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Introduction of *Brachiaria brizantha* cv. Marandú for Milk Production, and Economic Results of a Buffalo Dairy

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ABSTRACT

The effect of introducing *Brachiaria brizanta* cv. Marandú for forage upon milk production and economic results was evaluated on Tayabito buffalo dairy farm affiliated to Maraguán Livestock Center in Camagüey municipality, Cuba. To this purpose, a two-hectare *B. brizanta* grazing ground was introduced and its effect on milk production and quality was estimated by a Switch Back design with two treatments and six replicas each. Initially, female buffaloes lactation span was 122 ± 5,7 days. Forage balances were performed on native pastures and half the area with *B. brizanta* grassland. This new species proved its suitability by spreading over 80 % of the 2 ha area after being planted. Concerning milk production during dry and rainy seasons, a significant increase was registered for *B. brizanta* compared to native pastures (over 0,54 and 0,83 l/animal/day for each season, respectively). Milk quality was not affected in either case. This farm forage production could supply current herd feeding needs by introducing 50 % grazing grounds of *B. brizanta*; besides, productive indexes could significantly improve.

Key Words: *cultivated pastures,* Brachiaria brizanta *cv. Marandú, buffalo milk production*

INTRODUCTION

Buffalo raising is a viable alternative to ease the pressing situation of cattle raising in many tropical countries in Latinamerica, Asia and Africa. It would also increase meat and milk production, with a high nutritional and therapeutic value, at competitive costs (Fundora and González, 2001; García and Planas, 2002; Anón, 2004).

Pulido (2001) reported that the knowledge on this species and the results achieved corroborate the development and true potential as a source of employment and food access. However, there are still technological deficiencies that could be overcome.

In 1990 several buffalo farms were set up in the province of Camagüey, with the ensuing spread of the species, still with rudimentary techniques. Exploitation was taken to less fertile lands, with low-yielding, poor-quality native pastures (MINAGRI, 2008). The results achieved then are a far cry from the real potentialities for the species. Assessment of pastures cultivated is essential to improve the nutritional base at the buffalo dairies, for higher production and economic results.

The aim of this paper is to assess the effect of *Brachiaria brizantha* cv Marandú on milk production at a buffalo dairy from Maraguán Catle Raising Farm in Camagüey.

MATERIALS AND METHODS

Location

The research took place at the Tayabito Buffalo Dairy, from the Maraguán Cattle Raising Farm, km 6, Carretera Central East, municipality of Camagüey (map scale 1.25000 Guanabaquilla, coordenates 394,336 North and 297,811 South, Cuban coordenate system).

Soil and Weather

The predominant soil is brown with typical carbonate, on soft carbonated limestone, moderately deep and humidified, with clay-like texture, and a proven depth of 20.0 cm. The topography is lightly undulatory (Hernández *et al*., 1999).

The weather falls within humid tropical, with seasonal humidifying and annual mean rainfall of 1 180 mm; relative humidity was 84 % from May to October, and top temperatures range between 24 and 29 °C .

Dairy Features and Handling

The dairy comprises 67.1 ha, allotted as follows:

- Area for facilities and homes: 4.5 ha
- Area for buffalo calves: 9 ha, split into 18 enclosures (0.5 ha/enclosures)

- *B. brizantha* cv. Marandú breeding area: 2 ha
- Area for night stay: 1 ha
- Area for sugar cane and king grass: 4.6 ha
- Pasturing area for adult animals: 46 ha in 4 enclosures

The farm has two workers, and includes a windmill and a Texan tank with a capacity of 1 500 l of water

The animals are milked by hand (calf support), at 5:00 am, starting from day ten after delivery. In both the rainy and dry seasons the buffalo cows are allowed to pasture for 16 h; the remaining time they are kept in stalls with a supply of forage and water.

The farm´s main income comes from milk sales (CUP $ 3.69, approximately), cheese and weaned animals.

Experimental procedure

The introduction of *B. brizantha* cv. Marandú in two hectares was implemented in November 2006. The soil was prepared using conventional methods, with plows and harrows, with shallow furrowing, at a distance of 60 cm . Sowing was by hand spreading, at a rate of 10 kg of gamic seed/ha; then the area was left unused for five months. Grazing was started in April 2007, when the grass reached over 90 cm high; no fertilizer or irrigation was applied at the setting phase.

Shoots were observed at 15, 30 and 45 days after sowing; then coverage was assessed for 180 days, until the plants were fully grown. Yielding was determined on the first day of grazing, by weighing five 0.25 m^2 frames at random. To evaluate the effect of brachiaria on milk production two tests were conducted in the rainy and dry seasons, in 2010. Switch Back was used in the two treatments, with six replicas each. The first treatment was grazing in bracharia fields; the second was grazing in native pasture.

Each grazing period included 7 days for adaptation and 15 days for assessment. The three last assessments in each period were calculated. The 12 buffalo cows selected weighed 488 ± 21.5 kg/day, and milk production of 4.6 l/animal/day.

Milk samples were analyzed in the pasteurization lab of the province. Chemical and physical determinations were carried out with the following techniques:

- Density by Quevene lacto densitometry, at a temperature of 15 ºC, according to NC (Cuban Standard) 119 (2006).
- Fat by Gerber butirometry, according to NCISO 1211 (2001).
- Non-fatty solids (NFS), according to the equation:

NFS = density / 4 + fat / 5 + 0.14

- pH (acidity) = ml * 0.1 * 0.09 * 100 / 9

Where:

ml: sodium hydroxide mililiters used

0.1: sodium hydroxide normality

0.09: equivalent

9 ml: sample volume

B. Brizantha cv. Marandu effects on milk production and forage balance were estimated as well in 50 % of the grazing areas; and the partial budget was analyzed to evaluate economic feasibility.

Bracharia introduction costs in 50 % of the grazing areas were determined (soil preparation, enclosing, purchase of supplies, pasture sowing), and the income was determined by additional milk production increase and sales of products that can be created during the initial period of maturation.

The main assessing indicator is CNU in the formula,

CNU = (income from technology + income from additional benefits) – technology costs + unperceived income), (Luening, 1996).

RESULTS AND DISCUSSION

Table 1 shows the number of plants per m^2 after sowing and development, from day 90 to 180. As observed, the number of plants increased up to 45 days after sowing, concurring with favorable environmental conditions and good seed quality, and leading to appropriate germination. According to Padilla (2000), these are decisive factors to achieve success in sowing and maturation of pastures, Cruz (2010) reported good species behavior during development, compared to other pratense graminaceae.

Species development also increased considerably up to day 180, which indicates its aggressiveness and competitive advantages over weeds in the study conditions. Reports (Cruz, 2010) also refer to these attributes in several species of *Brachiaria,* especially in *B. brizantha*.

Milk production based on Bracharia and native pasture showed significantly higher results

($P \leq 0.05$) in the rainy and dry seasons (tables 2 and 3), with a difference of 0.54 l in the rainy season and 0.83 l in the dry one. Hence, pasture quality plays a key role. This effect is more striking during the low-rain season, as the productive balance of the cultivated species is better than in the native pasture lands.

Campo and Hincapié (2003), Campo *et al.* (2005), Fundora *et al.* (2001), Curbelo (2004) and Guevara (2005) reported the positive effect of introducing the cultivated graminaceae on milk production, mainly due to an increase in the availability of biomass and better balance between the rainy and dry seasons. This effect favors greater consumption and grazing animal selection, and therefore, higher pasture quality (Senra, 2005).

Tables 4 and 5 show the milk quality parameters in the two treatments, where no differences are observed for both seasons. Pasture species or variety, especially graminaceae, used has been previously reported to have no adverse effect on the composition of the milk produced, perhaps due to the pasture´s chemical composition inducing similar rumen fermenting patterns.

Besides, the effect of seasons on milk composition has been reported in Colombia, on Bufalipso (Hurtado *et al*., 2004) and Cuba (Capdevila *et al*., 2001); however, in Argentina, Patiño (2004) found no significant differences for these parameters in the seasons studied. It seems that seasons are linked to feeding conditions, which may vary in terms of availability and quality of feed.

Estimation of the productive effect of bracharia in 50 % of the grazing area of the dairy shows a remarkable increase in milk production (table 6), both individually and as a whole in the year, chiefly associated to biomass availability in the grazing lands. It prevents dry matter deficits produced in the low-rainy season, as indicated in the forage balances (table 7).

Graminaceae introduction in dairies has been reported to have a positive effect on milk production, due to an increase in the availability and quality of the grazing lands when compared to the native pasture areas (Martín, 1999). To achieve positive increases it is important to consider the inclusion of crawling and arborescent legume species, which significantly raise the quality of the matter consumed by animals (Iglesias, 2003; Sánchez, 2007 y Loyola, 2011).

In terms of economic feasibility, the analysis of partial budget for the introduction of *B. brizantha* cv. Marandú in 50 % of the farm lands, produced favorable CNU (table 9), mainly due to an increase in profits from milk sales increases, which compensate for fencing costs, soil preparation and sowing.

Fencing and soil preparation are costly, but profitable in the mid-term, as land can be exploited sooner and the cultivated species remain in the area for years; a goal Cuban productive systems should meet (Padilla, 2000, Cino *et al*., 2005 and Guevara, 2005).

Moreover, the economic and practical advantages of sowing agamic pasture seed are known, compared with vegetative seeds (Padilla, 2000), which is favorable, considering that quality seeds are produced in our conditions (Cruz, 2010).

CONCLUSIONS

The introduction of *B. brizantha* cv. Marandú in buffalo dairy was satisfactory, and grazing had a positive effect on milk production, without changes in quality. The graminaceae used in 50 % of the farm grazing lands could be economically feasible and significantly improved farm productivity indicators.

REFERENCES

ANÓNIMO (2004). *Crías de búfalos (Bubalus bubalis)*. Extraído el 14 de marzo de 2007, desde http://es.wikipedia.org/wiki.

CAMPO, E. y HINCAPIE, J. H. (2003). *Búfalos de agua la especie del tercer milenio*. Cuba: UNAH.

CAMPO, E.; HERRERA, E.; HINCAPIE, J. J.; QUESADA, M. S. y FUNDORA, O. (2005). Estacionalidad de los partos, reproducción *y* producción láctea en búfalas de río y mestizas. *REDVET, Revista Electrónica de Veterinaria*, *IV* (4). Extraído el 15 de abril de 2007, desde http://www.veterinaria.org.revistas.redvetn040405.html.

CAPDEVILA, J.; ZALDÍVAR, V.; PONCE, P. y MARTÍNEZ, I. (2001). *Caracterización fisico-química de la leche de búfala proveniente de mezclas en Cuba. Efecto del mes y la época del año*. VI World Buffalo Congress, Maracaibo, Venezuela.

CINO, M. D.; FUNDORA, O. y GONZÁLEZ, M. E. (2005). Evaluación económica preliminar en una unidad experimental de búfalos (Bufalipso). *Revista Cubana de Ciencia Agrícola*, *39* (2), 141-146

CRUZ, M. (2010). *Evaluación de variedades de pastos en Camagüey*. Tesis de maestría en Producción

Animal Sostenible, Universidad de Camagüey, Cuba.

CURBELO, L. (2004). *Alternativas forraje-ganadería para las sabanas infértiles del norte de Camagüey.* Tesis de doctorado en Ciencias Veterinarias, Universidad de Camagüey, Camagüey, Cuba.

FUNDORA, O. y GONZÁLEZ, M. E. (2001). *Performance of Primiparous Buffaloes and their Progeny*. Proceedings of VI World Buffalo Congress, Maracaibo, Venezuela.

GARCÍA, S y PLANAS, TERESA (2002). *Manual de Crianza del Búfalo*. La Habana, Cuba: Sociedad Cubana de Criadores de Búfalos ACPA.

GUEVARA, G. (2005). *Evaluación de sistemas lecheros de la cuenca lechera de Camagüey*. Tesis de doctorado en Ciencias Veterinarias, Instituto de Ciencia Animal, La Habana, Cuba.

HERNÁNDEZ, A.; PÉREZ, J. M.; BOSCH, D.; RIVERO, L.; CAMACHO, E.; RUIZ, J. *et al*. (1999). *Clasificación genética de los suelos de Cuba*. Ciudad de la Habana, Cuba: Instituto de Suelos, Ministerio de Agricultura.

HURTADO-LUGO, M. F.; CERÓN-MUÑOZ, M. I.; LOPERA, A.; BERNAL, CIFUENTES, T. (2004). *Determinación de parámetros físico-químicos de leche bufalina en un sistema de producción orgánica*. Medellín, Colombia: Grupo de Investigación en Ciencias Agrarias, Facultad de Ciencias Agrarias, Universidad de Antioquía. Extraído el 24 de enero de 2007, desde nhurtado@universia.net.co.

IGLESIAS, J. (2003). *Los sistemas silvopastoriles, una alternativa para la crianza de bovinos jóvenes en condiciones de bajos insumos*. Tesis de doctorado en Ciencias Veterinarias, Instituto de Ciencia Animal, La Habana. Cuba.

LOYOLA, O. (2011). *Integración de leguminosas nativas y árboles frutales a sistemas de producción vacuna en sabanas ultramáficas del centro norte de Camagüey*. Tesis de doctorado en Ciencias Veterinarias, Universidad de Camagüey. Cuba.

LUENING, R. (1996). *Manual de Administración de Empresas Lecheras*. Wisconsin, USA: Univ. Wisconsin.

MARTÍN, P.C. (1999). Valor nutritivo de gramíneas tropicales. *Revista Cubana de Ciencias Agrícolas*, *32* (1), 3-9.

MINAGRI (2008). *Boletín Integral de Ganadería*. Camagüey, Cuba: MINAGRI.

NC (2001). *Leche: determinación del contenido de materia grasa. Método de referencia*. NC. ISO: 1211: 2001.

NC (2006). *Leche determinación de densidad*. NC. 119: 2006.

PADILLA, C. (2000). *Renovación, recuperación y vida útil de los pastizales*. Taller 35 Aniversario del Instituto de Ciencia Animal, La Habana, Cuba.

PATIÑO, M. (2004). *Factores que afectan la composición físico-química de la leche de búfalas* (Bubalus bubalis) *en Corrientes, Argentina*. Comunicaciones Científicas y Tecnológicas, Universidad Nacional del Nordeste.

PULIDO, C. C. J. (2001). *Búfalo asiático: un recurso inexplorado para producir proteína animal* (2da ed.). Venezuela.

SÁNCHEZ, T. (2007). *Evaluación de* L. leucocephala *para la producción de leche con vacas Mambí de Cuba*. Tesis de doctor en Ciencias Veterinarias, Universidad de Camagüey, Cuba.

SENRA, A. F. (2005). Índices para controlar la eficiencia y sostenibilidad del ecosistema del pastizal en la explotación bovina. *Revista Cubana de Ciencia Agrícola*, *39* (1), 13-20.

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Table 1. Number of plants/m^2 and *B. brizantha* spreading during development

No. plants/m^2	Days	Spreading (%)	Days
14	15	67	90
22	30	75	120
25	45	93	180

Table 2. ***B. brizantha*** **grazing effects on milk production in the rainy season (June 2010)**

Treatments	Milk production (l/buffalo cow/day)
Native pasture	5.17 ± 0.032 a
B. brizantha	5.71 ± 0.034 b
Significace	**

Different letters mean significant differences P < 0.01

Table 3. ***B. brizantha*** **grazing effect on milk production in the low-rain season (December 2010)**

Treatments	Milk production (l/buffalo cow day)
Native pasture	3.19 ± 0.022 a
B. brizantha	4.02 ± 0.022 b
Significance	**

Different letters mean significant differences P < 0.01

Table 4. ***B. brizantha*** **grazing effect on milk quality in the rainy season (June 2010)**

Indicators	Treatments		
	Native pasture	*B. brizantha*	Sign.
Specific weight (kg/l)	1.0360 ± 0.0022	1.0351 ± 0.002	NS
Non-fat solids (kg)	11.37 ± 0.032	11.04 ± 0.043	NS
Fat (%)	6.90 ± 0.031	6.70 ± 0.020	NS
Acidity (%)	0.13 ± 0.0019	0.13 ± 0.0021	NS

Table 5. ***B. brizantha*** **grazing effect on milk quality in the low-rain season (december 2010)**

Indicators	Treatments		
	Native pasture	*B. brizantha*	Sign.
Specific weight (kg/l)	1.0360 ± 0.022	1.0351 ± 0.022	NS
Non-fat solids (kg)	11.37 ± 0.047	11.04 ± 0.035	NS
Fat (%)	6.90 ± 0.033	6.70 ± 0.041	NS
Acidity (%)	0.13 ± 0.0016	0.13 ± 0.0018	NS

Table 6. Current productive indicators of the farm, with 50 % of lands covered with ***B. brizantha*** **cv. Marandú**

Indicator	UM	Current	50 % Brachiaria
Overal milk production	l/year	9.2	14.5
Milking buffalo cows	heads	242	336
Milk production per buffalo cow	l	3.2	3.4
Cheese production	kg	4.5	7.6

Table 7. Current balances of forage and *B. brizantha* cv. Marandú 50 % coverage

	Current			50 % Brachiaria		
	Area (ha)	PLL t ms	PS t ms	Area (ha)	PLL t ms	PS t ms
Native pasture	46.0	156.0	73.6	23.0	78.2	36.8
Brachiaria	2.0	10.0	4.0	23.0	115.0	46.0
Sugar cane	3.4	-	57.6	3.4	-	57.6
kg CT169	1.4	11.2	2.8	1.4	11.2	2.8
Total		177.6	138.0		204.4	143.2
Herd needs		123.0	123.0		123.0	123.0
Differences		54.6	-28.3		81.4	20.2

Table 8. Economic feasibility of *B. brizantha* cv. Marandú introduction in 50 % of grazing lands at the buffalo dairy (CNU in CUP)

Indicators	Values
Overal costs	35 468.65
Soil preparation costs	6 605.08
Brachiaria sowing costs	30 595.04
Fencing costs	7 641.57
Extra diet (Norgold) costs	1 976.00
Overal income	56 073.00
Female calf sales income	15 120.00
Male calf sales income	6 624.00
Additional milk production income	34 329.00

CNU = (56 073,00 CUP) - (35 468,65 CUP)
CNU = 20 604,35 CUP