



## To assess the effect of dry period on subsequent production and reproduction performance of Holdeo (Holstein Friesian x Deoni) straightbreds

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### Abstract

The present study was undertaken to evaluate the effect of non genetic factors on production and reproduction performance in Holdeo (HF x Deoni). It involves investigations of productive and reproductive characteristics viz., Lactation milk yield, Peak milk yield, Days to reach peak milk yield, Lactation period, Dry period, Service period, Gestation period and Inter calving period. The study included 20 years data (1976-1995) on total number of animals 223 Holdeo straightbred cows. The overall least squares means were recorded for LMY ( $1491.58 \pm 21.62$  kg), PMY ( $7.12 \pm 0.02$  kg), DRPMY ( $35.82 \pm 0.16$  days), LP ( $288.58 \pm 2.14$  days), DP ( $141.24 \pm 1.52$  days), SP ( $156.96 \pm 2.49$  days), GP ( $273.77 \pm 0.06$  days) and ICP ( $429.43 \pm 2.44$  days). The LMY, PMY, LP, DP, SP, GP and ICP in Holdeo cow was not significantly affected by period of calving, season of calving and lactation order and dry period. The DRPMY was significantly affected by lactation order and dry period ( $P < 0.05$ ) in Holdeo straightbred cows. However, period of calving and season of calving had non-significant effect on DRPMY. Overall least squares means of DP in Holdeo cow was  $141.24 \pm 1.52$  days. The effect of period of calving on GP was significant ( $P < 0.01$ ), however, season of calving lactation order and dry period was non significant effect on GP. Overall least squares means for GP in Holdeo cows was  $273.77 \pm 0.05$  days. Only period of calving had significant ( $P < 0.01$ ) effect on GP.

**Key words.** Holdeo, productive and reproductive characteristics.

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### I. Introduction

India is the world's largest producer and consumer of milk with a global share of about 22 per cent. Another factor that makes India leading producer in milk is the technology, which enables it to increase productivity. India has largest livestock population in the world 535.78 millions. The cattle population is 192.49 millions, out of which 142.11 millions indigenous and 50.42 millions crossbred. The total buffaloes in the country is 109.85 Million. The overall contribution of livestock sector in total GDP is 4.11 per cent and 25.6 % of total Agriculture GDP. In our country, the average milk productivity of crossbred cows, indigenous cows and buffaloes is about 7-8, 2.4-3 and 6.8 kg/day, respectively (20<sup>th</sup> Livestock Census). Holstein Friesian is the exotic elite milch purpose breed. It was originated in two Northern most provinces of Netherlands i.e. Western Friesland and North-Holland. Later on it has spread almost all over the European countries as well as over the world. The main stay of dairy industries in countries like U.S.A., Australia, New Zealand is the Friesian breed. With the introduction of exotic inheritance in indigenous cattle, improved attributes like high milk yield, age at first calving, early sexual maturity, efficient feed conversion efficiency and higher butter fat percentage has been observed.

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In India, crossbreeding of Zebu cattle with exotic germplasm is considered as a national policy, both on the organized farm as well as in field condition. Crossbreeding of Indian cows with exotic dairy breeds has been

started in our country under cattle developing programme from 3<sup>rd</sup> five year plan. Crossbreeding programme in India has made significant impact on milk production in the country. The greatest advantage of crossbreeding is attributed to faster growth rate eventually leading better reproduction and production. Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (MS), has taken a project for improvement of Deoni cattle breed by crossbreeding with elite exotic breed, named as Holstein Friesian. The effect of variation in dry period on subsequent lactation production and reproduction, for modern day dairy cattle is largely unknown and warrants re-evaluation. Therefore, this investigation was planned to study “Effect of Dry Period on the Subsequent Productive and Reproductive Performance in Holdeo (Holstein Friesian x Deoni) Straightbreds”.

## II. Materials and Methods

Earlier the CCBP use to maintain Friesian x Deoni cattle. The data accumulated on production characters of Holdeo straightbred was considered in the present study. The information on characters namely lactation milk yield (LMY), Peak milk Yield (PMY), Days to reach peak milk yield (DRPMY), Lactation period (LP), Dry period (DP), Service period (SP), Gestation period (GP) and Intercalving period (ICP) were taken from the pedigree sheets, daily milk yield record and breeding records maintained at the farm. In all records of Holdeo straightbred dams with lactations over a period of 20 years (1976 to 1995) were included in the study. The data were analysed for linear model. Duncan Multiple Range Test (DMRT) was employed to test and locate means that significantly differed from each other (Kramer, 1957).

$$y_{ijkl} = \mu + S_i + P_j + e_{ijkl}$$

$y_{ijkl}$  - Observation for  $i^{\text{th}}$  season and  $j^{\text{th}}$  period of calving

$\mu$  - The overall mean

$S_i$  - The effect of  $i^{\text{th}}$  season of calving

$P_j$  - The effect of  $j^{\text{th}}$  period of calving

$e_{ijkl}$  - Random error associated with NID ( $\delta^2e$ )

## III. Results and Discussion

### Lactation Milk Yield

The least squares means of LMY and analysis of variance showing effect of period of calving, season of calving, lactation order and dry period on lactation milk yield in Holdeo straightbred cattle are presented in Table 1 and 2. The overall least squares means for LMY of Holdeo crossbred cattle was  $1491.58 \pm 21.62$  kg. These results were close to Sing and Dave (1989), Thombre (1991) and Bhutkar (2015) in Holstein Friesian x Deoni halfbred. The effect of period of calving on LMY was non significant in Holdeo straightbred cattle (Table 8). The mean LMY (Kg) was higher in period  $P_3$  ( $1552.02 \pm 33.87$ ) followed by  $P_1$  ( $1546.67 \pm 54.61$ ),  $P_2$  ( $1467.16 \pm 36.21$ ) and lowest in  $P_4$  ( $1400.46 \pm 38.85$ ). The results were supported with the findings of Taneja and Sikka (1981) in Red Sindhi, Thombre (1991) in HF x Deoni halfbred, Bhopale (2008) in Holstein Friesian x Deoni and Zewdu *et al.* (2013) in Holstein Friesian x Deoni crossbred cattle. The variation due to season of calving in LMY of Holdeo straightbred cattle was non significant (Table 8). The LSM of LMY (Kg) was higher in cows calved during season  $S_1$  ( $1565.72 \pm 32.35$ ) followed by  $S_2$  ( $1473.24 \pm 32.90$ ) and lowest in  $S_3$  ( $1435.78 \pm 37.98$ ). Similar results reported by Sing and Dave (1989) in Friesian x Tharparkar, Thombre (1991) in Holstein Friesian x Deoni crossbred and Bhutkar *et al.* (2015) in Holstein Friesian x Deoni.

**Table 1 Peak Milk Yield (PMY) in Holdeo Straightbreds**

Source	Code	N	LSM+SE
Mean	$\mu$	860	$1491.58 \pm 21.62$
Period of calving	$P_1$	99	$1546.67 \pm 54.61$
	$P_2$	276	$1467.16 \pm 36.21$
	$P_3$	280	$1552.02 \pm 33.87$
	$P_4$	205	$1400.46 \pm 38.85$
Season of calving	$S_1$	335	$1565.72 \pm 32.35$
	$S_2$	308	$1473.24 \pm 32.90$
	$S_3$	217	$1435.78 \pm 37.98$

**Table 2 Analysis of variance for LMY in Holdeo Straightbreds**

Sources	DF	SS	MSS	F value calculated
Period of calving	3	3.09	1.03	0.35 <sup>NS</sup>
Season of calving	2	2.44	1.22	0.41 <sup>NS</sup>

### Peak Milk Yield (PMY)

The least squares means of PMY and analysis of variance showing effect of period of calving, season of calving, lactation order and dry period on peak milk yield in Holdeo straightbred cattle are presented in table

3 and 4. The effect due to season of calving on PMY was non significant (Table 4). This revealed that the season of calving not very influencing the variation on PMY in Holdeo straightbred cows (Table 9). The LSM for PMY (Kg) was higher in S<sub>3</sub> (7.19 ±0.04) followed by S<sub>1</sub> (7.11 ±0.04) and lowest in S<sub>2</sub> (7.07 ±0.04). These result support that Rathi and Sharma (1990) in Jersey x Sahiwal crossbreds, Kumar *et al.* (2014) and Bhutkar *et al.*(2015) in Holstein Friesian × Deoni.

**Table 3. Peak Milk Yield (PMY) in Holdeo Straightbreds**

Sources	Code	N	LSM ±SE
Mean	μ	860	7.12 ±0.02
Period of calving	P <sub>1</sub>	99	7.13 ± 0.06
	P <sub>2</sub>	276	6.96 ±0.04
	P <sub>3</sub>	280	7.11 ±0.04
	P <sub>4</sub>	205	7.30 ±0.04
Season of calving	S <sub>1</sub>	335	7.11 ±0.04
	S <sub>2</sub>	308	7.07 ±0.04
	S <sub>3</sub>	217	7.19 ±0.04

**Table 4 Analysis of variance for PMY in Holdeo Straightbreds**

Sources	DF	SS	MSS	Fvalue calculated
Period of calving	3	11.82	3.94	1.08 <sup>NS</sup>
Season of calving	2	15.74	7.87	2.16 <sup>NS</sup>

#### Days to Reach Peak Milk Yield (DRPMY)

The least squares means of DRPMY and analysis of variance showing effect of period of calving, season of calving, lactation order and dry period on days to reach peak milk yield in Holdeo straightbred cattle are presented in Table 5 and 6. The analysis of variance revealed non significant effect of period of calving on DRPMY in Holdeo straightbred cattle (Table 6). The effect due to season of calving on DRPMY was non significant (Table 12). The LSM for DRPMY (Days) was same in cows calved during S<sub>1</sub> (35.95 ±0.24) and S<sub>3</sub> (35.81 ±0.28) and lowest in S<sub>2</sub> (35.71 ±0.24). This has indicated that irrespective of any season of calving the cows for their DRPMY remains unchanged. These results were in agreement with Anarase (2011) in Holstein Friesian x Deoni crossbred cattle and Rafiullah (2014) in Holstein Friesian x Deoni crossbred cattle.

**Table 5 Days to reach peak milk yield in Holdeo Straightbreds**

Sources	Code	N	LSM ±SE
Mean	μ	860	35.82 ±0.16
Period of calving	P <sub>1</sub>	99	35.87 ±0.40
	P <sub>2</sub>	276	35.94 ±0.27
	P <sub>3</sub>	280	35.85 ± 0.25
	P <sub>4</sub>	205	35.64 ±0.29
Season of calving	S <sub>1</sub>	335	35.95 ±0.24
	S <sub>2</sub>	308	35.71 ±0.24
	S <sub>3</sub>	217	35.81 ±0.28

**Table 6 Analysis of variance for DRPMY in Holdeo Straightbreds**

Sources	DF	SS	MSS	F value calculated
Period of calving	3	10.26	3.42	2.16 <sup>NS</sup>
Season of calving	2	9.00	4.50	2.85 <sup>NS</sup>

#### Lactation Period (LP)

The least squares means of lactation period and analysis of variance showing effect of period of calving, season of calving, lactation order and dry period on lactation period in Holdeo straightbreds and presented in Table 7 and 8. The overall least squares means for LP of Holdeo straightbred cattle was 288.58 ±2.14 days. These results were close to Hassan and Khan (2013), Kumar *et al.* (2014) and Bhutkar *et al.* (2015) in Holstein Friesian x Sahiwal crossbred cattle. The analysis of variance indicated that effect due to period of calving on LP was non significant (Table 14). The LSM for LP was higher in cows calved in P<sub>3</sub> (294.49 ±3.36) followed by P<sub>1</sub> (293.99 ±5.41), P<sub>2</sub> (288.80 ±3.59) and lowest in P<sub>4</sub> (277.06 ± 3.85). Similar results were reported by Auradhkar and Sakhare (1984), Yadav and Rathi (1992) in Sahiwal and Dhale (2003) in Deoni cattle and Kumar *et al.* (2014) in HF crossbred cattle. The effect due to season of calving on LP was non significant (Table 8). The LSM of LP was higher in cows calved during S<sub>1</sub> (295.91 ± 3.21) followed by S<sub>2</sub> (291.10 ±3.26) and lowest in S<sub>3</sub> (278.73 ±3.76). These results were in agreement with Yadav and Rathi(1992), Joshi *et al.*(2005) in Deoni and Ongole cattle.

**Table 7 Lactation period in Holdeo Straightbreds**

Sources	Code	N	LSM + SE
Mean	$\mu$	860	288.58 $\pm$ 2.14
Period of calving	P <sub>1</sub>	99	293.99 $\pm$ 5.41
	P <sub>2</sub>	276	288.80 $\pm$ 3.59
	P <sub>3</sub>	280	294.49 $\pm$ 3.36
	P <sub>4</sub>	205	277.06 $\pm$ 3.85
Season of calving	S <sub>1</sub>	335	295.91 $\pm$ 3.21
	S <sub>2</sub>	308	291.10 $\pm$ 3.26
	S <sub>3</sub>	217	278.73 $\pm$ 3.76

**Table 8 Analysis of variance for LP in Holdeo Straightbreds**

Sources	DF	SS	MSS	Fvalue calculated
Period of calving	3	3.87	1.29	0.44 <sup>NS</sup>
Season of calving	2	3.86	1.93	0.67 <sup>NS</sup>

### Dry Period (DP)

The least squares means of DP and analysis of variance showing effects of season of calving, period of calving, lactation order and dry period on dry period in Holdeo cows are presented in Table 9 and 10. The effect of period of calving on DP was non significant in Holdeo cows (Table 16). The mean DP (Days) was higher in period P<sub>3</sub> (144.92  $\pm$  2.38) followed by P<sub>2</sub> (143.14  $\pm$  2.55), P<sub>4</sub> (140.53  $\pm$  2.73) lowest in P<sub>1</sub> (136.35  $\pm$  3.84). These results were supported with the findings of Jadhav *et al.* (1991) Thombre *et al.* (2000) in Friesian x Deoni and Soleimani *et al.* (2010) in HF cows and Zadeh and Mohit (2013) in Holstein cows. The variation due to season of calving in DP was non significant (Table 16). The LSM of DP (Days) was higher in cows calved during S<sub>3</sub> (143.70  $\pm$  2.67) followed by S<sub>2</sub> (140.00  $\pm$  2.32) and lowest in S<sub>1</sub> (140.00  $\pm$  2.78). More or less similar results were reported by Singh *et al.* Friesian x Sahiwal crossbreds, Siddiqui (1984) in Friesian x Sahiwal halfbred and Thalkari (1984) in Jersey x Deoni, Friesian x Deoni cattle, Soleimani *et al.* (2010) in HF cows and Zadeh and Mohit (2013) in Holstein cows.

**Table 9 Dry period in Holdeo Straightbreds**

Sources	Code	N	LSM $\pm$ SE
Mean	$\mu$	860	141.24 $\pm$ 1.52
Period of calving	P <sub>1</sub>	99	136.35 $\pm$ 3.84
	P <sub>2</sub>	276	143.14 $\pm$ 2.55
	P <sub>3</sub>	280	144.92 $\pm$ 2.38
	P <sub>4</sub>	205	140.53 $\pm$ 2.73
Season of calving	S <sub>1</sub>	335	140.00 $\pm$ 2.78
	S <sub>2</sub>	308	140.00 $\pm$ 2.32
	S <sub>3</sub>	217	143.70 $\pm$ 2.67

**Table 10 Analysis of variance for DP in Holdeo Straightbreds**

Sources	DF	SS	MSS	Fvalue calculated
Period of calving	3	6.09	2.03	1.4 <sup>NS</sup>
Season of calving	2	2.18	1.09	0.75 <sup>NS</sup>

### Service Period (SP)

The least squares means of SP and analysis of variance showing effects of period of calving, season of calving, lactation order and dry period on service period in Holdeo cows are presented in Table 11 and 12. The effect of period of calving on SP was non significant in Holdeo cows (Table 18). The DMRT revealed that the SP of Holdeo cows calved during P<sub>3</sub> (166.29  $\pm$  3.91) was higher than cows calved in P<sub>1</sub> (161.13  $\pm$  6.30), P<sub>2</sub> (158.36  $\pm$  4.18), P<sub>4</sub> (142.07  $\pm$  4.48). The results are supported with the findings of Patil (1983) in F x D halfbred, Sharma *et al.* (1988) in Friesian x Ongole, Chaudhari *et al.* (2013), Bhutkar *et al.* (2014a) in Holstein Friesian x Deoni cows. The variation due to season of calving on SP in Holdeo cows was non significant (Table 12). The LSM of SP was higher in cows calved during season S<sub>1</sub> (162.98  $\pm$  3.73) followed by S<sub>2</sub> (160.15  $\pm$  3.80), S<sub>3</sub> (147.75  $\pm$  4.38). More or less similar results were reported by Singh and Gurnani (2004) in Karan Fries and Karan Swiss, Chewale (2008) in HF X Deoni interse crossbred, Komatwar *et al.* (2010) in Friesian x Sahiwal cattle and Bhutkar *et al.* (2014a) in Holstein Friesian x Deoni.

**Table 11 Service period in Holdeo Straightbreds**

Sources	Code	N	LSM $\pm$ SE
Mean	$\mu$	860	156.96 $\pm$ 2.49
Period of calving	P <sub>1</sub>	99	161.13 $\pm$ 6.30
	P <sub>2</sub>	276	158.36 $\pm$ 4.18

	P <sub>3</sub>	280	166.29 ± 3.91
	P <sub>4</sub>	205	142.07 ± 4.48
Season of calving	S <sub>1</sub>	335	162.98 ± 3.73
	S <sub>2</sub>	308	160.15 ± 3.80
	S <sub>3</sub>	217	147.75 ± 4.38

**Table 12 Analysis of variance for SP in Holdeo Straightbreds**

Sources	DF	SS	MSS	Fvalue calculated
Period of calving	3	6.96	2.32	0.60 <sup>NS</sup>
Season of calving	2	3.18	1.59	0.41 <sup>NS</sup>

### Gestation Period (GP)

The least squares means of GP and analysis of variance showing effects of period of calving, season of calving, lactation order and dry period on gestation period in Holdeo cow are presented in Table 13 and 14. The effect of period of calving on GP was non significant ( $P < 0.05$ ) in Holdeo cows (Table 14). The DMRT revealed that the GP of Holdeo cows calved during period P<sub>4</sub> (276.31 ± 0.10) was significantly higher than P<sub>3</sub> (273.58 ± 0.09), P<sub>1</sub> (272.92 ± 0.15) and P<sub>2</sub> (272.27 ± 0.10). The results are supported with the findings of Hassan (1995) indigenous, Jersey cross, Sindhi cross, Sahiwal cross and Tariq (2000) in HF x Sahiwal crossbred cattle, Diack *et al.* (2004), Holstein cross and Bhutkar *et al.* (2014b) in Holstein Friesian x Deoni cows. The variation due to season of calving on GP in Holdeo cow was non significant (Table 14). The LSM of GP (Days) was higher in cows calved during S<sub>2</sub> (273.90 ± 0.08) followed by S<sub>1</sub> (273.77 ± 0.08), S<sub>3</sub> (273.64 ± 0.10). The results revealed that seasonal changes did not influence on the variation on GP in Holdeo cow. More or less similar results were reported by Mondal *et al.* (2005) in Jersey cross, Sahiwal cross and Sindhi crossbreds and Bhutkar *et al.* (2014b) in Holstein Friesian x Deoni cows.

**Table 13. Gestation period in Holdeo Straightbreds**

Sources	Code	N	LSM ± SE
Mean	μ	860	273.77 ± 0.06
Period of calving	P <sub>1</sub>	99	272.92 ± 0.15
	P <sub>2</sub>	276	272.27 ± 0.10
	P <sub>3</sub>	280	273.58 ± 0.09
	P <sub>4</sub>	205	276.31 ± 0.10
Season of calving	S <sub>1</sub>	335	273.77 ± 0.08
	S <sub>2</sub>	308	273.90 ± 0.08
	S <sub>3</sub>	217	273.64 ± 0.10

**Table 14 Analysis of variance for GP in Holdeo Straightbreds**

Sources	DF	SS	MSS	Fvalue calculated
Period of calving	3	18.42	6.14	2.94*
Season of calving	2	8.26	4.13	1.98 <sup>NS</sup>

### Inter Calving Period (ICP)

The least squares means of ICP and analysis of variance showing effects of period of calving, season of calving and lactation order and dry period on gestation period in Holdeo cows are presented in Table 15 and 16. The effect of period of calving on ICP was non significant in Holdeo cow (Table 16). The mean ICP (Days) was higher in period P<sub>3</sub> (436.73 ± 3.81) followed by P<sub>1</sub> (433.77 ± 6.15), P<sub>2</sub> (429.75 ± 4.07) and lowest in P<sub>4</sub> (417.46 ± 4.38). The results are supported with the findings of Bhoite *et al.* (1998) in Friesian x Jersey x Gir, Jersey x Friesian x Gir and Brown Swiss x Friesian x Gir crossbred, Bhutkar *et al.* (2014b) in Holstein Friesian x Deoni cows. The results revealed that Holdeo crossbred genotype possess shorter ICP and well adopted to the season of tract as such there will not be significant deviation in the expression of character. Results of Thombre *et al.* (2001) in Holstein Friesian x Deoni halfbred, Dubey and Singh (2005) in Sahiwal x Holstein Friesian, Sahiwal x Jersey and Sahiwal x Rathi x Holstein Friesian,

**Table 15 Inter calving period in Holdeo Straightbreds**

Sources	Code	N	LSM ± SE
Mean	μ	860	429.43 ± 2.44
Period of calving	P <sub>1</sub>	99	433.77 ± 6.15
	P <sub>2</sub>	276	429.75 ± 4.07
	P <sub>3</sub>	280	436.73 ± 3.81
	P <sub>4</sub>	205	417.46 ± 4.38
Season of calving	S <sub>1</sub>	335	437.75 ± 3.64
	S <sub>2</sub>	308	431.68 ± 3.70
	S <sub>3</sub>	217	418.85 ± 4.28

**Table 16 Analysis of variance for inter ICP in Holdeo Straightbreds**

Sources	DF	SS	MSS	Fvalue calculated
Period of calving	3	4.5	1.50	0.40 <sup>NS</sup>
Season of calving	2	4.62	2.31	0.62 <sup>NS</sup>

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