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Agricultura Intensiva en la Islas del Caribe : posturas, coacciones y perspectivas

PERFORMANCE OF DWARF AND TALL NAPIERGRASS SELECTIONS AT THREE CUTTING INTERVALS DURING TWO YEARS IN NORTHWESTERN PUERTO RICO

S. TORRES-CARDONA, A. SOTOMAYOR-RIOS
and A. QUILES-BELÉN

USDA-ARS, Tropical Agriculture Research Station Mayaguez, Puerto Rico

ABSTRACT

Dwarf Napiergrass (Pennisetum purpureum) selections N75, N114, N127, N128, and tall cultivars, Merker (M) and Merkeron (N43) were evaluated on an Oxisol during a 2-year period at 45-, 65-, and 85-day cutting intervals (CI) at Isabela, Puerto Rico. Dry forage yield (DFY) and crude protein yield (CPY) was superior in N43 than in the other grasses. Among the dwarf selections, N128 had the highest DFY, while N75 and N127 had the highest crude protein content (CPC). The 65-day CI appeared to be the most appropriate time to harvest the grasses. At this stage, M and N43 DFY and CPC were 7 t/ha and 9%, respectively. The dwarf selections could be potential candidates for use under grazing management due to their high leaf stem ratio as compared to the tall cultivars although their DFY was significantly lower than the tall cultivars.

Keywords: dwarf selections, cutting intervals, Pennisetum purpureum

INTRODUCTION

Napiergrass, Pennisetum purpureum Schum, is a widely-used forage in the tropics and subtropics. In Puerto Rico, VICENTE-CHANDLER *et al.* (8) reported that the highest production of dry forage yield (DFY) in the world (84,800 kg ha^{-1} $year^{-1}$ was obtained when it was fertilized with 897 kg N^{-1} ha^{-1} per year and cut every 90 days. Although Napiergrass is propagated vegetatively, Hanna and Monson (2) reported that viable seed is easily obtained from crosses between pearl millet (2n=2x=14) and Napiergrass selections (2n=4x=28). Pioneer work by Burton (1) made possible the development of Merkeron (N43) in 1943, which has proven to be an excellent source of new high-quality Napiergrass forage cultivars.

The comparative performance of four dwarf Napiergrass selections from the USDA-ARS, Tifton, Georgia, breeding program and Merkeron (N43) with that of Merker, a variety of Napiergrass used in Puerto Rico (PR), at three cutting intervals (CI) during two years at Isabela, PR, is herein reported.

MATERIALS AND METHODS

The experiment was conducted at the experimental farm of the Tropical Agriculture Research Station (TARS), USDA, ARS, at Isabela, in northwestern Puerto Rico. The soil is an Oxisol (Typic Hapludox). General characteristics of the experimental site are as follows:

- Latitude	18° 30' N
- Longitude	67° W
- Temperature range	18.8 - 29.4° C
- Elevation	128 m
- Annual rainfall	1,675 mm
- Organic matter content	2.5%
- Exchange capacity	23 (meq./100 g soil)
- pH	5.0
- p	53 (ppm)
- K	130 (ppm)
- NO_3	10 (ppm)

Four dwarf Napiergrass selections (N75, N114, N127, N128), from the USDA-ARS Coastal Experiment Station, Tifton, Georgia, and tall cultivars Merker and Merkeron (N43) were planted on August, 1991. Each plot consisted of three rows, 5 m long, spaced 0.9 m apart. The experimental design was a complete block in a split-split plot arrangement with four replications. Main plots were the six genotypes; subplots, the cutting intervals. Fourteen, ten and seven harvests were made at 45-, 65-, and 85-day intervals, respectively.

Immediately after planting, propazine (2-chloro-4,6-bis (isopropylamine)-s-triazine) was applied at a rate of 2.5 kg of active ingredient/ha to control weeds. At planting, and after each cutting, 560 kg/ha of a 15-5-10 fertilizer was applied to all plots. Irrigation was applied as needed to prevent moisture stress. Before each cutting, plant height (from the ground to the midpoint of the upper leaf blade) was measured taking five plants at random from the middle row. Yields of green forage, dry forage (DF), and crude protein (CP) were calculated for each cutting. Samples were analyzed for dry matter content (DMC), crude protein (CPC) at TARS and in vitro dry matter digestibility (IVDMD) at the UPR laboratories utilizing the Tilley-Terry two-stage technique (7). Data were statistical analyzed.

RESULTS AND DISCUSSION

Significant differences among genotypes and cutting intervals (CI) were found for most traits. The DFY of N43 was higher than the remaining grasses at all CI except at 85 days (Fig. 1). The DFY of Merker increased from 4,493 (45 days) to 11,692 kg/ha (85 days). The DFY of N43 increased from 4,889 (45 days) to 11,553 kg/ha (85 days). Total DFY of Merker and N43 for a 650 day growth period (65-day CI) were 68,790 and 73,210 kg/ha, respectively. These yields are comparable to those produced by the best tropical forage grasses when harvested at similar cutting intervals in Puerto Rico (3,4,5,6).

The CPC of the dwarf grasses was excellent, compared to that of other tropical grasses, and consistently higher than that of Merker. At the 45-day CI, the dwarf selection N127 mean CPC value was 12.8% while Merker's mean CPC value was 10.3% (Fig. 2).

The CPY of the six grasses followed a trend similar to that of DFY. The CPY of Merker increased from 457 (45 days) to 663 kg/ha (85 days). The CPY of dwarf selection N75 increased from 433 (45-day) to 476 kg/ha (85-day) (Fig. 3).

Among the dwarf selections, N128 and N114 were significantly taller than the remaining genotypes. Plant height increased with cutting intervals (Fig. 4). Previous studies have shown that plant height is an important trait highly associated with yield (3,4,5,6).

The IVDMD of the genotypes ranged (45 to 85 days) from 59 to 51 percent (Fig. 5). Apparently the optimum time to utilize the grasses is about 65 days when the best compromise is reached between IVDMD and DFY. At this stage the DFY were 6,879, 7,321, 3,488, 4,790, 5,073, and 4,736 kg/ha for Merkergrass, N43, and dwarf selections N127, N75, N128, and N114, respectively. The IVDMD for the same CI ranged from 52 to 56% while the CPC ranged from 7 to 10%.

Although the dwarf Napiergrass selection yields were inferior to those of N43, they compared favorably with yields of other well-known forages of the tropics. These dwarf grasses harvested every 50 to 60 days are capable of producing good-quality forage of approximately 4,000 kg/ha, with 9.0% CPC and IVDMD of about 50%. These dwarf grasses contain useful genes for leafiness and dwarfness that would be of value in tropical breeding programs aimed at developing high-quality forages.

It was established that the Napiergrass selection N43 is an excellent forage source with DMY, CPC and IVDMD values comparable or superior to the best tropical grasses. One advantage of this genotype over most tropical grasses is its ability to be completely established in a relatively short time. The optimum cutting time for all the genotypes evaluated is about 65 days when the best compromise is reached between DFY and IVDMD.

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Table 1. Dry matter yield, crude protein content, crude protein yield, plant height, and *in vitro* dry matter digestibility of dwarf and tall napiergrass selections at three cutting intervals during two years in Puerto Rico.

Cutting interval			Genotypes			
1/ (days)	N127	Merker	N75	N128	N43	N114
			Dry forage yield (kg/ha)			
45	3074	4493	3787	3777	4889	3612
65	3488	6879	4790	5073	7321	4736
85	3955	11692	6761	8169	11553	6941
			Crude protein content (%)			
45	12.8	10.3	12.0	10.9	10.5	10.9
65	8.3	7.2	8.9	7.8	7.3	9.8
85	7.5	5.6	7.8	6.1	6.3	6.3
			Crude protein yield (kg/ha)			
45	368	457	433	401	496	382
65	283	486	392	392	514	353
85	287	663	476	464	710	395
			Plant height (m)			
45	1.1	1.4	1.0	1.2	1.5	1.2
65	1.5	2.1	1.3	1.7	2.3	1.8
85	1.7	2.6	1.6	2.0	2.6	2.1
			In vitro dry matter digestibility			
45	58.22	59.44	59.14	57.57	57.84	58.99
65	55.71	55.40	56.43	51.79	52.36	53.03
85	52.14	51.39	53.41	50.74	50.57	50.79

1/ Fourteen, ten and seven harvests were made at 45-, 65-, and 85- day intervals, respectively.

Fig.1 Dry Forage Yield

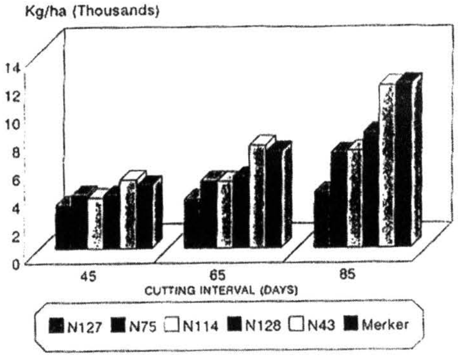


Fig.2 Crude Protein Content

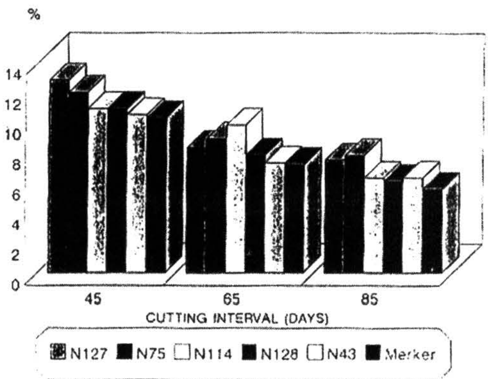


Fig.3 Crude Protein Yield

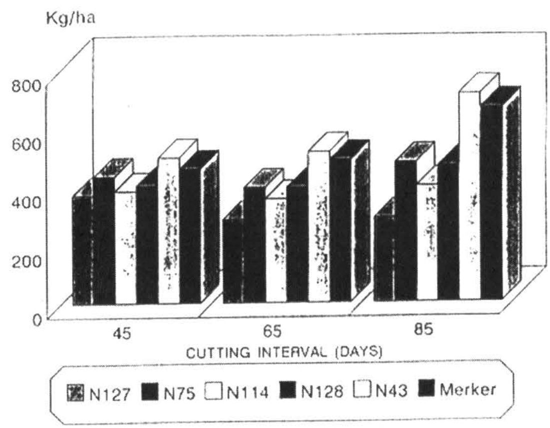


Fig.4 Plant Height

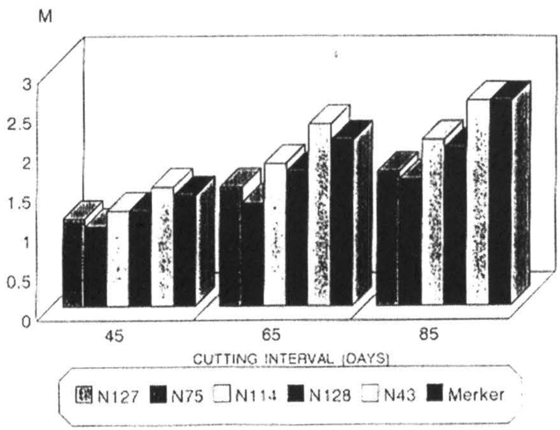
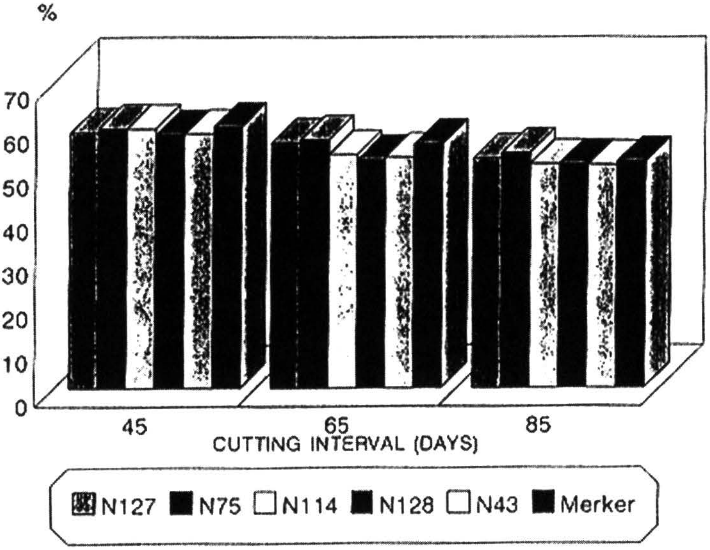


Fig.5 IVDMD


%
70
60
50
40
30
20
10
0
45
65
85
CUTTING INTERVAL (DAYS)
N127
N75
N114
N128
N43
Merker