

A Guide to the Species of **CYNODON (Gramineae)**

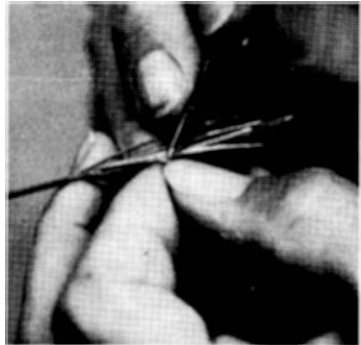
Jack R. Harlan, J. M. J. de Wet,
Wayne W. Huffine and John R. Deakin

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Individual plants of the bermudagrass world collection.



The small, inconspicuous flowers of bermudagrass are systematically crossed by W. L. Richardson.



Proportional enlargement of millimeter scale to bermudagrass spikelet.

A Guide To The Species of CYNODON (Gramineae)

Jack R. Harlan, J. M. J. de Wet,
Wayne W. Huffine, and John R. Deakin¹

The genus Cynodon L. C. Rich, tribe Chlorideae, comprises nine species and 10 varieties. This guide is based upon taxonomic studies of the genus by Harlan and de Wet.

Materials used in these studies were gathered primarily through a collecting trip by Huffine in 1963. The photographs were made by Deakin.

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Research Reported herein was conducted under Oklahoma Agricultural Experiment Station Project Number 1288.

1. Cynodon aethiopicus Clayton et Harlan

No. whorls in inflorescence: usually 2 or 3, sometimes 1 or more than 3

Racemes: stout, often appressed, few to 10 or more, red

Spikelets: medium dense to lax, ca. 3.5 mm

Glumes: subequal, about $\frac{3}{4}$ spikelet length

Lemma: pointed, hairy on keels

Stolons: stout, long internodes

Rhizomes: none

Leaves: linear lanceolate, coarse, stiff and harsh, glabrous or sparsely hairy

Chromosome number: $2n=18, 36$

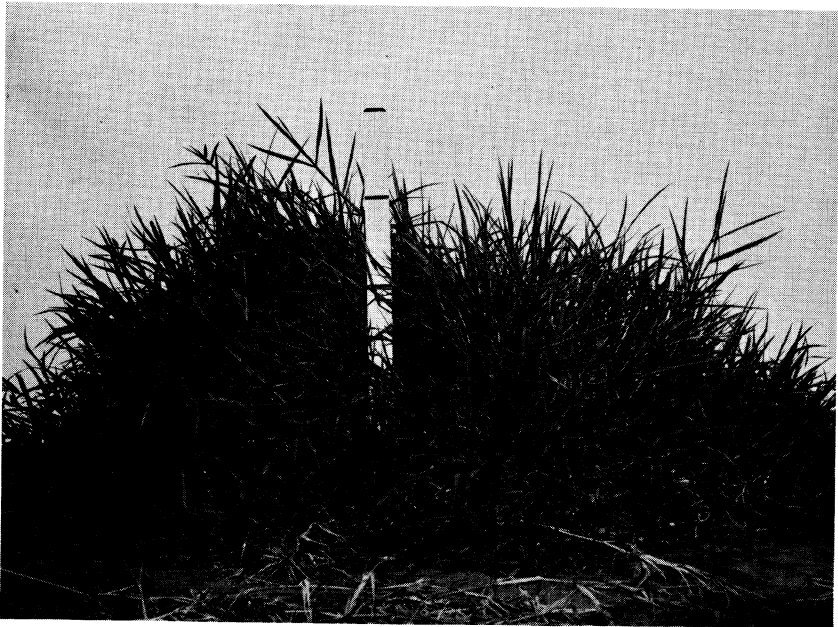
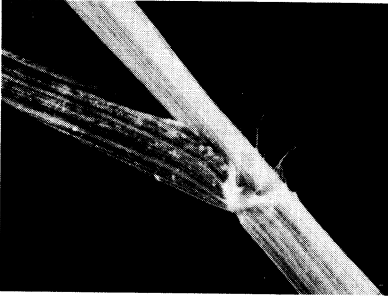
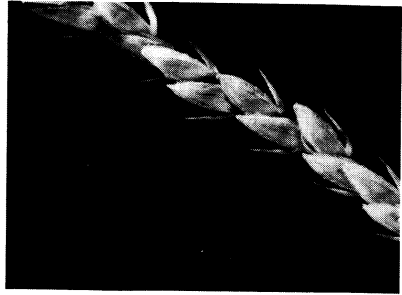
Prussic acid content: low to medium

Growth habit: tall, coarse, culms hard, shiny, rather woody, vigorously spreading by coarse stolons

Habitat: coastal plain to highlands, absent in dry regions

Distribution: Ethiopia to Transvaal, primarily along the rift and East African highlands

Remarks: inflorescence shape is rather like C. plectostachyus, but smaller and usually pigmented dark red. Spikelets are much more like C. dactylon and growth habit is quite distinctive. No winter hardiness.



2. Cynodon arcuatus J. S. Presl ex C. B. Presl

No. whorls in inflorescence: 1

Racemes: very long, slender, flexuous, broadly spreading or recurved

Spikelets: fairly densely arranged on raceme, ca. 3 mm long

Glumes: subequal, about ½ spikelet length

Lemma: pointed, somewhat hairy on keel

Stolons: slender, rather short internodes, usually red in color

Rhizomes: none

Leaves: very broadly lanceolate, sometimes red pigment conspicuous

Chromosome number: $2n=36$

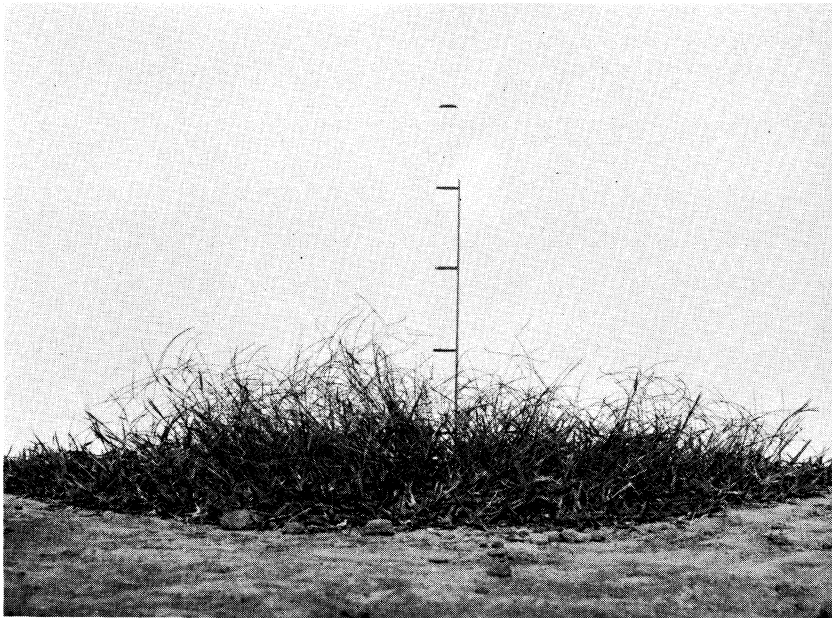
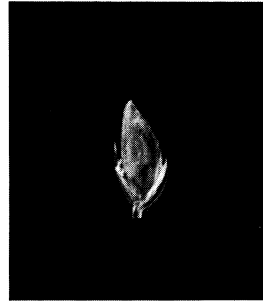
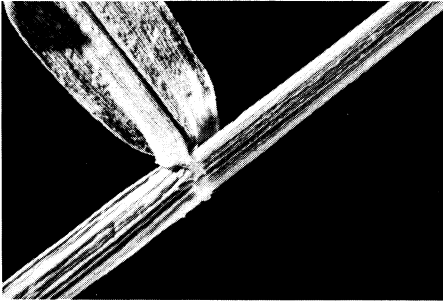
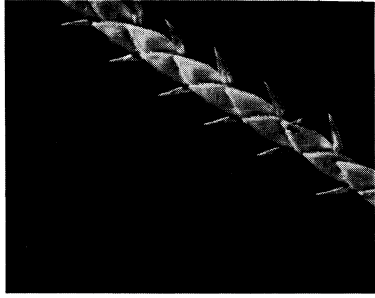
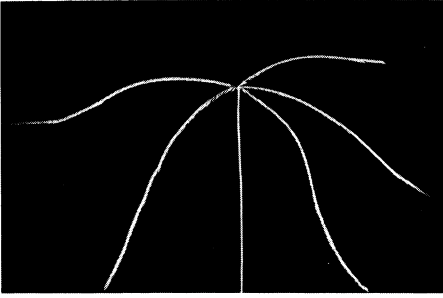
Prussic acid content: medium to high, occasionally low

Growth habit: very characteristic growth, forming low, loose mats with broad leaves and a tangle of inflorescences above; prolific seed production

Habitat: rather weedy in wet areas, lowland

Distribution: Northern Madagascar and adjacent islands to Ceylon, South and East India, Southeast Asia, Taiwan, Philippines, Indonesia to Northern Australia

Remarks: a very distinctive and easily recognized species, genetically isolated from other species in the genus. No winter hardiness.



3. Cynodon barberi Rang. et Tad.

No. whorls in inflorescence: 1

Racemes: short, slender, delicate, 2-5

Spikelets: rather widely spread on racemes, ca. 3mm or less

Glumes: unequal, the longest slightly exceeding the lemma

Lemma: pointed, somewhat hairy on keel

Stolons: very fine, slender, short internodes, often red in color

Rhizomes: none

Leaves: short, broadly lanceolate with long, sparse hairs particularly near the base, sometimes with red pigment

Chromosome number: $2n=36$

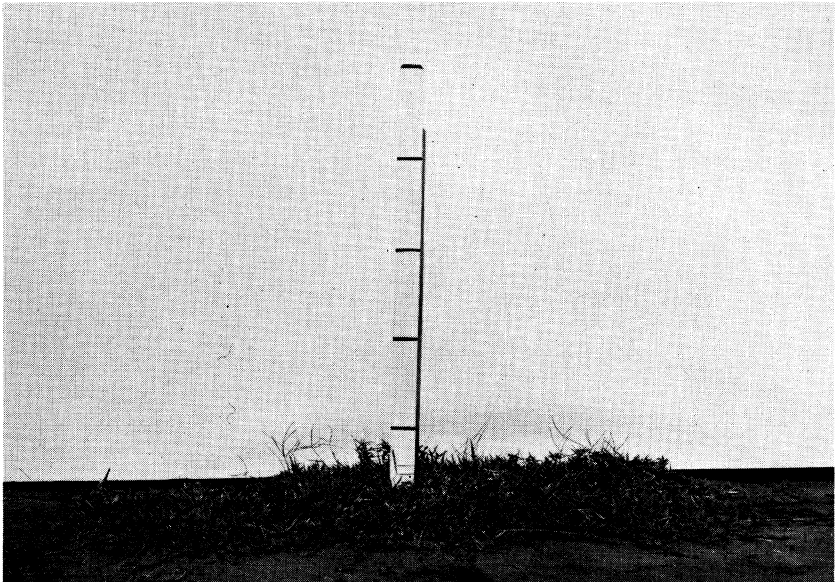
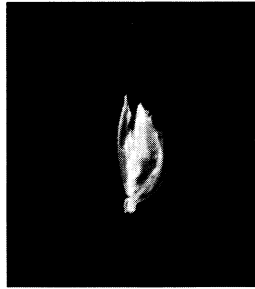
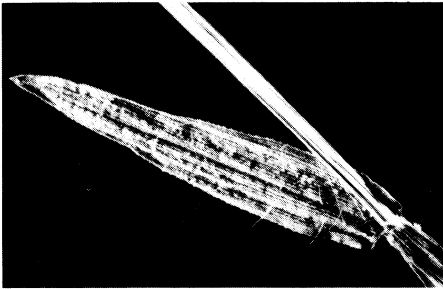
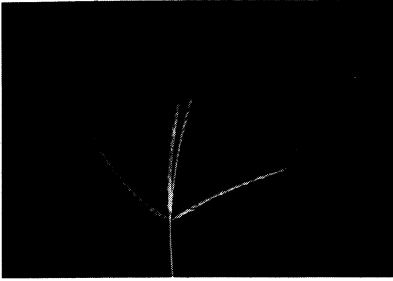
Prussic acid content: low

Growth habit: the slender stolons form loose mats less than 10 centimeters in height

Habitat: confined to wet ground and edges of permanent waterways

Distribution: South India

Remarks: except for the very different inflorescence, this species suggests a miniature version of C. arcuatus. Genetically it is well isolated from other species in the genus. The long glumes may suggest affinity to Brachyachne. No winter hardiness.



4a. Cynodon dactylon (L.) Pers. var. dactylon

No. whorls in inflorescence: 1, rarely 2

Racemes: rather slender, stiff, spreading, 2 to several

Spikelets: spacing on raceme medium to wide, ca. 3mm

Glumes: $\frac{3}{4}$ spikelet length or more

Lemma: glabrous or somewhat hairy on keel

Stolons: very fine to rather coarse; never as large as in C. plectostachyus,
C. aethiopicus or C. nlemfuensis.

Rhizomes: present, slender to stout and fleshy

Leaves: linear lanceolate; always finer than in the robust East African species

Chromosome number: $2n=36$

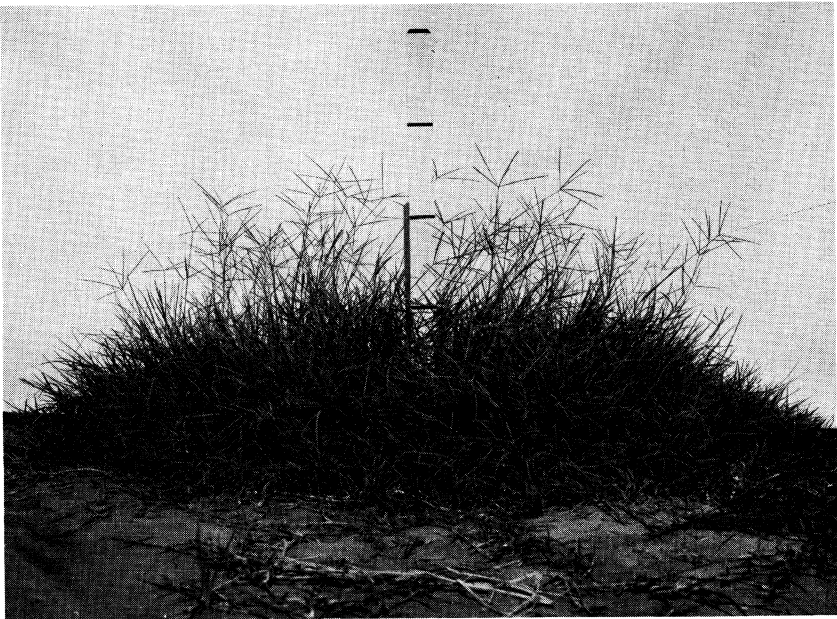
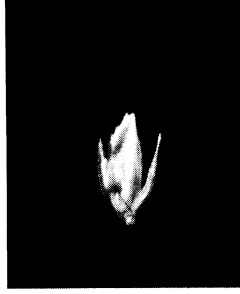
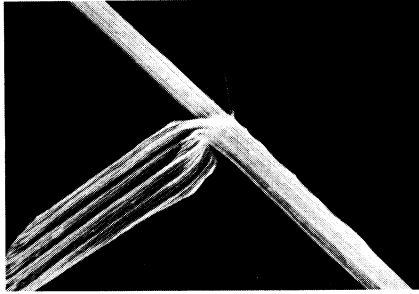
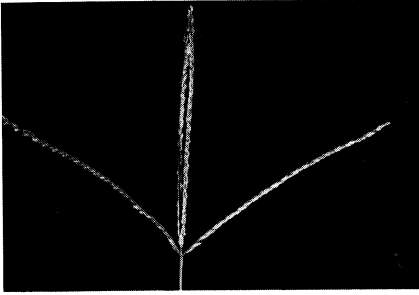
Prussic acid content: almost always low, rarely medium

Growth habit: extremely variable from very small, fine, turfy types to medium robust forage types, but always smaller than the robust East African species.

Habitat: a cosmopolitan weed occupying disturbed sites

Distribution: throughout the warmer parts of the world; pantropical and penetrating to 53°N in Europe and to 12,000 ft. elevation in Himalayas; found on remote atolls and islands in the Pacific, Atlantic and Indian Oceans.

Remarks: this is the only variety of the six in the species with a truly cosmopolitan distribution; it is one of the most widely distributed of all plants. Winter hardiness variable from none to very hardy.



4b. Cynodon dactylon var. afghanicus Harlan et de Wet

No. whorls in inflorescence: 1

Racemes: stout, stiff, the diploid race especially broad

Spikelets: closely imbricate on racemes of diploids, less so in tetraploids, ca. 4mm

Glumes: ca. $\frac{3}{4}$ length of spikelet

Lemma: rather blunt in diploids, hairs on keel

Stolons: long, slender, internodes > 10 cm and sometimes > 20 cm long

Rhizomes: none in diploids; a very short rhizome-like structure present in tetraploids

Leaves: linear lanceolate, rather long, widely spaced, bluish

Chromosome number: $2n=18, 36$

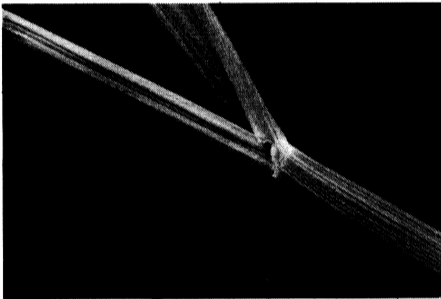
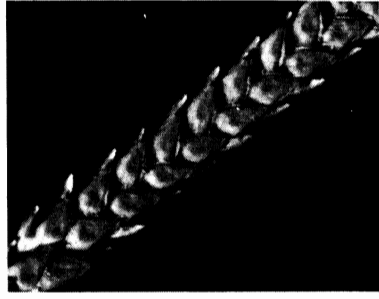
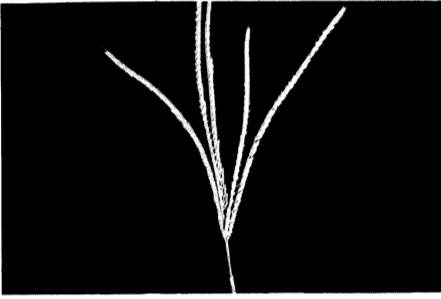
Prussic acid content: low

Growth habit: very loose and lax, spreading by characteristic long, looping, slender stolons; seed set usually good

Habitat: lowland steppes and along irrigation ditches; the diploids from the Paropamisus northward; the tetraploids both north and south

Distribution: known only from Afghanistan

Remarks: no doubt closely related to var. aridus, but var. afghanicus has good winter hardiness under Oklahoma conditions and no rhizomes



4c. Cynodon dactylon var. aridus Harlan et de Wet

No. whorls in inflorescence: 1, rarely 2

Racemes: rather slender, stiff, 2 to several

Spikelets: spacing on raceme medium, ca. 3.5 mm

Glumes: about $\frac{2}{3}$ spikelet length

Lemma: pointed; glabrous or somewhat hairy on keel

Stolons: in the larger races resembling those of var. afghanicus, very fast spreading and sometimes festooning over shrubs 3 meters high; the smaller races more subdued

Rhizomes: long, slender, with long internodes and penetrating deeply into the soil

Leaves: linear lanceolate, bluish

Chromosome number: $2n=18$

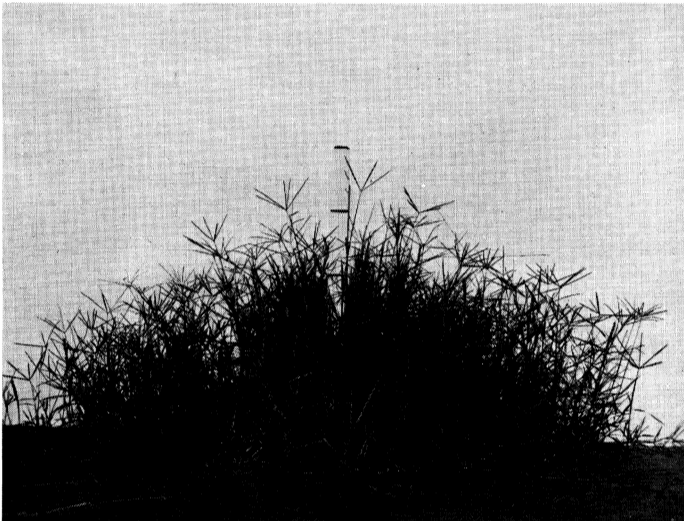
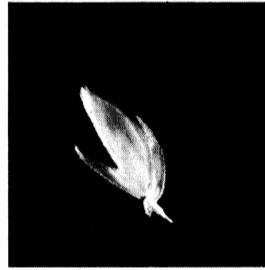
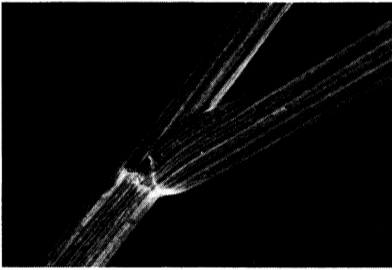
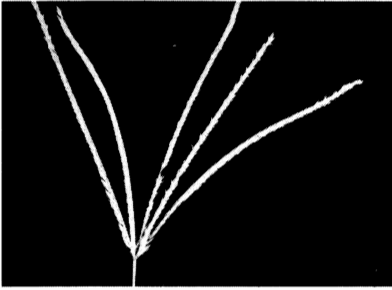
Prussic acid content: low

Growth habit: the larger races producing a very loose mat rather than a turf, while the small race develops a coarse turf resembling a common bermudagrass

Habitat: dry thornbush savanna in Africa and semiarid steppes in the Near East; a small race of South India grows in low spots that are wet in the rainy season, but dry out in the dry season

Distribution: not well known; we have collected material from South Africa, Zambia, Tanzania, Israel, and several states of west and south India; apparently not common over much of its range. It has been introduced to Hawaii and the Yuma region of Arizona where it is called 'Giant'.

Remarks: the larger races are remarkably vigorous and seed set is often good. There seems to be little hardiness under Oklahoma conditions, but plants often survive by virtue of the deep rhizomes that escape freezing temperatures.



4d. Cynodon dactylon var. coursii (Camus) Harlan et de Wet

No. whorls in inflorescence: 1, rarely 2

Racemes: stout, spreading, usually about 5-6

Spikelets: medium spacing on raceme, ca. 4 mm

Glumes: subequal, about $\frac{3}{4}$ spikelet length

Lemma: pilose on keel, somewhat hairy on margins

Stolons: medium coarse

Rhizomes: none

Leaves: linear lanceolate, often bunched and appressed at tip of culm; glabrous or nearly so

Chromosome number: $2n=36$

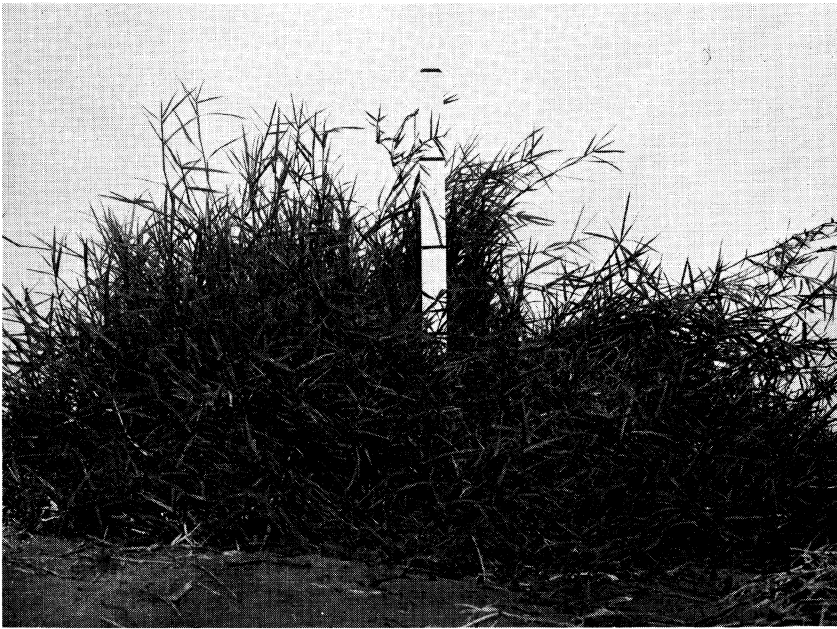
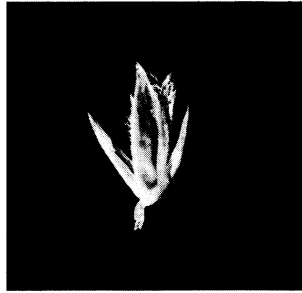
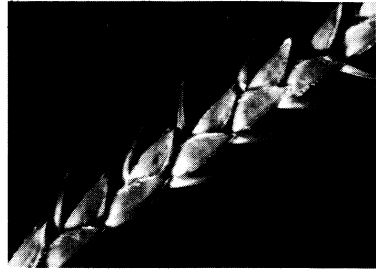
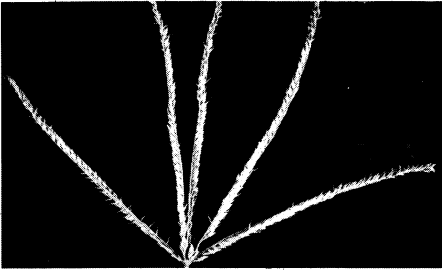
Prussic acid content: low to medium

Growth habit: tall, coarse, and distinctive, the foliage making a pile some 4-5 decimeters high, the upper leaves of the culms and aerial stolons bunched, ascending and appressed

Habitat: rather weedy on disturbed sites

Distribution: the central plateau of Madagascar

Remarks: although this variety has no rhizomes, it can cross rather easily with var. dactylon and the hybrid derivatives segregate freely for rhizome characters. No winterhardiness in Oklahoma.



4e. Cynodon dactylon var. elegans Rendle

No. whorls in inflorescence: 1

Racemes: rather slender, stiff, usually 4-5

Spikelets: spacing on raceme medium; ca. 4mm

Glumes: $\frac{1}{2}$ to $\frac{3}{4}$ spikelet length

Lemma: somewhat hairy on keel

Stolons: medium coarse, long

Rhizomes: present, slender to somewhat fleshy

Leaves: linear lanceolate, stiffly ascending, often hairy

Chromosome number: $2n=36$

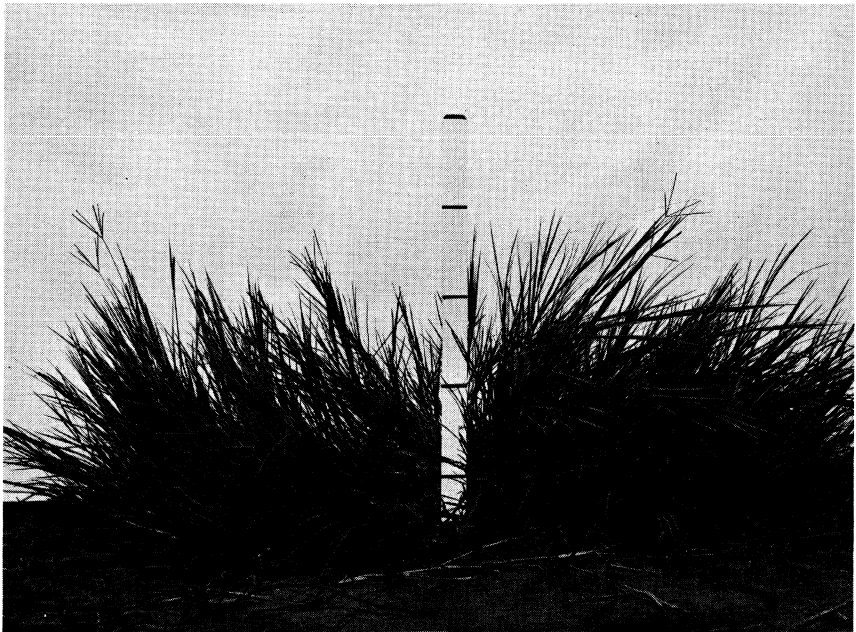
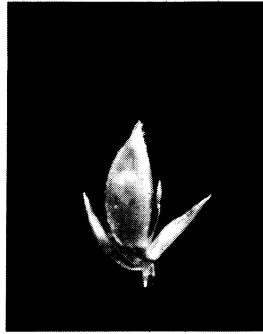
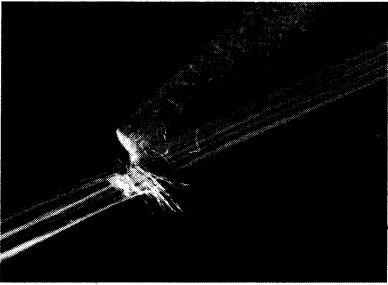
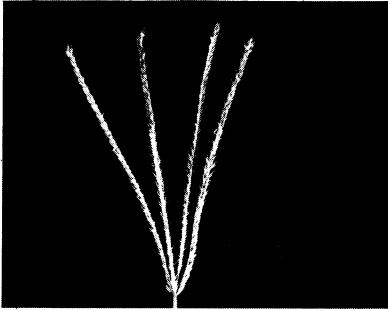
Prussic acid content: low

Growth habit: conspicuously distinct, forming a lax, loose sod; the culms clearly decumbent with ascending appressed leaves

Habitat: from coastal plain to Karoo and Highveld; somewhat weedy but part of natural vegetation

Distribution: Southern Africa in general Mozambique, Rhodesia, Zambia, Angola and southward to the Cape. This variety is the common indigenous Cynodon of Southern Africa.

Remarks: the second floret in the spikelet figured has no taxonomic significance since any species or variety can produce them occasionally. No winterhardiness under Oklahoma conditions.



4f. Cynodon dactylon var. polevansii (Stent) Harlan et de Wet

No. whorls in inflorescence: 1

Racemes: small, slender, widely spreading, 2 to several

Spikelets: often angular, ca. 4mm

Glumes: $\frac{1}{2}$ to $\frac{3}{4}$ spikelet length

Lemma: pointed; hairs on keel

Stolons: rather fine; short internodes

Rhizomes: present, small

Leaves: linear lanceolate, small, fine, stiffly ascending, harsh, glabrous to somewhat hairy

Chromosome number: $2n=36$

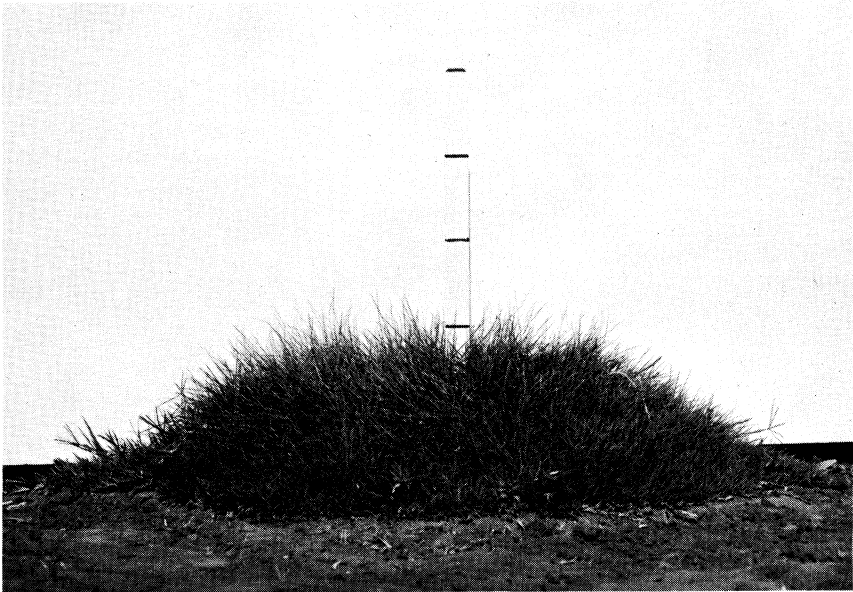
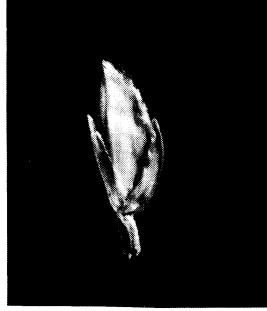
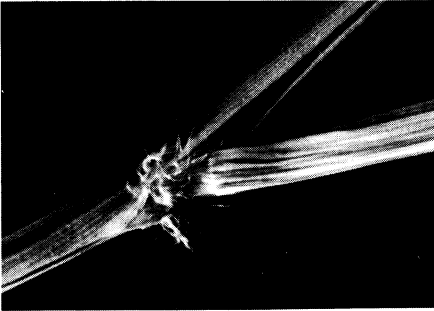
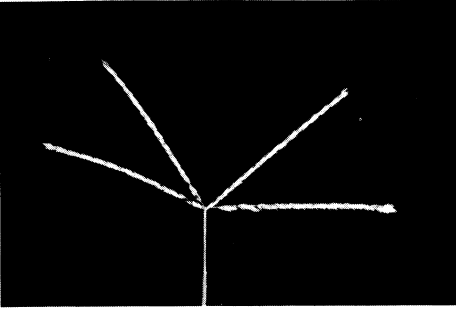
Prussic acid content: low

Growth habit: the harsh, stiffly ascending leaves give a characteristic aspect to the plants which are otherwise rather small and turfey

Habitat: saline soils of the dry Karoo

Distribution: known only from the type site near Barberspan in South Africa

Remarks: the variety may have value as a turfgrass; it has good winter-hardiness in Oklahoma.



5a. Cynodon incompletus Nees var. incompletus

No. whorls in inflorescence: 1

Racemes: slender, stiff, often reflexed, 2 — several

Spikelets: rather widely spaced on raceme, ca. 3.5mm

Glumes: subequal, less than $\frac{1}{2}$ to $\frac{3}{4}$ spikelet length

Lemma: somewhat blunt, hairy on keel

Stolons: fine, slender, short internodes, often pigmented red

Rhizomes: none

Leaves: linear-lanceolate, short to rather long, moderately hairy below, sparsely hairy to almost glabrous above

Chromosome number: $2n=18$, very rarely 36

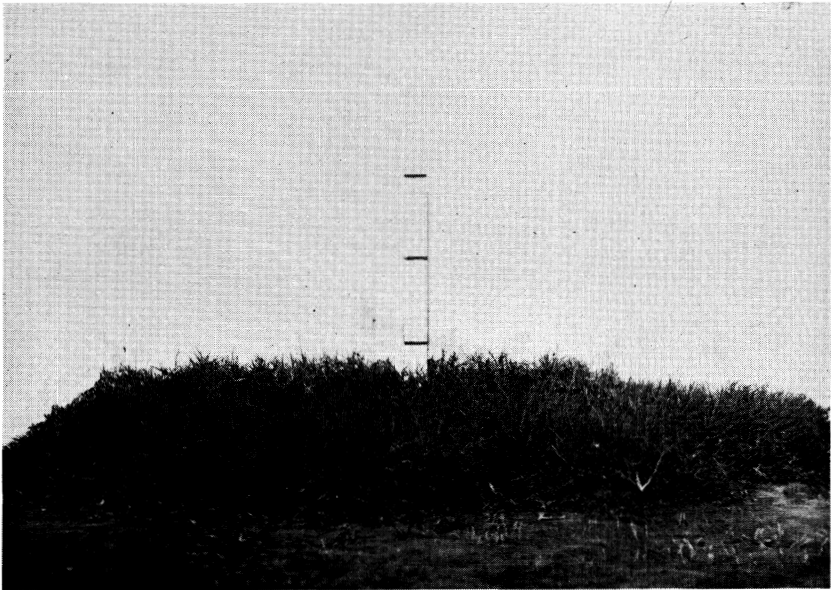
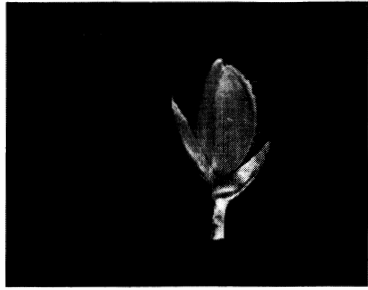
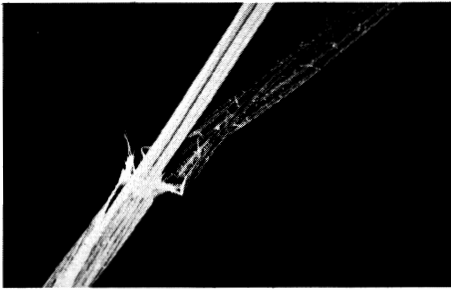
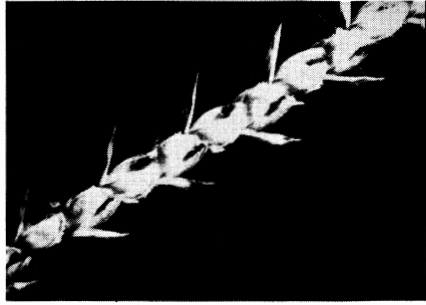
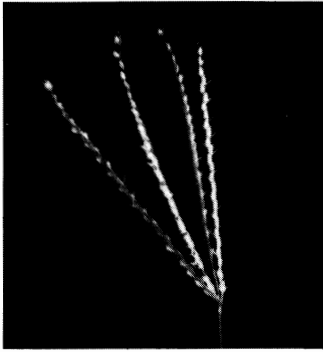
Prussic acid content: low, medium and high, with no obvious pattern

Growth habit: low, rather dense sod, ungrazed plants making a characteristically loose pile of foliage, culms and stolons some 2 decimeters high

Habitat: Highveld, mostly on Karoo and Karoid veld of South Africa, often weedy but definitely part of natural grass vegetation

Distribution: Southern Africa, as far north as 23° south latitude

Remarks: the species is extremely variable in respect to leaf length and leaf pubescence. It occasionally crosses in nature with C. dactylon var. elegans. Winterhardy in Oklahoma.



**5b. Cynodon incompletus var. hirsutus (Stent) de Wet
et Harlan**

No. whorls in inflorescence: 1

Racemes: slender, stiff, sometimes reflexed, 2 — several

Spikelets: rather loosely arranged on raceme, ca. 3.5mm

Glumes: subequal, less than $\frac{1}{2}$ to over $\frac{3}{4}$ spikelet length

Lemma: often somewhat blunt, hairy on keel

Stolons: fine, sometimes very fine and slender, often reddish in color

Rhizomes: none

Leaves: linear-lanceolate, rather short, moderately to densely hairy on both surfaces

Chromosome number: $2n=18$

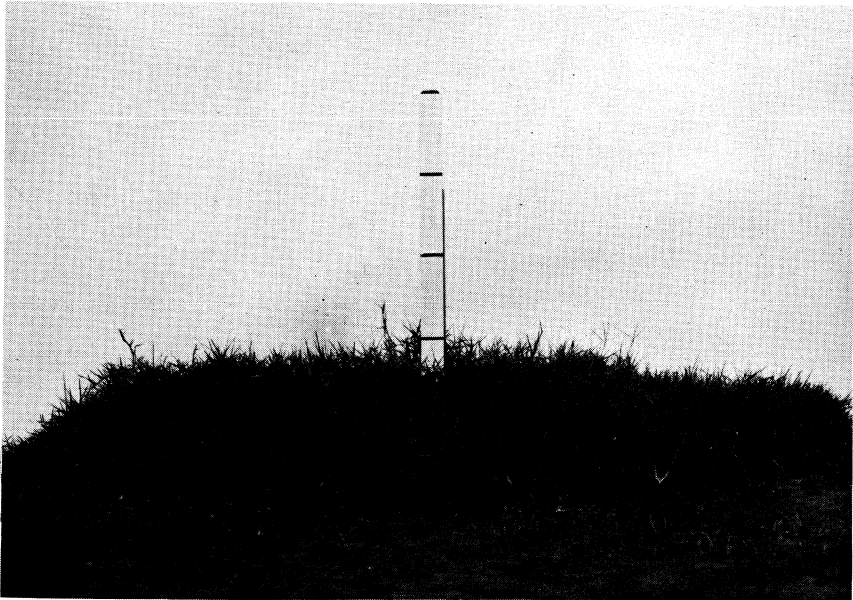
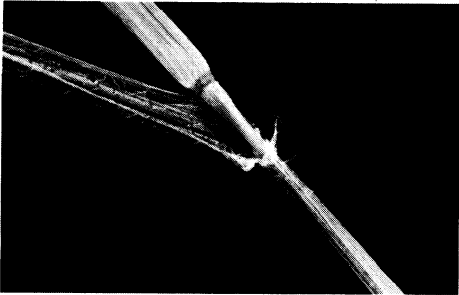
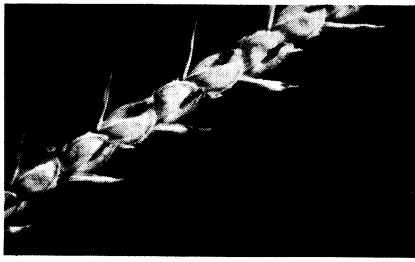
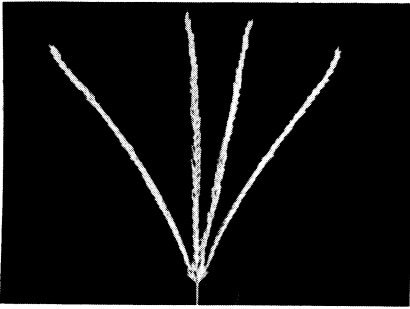
Prussic acid content: variable from low to high

Growth habit: low, rather dense sod, often forming a rather fine turf, but when not grazed up to 20 centimeters high

Habitat: Highveld to low-veld, mostly in areas with somewhat higher rainfall than the previous variety, a conspicuous part of the semi-tropical grass vegetation of Southern Africa

Distribution: Southern Africa below 23° south latitude, but rare in Karoid veld

Remarks: this variety is variable in size, and is recognized to include the widely cultivated lawn grass known as C. bradleyi. Winterhardy in Oklahoma



6a. Cynodon nlemfuensis Vanderyst var. nlemfuensis

No. whorls in inflorescence: 1, rarely 2 or 3

Racemes: slender, long, often somewhat flexuous, 4-7 cm long

Spikelets: rather widely spaced on raceme, ca. 4mm

Glumes: subequal, longest about $\frac{3}{4}$ spikelet length

Lemma: pointed, hairy on keel, sometimes slightly hairy along margins

Stolons: stout, long internodes

Rhizomes: none

Leaves: linear-lanceolate, sometimes with scattered hairs

Chromosome number: $2n=18$, rarely 36

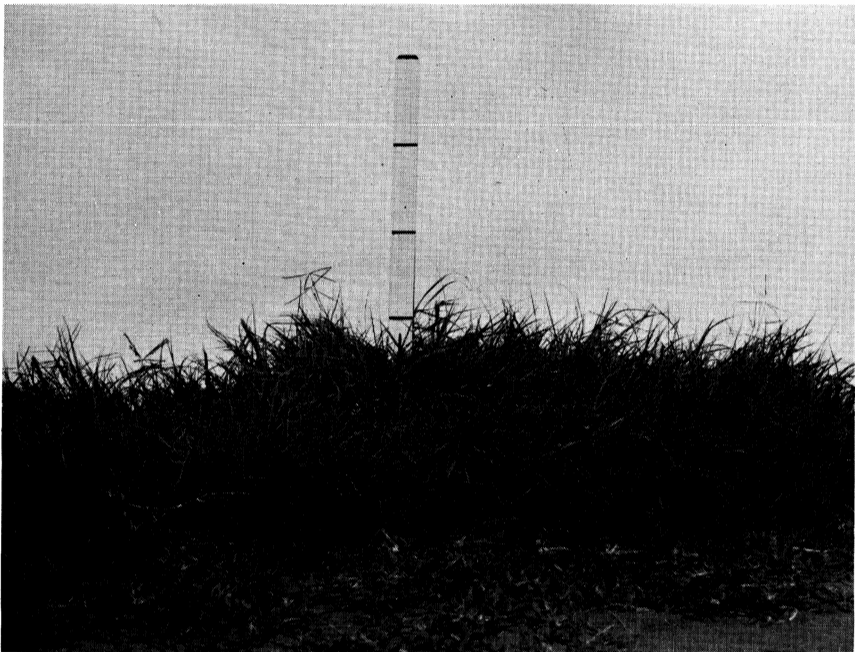
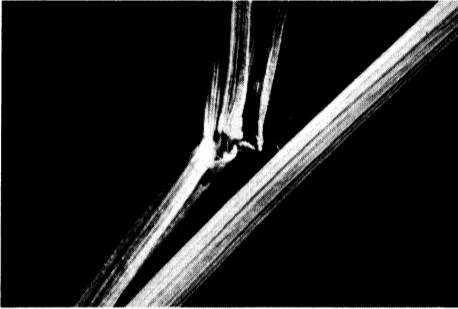
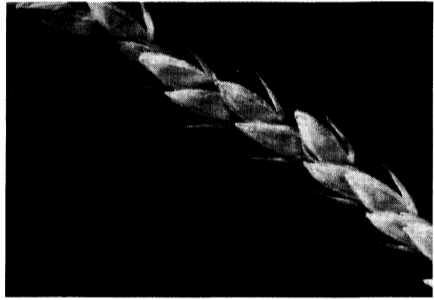
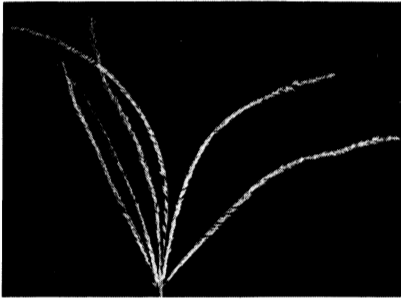
Prussic acid content: low to medium

Growth habit: The stout stolons and rather slender culms form loose mats up to 60 cm high

Habitat: coastal plain to the highlands in damp, shady areas, often along the banks of streams

Distribution: Ethiopia to Rhodesia and Angola

Remarks: somewhat resembling C. dactylon var. coursii in growth habit, but usually more slender, and often less robust. No winterhardiness.



6b. Cynodon nlemfuensis var. robustus Clayton et Harlan

No. whorls in inflorescence: 1, rarely 2

Racemes: very long, spreading, often rather flexuous, usually 5 or more, 6 - 10 cm long

Spikelets: rather widely spaced on raceme, ca. 4mm

Glumes: subequal, longest about $\frac{3}{4}$ spikelet length

Lemma: pointed, sparsely hairy on keel

Stolons: stout, long internodes

Rhizomes: none

Leaves: linear lanceolate, soft, glabrous or nearly so

Chromosome number: $2n=18, 36$

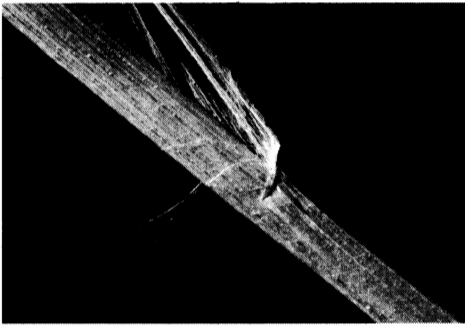
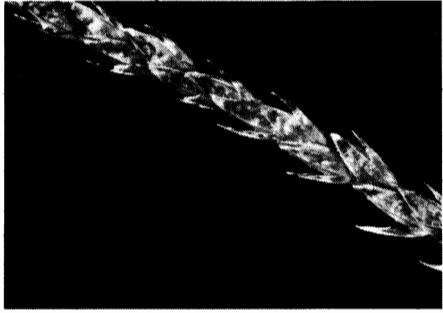
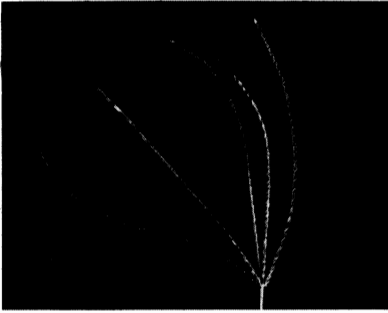
Prussic acid content: medium to high

Growth habit: tall, coarse plant with stiff foliage, spreading vigorously by stolons

Habitat: high rainfall areas of eastern Africa

Distribution: Ethiopia to Rhodesia and westward to Angola

Remarks: differs from C. plectostachyus in shape of inflorescence, length of glumes, lemma pubescence, and in having essentially glabrous leaves. The variety differs from C. dactylon in lacking rhizomes, length of racemes, and growth habit. No winterhardiness.



7. Cynodon plectostachyus (K. Schum.) Pilg.

No. whorls in inflorescence: 1-5, almost always 2 or more

Racemes: large or rarely short, stout, stiff, several

Spikelets: rather closely spaced on raceme, ca. 4mm long

Glumes: usually reduced to almost wanting, more rarely up to $\frac{1}{4}$ spikelet length

Lemma: pointed, elliptical, hairy on keel and margins

Stolons: large, stout, long internodes, arching between nodes

Rhizomes: none

Leaves: linear-lanceolate, broad at base, soft and hairy

Chromosome number: $2n=18$

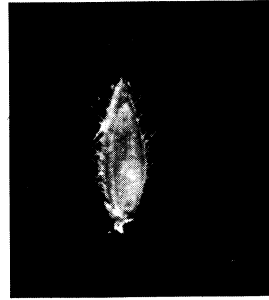
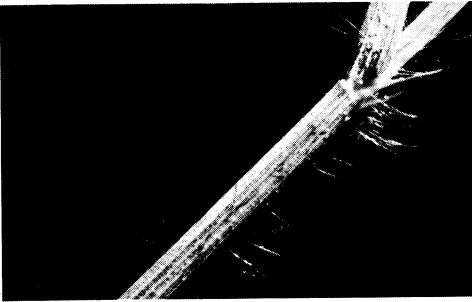
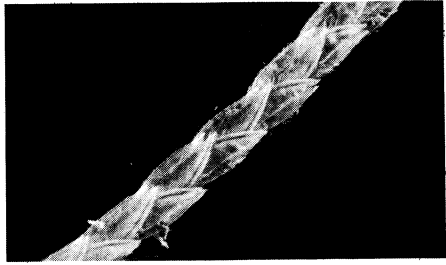
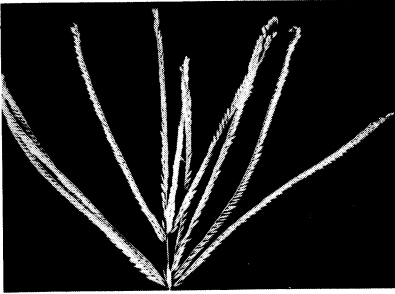
Prussic acid content: medium to high, occasionally low

Growth habit: large, robust plants with thick stolons, and rather wide, soft and hairy leaves, very distinctive

Habitat: areas of relatively high rainfall, particularly along the highlands of East Africa

Distribution: Ethiopia, Kenya, Tanzania, Zambia, Malawi, Uganda, Eastern Congo

Remarks: a very distinct and easily recognized species, genetically isolated from other species in the genus. Reports of hybrids involving C. plectostachyus actually refer to crosses with C. nlemfuensis. No winterhardiness.



8. Cynodon transvaalensis Burtt-Davy

No. whorls in inflorescence: 1

Racemes: fine, small, stiff, 3-5

Spikelets: spacing on raceme rather loose, ca. 4mm

Glumes: rather unequal, the longest about $\frac{3}{4}$ spikelet length

Lemma: pointed, slightly hairy on keel

Stolons: slender, internodes short, often red in color

Rhizomes: present, small but fleshy

Leaves: finely linear, ascending, yellowish green cast, hairy

Chromosome number: $2n=18$

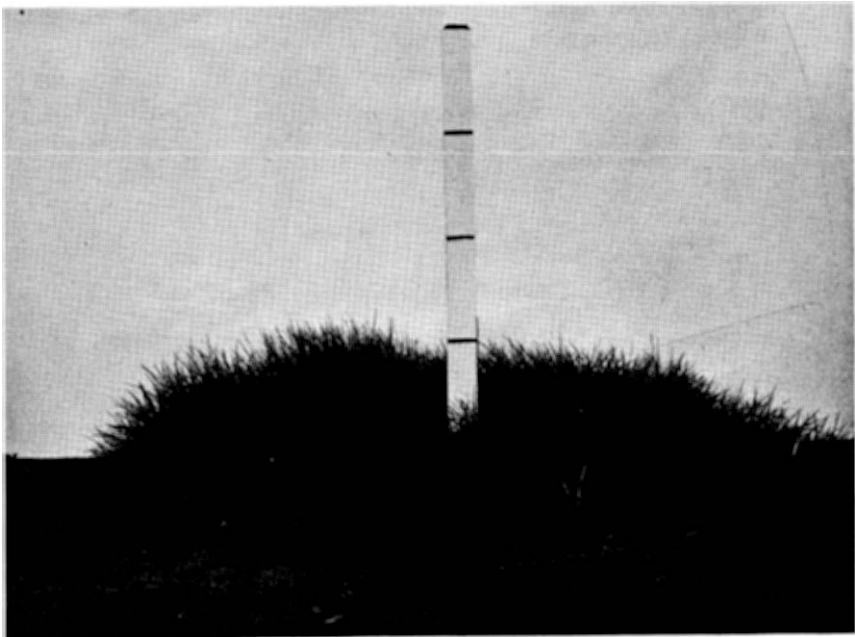
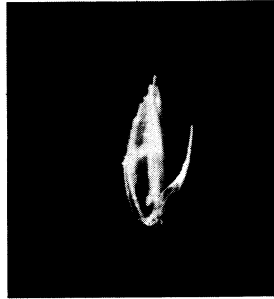
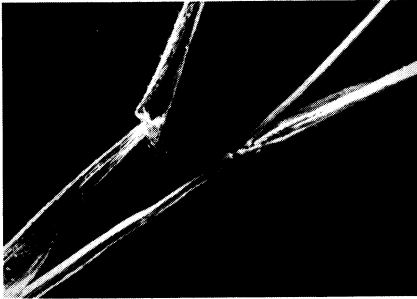
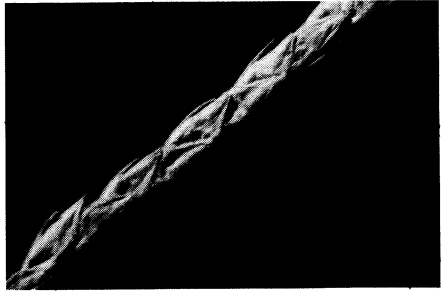
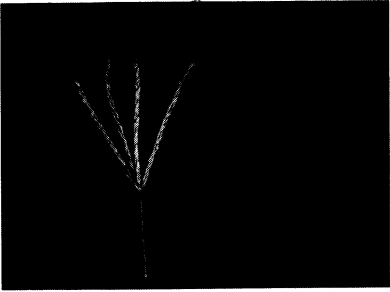
Prussic acid contents: low

Growth habit: fine-textured turf, easily identified by yellowish-green color and erect narrow leaves

Habitat: usually in damp areas around permanent waterholes and along streambanks

Distribution: southwestern Transvaal, Orange Free State and the northern part of the central Cape Province of South Africa

Remarks: plants are rather sterile when self pollinated, but set seed readily when different collections of C. transvaalensis are planted together. Winterhardy in Oklahoma. Often used as a turfgrass and called 'African Bermudagrass'.



9. Cynodon X magenissii Hurcombe

No. whorls in inflorescence: 1

Racemes: small, slender, 2-4

Spikelets: widely spaced on raceme, sterile, ca. 3mm

Glumes: subequal, ca. $\frac{2}{3}$ spikelet length

Lemma: pointed, slightly hairy on keel

Stolons: very fine, short internodes

Rhizomes: very short, shallow, small

Leaves: linear-lanceolate, rather dark green, fine, hairy

Chromosome number: $2n=27$

Prussic acid content: low

Growth habit: fine, low-growing, dense turf, commercially known in America as "Sunturf"

Habitat: strictly cultivated as a lawn grass

Distribution: a single clone produced this widely used turfgrass

Remarks: a natural triploid hybrid between C. dactylon and C. transvaalensis. We have several other natural triploid hybrids in our collections that represent hybrids between tetraploid and diploid varieties of C. dactylon. Winterhardy in Oklahoma.

