Season production of 11 *Panicum maximun* cultivars harvested at a 45-day interval[1]

Rafael Ramos-Santana[2] and José E. Rodríguez-Arroyo[3]

ABSTRACT

The productive potential of 11 guinea grass forage genotypes was evaluated at harvest intervals of 45 days during the short and long day seasons. Guinea grass genotypes PRPI 3637 and 3622 produced the highest dry matter yields. *P. maximun* PRPI 12917 (cultivar Makueny) was not different from 3637 or 3622 during short days; however, during long days it differed from cultivar 3637. *In vitro* true digestibility (IVTD) estimated by the predicting equation of Arroyo-Aguilú and Coward-Lord was similar for most cultivars under evaluation. Cultivar Guadalupe produced the highest IVTD values during both seasons. Among all genotypes, *P. maximun* 3637 and 3634 consistently had the highest average regrowth percentages and the best capacity to recover.

RESUMEN

Producción estacional de 11 genotipos de yerba guinea cosechados cada 45 días

Se evaluó el potencial de producción de 11 genotipos de *P. maximun* cortados cada 45 días. En las épocas de días largos y cortos y durante el año entero la selección PRPI 3637 y 3622 fueron las de mayor producción de materia seca. PRPI 12917 (cultivar Makueny) no tuvo diferencias significativas en producción de materia seca sobre PRPI 3637 ni PRPI 3622 en los días cortos, pero durante los días largos solo fue significativamente inferior que PRPI 3637. Los estimados de digestibilidad verdadera *in vitro* con la ecuación sumativa de Arroyo-Aguilú y Coward-Lord fueron similares para la mayor parte de los genotipos evaluados. Los genotipos PRPI 3637 y 3734 mostraron consistentemente los más altos promedios de porcentajes de rebrote y mostraron mejor capacidad para recobrar que los demás genotipos evaluados.

INTRODUCTION

Guinea grass (*Panicum maximun*; Jacq) is one of the best adapted tropical forages. It produces yields in a variety of soil and climatic conditions and adapts well to different animal feeding systems such as grazing, soilage, hay and silage (6, 7). Although guinea grass is an excellent forage crop, the low seed germination percentages of some genotypes limit its use (3).

[1]Manuscript submitted to Editorial Board 24 May 1990.

[2]Research Assistant, Department of Agronomy.

[3]Research Technician, Corozal Substation.

Various studies have been conducted in different ecological areas of Puerto Rico to evaluate the dry matter yield potential of different guinea grass accessions (4, 7, 8, 9, 10, 11). At the Gurabo Substation Sotomayor-Ríos et al. (7), using harvest intervals of 60 days, found that *P. maximun* cultivar PRPI 3622 produced 53,476 kg/ha/year of dry forage. At the Lajas Substation with harvest intervals of 42 days and irrigation, *P. maximun* cultivars PRPI 13093, 13092, and 12917 had dry forage yields of 45,574, 40,267 and 44,811 kg/ha, respectively, in a 378-day period. Genotype Makueny (PRPI 12917) produced significantly higher yields between October and March, when shorter day lengths and cooler temperatures prevail (9).

The objectives of our study were 1) to compare the forage yield and adaptation of 11 guinea grass accessions at harvest intervals of 45 days, and 2) to continue another year of evaluation with cattle grazing on the same plots as recommended by Mott (5).

MATERIALS AND METHODS

Eleven guinea grass accessions were evaluated in a balanced incomplete block design with four replications from 22 September 1987 to 19 September 1988. The experiment was conducted at the Corozal Agricultural Experiment Station on a Corozal clay soil (Aquic Tropudults). Soil pH was raised to 5.5 by applying limestone before planting. Total annual precipitation was 2121 mm and the mean daily temperature was 25.10° C during the experimental period.

For propagation, 28 grown clusters of guinea grass accessions were planted in four rows on each 12.5 m^2 plot. During the establishment period all plots received 336 kg/ha of a commercial 15-5-10 fertilizer. During the year after this establishment, each plot was fertilized at a rate of 3,366 kg/ha of the same fertilizer divided into eight applications done shortly after harvest. The plots were cut 15 cm from the ground every 45 days for determining dry matter yield during both the short and long dry seasons.

Plant height (PH) was obtained by measuring from the ground to the top leaves of three plants randomly selected from every plot. Measurements were made on regrowth 15, 30 and 45 days after one harvest during the short day season, and one harvest during the long day season. Average regrowth percentage (APR) was calculated by the following formula:

$$APR = \frac{\text{PH at 30 days - PH at 15 days}}{\text{PH at 15 days}} + \frac{\text{PH at 45 days - PH at 30 days}}{\text{PH at 30 days}} \div 2x100$$

The method of Goering and Van Soest (2) and the additive equation of Arroyo-Aguilú and Coward-Lord (1) were used to estimate the per-

centage of *in vitro* true digestible dry matter (IVTD) from a composite forage sample of four plots from harvests during the middle of the long and short day seasons. The equation used for IVTD was as follows:

IVTD = 96.86 + .62 (%CP) - .51 (%C) - 2.59 (%L) - 2.34 (Si), where % CP = percent crude protein, %C = percent cellulose, %L = percent lignin and %Si = percent silica.

Analysis of variance and Duncan's multiple range (P = 0.05) were used to compare the performance of the forage accessions.

RESULTS AND DISCUSSION

In comparison with the other genotypes in the trial, *P. maximun* genotypes PRPI 3637 and 3622 produced significantly more dry matter yields when harvested at 45-days intervals during the 1987-88 growing season (table 1). The results are in contrast with those of Sotomayor et al. (7), in which *P. maximun* PRPI 3622 had significantly higher yields than the other 15 *P. maximun* genotypes harvested at an interval of 60 days. It should be noted, however, that cultivar Makueny PRPI 12917 did not differ significantly in dry matter yield from the above mentioned genotypes during the short-day season. This finding agrees with the results of Vélez-Santiago et al. (9) at Lajas during the short-day season, in which cultivar Makueny was one of the highest yielding cultivars. During the long-day season, cultivars *P. maximun* PRPI 3634, 12917 and common guinea grass had dry matter yields similar to that of *P.*

TABLE 1.—*Mean dry matter yield of eleven* Panicum maximun *genotypes evaluated using harvest intervals of 45 days during the 1987-88 growing season*

Identification P.R.P.I. or common name	Dry matter yield kg/ha	Dry matter yield kg/ha	Dry matter yield kg/ha
	September to February	*March to August*	*Yearly total*
3637	18,918 ab[1]	23,140 a	42,061 a
3622	18,739 ab	21,039 ab	39,777 a
3634	15,820 cd	19,651 bcd	35,470 bc
12917	16,893 bc	18,223 bcde	35,117 c
13093	14,172 d	20,629 abc	34,804 c
Common	14,485 cd	18,721 bcde	33,614 cd
Sp.	14,485 cd	17,891 cdef	32,371 cde
Guadalupe	11,670 e	17,396 defg	29,065 efg
13605	14,229 d	14,642 g	28,869 efg
13606	11,705 e	15,078 g	26,781 fg
1987	10,253 e	15,418 fg	25,656 g
Mean	14,707	18,348	33,053

[1]Means followed by the same letter or letters do not differ at the 0.05 probability level

TABLE 2.—*In vitro true digestibility (IVTD) of all cultivars according to the predicting equation of Arroyo-Aguilú and Coward-Lord (1) during short and long day season*

Identification P.R.P.I. or common name	IVTD December	IVTD June	Average IVTD
	%	%	
13605	54.34	59.87	56.60
Guadalupe	52.35	59.15	55.75
Sp.	53.22	54.36	54.79
1987	51.01	57.93	54.47
12917	52.82	55.68	54.25
13093	51.76	55.73	53.74
3637	48.48	59.13	53.80
Common	45.64	60.92	53.28
3634	53.01	51.87	52.44
3622	48.87	53.84	51.35
13606	45.46	57.11	51.28
Mean	50.52	56.87	53.79

maximun 3622. However, the yields of PRPI 13093, 3637 and 3622 were all excellent during the long dry season. When both seasons were combined cultivars 3637 and 3622 significantly outyielded the other cultivars.

Table 2 presents the predicted IVTD of the 11 cultivars under evaluation according to the equation of Arroyo-Aguilú and Coward-Lord (1).

TABLE 3.—*Average plant height (cm) and average regrowth percentages (APR%) at 15, 30 and 45 days intervals during long days season (July to August, 1988)*

	Days of regrowth			
Identification P.R.P.I. or common name	15 days	30 days	45 days	ARP
	----------cm----------			%
3637	21	81	142 a[1]	180
3634	27	80	127 b	127
3622	26	64	107 c	106
13093	25	59	106 c	108
Sp.	22	57	100 cd	117
Common	24	60	100 cd	108
12917	29	61	85 ef	74
13605	17	44	78 fg	118
13606	21	51	72 gh	92
1987	15	35	67 gh	112
Guadalupe	15	34	64 h	107
Mean	22	57	95	113

[1]Means followed by the same letter or letters do not differ at the 0.05 probability level.

TABLE 4.—*Average plant height (cm) and average regrowth percentages (APR%) at 15, 30 and 45 days intervals during short days season (September to October, 1987)*

Identification P.R.P.I. or common name	Days of regrowth			
	15 days	30 days	45 days	APR
	---cm---			%
3637	26	69	135 a[1]	130
3634	23	71	115 b	135
3622	27	68	108 bc	105
Common	24	60	100 cde	108
13093	30	57	98 cde	81
12917	29	73	94 de	90
Sp.	23	60	91 e	106
13606	20	45	78 f	74
13605	16	44	75 f	122
Guadalupe	14	37	72 f	129
1987	14	38	53 f	105
Mean	22	56	93	108

[1]Means followed by the same letter or letters do not differ at the 0.05 probability level.

In general, average IVTD estimates were similar for all cultivars under evaluation. With the exception of cultivar PRPI 3622, IVTD estimates for most cultivars were higher during long-day than during short-day season. Cultivar Guadalupe showed consistently the highest IVTD for both seasons.

Table 3 and 4 show average plant height and average regrowth percentages of each cultivar in one of the harvests of each season. As indicated, *P. maximun* PRPI 3637 and 3634 had consistently higher average regrowth percentages (ARP%), thus indicating an excellent capacity to recover after each harvest. These two cultivars also had the greatest plant height at 45 days of regrowth in both seasons.

LITERATURE CITED

1. Arroyo-Aguilú, J. A. and J. Coward-Lord, 1974. Relationship between and within physical and chemical constituents and in vitro true digestibility in tropical forage grasses. *J. Agric. Univ. P.R.* 58 (4): 437-47.
2. Goering, H. K. and P. J. Van Soest, 1970. Forage fiber analyses aparatus reagents procedures and some application. USDa, Agric. Handb., p. 379.
3. Keognan, J. M., P. Philip and G. Proverb. Guinea grass (*Panicum maximun*) seed production fact sheet. Caribbean Agricultural Research and Development Institute. Order no. AP-F/17-85.
4. Méndez-Cruz, A. V., V. Siberio-Torres, J. Fernández-Van Cleve, E. Fontanet and G. Ramírez-Oliveras, 1988. Yield and nutritive value of hay from five tropical grasses at three harvest intervals. *J. Agric. Univ. P.R.* 72 (1): 109-18.
5. Mott, G. O., 1983. Evaluación del germoplasma forrajero bajo diferentes sistemas de manejo del pastoreo. Germoplasma forrajero bajo pastoreo en pequeñas parcelas.

Metodología de evaluación. Memorias de una reunión de trabajo, Cali, Colombia, Sept. 22-24, 1982 RIEPT CIAT, P. 149-150. Editadas por Osvaldo Paladines y Carlos Lascano.

6. Soldevila-Martínez, M., J. Vélez-Santiago, A. V. Méndez-Cruz and D. Jiménez-Tosado, 1979. Manejo y utilización de los forrajes en Puerto Rico. Publ. 125, GT1. Esta. Exp. Agric., Univ. P.R.
7. Sotomayor-Ríos, A., A. Acosta-Matienzo and J. Vélez-Fortuño, 1971. Yield comparison and plant character correlation on 16 *Panicum* accessions. *J. Agric. Univ. P.R.* 55 (2): 174-83.
8. Vélez-Santiago, J. and J. A. Arroyo-Aguilú, 1984. Influence of two fertilizer levels on forage and crude protein yields of seven tropical grasses. J. Agric. Univ. P.R. 68 (4): 471.
9. ——, A. Sotomayer-Ríos, S. Torres-Rivera and A. V. Méndez-Cruz, 1982. Performance of six *Cenchrus* and four *Panicum* forage grasses under cutting management in the Lajas valley, Puerto Rico. *J. Agric. Univ. P.R.* 44 (4): 268-77.
10. ——, J. A. Arroyo-Aguilú and J. Rodríguez Arroyo, 1985. Effects of seeding rates and methods on the establishment and yield of common guinea grass, J. Agric. Univ. P.R. 69 (3): 339.
11. Vicente-Chandler, J. and J. Figarella, 1958. Growth characteristics of guinea grass on the semiarid south coast of Puerto Rico. *J. Agric. Univ. P.R.* 42 (5): 151-60.