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Comparative performance of six Holstein-Friesian x Guzera grades in Brazil. 9. Stayability, herd life and reasons for disposal

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ABSTRACT

As part of a more comprehensive crossbreeding trial, herd survival traits were studied in 527 females of six crossbred Holstein-Friesian (HF) x Guzera groups (1/4,1/2, 5/8, 3/4, 7/8 and > 31/32 HF) on 67 farms in the southeast region of Brazil, grouped into high vs. low management leveis, with 133 and 394 heifers each. Heifers were distributed to farms at 22 months of age and recorded up to 12 years of age. Percentages of parous females in high management, for the six groups in the above order, were 96.6, 95.8,100.0, 89.4, 96.3, and 100.0, and for low management, 89.6,95.5,81.8,88.1,85.9 and 71.9. Percentages of firstcalvers completing five lactations in high management were 21.4, 87.0, 23.5, 82.4, 61.5, and 64.7, and in low management, 26.7, 74.6, 33.3, 54.2, 38.2 and 26.1. Mean number of lactations in high management were 4.0, 8.5, 4.1, 6.7, 5.6 and 6.4, and in low management, 3.8,6.0,3.6,4.5,3.7 and 3.2. The FI group had a lower frequency of non-parous heifers, longer herd life and a higher number of lactations. They were culled less intensely than the other groups and had the lowest mortality rates, along with the 1/4 HF group. These measures of performance declined with increasing HF fractions, particularly in low management. The 1/4 and the 5/8 groups, although showing low mortality rates, were culled heavily, mainly because of low yield, particularly in high management. No clear trends between groups were apparent for the frequencies of cows disposed of due to mastitis and reproductive problems, but the frequencies of disposals due to accident, health and other causes, which were similar for 1/4 and FI, tended to increase with HF fractions above 1/2.

INTRODUCTION

Herd survival is of paramount importance for economic dairy production. Dekkers and Jairath (1994) reported that literature estimates of the economic value of survival relative to production ranged between 20 and 60 percent. Vaccaro (1990) drew attention to the major survival problems of *Bos taurus* dairy breeds in the tropics, which were "not able to sustain their numbers", and indicated higher survival of *B. indicus* crossbreds. In spite of its economic importance, very few experiments have measured dairy cattle longevity either in temperate (McAllister, 1986) or in tropical countries. Crossbred superiority hás been reported for both situations, although it seems to be far more important in the tropics (Vaccaro, 1990).

This paper reports on herd survival traits in a long term trial designed to evaluate crossbreeding strategies in Brazil (Madalena, 1989).

MATERIAL AND METHODS

Heifers (527) of six red Holstein-Friesian (HF) x Guzera (Gu) crosses (denoted by their HF gene fraction:

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1/4,1/2,5/8,3/4,7/8 and > 31/32) from 65 private and two experimental farms located in the States of Minas Gerais, São Paulo, Rio de Janeiro and Espírito Santo had lifetime monthly milk recording. Rationale, farm location and other trial details have been previously described (Madalena, 1989).

The crossbred groups were F_{lr} backcrosses to both parental breeds and an *inter* se of 5/8 HF sires and dams. Number of HF, Gu and 5/8 sires were 30,15, and 8. Further Information on the origin of these groups is given in Lemos *et ai.* (1984).

Heifers were born at Santa Mônica Experimental Farm, State of Rio de Janeiro, between March 1977 and December 1981. They were distributed to cooperator farms at mean age 22 months and mean weight 220 kg. With a few exceptions, each private farm received a set of six heifers, one of each crossbred group. Heifers in each set were contemporary (average age difference = 36 days, average range = 83 days). The two experimental farms (UEPAE São Carlos-SP and Santa Mônica) received 29 and 97 heifers with unequal numbers of each cross.

Recording continued up to 12 years of age, except for 30 females, which had recording terminated earlier due to lack of funding. Those 30 females were sold for dairy use at average age 9 years (range 8 to 11). Thus, ali non-culled females in this study were sold for dairy and ali culls were sold for beef. Cows reaching 12 years of age during lactation were not culled until they dried off. Cause of death was diagnosed by a local veterinarian.

Animais remained the property of the Research Center, up to disposal, when they were sold by a supervising techmcian at local prevailing prices. By contract terms, farmers were not permitted to cull for production before the youngest heifer in the set reached 7.5 years of age. However, date and reasons for culling intention were recorded. Culling for reasons other than low production was possible at any time.

Traits analyzed in this report were defined as follows. Stayability up to the end of the i-th lactation (Sj, i = l to 10) was coded O for disposal and l for staying. Herd life was the time span from first calving to the end of the last lactation. Fate was died, sold for beef or sold for dairy. Three stolen animais were included as dead for unknown reasons to avoid biasing proportions. There were 49 noted reasons for disposal, which were grouped into the following six classes for statistical analyses:

1. Low yield.
2. End of recording.
3. Mastitis.
4. Reproductive problems (including abortions, brucellosis, metritis, dystokia, uterine/vaginal prolapse).
5. Accident (including fali down a hill, snake bite, traumatic pericarditis).
6. Other reasons, including intoxication (by poisonous plants, by chemicals, typanism), diseases (cachexia, plasmosis, intestinal hemorrhage, tuberculosis, tetanus, rabies, pneumonia), temperament and unknown reasons.

Farms were grouped into two classes of "high" and "low" management leveis as described previously (Madalena *eí ai,* 1990). Farms receiving more than six heifers were grouped into contemporary batches for statistical analyses. Females placed at the Santa Mônica farm made up 73% of the high management females.

Analyses were performed within each management levei. Heterogeneity of the distributions of fate, stayabilities and reasons for disposal among crossbred groups was tested by chi-square (Soares *et ai.,* 1991). Herd life was analyzed by the method of least squares analysis of variance (Scheffé, 1959), under a linear model, which included the fixed effects of crossbred group and batch effects.

RESULTS AND DISCUSSION

The distribution of females among calved/ never calved and fate classes is presented in Table I. Very few (< 4%) heifers did not calve in high management, but > 14%, failed to do só in low management.

The percentage of cows calving at least once in low management was higher for the Fj group and declined with higher or lower HF fractions (Table I). The same trend held for the percentage of cows sold for dairy in both management systems, although valid $\%^2$ tests could only be performed for the low group. The 1/4 and the 5/8 *inter se* had the highest percentages of cows culled for beef. Mortality was lowest for the 1/4 and FJ groups. Mortality was very high for groups with a high HF fraction, even for non-parous heifers under low management, in spite of their rather advanced age when distributed to cooperator farms.

Trends similar to the present ones for mortality and disposal of cows and heifers of genetic groups were reported by Amble and Jain (1967) in índia; i.e. increased rates as HF fraction departed from 1/2 in either direction. Data from Cuba reported by Vaccaro (1990) also indicated higher mortality for groups above 5/8 HF. Culling was higher for the Fj, but it is not clear

Table I - Total number of females and percentage distribution of calving status/fate categories*.

High management

	Holstein-Friesian gene fraction						
	1/4	**1/2**	**5/8**	**3/4**	**7/8**	**> 31/32**	**Total**
Total number	29	24	17	19	27	17	133
	%						
Calved	**96.6**	**95.8**	**100.0**	**89.4**	**96.3**	**100.0**	**96.2**
Died	3.4	4.2	5.9	21.0	18.5	41.2	14.3
Sold for beef	89.7	33.3	94.1	47.4	63.0	52.9	63.9
Sold for dairy	3.5	58.3	0.0	21.0	14.8	5.9	18.0
Not calved	**3.4**	**4.2**	**0.0**	**10.6**	**3.7**	**0.0**	**3.8**
Died	3.4	0.0	0.0	5.3	0.0	0.0	1.5
Sold for beef	0.0	4.2	0.0	5.3	3.7	0.0	2.3

Low management

	Holstein-Friesian gene fraction						
	1/4	**1/2**	**5/8**	**3/4**	**7/8**	**≥31/32**	**Total**
Total number	67	66	66	67	64	64	394
	%						
Calved	**89.6**	**95.5**	**81.8**	**88.1**	**85.9**	**71.9**	**85.5**
Died	10.5	13.7	19.7	25.4	42.2	37.5	24.6
Sold for beef	62.7	21.2	40.9	29.9	28.1	29.7	35.5
Sold for dairy	16.4	60.6	21.2	32.8	15.6	4.7	25.4
Not calved	**10.4**	**4.5**	**18.2**	**11.9**	**14.1**	**28.1**	**14.5**
Died	3.0	1.5	9.1	10.4	14.1	23.4	10.2
Sold for beef	7.4	3.0	9.1	1.5	0.0	4.7	4.3

*Heterogeneity chi-square: not applicable for high management. For low management, $\chi^2 = 121.37$, $P < 0.001$.

whether culling criteria were the same in the different groups, representing different generations in breed development programs aiming at 5/8 and 3/4 populations. Osman and Russell (1974) reported increased mortality or cows, from 12% for Butana to 28% for 3/4 *B. taurus* crosses. The Fj and F_2 (majority) were grouped together as half-breds, só that the mortality of that group (20%) cannot be compared readily with out own results.

Stayabilities of parous females are presented in Table II for second lactation onwards, since S; = 1 for this category. Because the *F^* were culled less and survived better, they showed impressive stayability compared with the other groups. In high management 78% completed eight lactations, against 47% of the 3/4 and approximately 30% of the higher HF groups. In low management, 30% of the Fj completed eight lactations, whereas only O to 8% did só in the other groups. Conceivably Stayabilities were higher for these cattle than for the farmers' own animais, because the salvage value belonged to the Research Center although this would not invalidate the comparison between the crossbred groups.

Ponce de Leon and Guzman (1993) reported survival of 93.4 and 83.1% for 1.5 and 3 years after first calving of Cuban Holsteins. Franklin *et ai.* (1976) reported that only 67 and 47% of AMZ in Australian cows stayed after the first and second lactations, whereas corresponding values for control cows (B. *taurus)* were 79 and 58%. The latter are comparable to values in North America and Europe (e.g. 82 and 62%, Hinks, 1966; 86 and 72%, Westell *et ai,* 1982; 68 and 41%, Dentine *et ai,* 1987; 79 and 65%, Renkema and Stelwagen, 1979) but the former are very low, even though farmers were subsidized to keep AMZ cows.

Stayabilities after the end of first and second lactations were calculated from the Kenyan data presented by Thorpe *et ai.* (1994), for Ayrshire sired crisscrossed cows (Ar, 65 and 47%), Sahiwal sired crisscrossed (Sr, 51 and 29%), and *inter se* of these two groups (Ar x Sr, 29 and 21%). High culling rates were applied to maintain herd numbers. Another cause of discrepancy with our results may be due to the differences in milking practices. Calf suckling stimulus was practiced in ali herds in our trial but not in the Kenyan herd, where calves were weaned at birth, and a substantial percentage of cows were disposed of at calving (8.6 in the first and 6.2 in the second lactation) due to poor temperament and milk let down, which was higher in the Sr. Brown Swiss x Ar and Brown Swiss x Sr had higher Stayabilities (80 and 61% and 81 and 72%), but again these groups might have been favored due to the ranch policy of developing a three-breed synthetic (Thorpe *et ai,* 1994).

Herd life means are shown in Table III. The FjS had the longest herd life in both management leveis, reflecting their higher Stayabilities. Increasing HF fraction reduced herd life, particularly under low management, due to increased mortality and culling. Herd lives of 1/4 and 5/8 were very short, particularly in high management, due to heavy culling.

Amble and Jain (1967) reported a herd life of 7.9 lactations in Fj, declining with HF fraction to 2.4 lactations in > 31/32 HF and to 4.3 lactations in Sahiwal. These figures are roughly comparable to our results. Joviano *et ai* (1963) found herd life decreasing from 9.6 years for 3/4 Jersey x B. *indicus* to 6.9 years for > 15/16

Table II - Stayabilities up to the end of each lactation for parous females*.

High management

Lactation number	Holstein-Friesian gene fraction 1/4	1/2	5/8	3/4	7/8	≥ 31/32	Total	P >χ^2
	%							
2	92.9	100.0	94.1	94.1	92.3	100.0	95.3	n.v.
3	75.0	95.7	64.7	88.2	88.5	100.0	85.2	n.v.
4	50.0	91.3	58.8	88.2	80.8	88.2	75.0	n.v.
5	21.4	87.0	23.5	82.4	61.5	64.7	55.5	0.001
6	14.3	82.6	17.7	76.5	53.9	64.7	50.0	0.001
7	14.3	78.3	11.8	58.8	42.3	52.9	42.2	0.001
8	3.6	78.3	11.8	47.1	15.4	29.4	29.7	0.001
9	0.0	60.9	0.0	11.8	11.5	11.8	16.4	n.v.
10	0.0	34.8	0.0	0.0	3.8	5.9	7.8	n.v.
N	28	23	17	17	26	17	128	

Low management

Lactation number	Holstein-Friesian gene fraction 1/4	1/2	5/8	3/4	7/8	≥ 31/32	Total	P> χ^2
	%							
2	91.7	98.4	81.5	89.8	76.4	78.3	86.7	0.002
3	68.3	90.5	63.0	78.0	60.0	60.9	70.9	0.001
4	46.7	81.0	44.4	66.1	45.5	34.8	54.3	0.001
5	26.7	74.6	33.3	54.2	38.2	26.1	43.3	0.001
6	20.0	61.9	20.4	33.9	27.3	21.7	31.8	0.001
7	11.7	50.8	14.8	25.4	16.4	6.5	22.0	0.001
8	8.3	30.2	1.9	8.5	7.3	0.0	10.1	0.001
9	3.3	11.1	0.0	3.4	1.8	0.0	3.6	n.v.
10	0.0	1.6	0.0	1.7	0.0	0.0	0.6	n.v.
N	60	63	54	59	55	46	337	

*S_1 = 100.0; n.v. = test invalid due to low numbers.

Jersey in a private herd in Brazil, although they indicated that part of the superiority of the 3/4 might have been due to the farm policy of increasing herd numbers. Osman and Russell (1974) found small differences among crossbred groups, herd life ranging from 6.7 in 1/4 B. *taurus* to 6.1 in half-breds. Thorpe *et ai.* (1994) reported herd lives of 3.3,2.3 and 1.9 years for their Ar, Sr and Ar x Sr crosses. Silva *et ai.* (1986) found herd lives of 2.8,2.9 and 3.6 years for Guernsey, Holstein and Jersey cows in Florida, corresponding to 3.2, 3.3 and 3.8 calvings. Other literature reports in which crossbred groups did not have the same opportunity to express herd life are not discussed here, nor are reports considering only survivors up to a given age, because this procedure attenuates the real differences between groups.

In the present study 37/528 females had the reason for culling intention recorded, of which 23 were in fact actually culled before the next lactation occurred. Had cows been culled by farmers when intended, total average number of lactations completed would have been only 0.05 less than the actual number. Effects on high management would be negligible since only one cow would have been culled earlier than actually done. Stayabilities under low management would have been somewhat reduced, e.g. for second lactation, from 1.7% inthe 1/4 to 4.4% in the > 31/32, with smaller reductions in later lactations. The superiority of FjS would have been augmented, because no cows of this group were intended for culling. A high proportion of 1/4 females was culled for low yield, particularly in high management (Table IV). Low yield was also an important reason for disposal of 5/8 in high management, but was not very frequent for the other groups. Disposal due to mastitis was more frequent in high than in low management, but

Table III - Least squares means for herdlife of crossbred groups ± standard errors.

Management level	Holstein-Friesian gene fraction 1/4	1/2	5/8	3/4	7/8	≥ 31/32	Mean
	days						
High	1393 ± 170^{C}	3077 ± 182^{a}	1374 ± 205^{c,d}	2634 ± 205^{a,b}	2163 ± 178^{b,d}	2516 ± 203^{a,b}	2193 ± 71.8
Low	1462 ± 122^{c}	2606 ± 117^{a}	1559 ± 127^{b,c}	2047 ± 123^{b}	1561 ± 126^{b,c}	1324 ± 142^{C}	1760 ± 50.4
	lactations						
High	4.0 ± 0.5^{d}	8.5 ± 0.5^{a}	4.1 ± 0.5^{c,d}	6.7 ± 0.5^{a,b}	5.6 ± 0.5^{b,c}	6.4 ± 0.5^{a,b,c}	5.9 ± 0.2
Low	3.8 ± 0.3^{b},c	6.0 ± 0.3^{a}	3.6 ± 0.3^{b},c	4.5 ± 0.3^{b}	3.7 ± 0.3^{b,c}	3.2 ± 0.3^{C}	4.1 ±0.1

^{a,b,c,} Means in the same row with different superscript letters differ significantly (P < 0.05).

differences among groups were not very important within management. Frequency of disposal because of accident and other causes, which included diseases, increased with a higher HF fraction in both management systems. More than 60% of FjS reached the end of recording in both management leveis, a much higher proportion than in other groups.

Osman and Russell (1974), who considered ali cows surviving up to the lOth lacta ti on, indicated decreasing percentages of cows disposed of because of old age with increased *B. taurus* fractions, ranging from 43% for 1/4 to 17% for 3/4.

Only one female (l /4 HF) in high management and four in low management (two 1/4 and two 5/8) were disposed of because of bad temperament.

For North American and European countries, Renkema and Stelwagen (1979) stated that about 70% of disposals are due to disease or involuntary reasons, whereas 30% are caused by culling for low yield (15%) and other reasons related to hard milking, temperament and type (15%); herd life was about 4.5 years. They found that cows that do not have to be removed because of disease have an optimum economic herd life of 13 lactations. Allaire (1981) concluded that voluntary replacement should not exceed 3% of the herd for optimum returns. Voluntary culling in our data was due only to low yield and temperament, which accounted for 17.2% and 15.2% of cows in high and low managements. Variation between groups was, however, very high. The fittest groups, such as the Fj, and to some degree the 3/4, also had a low frequency of voluntary culling, and therefore a larger proportion of cows reached older ages, with a consequently higher number of lactations, which should reflect in higher profit.

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Table IV - Distribution of reasons for disposal*.

High management levei

Reason for disposal	Holstein-Friesian gene fraction						
	1/4	1/2	5/8	3/4	7/8	> 31/32	Total
	%						
Low yield	51.7	4.2	29.4	0.0	3.7	0.0	16.5
End of recording	3.5	62.5	0.0	21.0	14.8	5.9	18.8
Mastitis	17.2	12.5	23.5	21.1	22.2	17.7	18.8
Reproductive problems	17.2	20.8	41.2	31.5	37.0	17.6	27.1
Accident	0.0	0.0	0.0	10.5	7.4	23.5	6.2
Other causes	10.3	0.0	5.8	15.8	14.8	35.3	12.8
N	29	24	17	19	27	17	133

"Heterogeneity χ^2, P <0.000

Low management levei

Reason for disposal	Holstein-Friesian gene fraction						
	1/4	1/2	5/8	3/4	7/8	>31/32	Total
	%						
Low yield	38.8	6.1	12.1	7.5	9.4	7.8	13.7
End of recording	17.9	60.6	21.2	32.8	15.6	6.3	25.9
Mastitis	3.0	0.0	6.6	6.0	9.4	6.3	5.1
Reproductive problems	22.4	16.6	22.7	20.9	12.5	23.4	19.8
Accident	4.5	4.6	13.6	9.0	23.4	26.6	13.5
Other causes	13.4	12.1	24.2	23.9	29.7	29.7	22.1
N	67	66	66	67	64	64	394

*Heterogeneity χ^2, P < 0.001.

RESUMO

Como parte de um experimento mais abrangente foram estudadas as características de sobrevivência de 527 fêmeas de seis cruzamentos de Holandês (HF) x Guzera (1/4, 1/2, 5/8, 3/4, 7/8 e > 31/32 HF) em 67 fazendas na região Sudeste, agrupadas em duas classes de alto e baixo nível de manejo, com 133 e 394 novilhas cada. As novilhas foram distribuídas às fazendas com idade média de 22 meses e acompanhadas até os 12 anos de idade. Os percentuais de fêmeas que pariram, no nível alto de manejo, para os seis grupos, na mesma ordem acima, foram, respectivamente, 96,6, 95,8,100,0, 89,4, 96,3 e 100,0, e, para o nível baixo, 89,6, 95,5, 81,8, 85,9 e 71,9. Os percentuais de vacas com um parto que completaram cinco lactações, no nível alto, foram 21,4, 87,0, 23,5, 82,4, 61,5 e 64,7, e, no nível baixo, 26,7, 74,6, 33,3, 54,2,38,2 e 26,1.0 número médio de lactações no nível alto foi 4,0, 8,5, 4,1, 6,7, 5,6 e 6,4, *e, no* nível baixo, 3,8, 6,0, 3,6, 4,5, 3,7 e 3,2. As FI tiveram menor número de novilhas sem parto, vida útil mais longa e maior número de lactações. Elas foram descartadas com menor frequência que nos outros grupos e tiveram as menores taxas de mortalidade, junto com as 1/4. Estas medidas do desempenho declinaram com maiores

frações de HF, particularmente no nível de manejo baixo. As 1/4 e as 5/8, embora tendo baixa mortalidade, foram frequentemente descartadas, principalmente por baixa produção, especialmente no nível alto. Não houve tendências claras entre os grupos nas frequências de vacas descartadas por mamite e problemas reprodutivos, mas as frequências de descarte por acidente, doença e outras causas, que foram similares nas 1/4 e nas FI, tenderam a aumentar com frações HF acima de 1/2.

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