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NOTES ON SELECTIONS FROM HYBRID DERIVATIVES OF ELEPHANT GRASS (PENNISETUM PURPUREUM SCHUM.)

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SUMMARY

The development of high-yielding clonal varieties of elephant grass by selection from a seedling population of Cameroon cultivar (Commonwealth Plant Introduction No. 20464) is recorded. The selected clones outyielded commercial elephant grass and unselected progenies of Cameroon cultivar.

I. INTRODUCTION

Elephant grass (*Pennisetum purpureum* Schum.) is a robust, high-yielding perennial pasture and fodder species with a widespread distribution over the tropical world between latitudes 10°N and 20°S. The species comprises several forms varying in size, stooling habit, propensity to flower, colour of culms, thickness of culms, etc.

The common form of elephant grass naturalized in several parts of coastal Queensland is an early-flowering, fibrous, stemmy cultivar. Introduction of ecological races from tropical Africa by the Plant Introduction Section of the Commonwealth Scientific and Industrial Research Organization has resulted in a range of variable material.

Most of the important tropical and subtropical pasture grasses in the tribes Andropogoneae, Paniceae and Chlorideae reproduce by apomixis. While asexual reproduction is advantageous in maintaining strain purity, this characteristic is regarded as the greatest barrier to improvement through breeding and selection of a high percentage of important tropical grass species (Hutton 1964, p. 43).

Brown and Emery (1957) listed elephant grass as an apomict, though this observation was based on a limited range of plant material.

Several reports deal with interspecific hybridization of *P. purpureum* and *P. typhoideum*. *P. purpureum* was successfully crossed with *P. typhoideum* in South Africa, and the hybrid was named Bana grass (Meredith 1955). The agronomic value of intraspecific hybrids was studied in Hawaii.

Considerable variation in morphology and agronomic characteristics is often evident when certain ecotypes of elephant grass are grown from seed (Hosaka and Ripperton 1948, p. 26; Grof 1961). This would suggest that apomictic as well as sexual reproduction occurs in *P. purpureum*.

Elephant grass is strongly protogynous, stigmas being exserted 3–4 days before the anthers appear. Protogyny in the case of sexual races of elephant grass tends to favour cross-pollination. The xenogamous reproduction of certain ecotypes of elephant grass was used to develop high-yielding clonal varieties. These were obtained by selective breeding from progenies of open-pollinated populations. The commercial cultivar Capricorn elephant grass is one of these. It is adapted to coastal and subcoastal areas in Queensland with a moderate rainfall (Grof 1961).

II. MATERIALS AND METHODS

In regions of North Queensland experiencing over 100 in. of rainfall annually, robust introductions from high-rainfall equatorial Africa indicated that higher yields may be obtained.

One of these introductions, *Pennisetum purpureum* cv. Cameroon, exhibited desirable leafy growth habit, rapid recovery after cutting and high yield of herbage. When sown from seed, a freely segregating population resulted. This indicated a degree of pronounced cross-pollination as the normal mode of reproduction of this cultivar.

The Cameroon cultivar was established in plant-to-row plots with 14 other ecotypes. Most of them displayed short-day flowering response. Judging from the freely segregating progenies, several of these were xenogamous. Some of the seedlings of Cameroon obtained from open pollination were obviously heterozygotes. These were considered to be the result of fortuitous hybridization between Cameroon as the mother plant and one of the other ecotypes established in the crossing plots.

Two outstandingly vigorous hybrid derivatives of Cameroon elephant grass were selected from the seedling population. These were denoted as red (R) and green (G) respectively, because of a distinctive red coloration of young leaves and stems in the case of the former.

To confirm the relative merits and hybrid origin of the selections, a field experiment was established.

Thirty clones of each of the two selections, and of the commercial cultivar, and 240 randomly chosen seedlings of C.P.I. 20464 cultivar, were included in the trial. Planting material of each of these was first planted in flats as single-stem cuttings with three nodes, and the rooted cuttings were planted out on a 5 lk x 5 lk grid (Figure 1). Treatments were arranged in 30 rows, each row or block containing eight seedlings and single clones of the two selections (R) and (G) and the common cultivar. The positions of the three clones and the eight seedlings were randomly allocated to each block.

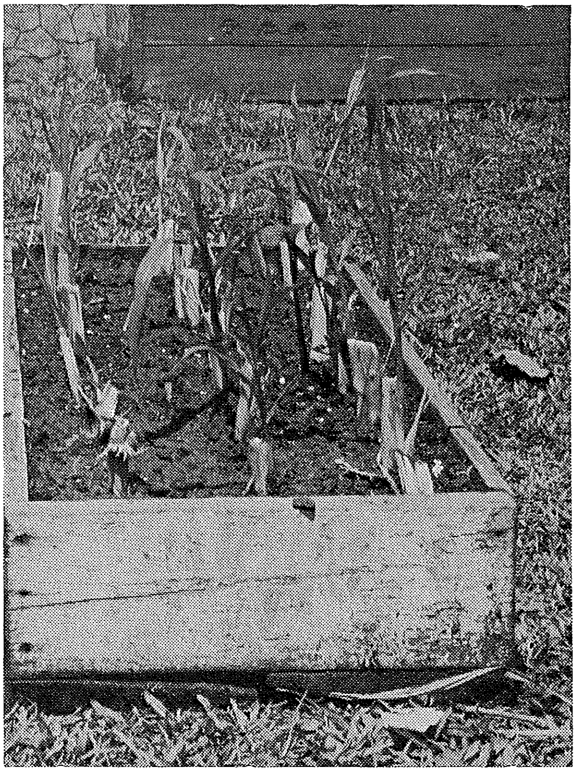

Fig. 1.—Clonal propagates of elephant grass established in flats.

After an equalization cut and a period of 6 weeks' recovery, each spaced plant was cut at ground level and dry-matter yields were measured. The first datum cut was taken on April 11, 1966, and the regrowth was harvested on May 18, 1966) (Figure 2).

III. RESULTS

Dry-matter yields are given in Table 1. At both cutting dates a significantly ($P<0\cdot01$) greater yield was obtained from the selected clones than from the

Fig. 2.—General view of elephant grass progeny test plot at South Johnstone, North Queensland. Note the variation in recovery after defoliation.

TABLE 1

MEAN YIELDS (LB) OF DRY MATTER PER PLANT

—	1st Cut		2nd Cut		Total 1st and 2nd Cuts	
1. Selection R ex C.P.I. 20464	3·412		2·955		6·367	
2. Selection G ex C.P.I. 20464	3·585		2·694		6·279	
3. Commercial cultivar	1·566		1·508		3·074	
4. Unselected seedling population C.P.I. 20464	1·013		0·754		1·767	
Necessary differences for significance	5%	1%	5%	1%	5%	1%
Between mean yields of selections and commercial cultivar	0·488	0·643	0·447	0·590	0·840	1·107
Between mean yields of selections, commercial cultivar and unselected seedlings	0·366	0·483	0·336	0·442	0·630	0·831

$1 \gg 3, 4$
$2 \gg 3, 4$
$3 \gg 4$

commercial cultivar or from the mixed population of seedlings of the Cameroon cultivar. There was no significant yield difference between the two clonal selections at either sampling date.

IV. DISCUSSION

The two selected clones are thought to be the result of fortuitous hybridization. This is manifested in the strong heterosis effect, which gives increased yield and more rapid recovery after defoliation.

Since elephant grass is commonly planted by cuttings, such clonal varieties are an end in themselves provided they are propagated by vegetative means.

Selection for hybrid vigour from seedling populations obtained by free intercrossing of xenogamous ecological races of elephant grass offers a convenient method of improvement of elephant grass.

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