartum heat period and calving interval.

Statistical analyses

Data of this study were analyzed using Least-Squares Mixed Model and Maximum Likelihood Computer Program (Harvey, 1990). Least squares analysis of variance (LSANOVA) was worked out for age at puberty; postpartum heat period, calving interval, service per conception. Least significant difference (LSD) tests were performed in order to compare treatment means when variance was significantly different according to the procedure outlined by Snedecor and Cochran (1980).

Results and Discussion

Age at puberty

Heifers born early in the calving seasons are usually heavier at weaning and reach puberty earlier than heifers born late in the calving season. Heifers must reach puberty by 13-14 months of age to calve as two-year-olds. Puberty is influenced by age, weight and breed. Table 4.2 represents the LSM of age at puberty of cows of this study. It reveals that age at puberty (days) followed the order (1011.78 ± 102.47) > (967.89 ± 104.39) > (953.61 ± 101.36) > (878.09 ± 97.66) > (794.27 ± 99.01) for genetic groups 4, 5, 3, 2 and 1 (Table 3). In the present study LSANOVA showed that genetic group significantly ($P<0.05$) affected age at puberty (Table 3). A study agrees with the present findings (Hoque *et al.* 1999,), the 5 genetic groups were Sahiwal (SL), Friesian (F), Local (L), ½L x$^{1'}$/2F and $^1/_2$SL x$^{1'}$/2F and the respective age at first service was 1124.25±26.43, 659.33±34.01, 977.86±50.9, 790.49±22.59 and 770.31±39.39 days. Ali *et al.,* (1998) reported age at puberty in indigenous cattle of Bangladesh to be 42.40 months. It appears that AAP was significantly ($P<0.05$) lower in '/$_2$Local x^1/Friesian and ½ Friesian x ½ Sindhi heifers compared to other breeds, types and crosses. Hoque*et al.* (1999) investigated AAP in different dairy type cattle of Bhaghabarighat Milk Pocket area of Bangladesh Milk Producers Cooperative Union Ltd. (Milk Vita) and visualized that Friesian crosses exhibit AAP earlier (765days) in comparison to Pabna (1176 days) and Pabna x Sahiwal(1050 days). Chaudry and Ahmad (1994) found a negative association of increasing Friesian inheritance into Sindhi - Sahiwal blood with a harmonic reduction in age at puberty. Estimates of age at puberty in *Bosindicus* cattle in the tropics and subtropics range between 480and 1200 days months (Steve Boyles 2007). *Bosindicus* cattle reach puberty later than *Bostaurus* x *Bosindicus* crossbreeds or purebred taurine cattle (Steve Boyles 2007).This is due to genetic and environmental factors, including nutrition, disease, temperature and season of birth.

Number of service per conception

Choudhuri *et al* (1984) estimated the repeatability of NSC to be 19% from 2152 records for Haryana cattle. The NSC was 2.81 ±0.03 and was significantly affected by herd, season, placenta expulsion time, lactation length and milk yield. Since heritability can be broadly estimated from repeatability, this study indicates that heritability of NSC is low and most of the variation in NSC is attributable to environmental factors.Factors that influence number of service per conception are the quality and quantity of semen used, accuracy of heat detection, time of insemination and skill of the inseminator. Service per conception is determined mostly by environmental attributes rather than by heredity. Number of services required for conception in descending order were 1.83±0.21, 1.80±0.21, 1.74±0.19, 1.72±0.17 and 1.60±0.19 in genetic group 5(LJ x LJ), 2 (L x J), 4 (LF x LF), 3 (LH x F) and 1 (L x F) respectively. The difference between genetic groups did not differ significantly (P>.05) (Table 3). The overall mean for service per conception among the 3 genetic groups studied was 1.72±0.17 and higher service per conception was observed in L J x LJ (1.83±0.21) and lowest was in Local x Friesian F(1.6210.19). The Least-Squares analysis of variance (LSANOVA) reveals that genetic groups and genetic group x parity interaction did not significantly (P>0.05) affect SPC (Table 5). These results were similar to the findings of (Hoque *et al.* 1999, Sultana 1995, Bhuiyan and Sultana 1994) observed SPC in Local (L), Sahiwal (SL), Sahiwal x Friesian (F_I), Jersey (J), L xJ(F,) Sindhi (S) and L x F (F,) to be 1.78±0.22, 1.12±0.70, 1.36±0.21, 2.05±0.02, 2.01+-0.34, 1.96±0.21 and 1.68±0.15 respectively. Bhuiyan and Sultana (1994) found highest SPC (2.05) in '/2Sahiwal x '/$_2$Friesian and lowest (1.12) in Sahiwal. Islam *et al.* (1997) observed SPC in Holstein-Friesian x Local, Sahiwal x Local, Sindhi x Local and Jersey x Local to be 1.8±1.6, 1.8±1.0, 1.6±0.9 and 1.4±0.7 respectively. Majid *et al.* (1995) reported SPC for 10 genetic groups as 1.90±0.12, 1.27±0.19, 1.76±0.08, 2.20±0.49, 2.21± 0.23, 2.00±0.37, 1.73±0.18, 2.00±0.39, 1.53±0.19 and 1.25±0.25. Jabbar and Ali (1998) reported SPC for crossbred, Local (milk) and Local (draft) as 1.61-+0.25, 1.26±0.30 and 1.72±0.59 respectively and average was 1.66±0.57.From the foregoing citations it is evident that most of the refits identified non-genetic factors as the determinant of SPC. But genetic group affect SPC in some studies to Choudhury and Ahmad, *(*1994).

Post-partum heat period

The post-partum heat period is a very important but lowly heritable reproductive trait in a dairy herd. Reproductive efficiency of an animal is influenced by post-partum heat period. Hafez (1987) suggested that the postpartum breeding should be delayed up to 60 - 90 days after parturition, when the uterus undergoes involution and preparation for the next pregnancy. Post-partum heat period in different genetic groups in ascending order were 148.78±94.44, 178.08±129.90, 176.22±110.50, 196.52±126.91 and 231.76±138.87 days respectively for genetic group 1 (L x F), 2 (L x J), 3 (LH x F), 4 (LF x LF) and 5 (LJ x LJ). Out of five genetic groups similar calving interval was observed in genetic group 4 and 5 (461.78±152.73 and 461.10±158.09 days). Other intervals of calving in genetic group 1 (L x F), 2 (L x J) and 3 (LH x F) were 432.26±96.26, 411.18±136.87 and 440.781124.36 days respectively. Least-Squares means with standard error for post-partum heat period are presented in Table 6. The observed post-partum heat periods in L x F, L x J, LH x F, LF x LF and LJ x LJ crossbred genetic groups were 145.75±94.44, 75.05±129.90, 176.22±110.50, 196.52±126.91 and 231.76±138.87 days, respectively. The analysis of variance showed that genetic group had significant (P<0.05) effect on this trait (Table2). Results of Chaudry and Ahmad (1994) are agreement with present findings. Chaudry and Ahmad (1994) observed PPH of Sahiwal cows and Friesian x Sahiwal cows with '/2, 5/8 and ^{3}/4-Friesian inheritance as 211.5, 154.8, 104.3 and 83.5 days respectively. Nahar *et al.* (1992) reported post-partum heat period of four genetic groups as crossbred of Sindhi, Sahiwal, Jersey and Holstein-Friesian with Local as 165.7±6.9, 145.6±8.8, 120.4±7.2 and 123.1±4.3 days. Islam *et al.* (1997) found post-partum heat period in Local and crossbred cattle in Natore district to be 116 and 149 days respectively. Majid *et al.* (1995) found insignificantly (P>0.05) shorter (117 days) PPH in ½Shahiwalx ½Friesian and longest (224 days) in 3/4Local x ¾Friesian in Savar Dairy and Cattle Improvement Farm.

Calving interval

The optimum calving interval seems to be somewhere between 12 and 14 months, while it is shorter for cows with low persistency than for those with high persistency. The calculated Least-Squares means along with their standard errors for calving interval are presented in Table 4.1. The highest calving interval (462±152.73 days) was observed in genetic group 4 (LF x LF) and other genetic groups follow in the order of (461 days), (441 days), (432 days) and (411 days) for genetic groups 5 (LJ x LJ), 3 (LH x F), 1 (L x F) and 2 (L x J) respectively. The analysis of variances showed that the genetic group had significant effect on calving interval in agreement with estimate reported by Hoqueet *et al.* (1999), Sultana and Bhuiyan (1997).Least Significant Difference (LSD) test showed that genetic group 1 (L x F) and 2 (L x J) and 4 (LF x LF) and 5 (LJ x LJ) are non-significant; but genetic group 1 (L x F) and 2 (L x J) significantly (P<0.05) differ from genetic group 4 (LF x LF) and 5 (LJ x LJ). Genetic group 3 (LH x F) did not significantly (P<0.05) differ from remaining 4 counterparts.

Total number of calving in lifetime

Total number of calving in lifetime of dairy cows is affected by many factors, both of genetic and non-genetic origin. For a profitable dairy enterprise, it would be desirable to have 6-8 calving in lifetime. In the present study the highest total number of calving in lifetime was found in genetic group 3 (LH x F) with the number being 5.00±0.30 and the other number of calving for remaining genetic groups were4.37±0.21, 2.41±0.09, 3.38±0.23 and 2.30±0.18 respectively. The Least-Square means and standard error for total number of calving in lifetime are presented in Table 4.2. It represents that highest number of calving (5.00) completed in lifetime was found in genetic group 3 followed by 1 L x F (4.37), 4 LF x LF (3.38), 2 L x J (2.41) and 5 LJ x U (2.30) respectively. Least Significant Difference (LSD) test reveals that genetic group 3 (5.0) and 1 (4.37) did not differ significantly (P>0.05) with each other; while genetic group 2 (2.41), 4 (3.38) and 5 (2.30) differ significantly with remaining counterparts, whereas genetic group 2, 4 and 5 are statistically insignificant (P>0.05).Genetic group significantly (P<0.05) affected TNCL (Table 4.3). This is in agreement with the report of Kumar *et al.* (1997). The cows were 2 - and 3 - breed crosses and 3 - breed inter se crosses of Hariana, Holstein, Jersey and Brown Swiss and showed overall mean number of lactation completed to be 4.73±0.05; while 2 - breed crosses had the best performance than others.

Service per conception

Number of services required for conception in descending order were 1.83±0.21, 1.80±0.21, 1.74±0.19, 1.72±0.17 and 1.60±0.19 in genetic group 5(LJ x LJ), 2 (L x J), 4 (LF x LF), 3 (LH x F) and 1 (L x F) respectively. Responsible factors for SPC are the quality and quantity of semen, accuracy of heat detection, time of insemination and skill of the inseminator, level of fertility, season of the year, other environmental factors and mostly determined by environmental attributes rather than by heredity. The overall mean for service per conception among the genetic groups studied was 1.72±0.17 and higher service per conception was observed in L J x LJ (1.83±0.21) and lowest was in Local x Friesian F_1 (1.6210.19). The LSANOVA reveals that genetic groups and genetic group x parity interaction did not significantly (P>0.05) affect SPC (Table 8). These results were similar to the findings of Hoque *et al.* (1999), Bhaiyan and Sultana (1994). Sultana (1995) observed SPC in Local (L), Sahiwal (SL), Sahiwal x Friesian (F_l), Jersey (J), L xJ(F,) Sindhi (S) and L x F (F,) to be 1.78±0.22, 1.12±0.70, 1.36±0.21, 2.05±0.02, 2.01+-0.34, 1.96±0.21 and 1.68±0.15 respectively. Bhuiyan and Sultana (1994) found highest SPC (2.05) in '/2Sahiwal x '/$_2$Friesian and lowest (1.12) in Sahiwal. Islam *et al.* (1997) observed SPC in Holstein-Friesian x Local, Sahiwal x Local, Sindhi x Local and Jersey x Local to be 1.8±1.6, 1.8±1.0, 1.6±0.9 and 1.4±0.7 respectively.

Repeatability

The concepts of repeatability and heritability are associated with the relative importance of heredity and environment in influencing the variations in a character. It includes the additive genetic variance and also the variance due to dominance deviations, epistatic deviations and the effect of environment that are permanent for each animal but differ from one animal to another. The repeatability estimates of lactation yield as calculated were 0.17±0.09 for (L x F) crossbred, 0.27±0.02 for (L x J), 0.07±0.04 for (LH x F), 0.17±0.08 for (LF x LF) and 0.03±0.05 for (LJ x LJ) crossbred (Table 4.4).Similar study was made by Atay *et al.* (1997).Repeatability of post-partum heat period was calculated as 0.24±0.10, 0.02± 0.06, 0.10±0.06, 0.11±0.09 and 0.05±0.09 (-ve) for respectively in genetic group 1 (L x F), 2 (L x J), 3 (LH x F), 4 (LF x LF) and 5 (LJ x LJ). Table 4.4 represents the repeatability of calving interval. Repeatability of calving interval was 0.30±0.12, 0.13±0.11, 0.09±0.05, 0.08(-ve) and 0.08±0.07for genetic group 1 (L x F), 2 (L x J), 3 (LH x F), 4 (LF x LF) and 5 (LJ x LJ) respectively. Similar studies were made by Rubio *et al.* (1996) estimated the repeatability of calving interval to be 0.10 and 0.17 for Girpure breed and crossbred respectively. Oyama *et al.,* (2013) found of repeatability of Black Cows of Hyobgo and Shimane of calving interval was 0.09. Padua *et al.* (1994) observed repeatability of Nilore and crossbred cattle as 0.24 and 0.28 for calving interval. Most of the value of repeatability calculated in the present study was low and in some cases it was even negative. Low repeatability estimation indicates that traits are mostly influenced by environment and management practices rather than genotype and permanent environmental influences.

Table 1. Number of observations on different traits in different genetic groups

Traits	1	2	3	4	5	Total
Age at puberty	54	36	59	52	43	244
Service per conception	233	87	282	176	99	877
Post-partum heat period	166	35	209	103	44	557
Calving interval	176	37	217	108	46	584
Number of calving completed in lifetime	54	36	59	52	43	244
Repeatability						
Post-partum heat period	166	35	209	44	103	557
Calving interval	176	37	217	46	108	584

* 1 = L x F ; 2 = L x J ; 3 = (L x H) x F ; 4 = (L x F) x (L x F) ; 5 = (L x J) x (L x J) .

Table 2. Level of significance of various traits in contrast to genetic groups

Traits	Genetic group	
Age at puberty	**	-
Service per conception	NS	NS
Post-partum heat period	**	NS
Calving interval	*	NS
Total number of calving in lifetime	**	-

*** P<0.001 ** P<0.01 * P<0.05 NS = Non= significant (P>0.05)

Table 3. Effect of different genetic groups on reproductive traits of dairy cows

Trait	Genetic group				
	L x LF	L x J	LH x F	LF x LF	LJ x LJ
Service per conception	1.602±0.19	1.800±0.21	1.72±0.17	17.4±0.19	1.83±10.21
Post partum heat period (days)	145.75 ^{c}± 94.44	175.05^{b}± 129.90	176.22^{b}± 110.50	196.52^{a} ±126.91	231.76^{a}±138.87
Calving interval (days)	432.26^{b}± 96.26	411.18^{b}± 136.87	440.78^{ab}± 124.36	461.78^{a} ± 152.73	461.10^{a}±1 58.09
Age at puberty (day)	794.27^{b}± 99.01	878.09^{b}± 97.66	953.61^{a}± 101.36	1011.78^{a} ± 102.47	967.89^{a}± 104.39
Number of calving in lifetime	4.37^{a} ±0.21	2.41^{b}±0.09	5.00^{a} ±0.30	3.38^{b} ±0.23	2.30^{b}±0.18

Means with same letter in the same row for each trait are not significantly different (P>0.05)

Table 4. Repeatability estimates of important reproductive traits of different genetic groups of dairy cows

Trait	Genetic group				
	L x F	L x J	LHxF	L F x L F	L J x L J
Post partum heat period	0.24± 0.10	0.02± 0.06	0.10± 0.06	0.05± 0.09 (-ve)	0.11± 0.09
Calving interval	0.30± 0.12	0.13¯± 0.17	0.09± 0.05	0.08±0.07	0.08±0.11(-ve)

Table 5. Least squares means with standard errors for service per conception (SPC) in different genetic groups and parities of dairy cow

Parity	Genetic group					Overall mean
	L x F	L x J	LHxF	L F x L F	L J x L J	
Overall mean	1.36±10.11	1.66± 0.30	1.59± 0.09	1.75±0.21	1.75± 0.30	
P_1	1.71± 0.28	1.00± 0.75	2.39± 0.22	1.60± 0.53	1.50± 0.75	1.52± 0.24
P_2	1.40±10.27	1.50±10.75	1.34± 0.22	1.25± 0.53	1.50± 0.75	1.39± 0.24
P_3	1.35±10.28	1.00± 0.75	1.13±10.22	1.75±10.53	2.50± 0.75	1.54± 0.24
P_4	1.35± 0.28	1.50±10.75	1.86± 0.22	2.50±10.53	1.00± 0.75	1.64±10.24
P_5	1.07± 0.28	3.50± 0.75	1.39± 0.22	1.75± 0.53	1.50± 0.75	1.79± 0.25

Table 6. Least squares means with standard errors for post-partum heat period (PPHP) in different genetic groups and parities of dairy cows

Parity	Genetic group					Overall mean
	L x F	L x J	LHxF	L F x L F	L J x L J	
Overall mean	93.63± 11.88	201.25± 31.61	137.13±9.32	217.29± 22.35	230.33± 31.61	
P_1	161.92± 29.26	427.50± 77.43	181.86± 22.83	208:50± 54.75	508.00± 77.43	297.50± 25.58
P_2	71.60± 28.27	94.50± 77.43	127.52± 22.83	168.00± 54.75	289.50± 77.43	150.22± 25.54
P_3	128.07± 29.26	141.00± 77.43	171.13± 22.83	241.25± 54.75	253.50± 77.43	186.99± 25.58
P_4	98.50± 29.26	97.00± 77.43	139.47± 22.83	261.75± 54.75	119.50± 77.43	154.04± 25.58
P_5	49.14± 29.26	357.50± 77.43	133.73± 22.83	281.25± 54.75	173.50± 77.43	188.22± 25.58

Table 7. Least squares means with standard errors for calving interval (CI) in different genetic groups and parities of dairy cows

Parity	Genetic group					Overall mean
	L x F	L x J	LHxF	LFxLF	LJxLJ	
Overall mean	322.81± 12.33	359.00± 32.80	354.89± 9.67	377.95± 2.19	423.16± 32.80	
P_1	447.53± 29.34	683.50± 80.35	479.60±23.69	493.25± 56.82	613.00±80.35	543.37± 26.50
P_2	409.57±30.37	362.50± 80.35	406.21±23.69	458.50±56.82	510.00±80.35	429.35±26.55
P_3	387.35± 30.37	429.00± 80.36	419.95±23.69	308.00±56.82	554.00±80.35	419.66±26.5
P_4	350.21± 30.37	449.00±80.35	428.39± 23.69	547.75±56.82	445.00±80.35	444.07±26.55
P_5	342.21± 30.37	230.00± 80.35	395.17± 23.69	460.25± 56.82	417.00±80.35	368.92±26.55

Table 8. Least squares means with standard errors for service per conception (SPC) in different genetic groups and parities of dairy cows

Parity	Genetic group					Overall mean
	L x F	L x J	LHxF	L F x L F	L J x L J	
Overall mean	1.36±10.11	1.66± 0.30	1.59± 0.09	1.75±0.21	1.75± 0.53	
P_1	1.71± 0.28	1.00± 0.75	2.39± 0.22	1.60± 0.53	1.50± 0.75	1.52± 0.24
P_2	1.40±10.27	1.50±10.75	1.34± 0.22	1.25± 0.53	1.50± 0.75	1.39± 0.24
P_3	1.35±10.28	1.00± 0.75	1.13±10.22	1.75±10.53	2.50± 0.75	1.54± 0.24
P_4	1.35± 0.28	1.50±10.75	1.86± 0.22	2.50±10.53	1.00± 0.75	1.64±10.24
P_5	1.07± 0.28	3.50± 0.75	¯1.39± 0.22	1.75± 0.53	1.50± 0.75	1.79± 0.25

Conclusions

From the compilation and analysis of data on various parameters, it is revealed that in respect of reproductive performances the L x F genetic group was found superior compared to other groups. It is concluded that lifetime productivity needs to be considered as an appropriate guideline for selecting genetic groups for the future productivity in the aspect of Bangladesh.

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