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Short Communication

Milk Production Performances of Crossbreed Dairy Cattle in Ethiopia: A Short Communication

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ABSTRACT

Crossbreeding had been initiated and put into practice in various parts of Ethiopia for a very long time to improve milk yield performance. This study was conducted for generating compiled information on milk production Daily Milk Yield (DMY), Lactation Length (LL) and Lactation Milk Yield of cross breed dairy cattle in Ethiopia. The results of milk production performances in Ethiopia varied greatly from one genotype to another. The on-station lactation milk yield, lactation length and daily milk yield were ranged from 1293.01 ± 23.70 to 2957.46 ± 72.98 liters, 298.68 ± 5.17 to 374.05 ± 7.24 days, 4.18 ± 5 to 8.70 ± 0.17 liters, respectively, whereas the on-farm review results were ranged from 631.69 ± 222.98 to 2705.43 liters, 241.65 ± 26.22 to 310.1 ± 41.83 days and 7.30 ± 0.16 to 9.91 liters, respectively. Among the genotypes, the 50% F1 and 75% Holstein Friesian, first generations were considered suitable for milk production parameters. The on-station development of 50% F2, F3 and 75% second generations showed low milk production. Regardless of blood level and genotype difference, the performance of on-farm crossbred cows was almost similar to on-station experimental cows. Crossbred cows were affected by non-genetic factors like year, season, and parity, depending on the breed and study location. In general, crossbred cows have good milk yield performances compared to indigenous (local) breeds. However, crossbred animals could not exploit their maximum potentials because animals are subjected to different environmental effects.

Keywords: Crossbred; Genotype; Milk performance

DESCRIPTION

Ethiopia is one of the developing countries in Africa known with a huge livestock population. The estimated total cattle population for the country is about 70 million constituting of male (44%) and female (56%). Out of the total cattle population in the country, the proportion of indigenous breeds are 97.4% and the remaining hybrid and exotic breeds are about 2.3% and 0.31%, respectively [1]. But, dairy industry is not developed as that of east African countries for example Kenya, Tanzania and Uganda [2].

The overall productivity and adaptive efficiency of cattle depends largely on their milk production performance in a given environment. Reproduction is an indicator of milk production efficiency and the rate of genetic progress in both selection and crossbreeding programs particularly in dairy production systems.

The milk production traits are crucial factors, contributing for the profitability of dairy production [3]. The common determinant traits for milk production performance of breeding animal are Daily Milk Yield (DMY), Lactation Length (LL) and Lactation Milk Yield (LMY) of breeding animal.

However, the ultimate goal in dairy production is to undertake economically efficient milk production, which is influenced by the reproductive efficiency of the cows. In the long-term crossbreeding program, different genotypes were produced in the country. The present review was focused on reviewing and generating compiled information on milk yield traits of crossbred dairy cattle in Ethiopia.

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Milk production traits

The milk production performance of dairy cattle is usually measured by determining the average DMY, LL, LMY or per year, lactation persistency, and milk composition [4,5]. Milk production is affected by genetic and environmental factors. Among the environmental factors, the quantity and quality of available feed resources are the major ones. Profitability of a dairy enterprise depends on obtaining as high level of milk production as possible with available feeds, relative to the maintenance cost of the animals. According [6] said that poor management of dairy cattle was the most probable factors affected the standard expected of milk production performance of cross breed cattle. Efficient heat detection and timely insemination, better health management, genetic improvement of crossbreeding, supplementing of good quality feed resources are required for optimal milk production performance.

Lactation milk yield

Most genetic improvement programs of developing countries have focused on improving production performance of dairy cattle particularly; increasing production of milk yield is the ultimate goal of dairy sectors (Table 1).

Table 1: Lactation milk yield of crossbred dairy cows with different genetic group in Ethiopia.

SL. No	Breed/ Genotype	LMY (L)	Study sites	Source
1	50% F1 Friesian	2203.23 ± 38.13	on station	[7]
2	50% F2 Friesian	1697.09 ± 71.82	on station	[7]
3	50% F3 Friesian	1522.67 ± 90.07	on station	[7]
4	50% HF	2019 ± 26	on station	[8]
5	50% HF × Local	631.69 ± 222.98	on farm	[9]
6	50% HF × Barca	2316 ± 98	on station	[10]
7	50%F1 Friesian	2369.95 ± 26.04	on station	[11]
8	50%F2 Friesian	1681.24 ± 47.66	on station	[11]
9	50%F3 Friesian	1542.38 ± 59.57	on station	[11]
10	50%HF × Borena	2088 ± 118	on station	[10]
11	50%HF × Borena	2031 ± 20.9	on station	[12]
12	50%HF × Borena (F1)	2355 ± 71	on station	[13]
13	50%HF × Borena (F2)	1928 ± 108	on station	[13]
14	50%HF × Horro	1836 ± 31.6	on station	[12]
15	50%Jersey × Borena	1788 ± 26.5	on station	[12]
16	50%Jersey × Borena (F1)	2092 ± 75	on station	[13]
17	50%Jersey × Borena (F2)	1613 ± 107	on station	[13]
18	50%Jersey × Horro	1621 ± 33.1	on station	[12]
19	75% F1 Friesian	2957.46 ± 72.98	on station	[7]
20	75% F2 Friesian	2027.16 ± 152.15	on station	[7]
21	75% Friesian	2480.4 ± 7	on station	[14]
22	75% HF	2182 ± 4	on station	[8]
23	75% HF × Local	762.71 ± 147.42	on farm	[9]
24	75% HF × Barca	2373 ± 105	on station	[10]
25	75% Jersey	1673.94 ± 4	on station	[14]
26	75%HF × Borena	2336 ± 96	on station	[10]
27	75%HF × Borena	2528 ± 141	on station	[13]
28	75%HF × Borena	2240 ± 35.9	on station	[12]
29	75%HF × Borena	2292.36 ± 102.55	on station	[11]
30	75%HF × Horro	2184 ± 72.8	on station	[12]
31	75%Jersey × Borena	1956 ± 133	on station	[13]
32	75%Jersey × Borena	1832 ± 56.0	on station	[12]
33	75%Jersey × Horro	1724 ± 73.9	on station	[12]
34	87.5% HF × Barca	2189 ± 183	on station	[10]
35	87.5%HF × Borena	1915 ± 163	on station	[10]
36	F1 Friesian	1908.06 ± 11	on station	[14]
37	F1 Jersey	1725.46 ± 7	on station	[14]
38	F2 Friesian	1622 ± 5	on station	[14]
39	F2 Jersey	1380 ± 5	on station	[14]
40	Friesian × Borena	1907.6 ± 15.1	on station	[15]
41	Holistian × Fogera	2705.43	on farm	[16]
42	Jersey × Borena	1684.1 ± 17.6	on station	[15]
43	Jersey × GH	2364.70 ± 85.06	on farm	[17]
44	Jersey × Horro	1293.01 ± 23.70	on station	[18]
45	Zebu × HF	2042.11	on farm	[19]

Note: LMY: Lactation Milk Yield; HF: Holstein Friesian; F1: 1^{st} filial generation; F2: 2^{nd} filial generation; F3: 3^{rd} filial generation; Fg: 1^{st} generation for 75% crosses; Sg: 2^{nd} generation for 75% crosses

Lactation length

Lactation length refers to the time of period from when a cow starts to secrete milk after parturition to the time of drying off. A lactation period of 305 days is recommended to take advantage of 60 days dry period (Table2).

Table 2: Lactation length of crossbred dairy cows with different genetic group in Ethiopia.

SL. No	Breed/ Genotype	LL (days)	Study sites	Source
1	50% F1 Friesian	343.62 ± 3.56	on station	[7]
2	50% F2 Friesian	319.42 ± 6.68	on station	[7]
3	50% F3 Friesian	319.25 ± 8.37	on station	[7]
4	50% HF	337 ± 3	on station	[8]
5	50% HF × Local	310.91 ± 41.83	on farm	[9]

6	50% HF × Barca	326 ± 11	on station	[10]
7	50% F1 Friesian	332.54 ± 2.82	on station	[11]
8	50% F2 Friesian	298.68 ± 5.17	on station	[11]
9	50% F3 Friesian	299.90 ± 6.46	on station	[11]
10	50% HF × Borena	328 ± 13	on station	[10]
11	50% HF × Borena	337.2 ± 3.6	on station	[12]
12	50% HF × Borena (F1)	348 ± 6	on station	[13]
13	50% HF × Borena (F2)	308 ± 9	on station	[13]
14	50% HF × Horro	321.0 ± 5.5	on station	[12]
15	50% Jersey × Borena	315.3 ± 0.6	on station	[12]
16	50% Jersey × Borena (F1)	343 ± 6	on station	[13]
17	50% Jersey × Borena (F2)	304 ± 9	on station	[13]
18	50% Jersey × Horro	303.8 ± 5.8	on station	[12]
19	75% F1 Friesian	374.05 ± 7.24	on station	[7]
20	75% F2 Friesian	303.12 ± 15.73	on station	[7]
21	75% Friesian	356.43 ± 6	on station	[14]
22	75% HF	351 ± 6	on station	[8]
23	75% HF × Local	303.42 ± 46.25	on farm	[9]
24	75% HF × Barca	360 ± 12	on station	[10]
25	75% Jersey	341 ± 4	on station	[14]
26	75% HF × Borena	358 ±11	on station	[10]
27	75% HF × Borena	331 ± 12	on station	[13]
28	75% HF × Borena	343.2 ± 6.3	on station	[12]
29	75% HF × Borena	331.02 ± 11.12	on station	[11]
30	75% HF × Horro	360.7 ±12.7	on station	[12]
31	75% Jersey × Borena	337 ± 11	on station	[13]
32	75% Jersey × Borena	302.8 ± 9.8	on station	[12]
33	75% Jersey × Horro	329.0 ± 12.9	on station	[12]
34	87.5% HF × Barca	351 ± 22	on station	[10]
35	87.5% HF × Borena	341 ± 20	on station	[10]
36	Zebu × HF	241.65 ± 26.22	on farm	[19]
37	F1 Friesian	340.64 ± 10	on station	[14]
38	F1 Jersey	333.37 ± 7	on station	[14]
39	F2 Friesian	3 37 ± 5	on station	[14]
40	F2 Jersey	330 ± 5	on station	[14]
41	HF × Fogera	273	on farm	[16]
42	Jersey × GH	270	on farm	[17]
43	93.75% HF	328.3 ± 5.50	on station	[20]

Note: LL: Lactation Length; HF: Holstein Friesian; F1: 1st filial generation; F2: 2nd filial generation; F3: 3rd filial generation; Fg: 1st generation for 75% crosses; Sg: 2nd generation for 75% crosses

Daily milk yield

Systematic incline or decline in daily milk yield can be used as a tool for early warning for management decisions and predicting production capacity of cows (Table 3).

Table 3: Daily milk yield of crossbred dairy cows with different genetic group in Ethiopia.

1.2	Breed/ Genotype	DMY (L)	Study sites	Source
1	50% F1 Friesian	6.69 ± 0.08	on station	[7]
2	50% F2 Friesian	5.66 ± 0.16	on station	[7]
3	50% F3 Friesian	5.02 ± 0.19	on station	[7]
4	50% HF	6.0 ± 0.1	on station	[8]
5	50% HF × Local	7.34 ± 2.61	on farm	[9]
6	50% HF × Barca	7.21 ± 0.26	on station	[10]
7	50% F1 Friesian	7.14 ± 0.06	on station	[11]
8	50% F2 Friesian	5.70 ± 0.12	on station	[11]
9	50% F3 Friesian	5.05 ± 0.15	on station	[11]
10	50% HF × Borena	6.36 ± 0.30	on station	[10]
11	50% HF × Borena	6.4 ± 0.06	on station	[12]
12	50% HF × Borena (F1)	7.1 ± 0.17	on station	[13]
13	50% HF × Borena (F2)	5.4 ± 0.24	on station	[13]
14	50% HF × Horro	5.7 ± 0.10	on station	[12]
15	50% Jersey × Borena	5.6 ± 0.08	on station	[12]
16	50% Jersey × Borena (F1)	6.2 ± 0.17	on station	[13]
17	50% Jersey × Borena (F2)	4.5 + 0.24	on station	[13]
18	50% Jersey × Horro	4.9 ± 0.10	on station	[12]
19	75% F1 Friesian	8.70 ± 0.17	on station	[7]
20	75% F2 Friesian	6.72 ± 0.37	on station	[7]
21	75% Friesian	6.95 ± 6	on station	[14]
22	75% HF	6.3 ± 0.1	on station	[8]
23	75% HF × Local	8.78 ± 1.69	on farm	[9]
24	75% HF × Barca	7.15 ± 0.28	on station	[10]
25	75% Jersey	4.9 ± 4	on station	[14]
26	75% HF × Borena	6.92 ± 0.25	on station	[10]
27	75% HF × Borena	7.2 ± 0.32	on station	[13]
28	75% HF × Borena	7.0 ± 0.11	on station	[12]
29	75% HF × Borena	6.91 ± 0.25	on station	[11]
30	75% HF × Horro	6.8 ± 0.23	on station	[12]
31	75% Jersey × Borena	6.1 ± 0.31	on station	[13]
32	75% Jersey × Borena	5.7 ± 0.17	on station	[12]
33	75% Jersey × Horro	5.5 ± 0.23	on station	[12]
34	87.5% HF × Barca	6.28 ± 0.52	on station	[10]
35	87.5% HF × Borena	5.98 ± 0.50	on station	[10]

36	F1 Friesian	5.6 ± 8	on station	[14]
37	F1 Jersey	5.17 ± 7	on station	[14]
38	F2 Friesian	4.81 ± 5	on station	[14]
39	F2 Jersey	4.18 ± 5	on station	[14]
40	Friesian × Borena	5.88 ± 0.05	on station	[15]
41	HF × Fogera	9.91	on farm	[16]
42	Jersey × Borena	5.21 ± 0.05	on station	[15]
43	Jersey × GH	7. 30 ± 0.16	on farm	[17]
44	Zebu × HF	8.45 ± 1.23	on farm	[19]

Note: DMY: Daily Milk Yield; HF: Holstein Friesian; F1: 1st filial generation; F2: 2nd filial generation; F3: 3rd filial generation; Fg: 1st generation for 75% crosses; Sg: 2nd generation for 75% crosses

CONCLUSION

Many literature results in Ethiopia agreed, crossbred dairy cows produced better milk yield performances than indigenous breeds because of the advantage of heterosis. However, their milk yield performance had lower than pure exotic parents. Most crossbred dairy cows milk yield trait performances were influenced by year, season, parity and lactation numbers. In the long-term experiment on station condition, 50% F1 crossbred genotypes were relatively performed well and indexed in milk production traits. The second and third generations in all genotypes were poor in both milk yield performances due to heterosis reduction. The 75% of first generations were higher milk producers than all other genotypes. Therefore, 50% F1 and 75% first-generation crosses as dairy cows were the best options to the producers under the current dairy production conditions in Ethiopia, as extreme performance differences were not seen as an on-station and on farm evaluated crossbred dairy cows. Regarding milk yield performances, index selection should be applied by including all economic important milk yield traits.

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