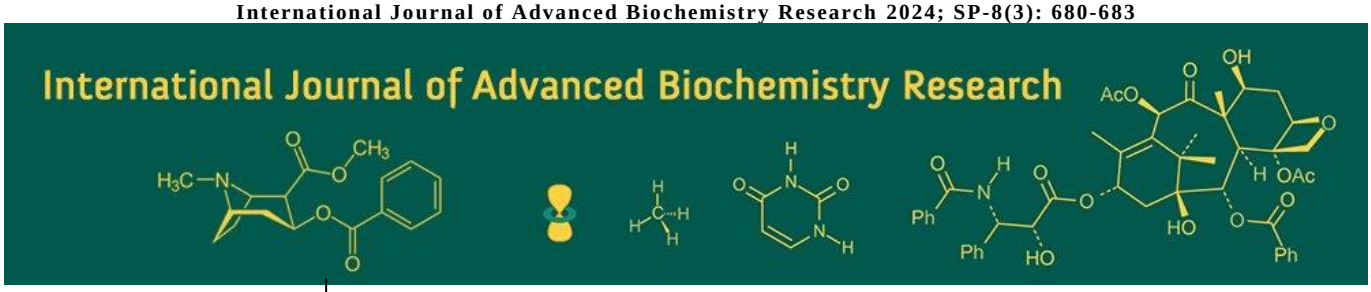

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Effect of non genetic factors on herd life and productive life of Gir crossbreds maintained at organized farm

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Abstract
The relevant data were collected from the history and pedigree sheets maintained at Research Cum Development Project on Cattle, M.P.K.V, Rahuri.(MS) for the period of 30 years (1990 to 2020) on lifetime traits of Phule Triveni and halfbreds. The data were classified into different seasons and periods and the data spred over 30 year duration were classified into total 8 period of calving of 3 year each. In order to overcome non rectiliniar of the data due to unequal subclass frequencies, least square techniques (Harvey 1990) [10] was used to examine by using different effect of non genetic factors. The results acheived in the present study of the overall least square means of herd life in IH, PT and R group were 3340.11±114.06 days, 2909.67±98.16, 3308.31±180.17 days respectively. The overall least squares means of productive life in IH, PT, R group were 1660.26±89.76 days, 1352.71±68.58days, 1378.72±106.68 days respectively. The period of calving had significant influence on herd life and productive life in all the genetic group of Gir crossbreds , while the season of calving had non significant influence on the herd life and productive life in all genetic group.

Keywords: Herd life, productive life, non genetic factors

Introduction
Animal husbandry and dairying has been an essential part of Indian culture since time age old. The more preponderance superiority of the vegetarian population of the country depends mainly on the milk and milk products to meet their need of animal protein of high biological value and trace nutrients. Productive life of the dairy cattle in the herd is a function of both fertility and producing ability of the animal. Animals with higher productive life are bound to have a greater herd life and are highly economical for dairy farming. Increasing productive life reduced costs of replacement, increased lifetime milk production and number of calving (Almasri *et al*., 2020) [15].

Lifetime traits are some of the economically essential traits in dairy production and are a replication of both the productive and reproductive efficiency of farm animals. The stayability of dairy cows is a convoluted trait with low heritability and affected by various factors. Longevity of a dairy cow is also measured by the culling practices of the farm and might be different due to differences in the production system. Animal could be culled due to disease, lower production, conformation problems and other economic reasons. The economic result of dairy cattle depends on its lifetime performance rather than single lactation performance. Advancement in the longevity of cows can result in higher lifetime milk production which leads to efficient economic output. In addition, higher longevity could help to mimimize the cost of replacement, enhance the proportion of cows found in high production age and avail data and productive cows for selection. However, there is limited information on the lifetime performance of crossbred dairy cattle in recent year. Therefore, this study was aimed to analyze the lifetime performance of crossbred dairy cattle (Tefera, *et al*., 2020) [14].

Materials and Methods Source of data
A total record of 236 Gir crossbreds spread over 30 years from 1990-2020 were collected for the study from history-cum-pedigree sheets and daily milk yield records maintained at

Research Cum Development Project (RCDP) on Cattle, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar (M.S.)

Standardization of data
The records of the Gir crosses of known pedigree and with normal lactation were included in the present study. The bulls with 3 or more progenies were considered for the present study. Lactation yields shorter than 100 days and less than 800 kg were excluded from the present study. The data were classified into different seasons and periods.

Classification of data
The observations pertain to some production traits of Phule Triveni and halfbreds of genetic group IH, PT and R will be collected for a period of 1990 to 2020.

Statistical Analysis
In order to reduce non rectilinear of the data outcoming from dissimilar and unequal sub class frequencies, the least squares analysis method recommanded by Harvey (1990) [10] was used for analysis of data. The following mathematical models were used to estimate least squares means of lifetime traits by considering effects of different factors.

Model – I
Model used for evaluation of least squares means of herd life, productive life by studying non-genetic factors, is as follows:

$Yijk = \mu + Pi + Sj + eijk$

Where,
Yijk = kth Observations of lifetime trait in ith period of calving and j th season of calving
μ = Population mean
Pi = Effect of ith period of calving (i = 1, 2……11) Sj= Effect of jth season of calving (j = 1, 2 and 3) eijk = Random error associated with NID ~ (0, σ2 e)

Duncan's Multiple Range Test (DMRT)
The effects whenever were significant the differences among means were examined for significance by Duncan's Multiple Range Test (DMRT) as modified by Kramer (1957) [16].

Write conclusion in 100-120 following
Results and Discussion
Herd life
The overall least squares means of herd life of Gir crossbreds in IH, PT and R genetic group was 3340.11±114.06, 2909.67±98.16 ,3808.31±180.17days respectively. However, Gahlot *et al*., (2001) [9], Chaudhary *et al*., (2019) [5] notes similar herd life in Tharparkar cattle. However, in R genetic group Ambhore *et al*., [1] observed similar herd life (2885.20±55.46) in PT cattle. Rathee (2015) [12] observed herd life in Frieswal cattle as 2928.89±145.43 days.

Effect of period of calving
The effect of period of calving was significant (P<0.01) on herd life in IH, PT and R genetic group. The highest (4007.14±356.13 days) herd life was noticed in IH genetic group in period P1 (1990-1993) and the lowest (2151.46±421.70days) herd life in period P7 (2014- 2017). In PT genetic group the highest (3578.22±253.57 days) was noticed in P5 (2006- 2009) period and the lowest (1974.52±211.11days) herd life in period 8 (2018-2020). In R genetic group the highest(4226.61±515.58) herd life between period P2 (1994-1997) and the lowest (2363.67±821.46) herd life between period p8 (2018-2020). Dash (2014) [6] and Ambhore *et al*., (2017) [1], Raheja (1994) [11], Chaudhary and Shafiq (1995) [4] indicated significant effect of Period of calving on herd life in HF crosses.

Effect of season of calving
The season of calving had non significant influence on herd life was in IH, PT and R genetic group. In IH, R and PT genetic group the highest herd life was observed (3444.42±149.35 days), (3369.70±243.43), (3097.19±136.38 days) in cows calved during winter season and the least (3265.84±165.05 days) (3204.44±243.55 days) and (2805.48±177.93 days) herd life was noticed in cows calved in summer season. Deshmukh (2008) [7] and Dash (2014) [6] reported non-significant herd life while, Chaudhary and Shafiq (1995) [4] and Raheja (1994) [11] stated effect of season of calving was significant on herd life in HF crossbreds

Productive life
The overall least square means of productive life in Gir crossbreds of IH, PT and R genetic group were 1660.26±89.76, 1352.71±68.58, 1378.72±106.68 days, respectively.
However, Ambhore *et al*., (2017) [1] observed similar PL in PT cattle (1875±28 days), Rathee (2015) [12] noted higher (2008.81±107.82 days) PL in Frieswal cattle. Deshmukh (2008) [7] reported PL as 1641.42±99.58 days in PT cattle which is in close agreement with present result in IH genetic group. However, Tefera *et al*., (2020) [14] reported (1367.8±37.7 days) similar herd life as reported in PT and R genetic group.

Effect of period of calving
The significant effect of (P<0.05) of Period of calving was observed in productive life in IH, PT and R genetic group. In IH genetic group the highest (1993.56±179.68) PL was noticed for the cows calved between the duration of period P2 (1994-1997) and the least (1339.35±331.88) PL was noticed between the duration of period of P7 (2014-2017). In PT genetic group the highest (2252±177.16) PL was noticed for the cows calved between the duration of the period P5 (2006-2009) and least (600.53±147.49) PL during P8 (2018-2020). In R genetic group the highest (2311.37±305.28) PL was viewed for cows calved between the duration of the period of P2 (1994-1997) and the least (180.98±486.40) PL between period P8 (2018-2020), respectively. Ambhore *et al* (2017) [1], Atrey *et al*., (2005) [3] Dubey and singh (2005) [8] rumored significant effect of period of calving on PL in Frieswal and PT cattle. However, Dash (2014) [6], Singh *et al*., (2002) [13] notified non significant effect of Period of calving in HF×S and KF cattle, respectively.

Effect of season of calving
The Season of calving was non significant influence on PL in IH, PT and R genetic group. The higher PL was observed for cows calved in winter season and least in summer season in all genetic group, respectively. Identical to the present results Ambhore *et al* (2017) [1], Dash *et al.*, (2014) [6] stated non significant effect of Season of calving on PL in HF crossbred cattle.

Table 1: Analysis of variance indicating effects of non genetic factors on life time traits in IH genetic group.

IH				
Source of variation	**d.f**	**M.S.S**	**d.f**	**M.S.S**
POC	6	2623777.62*	6	896840.32*
SOC	2	228327.05*	2	89583.83
Error	77	884884.74	77	548094.62
Total	85		85	

Table 2: Least squares means for life time traits as affected by non genetic factors in IH genetic group.

IH						
Source of variation	**HL(days)**			**PL(days)**		
	N	**Mean**	**SE**	**N**	**Mean**	**SE**
Population mean (µ)	86	3340.11	114.06	86	1660.26	89.76
Period of calving						
P1 (1990-1993)	7	4007.14a	356.13	7	1844.34b	280.28
P2 (1994-1997)	17	3630.17b	228.30	17	1993.56a	179.68
P3 (1998-2001)	12	3363.46c	275.14	12	1459.68c	216.54
P4 (2002-2005)	14	3862.71b	260.55	14	1623.72b	205.06
P5 (2006-2009)	21	3397.55c	208.18	21	1968.99a	163.84
P6 (2010-2013)	10	2968.29d	298.85	10	1392.21c	235.20
P7 (2014-2017)	5	2151.46e	421.70	5	1339.35c	331.88
Season of calving						
S1 (Rainy)	22	3265.84	165.05	22	1602.93	162.37
S2(Winter)	29	3444.42	149.35	35	1720.85	134.00
S3 (Summer)	35	3310.07	136.22	29	1657.02	146.93

Means under each class in the same column with different superscripts differed significantly

Table 3: Analysis of variance indicating effects of non genetic factors on life time traits in PT genetic group.

Phule Triveni				
Source of Variation	**HL(days)**		**PL(days)**	
	d.f.	**M.S.S**	**d.f.**	**M.S.S**
POC	7	4216652.32**	7	2958430.89**
SOC	2	875675.72	2	570357.61
Error	84	578715.21	84	282471.23
Total	93		93	

Table 4: Least squares means for life time traits as affected by non genetic factors in Phule Triveni genetic group.

Source of variation	**HL (days)**			**PL(days)**		
	N	**Mean**	**SE**	**N**	**Mean**	**SE**
Population mean (µ)	94	2909.67	98.16	94	1352.71	68.58
Period of calving						
P1 (1990-1993)	8	3004.83c	269.38	8	1255.77c	188.20
P2 (1994-1997)	13	3411.26b	213.39	13	1747.78b	149.08
P3 (1998-2001)	10	2843.71c	240.91	10	1375.85c	168.31
P4 (2002-2005)	3	3349.71b	445.60	3	1561.43b	311.31
P5 (2006-2009)	9	3578.22a	253.57	9	2252.00a	177.16
P6 (2010-2013)	6	2891.74c	317.19	6	1076.41d	221.60
P7 (2014-2017)	31	2223.34d	140.99	31	951.92d	98.50
P8 (2018-2020)	14	1974.52e	211.11	14	600.53e	147.49
Season of calving						
S1 (Rainy)	23	2805.48	177.93	23	1201.20	124.31
S2(Winter)	41	3097.19	136.38	41	1487.03	95.28
S3 (Summer)	30	2826.32	146.83	30	1369.89	102.58

Table 5: Analysis of variance indicating effects of non genetic factors for life time traits in R genetic group.

R				
Source of Variation	**HL(days)**		**PL(days)**	
	d.f.	**M.S.S**	**d.f.**	**M.S.S**
POC	6	1227457.25*	6	936988.90**
SOC	2	119165.70	2	332175.03
Error	48	451288.48	48	158223.55
Total	56		56	

*$P<0.05$, **$P<0.01$

Table 6: Least squares means for life time traits as affected by non genetic factors in R genetic group.

R						
Source of variation	**HL(days)**			**PL(days)**		
	N	**Mean**	**SE**	**N**	**Mean**	**SE**
Population mean (μ)	57	3308.31	180.17	57	1378.72	106.68
Period of calving						
P2 (1994-1997)	7	4226.61a	515.58	7	2311.37a	305.28
P3 (1998-2001)	5	3651.35c	541.90	5	1649.58c	320.87
P4 (2002-2005)	6	3254.36c	348.59	6	1351.63d	206.40
P5 (2006-2009)	9	4115.21b	405.10	9	2071.40b	239.86
P6 (2010-2013)	23	2909.73d	190.88	23	1217.56d	113.02
P7 (2014-2017)	6	2637.25d	317.30	6	868.48e	187.88
P8 (2018-2020)	1	2363.67e	821.46	1	180.98f	486.40
Season of calving						
S1 (Rainy)	15	3350.79	243.49	26	1218.29	144.21
S2(Winter)	16	3369.70	243.43	15	1524.00	144.17
S3 (Summer)	26	3204.44	243.55	16	1393.86	144.14

Conclusion

In conclusion, the study investigated the herd life and productive life of Gir crossbreds across different genetic groups, considering the effects of period and season of calving. Results indicated significant variations in herd life across genetic groups and periods of calving, with notable differences observed between the highest and lowest values. Similarly, productive life also varied significantly across genetic groups and periods of calving. However, the season of calving showed no significant influence on either herd life or productive life across all genetic groups. These findings contribute to our understanding of factors affecting the longevity and productivity of Gir crossbred cattle, highlighting the importance of considering genetic background and calving periods in herd management strategies. Further research may delve into additional factors influencing these parameters for comprehensive herd management practices.

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