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CLASSIFICATION OF RIVER BUFFALO COWS ON THE BASIS OF TWO EVALUATION CRITERIA APPLIED TO HERDS IN GRANMA PROVINCE, CUBA

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ABSTRACT

Milk production data were collected from 150 river buffalo cows raised in six herds in Granma, Cuba, and having from 1 to 10 production cycles, during the 1997-2005 period. The data originated from monthly samples collected in the morning with the presence of the calf. SAS 9.0 was used to analyze the data by means of a model containing the effects of herd, calving year, calving season and calf sex, plus the linear effect of age at first calving, in order to classify the cows according to total milk yield adjusted to 7% fat content (TMYA) or total unadjusted yield (TMY). The individual values of TMYA were then adjusted according to the effects of herd, calving year and calf sex, which had shown significance in the variance analysis. TMY was adjusted for only the first two effects. Spearman's correlation between these two variables was 0.95. The final classification reflects the present state of each cow, taking into account the whole evaluation and the number of lactations. This work has practical interest, since it allows the selection of the best animals for becoming mothers of future bulls and the culling of the least productive cows. Furthermore, information is given on the herds productiveness, based on overall means and their dispersion values. In conclusion, buffalo cow classification can be done either on the basis of total milk yield or on the basis of total milk yield adjusted for fat content, because of the high correlation between both variables; however, adjusted yield showed a higher variability.

Keywords: buffalo cows, classification, correlation, milk.

INTRODUCTION

During the last decade buffalo husbandry has been an alternative for milk and meat production, since this species is more profitable than Zebu cattle when raised on infertile lands, due to its high rusticity and ability to make use of natural pastures, as well as many other virtues that favor its husbandry. There is information that on many spots buffaloes are equal to or better than local cattle, in terms of growth, tolerance to the environment, health and meat production, calves and milk, which indicate that buffalo raising could become an important economic resource in tropical, subtropical and temperate zones of different countries of the northern hemisphere. (Encarta, 2004).

A breeding program for this species has begun in Cuba, with the objective of increasing milk yield, taking into account that genetic improvement must occur together with improvements in feeding and management, particularly in the Granma province, where application of these principles is necessary, as stressed by Anioli (2007).

The fat content of buffalo milk is about 4 percentage points higher than that cattle milk (Iñiguez et al, 1987; Campo, 1997), and the fat percentage represents energy content, which in practice is used for correcting or adjusting milk yield for comparative purposes. In order to make these comparisons possible, some researchers consider milk as a substance with constant energy content.

Presently in Cuba it is not possible to measure milk fat content in all herds, and there is a question whether it should use total uncorrected milk yield or fat-corrected milk yield when evaluating buffalo cows for positive or negative selection.

The objective of the present paper was to gather primary information on buffalo cow evaluation based on total unadjusted milk yield or fat-corrected milk yield, taking into an account fixed environmental effects. Based on these results, we studied the relationship between two variables, using Spearman's correlation, in other to obtain a preliminary idea on the similarity between two evaluation methods.

MATERIALS AND METHODS

The records of total milk yield (499 observations) from 150 Bufallipso x Carabao crossbred cows were used, raised in six herds in Granma province, Cuba, with 1-10 parturition cycles, occurring from 1997 to 2005. Those cows having zero milk yield was zero or no information on milk fat content was eliminated from the original files. At the end, a total of 88 cows were considered.

The milk production records were based on monthly samples collected in the morning, with the calf present and from all four teats, the usual practice being to leave one teat for the calf, in rotation. The cows stayed 24 hours a day on natural and King Grass pastures, without supplementation, except on a few farms, where the cows produce more than 2 liters/day were given 1 kg/day of imported pure Norgold (a corn sub-product used for ethanol production).

Data analysis used SAS 9.0, by means of a model including the effects of herd, calving year, calving season and calf sex, as well as linear regression of age at first calving. The values obtained from the **Predicted** option were used to classify the cows according to a total milk yield adjusted to 7% fat content (TMYA) or total unadjusted yield (TMY). Furthermore, Spearman's correlation between both classifications was calculated.

RESULTS AND DISCUSSION

Table 1 shows the dispersion values and the model adjustment (R^2) for the mentioned period. This table shows the overall means, not adjusted for the model. The value for fat-corrected milk yield was slightly lower (18 kg) than for unadjusted yield. The standard error was also slightly lower for fat-corrected yield, but had a slightly higher coefficient of variation. It can be observed that the yield values, although satisfactory, were lower than those reported for Cuba by other authors (Hernández y Espinosa, 2005; Fraga et al, 2006).

Table 2 shows the results of the variance analysis for each variable. Significant effects (P<0.001) were found for herd and calving year in TMY, whereas in TMYA significance was found for herd, calving year and calf sex.

The significant effects of herd and calving year agree with other results obtained in Cuba; however, the same cannot be said about the effect of calf sex (Table 5), which is usually not significant, this result may be attributed to the small sample size (Fraga, et al, 2006; García, 2006). It is relevant that, by maintaining only the records having milk fat data, all the information from a herd was lost. Nevertheless, the variability of TMYA was higher, according to its standard error and coefficient of variation, when the same number of observations and the same animals were used for both variables.

The results show that the yield range was 868 kg for TMY and 929 kg for TMYA, which indicates that correcting for 7% fat content increased variability, which would allow a greater selection differential, as observed in the coefficient of variation.

Spearman's correlation between two variables was 0.95, and this high value indicates that ranking cows by either method produces very similar results.

Based on our results, we may conclude that cow ranking may be done using either total yield or total yield corrected to 7% fat, since the correlation between them is high, although fat-corrected yield shows higher variability, and its large value range could be used for negative selection, in the case of an annual replacement rate of 10%, preferably using daughters of the best dams.

Table 1. Overall means and dispersion parameters for milk yield.

Variable	N	Mean	SE ±	CV%	R^2
TMY, kg	332	627	12.6	35.6	0.13
TMYA, kg	325	610	13.5	39.8	0.12

Table 2. Variance Analyses for the yield variables

Variable	Herd		Calving year		Calving season		Calf sex		EPA1		Error	
TMY, kg	3	465602^{***}	9	246489^{***}	1	136607	1	12160	1	66492	278	44577
TMYA, kg	2	361585^{***}	9	142394^{*}	1	59345	1	278973^{*}	1	180	310	58986

$^{***}p< 0.001$ $^{*}p< 0.05$

Tables 3. Effects of herd on TMYA and TMY.

Herd	TMYA, kg		TMY, kg	
	Mean	SE±	Mean	SE±
1	630^{b}	31	625^{c}	21
2	553^{a}	36	554^{b}	26
3	496^{a}	48	460^{a}	40
4			607^{bc}	43

a,b,c Means sharing a letter do not differ P > 0.05 (Duncan, 1955).

Table 4. Effect of calving year on TMY and TMYA.

Calving year	TMYA, kg		TMY, kg	
	Mean	SE±	Mean	SE±
1997	335[a]	69	365[a]	64
1998	575[bc]	61	559[bcd]	57
1999	575[bc]	61	480[ab]	58
2000	544[bc]	51	517[bc]	51
2001	501[b]	42	534[bc]	40
2002	629[c]	40	640[d]	34
2003	622[c]	38	663[d]	33
2004	596[bc]	33	617[cd]	30
2005	623[c]	34	677[d]	30

a,b,c,d Means sharing a letter do not differ P >0.05 (Duncan, 1955).

Table 5. Effect of calf sex on TMYA.

Calf sex	TMYA	
	Mean	SE±
Female	590	34
Male	530	33

This method could be of interest when applying an annual negative selection; in case of one does not use more complex procedures for the evaluation of breeding value. One should always use fat-corrected total yield when it is possible to measure fat content and when it is not possible to rank cows without this adjustments.

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