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## Study of reproductive traits of Binjharपुरi cattle in its breeding tract

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### Abstract

The present study was conducted on 507 lactation records of Binjharपुरi cows from different clusters in Jajpur district of Odisha covering 4 blocks. The data were first analysed by least-squares variance technique of fitting constants to estimate the mean performance and the effect of genetic and non-genetic factors on reproduction traits. The average age of Binjharपुरi heifers at first calving was observed to be 1452.332±10.160 days. The least-squares mean and standard error are 115.061±1.106 days for service period, 281.296±0.193 days for gestation period, 396.357±1.088 days for calving interval. The location and lactation order had highly significant influence on service period, calving interval, age at first calving except gestation period. The season of calving had highly significant effect on service period, calving interval and non-significant influence on rest. The sex of calf had non-significant influence on all the reproduction traits.

**Keywords:** Binjharपुरi cattle, reproduction traits, service period, calving interval

### Introduction

Livestock are an integral component of agriculture in India and make multifaceted contributions to the growth and development of the agricultural sector. The Indian dairy sector is characterized more by 'production by masses' than 'mass production'. Odisha is one of the eastern coastal states of India blessed with great livestock diversity. Binjharपुरi is a dual purpose breed which derives its name from the place of its natural habitat i.e. Binjharपुर block in Jajpur district. It is found in large density in Jajpur district and some areas in adjoining Kendrapara and Bhadrak district of Odisha state. This study has been carried out to assess the influence of important genetic and non-genetic factors on reproduction traits in Binjharपुरi cattle as in absence of reliable information regarding these traits, it becomes difficult to estimate genetic parameters of the traits that provide the base to determine the optimum criterion of selection for improving overall performance of the animals.

### Materials and Methods

This study was carried out in the breeding tract of Binjharपुरi cattle i.e. the place of its natural habitat Binjharपुर block and adjacent blocks in Jajpur district. A total of 507 lactation records of Binjharपुरi cattle were collected from the breeding tracts through field survey. All complete lactations irrespective of their length were used for the study. Binjharपुरi cattle are reared mostly in free range system and occasionally in semi intensive system without any feed supplement as most of the farmers follow mixed agriculture. So field level data were collected by the questionnaire to the farmers. The study was undertaken in Binjharपुरi cattle of 5 clusters namely C1 to C5 (location) with various lactation order namely L1 to L5 and above at various seasons where S1 signifies summer season (March – June), S2 as rainy season (July – October) and S3 as winter season (November – February).

The analysis of data was done using the least squares analysis of variance technique (Harvey, 1990) [17] to study the non-orthogonal data associated with location, lactation order, season of calving and sex of calf born. Duncan's Multiple Range Test (DMRT) as modified by Kramer (1957) [18] was done for pair-wise comparisons of means wherever the significant difference among different levels of effects were obtained.

### Result and Discussion

**Age at first calving:** The mean age at first calving of 1452.332±10.160 days was observed in the present study. This was however lower than that of reports of Swain (2003) [19] in Motu cattle (1759.81±10.30 days), Samantray *et al.* (2009) [14] in Ghumusari cattle

(1577.95±10.17days). Lower than the present findings have also been reported by Dash *et al.* (2013)<sup>[6]</sup> in Binjharपुरi cow (1250.6±1.62 days) of Odisha.

#### Effect of location

The analysis of variance revealed highly significant effect of location on age at first calving. Similar results were also reported by Sai Reddy (2010)<sup>[12]</sup>, Kumar *et al.* (2016)<sup>[10]</sup> in Ongole cattle. It may be due to the differences in micro climate and feeding management at different locations.

#### Effect of season of calving

The average AFC was found to be 1530.550±17.846 days in summer season i.e. minimum and maximum as 1400.654±16.976 days in winter calvers. Age at first calvings among different seasons differed significantly. Winter calvers showed comparatively lower age at first calving than the summer calvers. Similar findings was also reported by Sai Reddy (2010)<sup>[12]</sup> in Ongole cattle. Contrary to this no significant effect of season of calving was observed by Savaliya *et al.* (2016)<sup>[15]</sup> in Gir cattle and Kishore (2016)<sup>[20]</sup> in Tharparkar cattle. The seasonal variations and provision of feeds and fodders to the cows during different seasons may be the reasons for varied age at first calving.

#### Effect of sex of calf

It has non significance impact on age at first calving in the present studies. The present finding is in accordance with Bhadoria *et al.* (2002)<sup>[2]</sup> in Gir cows.

#### Service period

The least-squares means for service period was found to be 115.061±1.106 days and was in close agreement with the results reported by Pundir *et al.* (2015)<sup>[11]</sup> in indigenous cattle of Mizoram (90-120 days) and Kishore (2016)<sup>[20]</sup> in Tharparkar cattle (122.04±4.264 days).

#### Effect of location

Service period of Binjharपुरi cattle among different location varied from 106.964±2.234 to 125.297±2.353 days. Analysis of variance revealed highly significant effect of location on service period. The significant effect of location on service period is also reported by Sai Reddy (2010)<sup>[12]</sup> and Kumar *et al.* (2016)<sup>[10]</sup> in Ongole cow, Singh *et al.* (2011)<sup>[16]</sup> in Hariana cattle and Kumar and Gandhi (2011)<sup>[9]</sup> in Sahiwal cow. Although service period is a reproductive trait of a breed but the highly significant variation among the locations indicates the influence of locality and variation in management practices which has ability to change the length of service period.

#### Effect of lactation order

The influence of lactation order was observed to be highly significant on service period. The minimum length of service period was noticed in 4th lactation and maximum in 5th and above lactation. Similarly Sai Reddy (2010)<sup>[12]</sup> in Ongole cattle, Kumar and Gandhi (2011)<sup>[9]</sup> in Sahiwal cow, Dangi (2013)<sup>[3]</sup> in Rathi cattle and Kishore (2016)<sup>[20]</sup> in Tharparkar cattle also observed highly significant effect of lactation order on the service period.

#### Effect of season of calving

The impact of season of calving on service period of Binjharपुरi cow found to be highly significant. The values are

varied from 112.707±1.725 to 119.640±1.887 days.

In the present study the service period was observed to be shortest in rainy season as against the longest service period during summer season. Kumar and Gandhi (2011)<sup>[9]</sup> in Sahiwal cow, Singh *et al.* (2011)<sup>[16]</sup> in Hariana cattle and Savaliya *et al.* (2016)<sup>[15]</sup> in Gir cattle also observed the similar seasonal effect. Contrary to this Kishore (2016)<sup>[20]</sup> in Tharparkar cattle, Basak and Das (2018)<sup>[1]</sup> in Deoni cattle and reported non-significant effect of season of calving on service period.

#### Effect of sex of calf

There was no significant influence of sex of calf on service period in the present investigation. It is also supported by Bhadoria *et al.* (2002)<sup>[2]</sup> in Gir cows and Sai Reddy (2010)<sup>[12]</sup> in Ongole cattle and Dangi (2013)<sup>[3]</sup> in Rathi cows.

#### Gestation period

In the present study the least-squares means in regards to gestation period of Binjharपुरi cows was found to be 281.296±0.193 days. It is in approximation with the reports of Sahoo *et al.* (2004)<sup>[13]</sup> in Malvi cattle.

#### Effect of location

The analysis of variance indicated that effect due to location on gestation period was non-significant which indicated that a genetic trait like gestation period is not influenced by variation in the geographical location and confirmed the fact that it is a breed specific character which has been repeatedly reported by several workers on different indigenous breed. Similar findings are obtained by Khaki (2017)<sup>[21]</sup> indigenous cattle of Arunachal Pradesh and Mohanty (2015)<sup>[22]</sup> in Binjharपुरi cattle. In contrary to the results of the present study, Sai Reddy in Ongole cow reported significant effect of location.

#### Effect of lactation order

Although the influence of lactation order on gestation period was significant in the present investigation the values did not differed much.

The order of lactation affected the gestation period significantly in the present study which is in concurrence with the report of Gahlot (2002)<sup>[8]</sup> in Tharparkar cattle, Vinu (2005)<sup>[23]</sup> and Sai Reddy (2010)<sup>[12]</sup> in Ongole cow for the same trait. On the other hand, Sahoo *et al.* (2004)<sup>[13]</sup> in Malvi cattle and Khaki (2017)<sup>[21]</sup> in indigenous cattle of Arunachal Pradesh reported non-significant effect of lactation order on gestation period.

#### Effect of season of calving

Like location the influence of season of calving on gestation period was also found to be statistically non-significant.

The statistical analysis of variance revealed that observed differences in gestation period due to season of calving were non-significant which is supported by the earlier results of Vinu (2005)<sup>[23]</sup> and Sai Reddy in Ongole cattle. Contrary to the present findings, significant effect of season of calving on gestation period was observed by Gahlot (2002)<sup>[8]</sup> in Tharparkar cattle and Sahoo *et al.* (2004)<sup>[13]</sup> in Malvi cattle.

#### Effect of sex of calf

Similarly it has been noticed from the analysis of variance table that sex of calf also did not exert significant influence on gestation period in the present investigation.

The sex of calf did not have significant influence on gestation period, while in contrary Sahoo *et al.* (2004) [13] in Malvi cattle and Sai Reddy (2010) [12] in Ongole cow observed significant effect ( $p \leq 0.01$ ) of sex of the calf on this trait.

### Calving interval

In the present study the overall least square mean for calving interval was found to be  $396.357 \pm 1.088$  days. The results is in agreement with the findings of Savaliya (2016) [15] in Gir cattle. Higher than present findings has also been reported by Dhal *et al.* (2007) [7] in Khariar cattle.

### Effect of location

Analysis of variance revealed highly significant effect of location on calving interval. The minimum value for calving interval was found in C5 and maximum at C1.

This result was corroborated with Kumar *et al.* (2016) [10] in Ongole cows, Singh *et al.* (2011) [16] in Haryana cattle and Kumar and Gandhi (2011) [9] in Sahiwal cow.

### Effect of lactation order

The differences in the length of calving interval due to lactation order were found to be highly significant. It was found to decrease from 1<sup>st</sup> lactation onward up to 4<sup>th</sup> lactation and thereafter it declined. Dangi (2013) [3] in Rathi cows, Savaliya, (2016) [15] in Gir cattle and Kishore (2016) [20] in Tharparkar cattle also observed similar effect of lactation order on calving interval. However, non-significant effect of lactation order was also observed by Sai Reddy (2010) [12] in Ongole cow.

### Effect of season of calving

The present results revealed that season of calving also significantly affected the calving interval. The minimum value of  $393.868 \pm 1.697$  days for the trait was obtained in rainy season as against maximum value ( $401.008 \pm 1.855$  days) for the same observed in summer season.

Reports by Kumar and Gandhi (2011) [9] in Sahiwal cows, Dangi (2013) [3] in Rathi cows and Savaliya (2016) [15] in Gir

cattle were similar to the present findings. On the contrary Kishore (2016) [20] in Tharparkar cattle, Basak and Das (2018) [1] in Deoni cows reported non-significant effect of season of calving on calving interval.

### Effect of sex of calf

The sex of calf has non-significant influence on calving interval. The average value of calving interval was  $396.485 \pm 1.432$  days in male and  $396.229 \pm 1.506$  days in female.

This investigation is in concurrence with Bhadoria *et al.* (2002) [2] in Gir cows, Sai Reddy (2010) [12] in Ongole cow and Dangi (2013) [3] in Rathi cows. The variability in calving interval is mostly attributed to the service period and same pattern was observed for both the traits in the present investigation.

**Table 1:** Least-squares means and standard errors for age at first calving according to location, season of calving and sex of calf

Sub-Class No.	No.	Age At First Calving (days)	SE
Overall	89	1452.332	10.160
Location			
C1	24	1361.807 <sup>a</sup>	18.911
C2	23	1669.828 <sup>b</sup>	19.317
C3	13	1348.268 <sup>ac</sup>	25.940
C4	14	1465.733 <sup>d</sup>	24.834
C5	15	1416.024 <sup>cde</sup>	24.362
Season of calving			
S1	29	1530.550 <sup>a</sup>	17.846
S2	29	1425.792 <sup>b</sup>	17.403
S3	31	1400.654 <sup>bc</sup>	16.976
Sex of calf			
M	41	1466.501	15.182
F	48	1438.163	13.614

The least-squares means with same superscripts do not differ significantly.

**Table 2:** Least-squares means and standard errors for service period, gestation period and calving interval according to location, season of calving and sex of calf

Sub-class no.	No	Service Period (days) ± SE	Gestation Period (days) ± SE	Calving Interval (days) SE
Overall	507	115.061±1.106	281.296±0.193	396.357±1.088
Location				
C1	100	125.297 <sup>a</sup> ±2.353	281.226±0.411	406.523 <sup>a±</sup> 2.314
C2	102	116.128 <sup>b</sup> ±2.327	281.390±0.406	397.518 <sup>b</sup> ±2.288
C3	103	109.642 <sup>c</sup> ±2.291	281.413±0.400	391.055 <sup>c</sup> ±2.253
C4	100	117.272 <sup>b</sup> ±2.298	281.143±0.401	398.415 <sup>b</sup> ±2.260
C5	102	106.964 <sup>c</sup> ±2.234	281.311±0.390	388.275 <sup>c</sup> ±2.197
Lactation order				
L1	89	116.487 <sup>a</sup> ±2.398	279.051 <sup>a</sup> ±0.419	395.538 <sup>a</sup> ±2.359
L2	149	109.660 <sup>b</sup> ±1.849	281.021 <sup>b</sup> ±0.323	390.68 <sup>ab</sup> ±1.819
L3	135	107.803 <sup>b</sup> ±1.950	281.777 <sup>c</sup> ±0.340	389.580 <sup>ad</sup> ±1.918
L4	91	107.118 <sup>b</sup> ±2.362	282.949 <sup>b</sup> ±0.412	390.066 <sup>bd</sup> ±2.322
L5 and above	43	134.236 <sup>c</sup> ±3.517	281.685 <sup>bc</sup> ±0.614	415.920 <sup>c</sup> ±3.457
Season of calving				
S1	153	119.640 <sup>a</sup> ±1.887	281.368±0.329	401.008 <sup>a</sup> ±1.855
S2	187	112.707 <sup>b</sup> ±1.725	281.161±0.301	393.868 <sup>b</sup> ±1.697
S3	167	112.835 <sup>b</sup> ±1.791	281.360±0.313	394.195 <sup>b</sup> ±1.761
Sex of calf				
M	267	115.231±1.456	281.254±0.254	396.485±1.432
F	240	114.890±1.532	281.339±0.267	396.229±1.506

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### Conclusion

Binjharपुरi cattle is maintained on free grazing (extensive) and semi-intensive system in its native tract in coastal region of Odisha comprising Jajpur, Bhadrak, Kendrapara districts. Despite of largescale crossbreeding programmes, still the Binjharपुरi cattle found mostly in purest form due to its economic and aesthetic values. It not only produces handful amount of milk in low input system but also it is well known for its draft ability and heat tolerance capacity. They are well adapted to the local agro-climatic conditions. They have proven their potential in hot and humid condition. This distinct and relatively known dual purpose breed of Odisha possesses a good potential for milk production and has not yet been fully explored for its production potential. There are several genetic and nongenetic factors that influence the phenotypic expression of these traits. So keeping in view its economic importance, so this study has been carried out to make a data base and also to help in designing breeding plan for genotypic improvement of Binjharपुरi cattle.

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