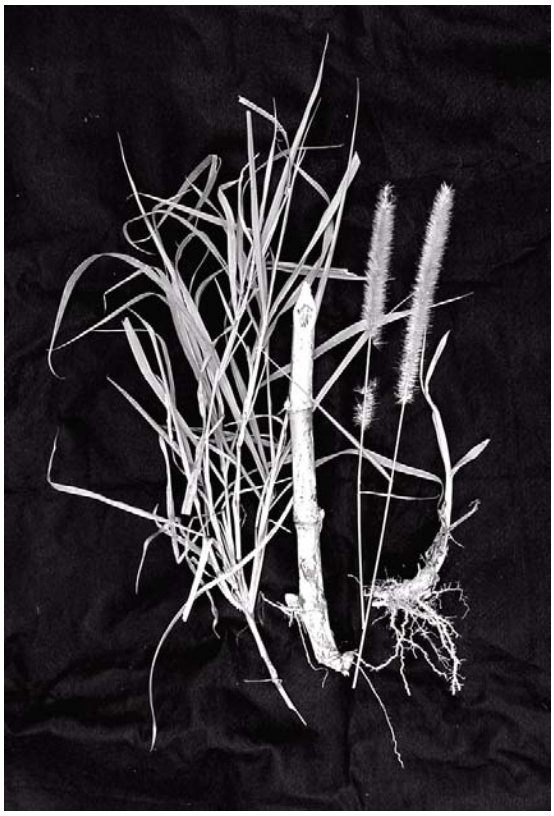
Pennisetum purpureum Schumacher elephant grass
POACEAE

Synonyms: none



General Description.—Elephant grass is also known as napier grass, marker grass, Uganda grass, yierba elefante, capim elefante, herbe à elephants, fausse-cane à sucre, and a host of native African names (Burkill 1994, Holm and others 1977). The species is a robust grass with perennial stems. The plants produce short, creeping rhizomes 15 to 25 cm long with fine roots at the nodes and culms that are from 2 to 8 m in height, up to 2.5 cm in diameter at the base, and have a solid center. Older culms may branch several times. Leaf blades are 50 to 90 cm long and 1 to 3 cm wide, flat, and have a white midrib. Leaves of new, vigorous growth have wide, robust leaves; older culms have finer, narrow leaves. Leaf margins are rough (fine-toothed). The inflorescence is a compact, erect, bristly tawny or purplish spike 8 to 30 cm long and 1.5 to 3 cm wide. Spikelets are arranged around a hairy axis, and fall at maturity. The chromosome number is 2n = 27, 28, or 56 (Burkill 1994, Holm and others 1977, Long and Lakela 1971, Skerman and Riveros 1990).

Range.—Elephant grass is native throughout humid, tropical mainland Africa and the island of Bioko (Burkill 1994). It has been planted for forage and has naturalized in many tropical areas in Asia, the America's, and Oceania. It grows wild in the U.S. territories of Florida, Texas, California, Hawaii, Guam, American Samoa, Puerto Rico, and U.S. Virgin Islands (Natural Resource Conservation Service 2002, Pacific Island Ecosystems at Risk 2002).

Ecology.—Elephant grass will grow on poorly drained clay soils through the gamut of soil types to excessively drained sandy soils. Growth is best on rich, moist, well-drained medium-textured soils. Soil reaction should range from pH 4.5 to 8.2 (Center for New Crops and Plant Products 2002). Rainfall should be in excess of 1500 mm per year and temperatures for optimum growth should be from 25 to 40 °C (Skerman and Riveros 1990). In its native range, the species is a fire sub-climax to broadleaf tropical forest (Center for New Crops and Plant Products 2002). Elephant grass will grow in light shade but is does not survive under a closed tree canopy. In turn, it will suppress most grasses, herbs, and tree seedlings. A frost will kill the above-ground parts, but the soil must be frozen to kill the rhizomes (Center for New Crops and Plant Products 2002).

Reproduction.—Flowering takes place mainly in the fall and winter (Long and Lakela 1971, Holm and others 1977). Because of asynchrony of male and female flower parts, the plant relies on cross-pollination by wind. Elephant grass is an inconsistent seed producer and rarely develops seeds in some habitats. When seeds are produced, they are often of low viability (Holm and others 1977). About 3.8 million seeds per kg were reported for a United States source (Skerman and Riveros 1990). A collection of seeds from Puerto Rico numbered 1.78 million per kg (author's observation). The seeds are wind-dispersed. Colonization of new habitats is slow (Skerman and Riveros 1990).

Growth and Management.—The growth of culms is vertical continually, but their weight bends them in the middle and lower part, causing a j-shaped habit. As the lower stem makes contact with moist soil, it roots at every node. Individual culms live more than 1 year, and by layering, they can continue until disturbed or a barrier is reached. New plantations are established by planting stem pieces with at least three nodes or with root cuttings (Skerman and Riveros 1990). In an agricultural research plot in Puerto Rico, elephant grass reached the height of 4 m in 3 months (Barrett 1925). The record yield for heavily fertilized elephant grass is 84,800 kg/ha/yr (Skerman and Riveros 1990). Not-withstanding its value as forage, elephant grass has become one of the worst weeds in the tropics because of the difficulty of controlling it in croplands and fallow areas. Cultivation alone is usually insufficient to control it in croplands (Skerman and Riveros 1990). Frequent mowing will cause it to be replaced by other grasses. The herbicide glyphosate provides acceptable control in at least aquatic sites (McCann and others 1996).

Benefits.—Elephant grass makes up the bulk of the diet of forest elephants in West Cameroon (Tchamba and Seme 1993). The species is an important forage and pasture grass in its native Africa and throughout the Tropics, especially for cattle. It is also cut for hay and fermented for silage. A number of forage samples of different ages of grass from several countries varied from 4 to 15 percent in crude protein, from 28 to 40 percent in crude fiber, from 10 to 16 percent in ash, from 0.9 to 3.8 percent in fat, and from 39 to 49 percent in nitrogen-free extract (Skerman and Riveros 1990). The species has been employed successfully using sown cuttings to replace *Imperata* swards in the Phillippines (Agus and others 1996, Skerman and Riveros 1990). It is planted as hedgerows for erosion protection and forage production in the alley cropping system of agroforestry (Magcale-Macandog and others 1998, Menz and others 1999). The plant is also effective as a windbreak for agricultural crops (Karschon and Heth 1958). Lines of plants are used to mark boundaries between plots and properties. Elephant grass is planted on riverbanks to prevent erosion. In Africa, the plant is used for thatch, and the thick culms are made into fences, screens, and reinforcement for mud huts. The young leaves and young shoots are eaten in soups and stews (Burkill 1994). Elephant grass is used for mulch in East Africa where a 25-cm depth of mulch is needed for good weed control (Nishimoto 1994). Extracts of the plant are strongly diuretic and are used for that purpose in Africa. It is also used in a number of other herbal remedies (Burkill 1994). The seeds are eaten by many bird species. However, because of the aggressive spread of the species, it is a menace to native vegetation in the Galapagos Islands (Mauchamp 1997) and at the margins of swamps and streams in Florida (Miami-Dade County 2002).

References

Agus, F., D.K. Cassel, and D.P. Garrity. 1996. Soil-water and soil physical properties under contour hedgerow systems on sloping Oxisols. Soil and Tillage Research 40(3-4): 185-199.

Barrett, O.W. 1925. The food plants of Puerto Rico. Journal of the Department of Agriculture of Puerto Rico 9(2): 193.

Burkill, H.M. 1994. The useful plants of West Tropical Africa. Royal Botanic Gardens. Kew, UK. 636 p.

Center for New Crops and Plant Products. 2002. *Pennisetum purpureum* K. Schumach. Perdue University. http://hort.purdue.edu/newcrop/duke_energy/Pennisetum_purpurium.html. 4 p.

Holm, L.G., D.L. Plucknett, J.V. Pancho, and J.P. Herberger. 1977. The World's worst weeds. East-West Center. Honolulu, HI. 609 p.

Karschon, R. and D. Heth. 1958. Wind speed, wind-borne salt and agricultural crops as affected by windbreaks. La Yaaran 8(3/4): 8-13, 32-38.

Long, R.W. and O. Lakela. 1971. A flora of Tropical Florida. University of Miami Press, Coral Gables, FL. 962 p.

Magcale-Macandog, D.B., C.D. Predo, K.M. Menz, and A.D. Calub. 1998. Napier grass strips and livestock: a bioeconomic analysis. Agroforestry Systems 40(1): 41-58.

Mauchamp, A. 1997. Threats from alien plant species in the Galapagos Islands. Conservation Biology 11(1): 260-263.

McCann, J.A., L.N. Arkin, and J.D. Williams. 1996. Noniddigenous aquatic and semi-aquatic plants in freshwater systems. University of Florida, Center for Aquatic Plants. http://aquat1.ifas.ufl.edu/mctitle.html. [Not

paged].

Menz, K.M., D. Magcale-Macandog, and I.W. Rusastra, eds. 1999. Improving smallholder farming systems in *Imperata* areas of Southeast Asia: alternatives to shifting cultivation. Australian Centre for International Agricultural Research. Canberra, Australia. 280 p.

Miami-Dade County. 2002. Napier grass-*Pennisetum purpureum*. http://co.miami-dade.fl.us/derm/environment/badplants/plant%20desc…/napier_grass.ht. 1 p.

Natural Resources Conservation Service. 2002. Plants profile: *Pennisetum purpureum* Schumacher. Washington, DC. http://plants.usda.gov/cgi_bin/plant_profile.cgi?symbol=PEPU2. 3 p.

Nishimoto, R.K. 1994. Weed control in coffee plantations. In: R. Labrada, J.C. Caseley, and C. Parker, eds. Weed management for developing countries. FAO Plant Production and Protection Paper 120. Food and Agriculture Organization of the United Nations. Rome. p. 354-359.

Pacific Island Ecosystems at Risk. 2002. Invasive plant species: *Pennisetum purpureum* Schumacher, Poaceae. http://www.hear.org/pier3/pepur.htm. 2 p.

Skerman, P.J. and F. Riveros. 1990. Tropical grasses. FAO Plant Production and Protection Series 23. Food and Agriculture Organization of the United Nations. Rome. 832 p.

Tchamba, M.N. and P.M. Seme. 1993. Diet and feeding behavior of the forest elephant in the Santchou Reserve, Cameroon. African Journal of Ecology 31(2): 165-171.

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