

***Brachiaria dura*, a Promising New Forage Grass**

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Highlight

In Barotseland, Zambia, in Central Eastern Africa a grazing and ecological survey has revealed *Brachiaria dura* to have unusually favorable characteristics as a forage grass on sandy soils of low fertility. Chief among these characteristics are relatively high protein content, a long period of succulence, and a special root adaption to sandy soil.

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Range managers are always on the lookout for promising new grasses, especially those which show some adaptability to adverse growing conditions. During a recent ecological study in Barotseland in Zambia, I became convinced that *Brachiaria dura* (a signal grass) has unusually valuable characteristics as a range forage species on low quality sandy soils where rainfall is abundant. The purpose of this paper is to state what is presently known about this grass and to discuss its possibilities.

Soils.—The loose Barotseland upland sands have a complex history. Starting from river alluvium and lake deltas this sand has been reassorted by stream, wave, and wind action. In the process it lost its clay and silt content. It has been bleached by organic solvents seeping out of the peat formations formed in the past on the floor of shallow seasonal

lakes, then blown from exposed lake shores into lacustrine dunes. This resulted in a loose, uniform, mainly coarse sandy soil consisting of rounded and frosted silica dioxide particles, with: a) low mineral content, b) low organic content, c) low absorption complex, d) high leaching potential, and, e) poor water retention capacity.

All this soil has to offer to the plants living on it is a loose well-aerated but inert medium in which to anchor. Only plants with special adaptations can thrive in this kind of solum. Some trees find this in a very deep penetrating and wide spreading root system, for access to subsoil moisture and to cover a wide range to obtain the scarce minerals. Some grasses like *Brachiaria dura* encase their roots by exuding selective absorbent resins (polysaccharides) and covering them with

fely masses of root hairs (Verboom, 1964). Possibly this root case assists absorption of nutrients and retention of moisture.

Vegetation.—The loose Barotse-land sands are covered with fire-climax woodland, which is disappearing as a result of land-clearing and fires. Not being fire-resistant, the Rhodesian teak *Baikiaea plurijuga* is doomed unless protected. The main woodland species are: *Burkea africana*, *Guibourtia coleosperma*, *Ricinodendron rauteneii*, *Pterocarpus angolensis*, *Diplorrhynchus condilocarpon*, *Erythrophloeum africanum* and *Brachystegia spiciformis*. *Cryptosepalum pseudotaxus* in the north replaces *Baikiaea plurijuga*. Sparse grasses occur under the trees (Trapnell, 1957).

The normal cropping period for the fields in this area is 2 years. The crops are bullrush millet (*Pennisetum thypoides*) and cassava (*Manihot utilissima*). The exhausted fields are left fallow for many years. They revert first to a sparse shrub-grassland followed by a fire-climax woodland. The shrub-grassland fields form the main upland grazing. The main shrubs are *Baphia obovata* and *Bauhinia macrantha*. The grasses are mainly *Aristida*, *Eragrostis*, *Loudetia*, *Digitaria*, and *Brachiaria* species (Crook, 1950). The carrying capacity of the fields reverting to bush is low. On these old deserted fields *Brachiaria dura* is an abundant species.

Botanical Description.—*B. dura*, Stapf. is a perennial, about 2½ ft high, compactly caespitose on a short oblique rhizome with intravaginal innovations. Culms slender, wiry, erect and simple, up to ½ ft, more or less geniculate and branched, terete or slightly compressed, glabrous or sometimes sparingly and minutely hairy below the nodes. Leaf-sheaths tight, terete or slightly compressed, very firm and hard, striate, the basal up to over 3 in long, hairy, long-persistent and coating the innovations and flowering culms, the others glabrous; ligules a narrow ciliolate rim; blades narrowly linear, convolute, very wiry, up to over 1 ft long, 11 in wide when flattened out, ½ in in diam. in the convolute state, pale green, glabrous except for a beard (lower leaves) or some fine pubescence at the base; blade of the uppermost leaves sup-

pressed, the sheath tapering gradually to an acute point. Inflorescences reduced to a solitary terminal upright straight or slightly arching spiciform raceme (Fig. 1). Complete description is given by Prain (1934).

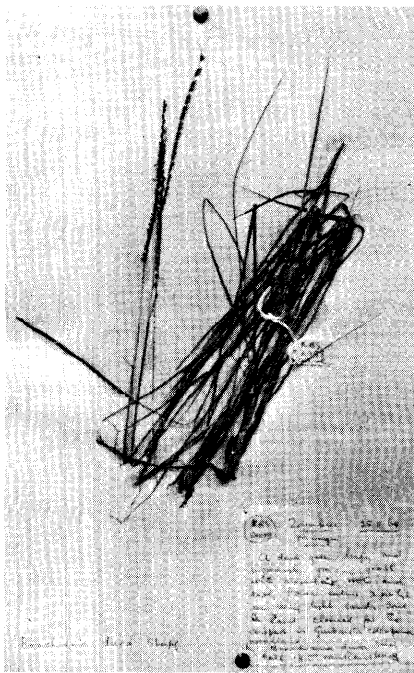


FIG. 1. Herbarium specimen of *Brachiaria dura* from Zambia, Africa.

Vegetative Characteristics.—While normally plant roots have only active hair roots near their growing tip, *B. dura* has masses of root hairs from tip to root base 1-3 mm long, intermingling with the sand particles. Also a vegetable glue (probably polysaccharides) is exuded by these roots, knitting the loose sand together. In other words, this grass creates its own soil complex, forming an absorbent mantle of soil around its roots. The lack of water retention and ion absorption in the loose sand is thus overcome. This important characteristic evidently promotes forage production.

The lower part of the shoots is covered with a dense mass of felty hairs. The tufty ligule catches dew from the rolled-up leaf, and this moisture finds its way to the root base. During the dry season the leaves are rolled up to expose a minimum evaporation surface. In the wet season the leaves flatten out to have a maximum surface for photosynthesis. The plant attains an average height of 18 inches in Ba-

rotseland, and stays green and sets seed the whole year round.

Other Site Factors.—*Brachiaria dura* occurs abundantly in Barotse-land at an average altitude of 3000 ft, longitude 22° to 25° 30' latitude 14° to 17° 45'. Rainfall comes in summer from November to March, 35-40 inches. Barotse-land minimum temperatures are for June the coldest month, 52F in the north and 38 in the south. Mean maximum for October the hottest month, 87 in the north and 95 in the south. There is frequent frost in the south in June, July.

Discussion

In reseeding trials at Mongu, capital city of Barotse-land, germination difficulties were encountered. Like some other tropical grasses, *B. dura* may have delayed germination. Seed planted in the early part of the rainy season (November) failed to germinate due to lack of sufficient moisture in the soil. Later plantings are expected to do better. In the early rainy season smut attacks the seeds. Transplanting with new shoots was successful. Further reseeding and fertilizing trials are planned.

B. dura has a protein content above the average for the upland grasses of Barotse-land, as the chemical analysis in Table 1 reveals.

Since *B. dura* has the excellent grazing quality of remaining green and succulent long after companion forage species have become dry, grazing animals seek out this grass and graze it heavily. Nevertheless, it appears to withstand heavy grazing well.

The characteristics of *B. dura* are such that it might grow well on sandy soils in eastern Texas.

Table 1. Chemical analysis of *Brachiaria dura* compared with associated forage species.

Species	CP	Ether			
		CF	extr.	Ash	NFE
<i>B. dura</i>					
Leafy					
stage	7.5	41.3	2.4	2.9	45.9
Flowering	6.4	43.3	2.2	2.4	45.7
All grasses					
Composite					
mix					
flowering	4.7	43.1	2.1	3.5	46.6

Summary

Brachiaria dura appears to be the most promising indigenous forage grass for the Barotseland loose sands; yet so far as I have been able to ascertain, this species has never been investigated for grassland improvement before. Further research into its unique adaptations to drought and infertile loose sands may well be rewarding. It should be tried in other parts of the world where similar soil and climatic conditions prevail, such as eastern Texas.

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