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THE EFFECT OF GENETIC AND NON-GENETIC FACTORS ON TOTAL ALIVE (NORMAL) CALVES BORN TRAIT IN PHULE TRIVENI CROSSBRED CATTLE

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ABSTRACT

Present study was carried out with the aim to determine the effect of genetic and non-genetic factors on alive (normal) calves born trait in Phule Triveni crossbred cattle. The present investigation was carried out by collecting the data from history and pedigree sheets maintained at Research-Cum-Development Project (RCDP)on Cattle, Mahatma Phule Krishi Vidyapeeth Rahuri, Ahmednagar (Maharashtra). The data were collected over a period of 39 years (1976 to 2014). The overall least squares mean for total alive (normal) calves born in Phule Triveni cattle was $\pm$0.11. The effect of period of birth, season of birth, generation and sire differences was non-significant on total normal (alive) calvesborn, while the effect of age at first calving and first lactation milk yield on total calves born was significant.

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INTRODUCTION

The demand for milk and milk products has increased sharply with increase in human population. The selective breeding and crossbreeding are main tools to improve the milk production potential of indigenous breeds (Ratwan *et al.,* 2016). Total cattle population of India is 190.9 million out of which indigenous cattle is 151.17 million and crossbred /exotic cattle is 39.73, indigenous cattle contributes 23.65% and crossbred/exotic contributes 26.16% to the total milk production of India (BAHS, 2014). Theaverage numberof totalnormalcalvesproducedby eachTharparkarcowsduring its herd lifewas3.68 calves(Rawal *et al.*, 1993). Tomar*et al.*(1995)noticedtheonanaverage, each cowproduced 3.42$\pm$O.12 total normal (alive) calvesduring its stayintheherd ofRed Sindhi cattle. Atrey *et al.* (2005) noticedthatthe periodofbirth hadhighly significant effectontotal alivecalvesbornin Frieswalcattle he also reported that theonan average each cowproduced2.57$\pm$0.06 livecalves. Mukherjee and Tomar (1997) studiedgeneticsof female calflosses uptomaturit yandre placementrate in Crossbred cattleandre portedthat thetotal normalcalves born in crossbred cows was non-significantly affected by seasonof calving. The numberoftotal alive(normal)calvesproducedby eachcow duringitslifetime wasnon-significantlyaffectedbyseasonofbirthinSahiwal cattle (Singh *et al.*, 2011).Mukherjee and Tomar (1996c) reportedthatthe totalalivecalvesborn were significantly affected byageatfirst calving(AFC) incrossbred cattle. Kumar *et al.* (2009) observed thatthelessernumberoftotal alivecalves (4.4$\pm$.031) wereproduced bythose cowswhichhadlonger Age at first calving AFC (>1700days) whereas thecows which had shorter AFC (<1100 days) produced more (5.4$\pm$0.59) in theherd of Harianacows. Atrey*et al.* (2005)reportedthat thecowsoffirst lactation milk yield (FLMY) groupsof 2201-2850kghadthehighestnumberoftotal normalcalves asaFrieswalcow with2201-2850 kgmilk productionwillhaveoptimum lactationperiod, allowing the cowstohavemorecalvingthanthecowswithhighermilk yield withlongerlactationperiods and longercalving intervals, resultinginto thelessnumberof calving. Rawal andTomar(1994) studiedt hegeneti cvariabilityinli fetimecalf crop of Sahiwal cattleand reported thatthe variation duetothege nerationontotal normal(alive) calvesproducedpercowwerefound tobehighly significantin the herd ofSahiwalcattle. Atrey *et al.* (2005) observed thatthesirehad highly significant effectontotal normal (alive)calvesborninherd of Frieswalcattle.

Present study was carried out with the aim to determine the effect of genetic and non-genetic factors on alive (normal) calves born trait in Phule Triveni crossbred cattle.

MATERIALS AND METHODS

Thepresentinvestigation was carriedoutby collectingthedatafromhistoryand pedigree sheets maint ainedat Research-Cum-DevelopmentProject (RCDP)on Cattle, Mahatma Phule Krishi VidyapeethRahuri,Ahmednagar(Maharashtra). Thedata werecolle ctedfromthe pedigree sheets and dailymil krecording sheetsovera period

of 39 years (1976to2014). The data were analyzed using a mixed model least-squares analysis for fitting constants (Harvey, 1990) due to non-orthogonal and disproportionate sub-class frequencies. The following model was used with assumptions that different components being fitted into the model were independent and additive.

$Y_{ijklmn} = \mu + S_i + (Sea)_j + P_k + (AFC)_l + (GG)_m + e_{ijklmn}$

where, Y_{ijklmn} is n^{th}total calves born of cattle which is progeny of i^{th} sire, calved in j^{th} season, k^{th} period, l^{th} age at first calving and m^{th} genetic group of the animal; ì is overall mean, S_i is random effect of i^{th} sire, Sea_j is fixed effect of j^{th} season of calving, P_k is fixed effect of k^{th}period of calving, AFC_l is effect of l^{th} age at first calving, GG_m is effect of m^{th} genetic group and e_{ijklmn} is random error associated with each observation assumed to be NID (0,ó²e). The differences of means between subclasses of periods, seasons, age at first calving and genetic groups were tested for significance using Duncan's multiple range test as modified by Kramer (1957).

RESULTS AND DISCUSSION

The analysis of variance for season, period of calving, age at first calving and genetic group of alive (normal) calves bornwere computed and presented in Table (1).

Table 1: Analysisof variance for totalalive calves bornas affectedby various factors in Phule Trivenicows

Sourceofvariance	d.f.	SS	MSS	F(cal)
POB	5	31.364	6.2730	1.901
AFC	3	37.619	12.5400	3.800*
SOB	2	17.809	8.9046	2.699
FLMY	6	277.890	46.3151	14.036**
Error		582	1920.453	3.2997

POB = Period of birth, AFC = Age of first calving, SOB = Season of birth, FLMY = First lactation milk yield. **P< 0.01, * P <0.05

Theoverallleastsquaresmeanfortotalalive(normal) calves born were 3.01 ± 0.11inPhuleTriveni cow (Table 2). Similar results werere portedinBrownSwisscrosses and total alive calves were 3.14 ± 0.1 (Mukherjee and Tomar, 1996a). Thelower valueof totalalive(normal)calvesbornthanthepresentresults wasreported inFrieswal cattle which were 2.57 ± 0.06 (Atrey*et al.,* 2005). However,thehighervaluesoftotal alive(normal) calvesborn were noticed inTharparkar cattleas 3.68 ± 0.18 (Rawal *et al.,* 1993) in Red Sindhicattle as 3.42 ± 0.12 (Tomar*et al.*, 1995), in Friesian-Boran crosses 3.58 ± 0.13(Goshu, 2005), Harianacattleas 4.9 ± 0.15 (Kumar *et al.,* 2009) and in HolsteinFriesiancows as 3.55 ± 0.12 (Goshu *et al.,* 2014).

Effect of seasonand birthperiod

Theinfluenceofperiodofbirthontotal alive (normal) calvesborn percowwasnon-significantin PhuleTrivenicow (Table1). Thesimilarobservation was found in Murrah buffalo (Gowane and Tomar, 2007) and inHolstein Friesiancattle(Goshu*et al.,* 2014). The opposite observation was reported in Brown Swiss crosses (Mukherjee and Tomar, 1996a), Frieswal cattle (Atrey *et al.,* 2005) and in Harianacattle(Kumar*et al*. 2009; Jakhar *et al*., 2010). InPhuleTriveni cow, the totalnormal calves produced by cowscal vedduringperiod P4 (3.39 ± 0.25) was highest followed by in P1 (3.19 ± 0.14) and lowestin period P6 (2.41 ± 0.32) (Table 2).

Thevariationintotal normal (alive) calve produced during different periods might beduetoinfluenceof environmental factors andalsogenetic inheritance ofparent.Theanalysisof variance revealed thattheseasonof birthhad non-significanteffect on totalalive (normal) calves borninPhule Triveni cow (Table 1). These results were corroborated with

Table 2: Leastsquares means for Totalalive calves bornas affectedby various factors in Phule Trivenicows.

Effects	N	Total alive calves born Mean	SE
μ	599	3.01	0.11
Period of birth			
P1 (1976-81)	213	3.19	0.14
P2 (1982-87)	130	2.85	0.17
P3 (1988-93)	126	3.17	0.17
P4 (1994-99)	65	3.39	0.25
P5 (2000-05)	32	3.19	0.33
P6 (2006- above)	33	2.41	0.32
Age at first calving (days)			
A1 (<900)	267	3.23b	0.14
A2 (901-950)	67	3.37a	0.23
A3 (951-1000)	62	2.88abc	0.24
A4 (>1000)	203	2.67c	0.13
First lactation milk yield(Kg)			
L1 (<1500)	82	1.70e	0.21
L2 (1500-2000)	75	2.41d	0.22
L3 (2000-2500)	128	2.63cd	0.18
L4 (2500-3000)	125	3.01c	0.18
L5 (3000-3500)	93	3.71ab	0.20
L6 (3500-4000)	54	3.97a	0.26
L7 (>4000)	42	3.81b	0.29
Season of birth			
S1 (Winter)	226	2.83	0.14
S2 (Summer)	196	3.03	0.15
S3 (Rainy)	177	3.25	0.16

Table 3: Analysisof variance for Totalalive calves bornas affectedby generationinPhule Triveni Cows

Sourceofvariance	d.f.	SS	MSS	F(cal)
Generation	8	17.038	2.130	0.660
Error	590	1903.4105	3.226	

Table 4: Least squares means for Total alivecal vesborna saffected by generation in Phule Triveni cows

Effect	N	Totalalivecalvesborn	
		Mean	SE
μ	599	3.12	0.13
Generation			
G1	121	3.07	0.16
G2	142	3.11	0.15
G3	106	3.04	0.17
G4	84	2.71	0.19
G5	56	3.28	0.24
G6	41	3.05	0.28
G7	36	2.84	0.29
G8	9	3.14	0.59
G9	4	3.83	0.89

Table 5: Analysis of variance for total alivecal vesbornas affected bysirein Phule Triveni cows

Sourceofvariance	d.f.	SS	MSS	F(cal)
Generation	8	17.038	2.130	0.660
Error	590	1903.4105	3.226	

Table 6: Least squares means forTotal alive calves bornas affectedbyonly10 toprankedSire in Phule Triveni cows

Effect	N	Totalalivecalvesborn	
		Mean	SE
μ	599	3.13	0.12
Sire			
R92	40	3.14	0.28
R29	31	3.52	0.32
R81	27	3.13	0.34
R65	22	3.33	0.38
R36	22	3.24	0.38
R24	21	2.97	0.38
R68	19	2.95	0.40
R40	19	3.10	0.40
R67	18	3.14	0.42
R90	17	2.96	0.38

observation in crossbred cattle (Mukherjeeand Tomar, 1997), Friesian-Borancattle (Goshu, 2005), Tharparkarcattle Poonmaand Goswami, 2005b) Sahiwal cattle (Singh*et al*., 2011)and Holstein Friesiancattle (Goshu *et al.,* 2014) In Phule Triveni cow, thehighesttotal alive (normal) calves born (3.25 ± 0.16) were observed during rainy season followed by summer season (3.03 ± 0.14) and lowest in winter season (2.83 ± 0.14) (Table2). These findings were close agreement with finding of Tharparkar cattle (Poonma and Goswami, 2005b). These variations might be due to influence of environmental factors and culling of cows.

Effect ofageat first calving (AFC) and firstlactationmilk yield

Theanalysisof variancerevealedthattheageatfirst calving had significant($P < 0.05$) effecton total normal (alive) calves bornpercowinPhuleTriveni cow (Table 1). Similar resultswereo btainedin Brown Swisscrosses (Mukherjee andTomar, 1996a), crossbred cattle (Mukherjee andTomar, 1996c), Harianacattle (Kumar *et al*., 2009) andHarianacattle (Jakhar *et al*., 2010). While, the contrad ictoryresults were reported by in Frieswal cattle (Atrey *et al*., 2005) and Ho lstein Friesian cattle (Goshu*et al.,* 2014). The Multiple Range Test (DMRT) indicated thatthehig hestnumber of total alive(normal) calvesborn wasobserved incows of A2 group (3.37 ± 0.23) followedbyA1 (3.23 ± 0.14) and lowestinA4 group (2.67 ± 0.13) (Table 8). Itindicated thatthetotalcalves born decreased with increase in AF Cin Phule Triveni cows. These findingswereincloseagreement with observation in Hariana cattle (Kumar *et al.,* 2009) and Frieswalcattle (Kumar *et al*., 2014). Theanalysisof variancerevealed that thetotal normal (alive) calvesbornwe resignificantly ($P < 0.01$) affected by first lactation milk yield in Phule Triveni cows (Table 1). These findingscorroboratedwitht heprevious observation in Frieswal cattle (Atrey *et al*., 2005), Harianacattle (Kumar *et al.,* 2009), Holstein Friesiancattle (Goshu *et al*., 2014) and Frieswalcattle (Kumar *et al*., 2014). InPhuleTriveni cattle, the DMRT indicated thatthe total normal (alive) calvesborn percows ofL6group (3.97 ± 0.26) weresignificantly higherthan L1 (1.70 ± 0.21), L2 (2.41 ± 0.22), L3 (2.63 ± 0.18), L4(3.01 ± 0.18) , L5(3.71 ± 0.20) and were atparwith L7 (3.81 ± 0.29) group (Table 2). Therewasan increasing trend forthetotal alive(normal) calvesborn witht heincrease in the FLMY. Highermilk producing cowsproduced morenumber ofnormalcalves ascomparedto lowmil kproduced. Thisvaried from1 $.70 \pm 0.21$ calves produced by lowmil kproducers (< 1500 kg) to 3.97 ± 0.26 calves by highproducers (> 3500kg).This might be due to allowing high producer cows to have more calvingthanlow producersand cullingof low producers.

Effect ofgeneration and sire

Thevariation due togenerationand sire in total alive (normal) calvesbornwasfound non-significant (Table 3 to 5).

These resultswerecontradictorywith findings Murrah buffalo (Tomarand Basu, 1981) and Sahiwal cattle (RawalandTomar, 1994). In Phule Trivenicows, the highest numberoftotal alive(normalcalvesborn(3.83 ± 0.89)wasrecorded in G9 generation followed by G5 generation (3.28 ± 0.24) and less numberoftotal normal calvesborn (2.71 ± 0.19) wasrecorded in G4generation (Table 4).

The non-significant effect of sire wasincloseagreement with observation in the Sahiwal cattle (Rawal and Tomar, 1994). Whereas, contradictoryfindingwerereportedin Brown Swiss crosses (Mukherjee and Tomar, 1996a) KaranSwisscattle (Mukherjee and Tomar, 1996b) and Frieswalcattle (Atrey *et al*., 2005). Thehighestnumberof totalalive (normal) calvesborn (3.52 ± 0.32) noticedforsire R29 followed by sire R65 (3.33 ± 0.38)and less num bero ftotalalivecal veborn wereobserved (2.96 ± 0.38) forsire R90 (Table 6).

periodof birth, seasonof birth, generation and siredif ferences wasnon-significantontotal normal (alive) calvesborn.While, theeffectof ageatfirstcalving and firstlactationmilkyieldon total calves born was significant.

REFERENCES

Atrey, R. K., Singh, H. and Sharma, R. K. 2005. Factorsaffecting theproductive herdlife, longevity andlifetimecalf productiontraitsin Frieswalcattle. *Indian J. Anim. Sci.* **75(10):** 1172-1175.

Goshu, G. 2005. Breeding efficiency, lifetimelactationand calvingperformanceof Friesian-Borancrossbredcows atCheffafarm. *Livestock Res. Rur. Develop.* **17(7):** 23-45.

Goshu, G., Singh, H. and Petersson, K. J. 2014. Effectof non-geneticfactorsonherd life,selectivevalueand its components inHolsteinFriesiancows. *Indian J. Anim. Sci.* **85(7):** 50-53.

Gowane, G. R. and Tomar, S. S. 2007. Geneticandnon-genetic factors affectingselectivevaluein aherdof Murrah buffaloes. *Indian J. Dairy Sci.* **60(1):** 25-29.

Harvey, W. R. 1990. Leastsquare analysisof data withunequal subclass numbers. ARS H-4, USDA, Washington, USA.

Jakhar, G. S., Singh, R., Malik, C.P. and Rajkumar. 2010. Factorsaf fecting productive herd life, longevityand life timecalf production traitsinHarianacattle, *Indian J. Anim. Sci.* **80(12):** 1251-53.

Kramer, C. Y. 1957. Extensionof multiplerangetestto group correlatedad justed mean, *Biometrics*. **13:** 13-20

Kumar, A., Gandhi, R. S. and Paul, A. K. 2009. Genetic evaluationofli fetimetraitsin Sahiwalcattle. *Indian J. Dairy Sci.* **62:** 31-34.

Kumar, A., Kumar, S., Singh, U. and Beniwal, B. K. 2014. Factorsaf fecting herdli feandtotalcalf productionin Frieswalcows. *Indian J. Anim. Res*. **48(2):** 159-161.

Kumar, A., Singh, U., Khanna, A. S. and Singh, R. P. 2009. Geneticandnon-geneticvariabilityinselectivevalue of Harianacows. *Indian J. Anim. Sci.* **79(3):** 388-91.

Mukherjee, K. and Tomar, S. S. 1996c. Geneticsanalysis of selective valueandits components in aherdof crossbred cattle. *Indian J. Anim. Sci.* **46:** 110-114.

Mukherjee, K. and Tomar, S. S. 1996a. Genetic analysis ofselective valueandits componentsina herd of Brown Swisscrosses. *Indian J. Dairy Sci.* **66(7):** 738-741.

Mukherjee, K. and Tomar, S. S. 1996b. Genetic analysisof selectivevalue and its component sinaherd of Karan Swisscattle. *Indian J. Anim. Sci.*, **66:** 738-41.

Mukherjee, K. and Tomar, S. S.1997. Geneticsof femalecalf lossesupto maturity andreplacement rate in crossbred cattle.*IndianJ. DairySci.*, **50(6):** 473-76.

Poonma, R. and Goswami, S. C. 2005a. Effectof ageatfirst calving onproductive herd life, longevity and lifetime calfproductionin Tharpar karcattle. *Indian J. Dairy Sci.* **58**: 439-41.

Poonma, R. and Goswami, S. C. 2005b. Effectofseasonoffirst calvingon productive herdlife,longevity and lifetime calf productionin Tharparkar cow. International. *J. Cow. Sci.* **1(1)**: 33-35.

Rawal, S. C. and Tomar S. S.1994. Geneticvariabilityinlifetime calfcropof Sahiwal cattle. *Indian J. Dairy Sci.* **47:** 455-58.

Rawal, S. C., Tomar, S. S., Lathwal, S. S. and Mukherjee, K. 1993. Coefficient of gene replication in a herd of Tharparkar cows. *Indian Vet. J.* **70:** 537-39.

Singh, U., Kumar, A., Kumar, S. and Beniwal, B.K. 2011. Evaluation of Sahiwal cattleforlifetimetraitsin an organizedherd. *Indian J. Anim. Sci.* **81(7)**: 708-710.

Tomar, S. S. and Basu, S. B. 1981. Genetic study on lifetime productivetraits of Murrahbuffaloes. *Indian J. Dairy Sci.* **34(2):** 195-98.

Tomar, S. S. and Rawal, S. C. 1994. Replace mentrate in Sahiwal herd. *Indian Vet.J.* **71(12)**: 1334-38.

Tomar, S. S., Lathwal, S. S. and Mukherjee, K. 1995. Genetic contribution of cows tofuture generationin Red Sindhiherd. *Indian J. Anim. Sci.* **65(12):** 1334-133.