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Phenotypic correlations among production and reproduction traits in Ongole Cattle

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Abstract
The present study was conducted at Livestock Research Station, Mahanandi, Andhra Pradesh for finding out the phenotypic correlations among the production and reproduction traits in Ongole cows. The data regarding the production traits (birth weight of calf, 305 day lactation milk yield, total lactation milk yield, peak yield and lactation length) and reproduction traits (age at first calving and calving interval) were calculated and/or collected from the daily production records and history sheets available in the farm. The mean values of age at first calving (yr), calving interval (yr), birth weight of calf (kg), lactation length (days), 305 day lactation milk yield (kg), total lactation milk yield (kg), daily peak yield (kg) and weekly peak yield (kg) were 4.948±0.074, 1.571±0.045, 27.875±0.233, 330.188±7.255, 750.972±21.143, 850.280±29.445, 4.170±0.097 and 24.877±0.658 respectively. The phenotypic correlations of age at first calving with calving interval, birth weight of calf, 305 day lactation milk yield, total lactation milk yield, peak yield and lactation length were -0.192, -0.110, -0.417, -0.379, -0.545 and 0.116 respectively which were changed to -0.160, -0.115, 0.559, 0.406, 0.441 and 0.091 during sixth and above lactations. It was found that the birth weight of calf was found to be negatively associated with the age at first calving during second lactation and with calving interval from third lactation onwards. The 305 day lactation milk yield positively correlated significantly (p<0.01) with total lactation milk yield, and peak yield and lactation length. From the results, it was concluded that the phenotypic correlation between the age at first calving and milk yield traits such 305 day lactation milk yield and peak yield changes from negative to positive with increase of lactation number, and there is a general trend of positive relation among the milk production traits in all the lactations.

Keywords: Phenotype, calving interval, age at first calving, lactation length

1. Introduction
Among all the dual-purpose cattle breeds of India, the Ongole breed carries a special distinction of being our mute ambassadors to many developed and developing countries such as USA, Australia, Switzerland, Sri Lanka etc., and being the first Indian cattle breed to get worldwide recognition. Most of the countries imported the breed to exploit its traits such as rapid growth rate, capacity to thrive on dry fodder, medium milk yield, heat tolerance, disease resistance and draughtability through crossbreeding (NBAGR, 2006) [1]. At present, the breed is being improved genetically for milk production through progeny testing programme in its native state of Andhra Pradesh.

The efficiency and profitability of milk production systems depend mostly on the production and reproduction traits of dairy cattle. The genetic parameters especially the phenotypic correlations of important production traits are of great help in designing of animal breeding programmes. The knowledge of correlation among different traits is necessary for choosing the method of selection to be employed for the cattle. Most of the previous studies reported a negative or unfavourable correlation between production traits such as the standard lactation milk yield and reproduction traits such as age at first calving (Lobo *et al*., 2000 [2]; Ojango and Pollott, 2001 [3]; Makgahlela *et al*., 2007 [4]; Canaza-Cayo *et al*., 2018 [5]) in different breeds of cattle. The present study was aimed at knowing the type of phenotypic correlation present among the production and reproduction traits in Ongole Cattle.

2. Materials and Methods

The present study was carried out using the data obtained from the Livestock Research Station, Mahanandi, Andhra Pradesh. Around 250 Ongole cattle of various categories such as calves, cows and heifers were maintained on the farm. Milk was extracted from the cows twice a day in the morning and evening after initial calf suckling for letdown of milk. Milk consumption by calf was not taken into account while presenting the results regarding milk yield.

The reproduction traits such as age at first calving and calving interval were calculated using the history records present in the farm. The production traits that were studied included birth weight of calf, 305 day milk yield, total lactation milk yield, peak yield and lactation length. With the exception of birth weight of calf which was collected from the records, all other production traits were calculated from the daily milk records available in the farm. The formula of phenotypic correlation coefficient (r_P) which indicate association between two traits (X and Y) was:

$$r_P(XY) = \frac{Phenotypic\ cov(X,Y)}{\sqrt{Phenotypic\ var\ (X)\ \times Phenotypic\ var\ (Y)}}$$

All the data were analysed through SPSS software as per the standard procedures.

3. Results and Discussion

The values of mean, standard deviation, standard error, minimum and maximum for the production and reproduction traits were presented in Table 1. The phenotypic correlation coefficients of the production and reproduction traits were depicted in Table 2.

Table 1: Mean, standard deviation, standard error, minimum and maximum for the production and reproduction traits

Trait	Mean	SD	SE	Min.	Max.
Age at first calving (yrs)	4.948	0.836	0.074	3.112	7.411
Calving interval (yrs)	1.571	0.442	0.045	0.877	2.792
Birth weight of calf (kg)	27.875	2.635	0.233	21.000	35.000
305 day lactation milk yield (kg)	750.972	239.201	21.143	277.450	1511.450
Total lactation milk yield (kg)	850.280	333.136	29.445	277.450	1933.950
Peak yield (kg)	4.170	1.097	0.097	1.900	7.500
Lactation length (days)	330.188	82.084	7.255	170.000	508.000

(Sample size was 128 for all the traits except calving interval for which it was 96)

Table 2: Phenotypic correlation coefficients of the production and reproduction traits

Trait	Calving interval	Birth weight of calf	305 day lactation milk yield	Total lactation milk yield	Peak yield	Lactation Length
First lactation (N=32)						
Age at first calving		0.016	-0.242	-0.174	-0.318	0.120
Birth weight of calf			0.122	0.114	0.123	-0.004
305 day lactation milk yield				0.910**	0.881**	0.496**
Total lactation milk yield					0.759**	0.762**
Peak yield						0.295
Second lactation (N=22)						
Age at first calving	-0.192	-0.110	-0.417	-0.379	-0.545**	0.116
Calving interval		0.151	0.176	0.153	0.011	0.138
Birth weight of calf			-0.023	0.031	0.018	0.047
305 day lactation milk yield				0.959**	0.915**	0.521*
Total lactation milk yield					0.852**	0.690**
Peak yield						0.276
Third lactation (N=16)						
Age at first calving	0.357	0.032	0.053	0.208	0.000	0.419
Calving interval		-0.219	0.569*	0.612*	0.362	0.562*
Birth weight of calf			-0.370	-0.242	-0.040	-0.378
305 day lactation milk yield				0.893**	0.751**	0.529*
Total lactation milk yield					0.571*	0.778**
Peak yield						0.083
Fourth lactation (N=17)						
Age at first calving	-0.296	0.181	-0.047	-0.012	-0.087	0.315
Calving interval		-0.259	-0.103	-0.103	-0.033	-0.272
Birth weight of calf			0.314	0.213	0.237	-0.003
305 day lactation milk yield				0.965**	0.748**	0.538*
Total lactation milk yield					0.677**	0.696**
Peak yield						0.108
Fifth lactation (N=15)						
Age at first calving	0.162	0.061	0.376	0.472	0.309	0.386
Calving interval		-0.193	-0.157	0.058	-0.094	0.108
Birth weight of calf			0.464	0.452	0.271	0.246
305 day lactation milk yield				0.913**	0.882**	0.476
Total lactation milk yield					0.730**	0.745**
Peak yield						0.177
Sixth and above lactation (N=26)						

Age at first calving	-0.160	-0.115	0.559**	0.406*	0.441*	0.091
Calving interval		-0.378	-0.020	-0.098	0.118	-0.203
Birth weight of calf			-0.139	-0.196	-0.160	-0.180
305 day lactation milk yield				0.914**	0.764**	0.359
Total lactation milk yield					0.652**	0.645**
Peak yield						0.036

*p<0.05 **p<0.01 N= Sample size

3.1 Reproduction traits

3.1.1 Age at first calving

The mean value of age at first calving in the present study (4.948±0.074 years) was similar to the reports of Vinoo *et al.* (2005) [6], Kumar *et al.* (2016) [7] and Reddy *et al.* (2021) [8] in the Ongole cattle. The present study revealed that the age at first calving was moderately negatively correlated with 305 day lactation milk yield and total lactation milk yield during first and second lactations, and significantly (P < 0.01) negatively correlated with peak yield during second lactation. These findings are in agreement with that of Ojango and Pollott (2001) [3], Ayalew *et al.* (2017) [9], Canaza-Cayo *et al.* (2018) [5], Girimal *et al.* (2020) [10] and Kusaka *et al.* (2021) [11]. Tamboli *et al.* (2022) [12] reported that the age at first calving had a negative relation with peak yield and but, positive relation with lactation milk yield. The age at first calving was moderately positively correlated with lactation length which coincided with that of Thombre *et al.* (2015) [13]. However, Abbas (2007) [14] and Ayalew *et al.* (2017) [9] reported a non-significant negative correlation between the traits which might be due to breed differences and environmental variation. The moderate positive association found between the age at first calving and calving interval during third and fifth lactations was similar to the reports of Brzáková *et al.* (2019) [15] and Atashi *et al.* (2021) [16]. The moderate negative association found between the age at first calving and calving interval during second, fourth, sixth and above lactations was similar to the report of Canaza-Cayo *et al.* (2018) [5].

3.1.2 Calving interval

The average calving interval in the Ongole cattle was found to be 1.571±0.045 years which was similar to the findings of Vinoo *et al.* (2005) [6], Singh *et al.* (2008) [17], Kumar *et al.* (2016) [7] and Reddy *et al.* (2021) [8] in Ongole cattle. It was found to have mild negative association with the birth weight of calf from third lactation onwards.

3.2 Production traits

3.2.1 Birth weight of calf

The mean birth weight of Ongole calf was 27.875±0.233 kg. Kumar *et al.* (2016) [7] reported similar value in Ongole cattle. The birth weight of calf was found to be negatively associated with the age at first calving during second lactation and with calving interval from third lactation onwards. It was similar to the findings of Dangi *et al.* (2021) [18]. However, Atashi *et al.* (2021) [16] found out that the calf birth weight was increased with increase in age at first calving.

3.2.2 305 day lactation milk yield

The mean standard lactation milk yield obtained in the present study was 750.972±21.143 kgs which was similar to the findings of Vinoo *et al.* (2005) [6] and Kumar *et al.* (2016) [7] in Ongole cows. It was positively correlated significantly (p< 0.01) with total lactation milk yield, and peak yield and lactation length. These findings were in agreement with those of Ahmad *et al.* (2001) [19], Abbas (2007) [14] and Ayalew *et al.* (2017) [9]. The present study revealed moderate antagonism between 305 day lactation milk yield and age at first calving during first and second lactations which was supported by Abbas (2007) [14]. However, there was positive association between the two traits from fifth lactation onwards.

3.2.3 Total lactation milk yield

The mean total lactation milk yield of Ongole cows was 850.280±29.445 kgs which was higher than findings of Vinoo *et al.* (2005) [6] and Singh *et al.* (2008) [17], and lower than that of Reddy *et al.* (2021) [8]. The disagreements were might be due to variation in the level of genetic improvement at different points of time. The total lactation milk yield has significant (p< 0.01) positive relation with 305 day lactation milk yield, peak yield and lactation length. Ahmad *et al.* (2001) [19], Abbas (2007) [14] and Ayalew *et al.* (2017) [9] found the similar results.

3.2.4 Peak yield

The mean value of the peak yield was 4.170±0.097 kg. Singh *et al.* (2008) [17] and Reddy *et al.* (2021) [8] reported almost similar values of peak yield. There was significant (P < 0.01) positive association of the peak yield with 305 day lactation milk yield and total lactation milk yield. These findings were in agreement with those of Reddy *et al.* (2021) [8].

3.2.5 Lactation length

The present study revealed that the lactation length of Ongole cattle was 330.188±7.255 days. Lower values were reported by Vinoo *et al.* (2005) [6], Singh *et al.* (2008) [17], Kumar *et al.* (2016) [7] and Reddy *et al.* (2021) [8] in Ongole cattle. The discrepancy is probably due to presence of many outliers in the data of present study which is evident from the maximum value of lactation length in Table 1. It was found through the present study that the lactation length had moderate positive relation with age at first calving, and significant (p<0.01) positive correlation with 305 day lactation milk yield and total lactation milk yield. The results coincided with the findings of Abbas (2007) [14], Ayalew *et al.* (2017) [9] and Reddy *et al.* (2021) [8].

4. Conclusions

From the results of the present study, it can be concluded that the phenotypic correlation between the age at first calving and milk yield traits such 305 day lactation milk yield and peak yield changes from negative to positive with increase of lactation number, and there is a general trend of positive relation among the milk production traits in all the lactations. In addition to the phenotypic correlations, genetic correlations have to be studied to know the effect of environment since P= G + E.

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6. References

1. NBAGR. Cattle Genetic Resources of India-Ongole. Indian Council of Agricultural Research- National Bureau of Animal Genetic Resources, Monograph; c2006, 44.
2. Lobo RNB, Madalena FE, Vieira AR. Average estimates of genetic parameters for beef and dairy cattle in tropical regions. Animal breeding abstracts. 2000;68(6):433-462.
3. Ojango JMK, Pollott GE. Genetics of milk yield and fertility traits in Holstein-Friesian cattle on large-scale Kenyan farms. Journal of Animal Science. 2001;79(7):1742-1750.
4. Makgahlela ML, Banga CB, Norris D, Dzama K, Ng'ambi JW. Genetic correlations between female fertility and production traits in South African Holstein cattle. South African Journal of Animal Science. 2007;37(3):180-188.
5. Canaza-Cayo AW, Lopes PS, Cobuci JA, Martins MF, Silva MVGBD. Genetic parameters of milk production and reproduction traits of Girolando cattle in Brazil. Italian Journal of Animal Science. 2018;17(1): 22-30.
6. Vinoo R, Rao GN, Gupta BR, Rao KB. Genetic study on productive and reproductive traits of Ongole cattle. The Indian Journal of Animal Sciences. 2005;75(4): 438-441.
7. Kumar A, Singh U, Singh R, Vinoo R. Genetic studies on production and reproduction traits of Ongole cattle at organized farms. Indian Journal of Animal Sciences. 2016; 86 (7): 826-830.
8. Reddy PP, Hiremath S, Sudhakar K, Metta M, Vinoo R, Reddy PR. Genetic Analysis of Production and Reproduction Traits of Ongole Cattle in an Organized Farm of Andhra Pradesh. Indian Journal of Animal Research; c2021. DOI: 10.18805/IJAR.B-4548.
9. Ayalew W, Aliy M, Negussie E. Estimation of genetic parameters of the productive and reproductive traits in Ethiopian Holstein using multi-trait models. Asian-Australasian journal of animal sciences. 2017;30(11):1550-1556.
10. Girimal, DG, Kumar D, Shahi BN, Ghosh AK, Kumar S. Genetic evaluation of Sahiwal and crossbred cattle for some economic traits. Pantnagar Journal of Research. 2020;18(2):153-57.
11. Kusaka H, Yamazaki T, Sakaguchi M. Association of the age and bodyweight at first calving with the reproductive and productive performance in one herd of Holstein dairy heifers in Japan. Veterinary Record Open. 2022;9:e44.
12. Tamboli P, Bharadwaj A, Chaurasiya A, Bangar YC, Jerome A. Association between age at first calving, first lactation traits and lifetime productivity in Murrah buffaloes. Animal Bioscience. 2022;35(8):1151-1161.
13. Thombre BM, Bhutkar SS, Mane ST. Genetic studies on components of production and reproduction traits in Holstein Friesian X Deoni (Holdeo) crossbred cattle. Bioinfolet-A Quarterly Journal of Life Sciences. 2015;12(2A):349-352.
14. Abbas, S. Effect of calving season, parity and age at first calving on performance traits and phenotypic correlations between these traits in Holstein Friesian cows. Journal of Animal and Poultry Production. 2007;32(10):8181-8190.
15. Brzáková M, Zavadilová L, Přibyl J, Pešek, P, Kašná, E, Kranjčevičová A. Estimation of genetic parameters for female fertility traits in the Czech Holstein population. Czech Journal of Animal Science. 2019;64(5):199-206.
16. Atashi H, Asaadi A, Hostens M. Association between age at first calving and lactation performance, lactation curve, calving interval, calf birth weight, and dystocia in Holstein dairy cows. PLoS One. 2021;16(1):e0244825.
17. Singh U, Kumar A, Beniwal BK, Vinoo R. Estimates of genetic parameters for economic traits in Ongole cattle. Indian Veterinary Journal. 2008;85(2):167-169.
18. Dangi M, Singh CV, Barwal RS, Shahi BN. Estimation of Genetic Parameters of First Lactation and Life Time Traits Using Sire Model and Animal Model in Crossbred Cattle. Journal of Animal Research. 2021;11(6):1089-1095.
19. Ahmad M, Van der Werf JHJ, Javed K. Genetic and phenotypic correlations for some economic traits in dairy cattle. Pakistan Veterinary Journal. 2001;21:81-86.