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# WEEKLY TEST DAY MILK YIELD AND LACTATION MILK YIELD IN HF X GIR HALFBRED

**U.Y. BHOITE[1], D.R. TAMBE[2] AND C.A. NIMBALKAR[3]**

***Department of Animal Husbandry and Dairy Science, Mahatma Phule Krishi Vidyapeeth, Rahuri – 413722, Dist. Ahmednagar (M.S.)***

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**ABSTRACT**

The data on milk production performance of 342 HF X Gir halfbreds were collected from records maintained at Research Cum Development Project on Cattle, Mahatma Phule Krishi Vidyapeeth, Rahuri (Maharashtra) for a period from year 1974 to 2013. Overall mean of 43 individual weekly test day milk yield varied from 3.16±0.14 kg ($WTDY_{43}$) to 13.52±0.14 kg ($WTDY_5$). The overall mean lactation milk yield was 3457.33 ± 41.79 kg. Effect of period of calving on all 43 weekly test day milk yield was significant (Ps<0.01) except $WTDY_4$. The influence of season and period of calving and age at first calving on lactation milk yield were significant (P<0.01). Phenotypic correlations among all test day milk yield ranged from 0.086 ($WTDY_1$ with $WTDY_{24}$) to 0.49 ($WTDY_{32}$ with $WTDY_{33}$). In HF X Gir halfbred heritability of lactation milk yield was 0.91 ± 0.15. The $h^2$ of weekly test day milk yield ranged from 0.10 ± 0.48 ($WTDY_{27}$) to 0.94 ± 0.44 ($WTDY_2$).

**Key word:** Gir, Lactation milk yield, Test day milk yield.

Livestock production plays a pivotal role in rural economy of developing countries like India. Milk yield is the result of interaction between genetic constitution of animal and its environment in which they thrive. There is a definite trend of milk secretion throughout the lactation of an animal. Milk production is a highly complex biological process influenced by animal genetic potential and several other non-genetic factors viz. season of calving, period of calving, age at first calving, lactation order etc. Genetic correlations amongst various weekly test days milk yield ranged from 0.26 ($WTDY_8$ with $WTDY_{18}$) to 1.0 ($WTDY_{12}$ with $WTDY_{42}$).

## MATERIAL AND METHODS

The present study was undertaken on milk production performance of 342 HF X Gir halfbreds having 1039 lactations and 14397 weekly test day milk yield by collecting data from pedigree, history and milk recording sheets maintained at Research Cum Development Project on Cattle, Mahatma Phule Krishi Vidyapeeth, Rahuri (Maharashtra) over a period of 40 years (1974 to 2013). Least squares means of weekly test day milk and lactation milk yield in HF x Gir halfbred were estimated by considering effects of season of calving, period of calving, lactation order and sire[5]. Duncan's Multiple Range Test (DMRT) was used to make pair wise comparison between the mean values[7]. The heritability of traits, phenotypic and genetic correlations among milk production traits were also worked out.

## RESULTS AND DISCUSSION

Overall mean weekly test day milk yield and least squares means of lactation milk yield as affected by period of calving, season of calving, lactation order, age at first calving and sire in HF X Gir halfbred are given in Table 1 and 2.

The overall mean weekly test day milk yield in HF X Gir halfbred varied from 3.16 ± 0.14 kg to 13.52 ± 0.14 kg recorded during 43$^{rd}$ and 5$^{th}$ weeks respectively. The results indicated that mean test milk yield gradually increased from 1$^{st}$ week (9.15 ±

1 Corresponding author: Professor and Department of Animal Husbandry and Dairy Science, E-mail: uddhavbhoite@yahoo.com

2 Ph.D. Animal Husbandry Scholar

3 Assistant Professor of Mathematics

0.13 kg) reaching peak during 5th week (13.52±0.14 kg) and thereafter, declined in same manner during succeeding weeks reaching lowest in 43rd week (3.16±0.14 kg). Similar trend of weekly test day milk yield was reported in Karan Fries[9] and Sahiwal cows[2].

The period of calving exerted significant (P<0.01) influence on weekly test day milk yield. These results were in accordance with those reported in Karan Fries cows[6]. The season of calving had non- significant effect on WTDMY except in $WTDY_1$ (P<0.05). The variation due to age at first calving was non- significant in all weekly test day milk yield from $WTDY_1$ to $WTDY_{43}$. Similar results were reported in Karan Fries cows[10].

The overall least squares mean of lactation milk yield in HF X Gir halfbred was 3457.33 ± 41.79 kg. These results were in accordance with those noticed in HF X Deoni halfbred[11]. The influence of period of calving on lactation milk yield was significant (P < 0.01). The DMRT revealed that lactation milk yield of cows calved during $P_1$ (4035.60 ± 68.87kg) was significantly higher than cows calved in $P_2$ to $P_6$ periods. The LMY of cows calved during $P_2$ (3643.89 ± 71.11) was significantly higher than cows calved in $P_3$ to $P_6$ periods. The higher LMY during initial period ($P_1$) than succeeding periods might be due to presence of cows of FG original group in that period which showed hetrotic effect. Whereas, LMY declined during later period than initial period might be due to the reduced number of original FG cows and increased interbred in which there might have been reduced the hetrotic effect.

In HF X Gir halfbred effect of season of calving on lactation milk yield was significant (P<0.01). The results revealed that lactation milk yield (kg) of cows calved during season $S_2$ (3567.24 **± 58.72**) was significantly higher than cows calved in $S_1$ (3343.39 ± 59.39) and at par with $S_3$ (3461.27 ± 56.51) season. The higher LMY in cows calved during winter season might be due to abundant availability of green fodder to milking cows in winter.

**Table 1. Overall mean weekly test day milk yield in HF X Gir halfbred**

| Week | WTDMY (Kg) | Week | WTDMY (Kg) |
|---|---|---|---|
| $WTDY_1$ | 9.15±0.13 | $WTDY_{23}$ | 8.37±0.11 |
| $WTDY_2$ | 11.21±0.14 | $WTDY_{24}$ | 8.16±0.11 |
| $WTDY_3$ | 12.30±0.14 | $WTDY_{25}$ | 7.91±0.11 |
| $WTDY_4$ | 13.13±0.14 | $WTDY_{26}$ | 7.64±0.12 |
| $WTDY_5$ | 13.52±0.14 | $WTDY_{27}$ | 7.38±0.12 |
| $WTDY_6$ | 13.45±0.14 | $WTDY_{28}$ | 7.20±0.11 |
| $WTDY_7$ | 13.13±0.14 | $WTDY_{29}$ | 6.96±0.11 |
| $WTDY_8$ | 12.64±0.14 | $WTDY_{30}$ | 6.73±0.12 |
| $WTDY_9$ | 12.24±0.14 | $WTDY_{31}$ | 6.50±0.11 |
| $WTDY_{10}$ | 11.87±0.14 | $WTDY_{32}$ | 6.26±0.12 |
| $WTDY_{11}$ | 11.55±.13 | $WTDY_{33}$ | 6.04±0.12 |
| $WTDY_{12}$ | 11.19±0.13 | $WTDY_{34}$ | 5.83±0.12 |
| $WTDY_{13}$ | 10.91±0.12 | $WTDY_{35}$ | 5.62±0.12 |
| $WTDY_{14}$ | 10.66±0.12 | $WTDY_{36}$ | 5.35±0.12 |
| $WTDY_{15}$ | 10.43±0.12 | $WTDY_{37}$ | 5.10±0.12 |
| $WTDY_{16}$ | 10.15±0.12 | $WTDY_{38}$ | 4.55±0.13 |
| $WTDY_{17}$ | 9.88±0.12 | $WTDY_{39}$ | 4.88±0.13 |

| | | | |
|---|---|---|---|
| $WTDY_{18}$ | 9.68±0.12 | $WTDY_{40}$ | 4.23±0.13 |
| $WTDY_{19}$ | 9.37±0.11 | $WTDY_{41}$ | 3.89±0.13 |
| $WTDY_{20}$ | 9.13±0.12 | $WTDY_{42}$ | 3.52±0.13 |
| $WTDY_{21}$ | 8.89±0.11 | $WTDY_{43}$ | 3.16±0.14 |
| $WTDY_{22}$ | 8.89±0.11 | | |

The variation due to lactation order in LMY of HF X Gir halfbred was significant (P < 0.01). These results were in conformity with those reported in HF X Deoni halfbred[11]. The LMY of cows in $L_5$ (3810.27 ± 10.94kg), $L_3$ (3560.49 ± 71.05 kg) and $L_4$ (3810.27 ± 104.94 kg) lactations was significantly higher than those of cows in $L_1$ (2966.56 ± 54.51 kg) and $L_2$ (3252.30 ± 62.48 kg) lactations, which did not differed significantly from each other. These results indicated that in HF X Gir halfbred LMY gradually increased from 1st lactation up to 5th lactation. This might be attributed to their physiological development of body, milk secretary tissues and mammary gland with advancing age.

Influence of age at first calving on lactation milk yield was significant (P < 0.05). Similar results were noticed in HF x Deoni crossbred[3]. The LMY of cows of $A_1$ group (3582.69± 55.75 kg) was at par with cows of $A_2$ (3436.10±77.78 kg) and significantly higher than $A_3$ (3353.22± 67.02 kg) group thereby indicating that cows calving at young age produced significantly less milk, which might be due to the animals in this age group might not have attained optimum age and body weight at calving. In HF X Gir halfbred phenotypic correlations among weekly test day milk yield were positive and significant which were low to moderate for different WTDY. Phenotypic correlations among all test day milk yield ranged from 0.086 ($WTDY_1$ with $WTDY_{24}$) to 0.49 ($WTDY_{32}$ with $WTDY_{33}$). These results were in agreement with those reported in Gir triple cross cows[8]. The genetic correlations amongst various weekly test days milk yield ranged from 0.26 ($WTDY_8$ with $WTDY_{18}$) to 1.0 ($WTDY_{12}$ with $WTDY_{42}$). In present study very high, positive and significant genetic correlations was observed among WTDY. Present results were similar to the estimates of genetic correlations among test day milk yield reported in Holstein Friesian[1].

**Table 2. Least squares means of lactation milk yield in HF X Gir halfbred as affected by non-genetic factors**

| Source of variation | n | LMY (kg) |
|---|---|---|
| Population mean (u) | 1039 | 3457.33 ± 41.79 |
| **Period of calving** | | |
| $P_1$ (1974-1980) | 385 | $4035.60^{a}$ ± 68.87 |
| $P_2$ (1981-1987) | 194 | $3643.89^{b}$ ± 71.11 |
| $P_3$ (1988-1994) | 143 | $3145.25^{d}$ ± 79.67 |
| $P_4$ (1995-2001) | 182 | $3428.52^{c}$ ± 69.90 |
| $P_5$ (2002-2008) | 95 | $3141.95^{d}$ ± 10.02 |
| $P_6$ (2008 and above) | 40 | $3378.81^{c}$ ± 15.69 |
| **Season of calving** | | |
| $S_1$ (Rainy) | 330 | $3343.39^{b}$±59.39 |
| $S_2$ (Winter) | 356 | $3567.34^{a}$±58.72 |
| $S_3$ (Summer) | 353 | $3461.27^{ab}$±56.51 |

| | | |
|---|---|---|
| **Lactation order** | | |
| $L_1$ | 342 | 2966.56$^{c}$±54.51 |
| $L_2$ | 268 | 3252.30$^{b}$±62.48 |
| $L_3$ | 201 | 3560.49$^{a}$±71.05 |
| $L_4$ | 144 | 3697.05$^{a}$±82.01 |
| $L_5$ | 84 | 3810.27$^{a}$±104.94 |
| **Age at first calving** | | |
| $A_1$ (<950) | 629 | 3582.69$^{a}$±55.75 |
| $A_2$ (951-1050) | 171 | 3436.10$^{ab}$±77.78 |
| $A_3$ (1051 and above) | 239 | 3353.22$^{b}$±67.02 |

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

In HF X Gir halfbred heritability of lactation milk yield was 0.91 ± 0.15. The $h^2$ of weekly test day milk yield ranged from 0.10 ± 0.48($WTDY_{27}$) to 0.94 ± 0.44 ($WTDY_2$). Higher heritability estimates were observed in middle segment than initial and later segment. In accordance with the present findings low to moderate heritability estimates were reported in Sahiwal cattle[2].

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