Genetic evaluation of Ongole bulls in organized herds in India

UMESH SINGH[1], ARUN KUMAR[2], RANI ALEX[3] and R VINOO[4]

Central Institute for Research on Cattle, Grass Farm Road, Meerut Cantt., Uttar Pradesh 250 001 India

Ongole breed, one of the dual purpose (milk and draft) cattle breeds of India, is well known for its hardiness, thriftiness, faster growth rate, natural tolerance to tropical heat, disease resistance, good beef conformation and a tendency to grow leggy with sparse light carriage. But due to various reasons, there is a declining trend in the production performance as well as in the population. The selection and evaluation of superior animals to be used as the parental stock is an important step for the success of any animal breeding program. Young Ongole bulls are being progeny tested and ranked bulls are being used in nominated matings for genetic improvement in milk production. So the study was conducted to estimate the breeding value of Ongole bulls for first lactation milk yield and to rank them for their future use in nominated matings for production of quality male calves as well as for their genetic improvement.

The genetic improvement program in Ongole cattle through progeny testing is being carried out by the Central Institute for Research on Cattle, Meerut at the Livestock Research Station, Lam Farm, Guntur (Andhra Pradesh). The other associated herds incorporated in the program were Government Cattle Breeding Farm, Chadalwada, Government Livestock Farm, Chintaldevi and Livestock Research Station, Mahanandi. The first four sets of 32 bulls have already been evaluated under the program. A total of eight bulls in the fifth set were inducted during the year 2003. The daughters of the fifth set have completed their first lactation records. The semen of7 these bulls were frozen at Germplasm Unit, Livestock Research Station, Lam Farm and also distributed to all associated herds for testing of bulls.

The first lactation records of 123 cows that were daughters of eight bulls and calved during five years from 2007 to 2012 were used in the analysis. Each year of calving was further classified into three seasons i.e., S1 (November to February), S2 (March to June) and S3 (July to October) based on climatological conditions. The data were classified into six different groups according to the age at first calving.

Present address: [1]Principal Scientist (usinghas@gmail.com), [3]Scientist (ranialex01vet@gmail.com), Animal Genetics and Breeding Section. [2]Principal Scientist (karunt04@yahoo.com), Central Sheep and Wool Research Institute, Avikanagar. [4]Professor and Head (vinoo31@yahoo.com), Department of Animal Genetics and Breeding, N.T.R. College of Veterinary Science, Gannavaram.

Sires with less than ten daughters were excluded from the study. Bulls' breeding values were estimated through best linear unbiased prediction procedure using least squares and maximum likelihood computer package (Harvey, 1990). The bulls were ranked on the basis of their breeding values. The following model was used for analysis:

$$Y_{ijklmno} = \mu + SR_i + Y_j + SC_k + YC_l + F_m + A_n + e_{ijklmno}$$

where, $Y_{ijklmno}$ = observation on o^{th} daughter of ith sire belonging to j^{th} year of birth, k^{th} season of calving, l^{th} year of calving, m^{th} farm and n^{th} age group, μ= overall mean, SR_i= random effect of ith sire, Y_j= fixed effect of jth year of birth, SC_k= fixed effect of kth season of calving, YC_l= fixed effect of lth year of calving, F_m = fixed effect of mth farm, A_n= fixed effect of age group and $e_{ijklmno}$ = random residual error with o^{th} progeny of ith sire.

The overall least-squares mean of first lactation milk yield was 622.97±43.82 kg (Table 1). Year of calving had no effect on first lactation milk yield. Season of calving was also found to have no effect on first lactation milk yield

Table 1. Effect of various factors on first lactation milk yield (kg) in Ongole cattle

Effect	No. of observations	LSM±SE
Overall mean	123	622.97±43.82
Year of birth*		
2004	42	487.94±69.93[a]
2005	66	636.11±44.50[b]
2006	15	744.86±67.29[c]
Season of calving		
S1(Nov-Feb)	53	629.15±51.26
S2(March-June)	46	564.54±50.09
S3 (July-Oct)	24	675.22±58.86
Farm**		
Government CattleBreeding Farm, Chadalwada	25	522.14±61.53[a]
Livestock Research Station, LamFarm, Guntur	42	483.56±54.54[a]
Livestock ResearchStation, Mahanandi	38	751.77±54.72[b]
GovernmentLivestock Farm Chintaldevi	18	734.42±62.64[b]

*P<0.05, **P<0.01, Means with superscript differs significantly.

Table 2. Genetic evaluation of Ongole bulls based on first lactation milk yield of their daughters

Sire No.	Number of daughters	Breeding values (kg)	Ranking	Per cent of genetic superiority over herd average
L – 292	18	613.64	7	–1.50
L – 300	19	607.07	8	–2.55
L – 302	18	616.30	6	–1.07
L – 306	12	625.91	3	0.47
L – 309	14	641.91	1	3.04
L – 313	18	629.46	2	1.04
L – 329	13	625.00	4	0.33
L – 400	11	623.45	5	0.08

in this study as reported by some other authors (Hassan and Khan, 2012 and Nawaz *et al*. 2013). The farm (P<0.01) and year of birth (P<0.05) significantly affected the first lactation milk yield in Ongole cattle. This is in confirmation with other studies (Singh *et al*. 2008 and Simran *et al*. 2014). The daughters which were born in the year 2006 had higher average milk yield (744.86±67.29 kg) followed by 2005 (636.11±44.50 kg) and 2004 (487.94±69.93 kg). The herd at Livestock Research Station, Mahanandi had higher average (751.77±54.72 kg) than Government Livestock Farm Chintaldevi (734.42±62.64 kg), Government Cattle Breeding Farm, Chadalwada (522.14±61.53 kg) and Livestock Research Station, Lam Farm, Guntur (483.56±54.54 kg). The age at first calving also found to have significant effect (P<0.05).

The information on bulls along with their breeding values is given in Table 2. A total of eight bulls were tested in 5th set and the breeding values of the bulls varied from 607.07 to 641.91 kg. The breeding values of four sets of 32 Ongole bulls were ranging from 485.84 to 565.69 kg in 1st set, from 518.49 to 553.94 kg in 2nd set and from 525.12 to 568.42 kg in 3rd set (Singh *et al*. 2006) and 472.56 to 531.18 kg in 4th set (Singh *et al*. 2006 and 2012). However, in another study (Vinoo *et al*. 2005) observed sire indices of Ongole bulls varied between 367 and 547 kg. In comparison to the earlier reported breeding values of Ongole bulls, the present study revealed an increase in the performance of bulls over the years. Out of eight bulls, five bulls exceeded the herd average in breeding value for first lactation milk yield. Genetic superiority of each bull is also presented in Table 2. The first ranking bull (Bull No.L-309) had 3.04 % genetic superiority over the population mean followed by Bull No. L-313 (1.04 %) and Bull No. L-306 (0.47 %).

SUMMARY

The first lactation records of 123 cows that were daughters of eight bulls were used to evaluate the breeding value of Ongole bulls and to rank them based on single trait analysis. The overall least-squares mean of first lactation milk yield was 622.97±43.82 kg. Nongenetic factors such as year of birth, age at first calving and farm/ herd were found to have significant on first lactation milk yield. Out of eight bulls, five bulls exceeded the herd average and the topmost ranking bull (Bull No. L- 309) had 3.04 % genetic superiority over the population mean followed by Bull No. L- 313 and Bull No.L-306. The frozen semen doses of top ranked bulls are to be used on elite cows to produce future bull calves for inducting into new set (s).

REFERENCES

Harvey W R. 1990. *User's Guide for LSMLMW and MIXMDL PC-2 Version Mixed Model Least-Squares and Maximum Likelihood Computer Program*. Ohio State University, Columbus, USA.

Hassan F and Khan M S. 2012. Performance of crossbred dairy cattle at military dairy farms in Pakistan. *Journal of Animal and Plant Sci*ences **23**: 705–14.

Nawaz A, Nizamani A H, Marghazani I B and Fatih N A. 2013. Influence of genetic and environmental factors on lactation performance of Holstein Friesian cattle in Balochistan. *The Journal of Animal and Plant Sciences* **23**:17–19.

Simran S, Das A K, Chakraborty D, Taggar R K, Kumar N, Gupta P, Mahajan V. 2014. Studies on genetic and non-genetic factors affecting performance traits of Frieswal cows. *Indian Journal of Animal Research* **48**:537–40.

Singh U, Gaur G K, Garg R C and Vinoo R. 2006. Genetic evaluation of Ongole bulls at organized herds. *Indian Journal of Animal Sciences* **76**: 931–33.

Singh U, Kumar A, Beniwal B K and Khanna A S. 2008. Evaluation of breeding values of Hariana bulls under organized farms. *Indian Journal of Animal Sciences* **78**: 388–90.

Singh U, Kumar A and Vinoo R**.** 2012**.** Breeding values of Ongole bulls at organized herds. *Indian Veterinary Journal* **89**: 92–93.

Vinoo R, Rao G N, Gupta B R and Rao K B. 2005. Genetic evaluation of Ongole sires. *Indian Journal of Animal Sciences* **75**: 1071–72.