Studies on productive performance of Gaolao Cattle in the breeding tract of Maharashtra

Wagh RU, Thombre BM and Londhe GK

Abstract
The productive performance of Gaolao cattle were studied at different location in the breeding tract. The idea behind the collection of data in breeding tract of Gaolao cattle from the farmers and breeder heard of Gaolao rather than on the organized farm to obtain the real picture of productive performance of breed in the breeding tract. The productive traits often help in judging the economic value of the animal. In present finding the overall least square means for lactation milk yield (LMY) of Gaolao cattle was recorded as 520.79 ± 6.20 kg. The effect of block and colour was found non-significant on lactation milk yield (LMY) of Gaolao cattle. The overall least square means for peak milk yield (PMY) of Gaolao cattle was recorded as 470.725 kg, milk per lactation. It is also observed that, the native home of the breed is located along the route taken by Rig Vedic Aryans from the Northern passes through central India to the South. Therefore, the present study has been following objective:

1. To study the productive characteristics
2. To study the colour pattern effect on various characteristics
3. To study the block effect on various characteristics

2. Material and Methods
In present study the data on productive characteristics i.e. lactation milk yield (LMY), Peak milk yield (PMY), days to reach peak milk yield (DRPMY), lactation period (LP) and dry period (DP) were collected by actual interview with the Gaolao owners with the help of model questionnaire. The collected data was classified as per colour pattern (viz., White colour followed by Yellowish White and Grayish White). The data on productive traits were collected from different block of Vidarbha region of Maharashtra as mention below.
2.1 Productive characteristics
The analysis of data was done by method of Least Square Technique as outlined by Harvey (1990) [4]. The following mathematical model will be employed to analyze the data.

\[ Y_{ijlm} = \mu + B_i + C_j + O_{ik} + e_{ijlm} \]

Where,

- \( Y_{ijlm} \) = the record of \( m \)th Gaolao individual in \( i \)th block, \( j \)th colour and \( l \)th type of individual.
- \( \mu \) = is the population mean common to all the observations.
- \( B_i \) = is the effect of \( i \)th block of individual.
- \( C_j \) = is the effect of \( j \)th colour of individual.
- \( O_{ik} \) = is the effect of \( k \)th off-type of individual.

The significant effect was further analyzed to have all pair wise comparison by Duncan’s Multiple Range Test (DMRT) as modified by Kramar (1957) [6].

3. Results and Discussion
3.1. Productive characteristics
3.1.1 Lactation milk yield (LMY)
It was observed from Table 2 that the overall least squares mean for lactation milk yield (LMY) of Gaolao cattle was recorded as 520.79 ± 6.20 kg in present study which was in agreement with Kothekar et al. (2006) [5] reported as 516.8 ± 18.68, 501.07 ± 16.61, 519 ± 15.75, 535.28 ± 21.25 and 583.02 ± 38.45 kg in I, II, III, IV and V lactation in Gaolao cattle, respectively. The higher lactation milk yield than the present result was reported by Dhimal et al. (1989) [3] as 646.00 kg in Red Kandhari cattle, respectively. The lower lactation milk yield than the present result was reported by Bainwad et al. (2017) [1] reported as 417.28 ± 1.09 kg in Red Kandhari cattle, respectively.

3.1.2 Block effect on lactation milk yield
The difference observed in the LSMs for PMY of Gaolao cattle was non-significant due to block effect. The LSM for LMY of Gaolao cattle in block \( B_1, B_2, B_3, B_4 \) and \( B_5 \) were 521.40 ± 9.53, 519.53 ± 9.21, 516.41 ± 9.08, 522.63 ± 10.09 and 523.87 ± 9.21 kg, respectively. The LSM for LMY of Gaolao cattle recorded in \( B_2 \) was higher to that of recorded in \( B_1, B_3, B_4 \) and \( B_5 \) which also differed non-significant from each other.

3.1.3 Colour pattern effect on lactation milk yield
The differences observed in the LSMs for LMY of Gaolao cattle were non-significant due to colour pattern effect. The LSM for LMY of Gaolao cattle for colour pattern \( C_1, C_2 \) and \( C_3 \) were 527.97 ± 3.88, 524.53 ± 11.01 and 509.87 ± 14.47 kg, respectively. The LSM for LMY of Gaolao cattle in \( C_1 \) was higher to that of recorded in \( C_2 \), which differed non-significant from each other.

3.2 Peak milk yield (PMY)
It was observed from Table 3 that the overall least square mean for peak milk yield (PMY) of Gaolao cattle was recorded as 3.10 ± 0.03 kg in the present study which was in agreement with Kothekar et al. (2006) [5] as 3.16 ± 0.05 kg in Gaolao cattle, respectively. The lower peak milk yield than the present result was reported by Siddiqui et al. (2000) [9] reported as 2.27 ± 0.35 kg and Bainwad et al. (2017) [11] 2.63 ± 0.01 kg in Red Kandhari cattle.

3.2.2 Block effect on peak milk yield
The difference observed in the LSMs for PMY of Gaolao cattle was highly significant due to block effect. The LSM for PMY of Gaolao cattle in block \( B_1, B_2, B_3, B_4 \) and \( B_5 \) were 2.97 ± 0.04, 3.17 ± 0.04, 2.92 ± 0.04, 3.12 ± 0.05 and 3.31 ± 0.05 kg, respectively. The LSM for PMY of Gaolao cattle recorded in \( B_1 \) was higher to that of recorded in \( B_2, B_3, B_4 \) and \( B_5 \) which also differed highly significant from each other. The DMRT revealed that Gaolao cattle maintained at \( B_1 \) block had significantly higher PMY over other blocks.

3.2.3 Colour pattern effect on peak milk yield
The differences observed in the LSMs for PMY of Gaolao cattle were non-significant due to colour pattern effect. The LSM for PMY of Gaolao cattle for colour pattern \( C_1, C_2 \) and \( C_3 \) were 3.07 ± 0.02, 3.15 ± 0.05 and 3.07 ± 0.07 kg, respectively. The LSM for PMY of Gaolao cattle recorded in \( C_2 \) was higher to that of recorded in \( C_1 \) and \( C_3 \) which differed non-significant from each other.

Table 1: List of villages randomly selected for collection of data

| Sr. No. | Name of District | Name of Block | Name of Villages |
|---------|-----------------|---------------|-----------------|
| 1       | Wardha          | Arvi (B1)     | Chincholi, Danapur, Kharangna, Kinhala (Bothali), Pachod, Talegaon (Raghugi) |
|         |                 | Karanja (B2)  | Bhiwapur Heiti, Dharti, Heiti Kundi, Jaurwada, Kannamwar Gram, Selgaon |
|         |                 | Selu (B3)     | Akoli, Antargaon, Jamni, Madani, Masala, Zadsi |
|         |                 | Wardha (B4)   | Ashtaa, Bhan kheda, Bhugaon, Jaulgaon, Selukate, Zanzapur |
| 2       | Nagpur          | Katol (B5)    | Chandinpardi, Khandala, Murti, Parsoda, Sawanga, Walni |

Table 2: Least squares means for lactation milk yield (LMY) as affected by block and colour pattern in Gaolao cows

| Sources | Code | N | Lactation milk yield (Kg) | LSM ± SE |
|---------|------|---|--------------------------|---------|
| Population mean | \( \mu \) | 370 | 520.79 ± 6.20 |
| Effect of Block | | | | |
| Arvi | B1 | 68 | 521.40 ± 9.53 |
| Karanja | B2 | 80 | 519.53 ± 9.21 |
| Selu | B3 | 77 | 516.41 ± 9.08 |
| Wardha | B4 | 60 | 522.63 ± 10.09 |
| Katol | B5 | 85 | 523.87 ± 9.21 |
| Effect of Colour | | | | |
| White | C1 | 310 | 527.97 ± 3.88 |
| Yellowish white | C2 | 38 | 524.53 ± 11.01 |
| Grayish white | C3 | 22 | 509.87 ± 14.47 |
3.3.1 Days to reach the peak milk yield (DRPMY)
It was observed from Table 4 that the overall least square mean for days to reach peak milk yield (DRPMY) of Gaolao cattle was recorded as 34.49 ± 0.44 days. The slightly higher days to reach the peak milk yield than the present result has been reported by Salunkhe (2007) as 36.39 ± 0.48 days, Bhutkar (2014) as 44.81 ± 2.52 kg in Deoni cattle at CCBP, Parbhani and Bainwad et al. (2017) as 39.48 ± 0.09 days in Red Kandhari cattle, respectively.

3.3.2 Block effect on days to reach the peak milk yield
The difference observed in the LSMs for DRPMY of Gaolao cattle was non-significant due to block effect. The LSM for DRPMY of Gaolao cattle in block B1, B2, B3 and B4 were 33.25 ± 0.67, 34.59 ± 0.65, 35.06 ± 0.64, 34.80 ± 0.71 and 34.73 ± 0.65 days, respectively. The LSM for DRPMY of Gaolao cattle recorded in B1 was higher to that of recorded in B2, B3, B4 and B5 which differed non-significant from each other.

3.3.3 Colour pattern effect on days to reach the peak milk yield
The differences observed in the LSMs for DRPMY of Gaolao cattle were non-significant due to colour pattern effect. The LSM for DRPMY of Gaolao cattle for colour pattern C1, C2 and C3 were 34.56 ± 0.27, 33.66 ± 0.78 and 35.24 ± 1.02 days, respectively. The LSM for DRPMY of Gaolao cattle recorded in C3 was higher to that of recorded in C1 and C2, which differed non-significant from each other.

3.4 Lactation period (LP)
It was observed from Table 5 that the overall least square mean for lactation period (LP) of Gaolao cattle was recorded as 254.51 ± 1.17 days. The lower lactation period than the present result has been reported by Kotekar et al. (2006) as 249.18 ± 2.65 days in Gaolao cattle and Bainwad et al. (2017) as 242.64 ± 0.46 days in Red Kandhari cattle, respectively. The DMRT revealed that Gaolao cattle maintained at B2 block had significantly higher LP over other blocks.

3.4.2 Block effect on lactation period
The differences observed in the LSMs for LP of Gaolao cattle was significant due to block effect. The LSM for LP of Gaolao cattle in block B1, B2, B3 and B5 were 253.99 ± 2.63, 257.24 ± 2.55, 248.81 ± 2.51, 256.86 ± 2.79 and 255.64 ± 2.55 days, respectively. The LSM for LP of Gaolao cattle recorded in B2 was higher to that of recorded in B1, B3, B4 and B5 which differed significant from each other. The DMRT revealed that Gaolao cattle maintained at B2 block had significantly higher LP over other block.

3.4.3 Colour pattern effect on lactation period
The differences observed in the LSMs for LP of Gaolao cattle were non-significant due to colour pattern effect. The LSM for LP of Gaolao cattle for colour pattern C1, C2 and C3 were 256.00 ± 1.07, 258.75 ± 3.04 and 258.77 ± 4.00 days, respectively. The LSM for LP of Gaolao cattle recorded in C3 was higher to that of recorded in C1 and C2 which differed non-significant from each other.

3.5.1 Dry period (DP)
It was observed from Table 6 that the overall least square mean for dry period (DP) of Gaolao cattle was recorded as 172.71 ± 0.90 days. The lower days dry period than the present result has been reported by Kotekar et al. (2006) as 125.25 ± 1.37 days in Gaolao cattle. The higher days dry period than the present result has been reported by Bainwad et al. (2017) as 180.79 ± 0.56 days in Red Kandhari cattle, respectively.

3.5.2 Block effect on dry period
The difference observed in the LSMs for DP of Gaolao cattle was highly significant due to block effect. The LSM for DP of Gaolao cattle in block B1, B2, B3, B4 and B5 were 170.14 ± 1.38, 172.20 ± 1.33, 178.06 ± 1.31, 169.94 ± 1.46 and 173.21 ± 1.33 days, respectively. The LSM for DP of Gaolao cattle recorded in B1 was higher to that of recorded in B1, B2, B4 and B5 which differed highly significant from each other. The DMRT revealed that Gaolao cattle maintained at B1 block had significantly higher DP over other blocks.
3.5.3 Colour pattern effect on dry period
The differences observed in the LSMs for DP of Gaolao cattle were non-significant due to colour pattern effect. The LSM for DP of Gaolao cattle for colour pattern $C_1$, $C_2$ and $C_3$ were $172.88 \pm 0.56$, $170.88 \pm 1.59$ and $174.38 \pm 2.10$ days, respectively. The LSM for DP of Gaolao cattle recorded in $C_3$ was higher to that of recorded in $C_1$ and $C_2$ which differed non-significant from each other.

Table 6: Least squares means for dry period (DP) as affected by block and colour pattern in Gaolao cows

| Sources       | Code | N   | Dry period (Days) LSM ± SE |
|---------------|------|-----|---------------------------|
| Population    | μ    | 370 | 172.71 ± 0.90             |
| Effect of Block |     |     |                           |
| Arvi          | B_1  | 68  | 170.14 ± 1.38             |
| Karanja       | B_2  | 80  | 172.20 ± 1.33             |
| Selu          | B_3  | 77  | 178.06 ± 1.31             |
| Wardha        | B_4  | 60  | 169.94 ± 1.46             |
| Katol         | B_5  | 85  | 173.21 ± 1.33             |
| Effect of Colour |     |     |                           |
| White         | C_1  | 310 | 172.88 ± 0.56             |
| Yellowish white| C_2  | 38  | 170.88 ± 1.59             |
| Grayish white | C_3  | 22  | 174.38 ± 2.10             |

Note: Means connected by superscript do not differ significantly.

Conclusion
The effect of block was found significant to highly significant on Peak milk yield (PMY), Lactation Period (LP) and Dry Period (DP) whereas the effect of colour was found non-significant on all productive characteristics of Gaolao cattle. Hence it is concluded that the management practices, available water and feed resources and climatic condition followed there plays an important role on productive performance of Gaolao cattle.

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