Weed Alert!

Cogongrass, *Imperata cylindrica*, in the United States[1]

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INTRODUCTION

Cogongrass [*Imperata cylindrica* (L.) Beauv. #[3] IMPCY] is an aggressive, pernicious, rhizomatous perennial in the Poaceae (Graminae). It is native to tropical and subtropical areas of the eastern hemisphere[4] (5, 19, 20). Introductions of cogongrass into the southeastern United States have been tracked to several separate sources, both accidental and intentional, in southern Alabama, southern Mississippi, and Florida (9, 10, 30). It was found to be unacceptable for use as a forage and in erosion control (6, 19). Cogongrass is a highly variable species[4] (1, 20) and has adapted to a variety of environmental conditions in its native and introduced range (24, 25). Today cogongrass infests 200 million ha in Asia, several thousand ha in the Southeastern United States, and over 500 million ha worldwide (9, 15, 19). It has been reported to be a weed problem in many annual and perennial crops (13, 14, 19, 29, 35). In addition to competing for light, water and nutrients, cogongrass interference is caused by alleopathy and physical injury when rhizome apices penetrate crop roots, bulbs, and tubers (4, 12, 19, 23). Holm et al. (19) designated cogongrass as the world's seventh worst weed.

DESCRIPTION

Cogongrass is a loose to densely compact aggressive perennial that grows with ascending to erect culms. It has an extensive fibrous root system arising from creeping, scaly rhizomes. The smooth, unbranched culms are slender to robust with 1 to 4 (rarely 8) nodes and are 0.15 to 1.2 m, rarely 3 m (0.4 to 3.9 ft, rarely 9.8 ft, respectively) tall[4] (5, 19, 20) (Figure 1).

Leaves become gradually shorter upward on the culm and have sheathing bases and erect to spreading blades with drooping tips. Leaf sheaths are smooth or ciliate and variable in length; lower sheaths are broader, overlapping the upper, and split longitudinally with age becoming fibrous. Leaf blades gradually narrow downward, often on almost petiole-like bases, and taper from above the middle to an acute, sharp tip. The midrib is whitish and prominent on the upper surface.

Leaf width and length vary with habitat from short to 1.5 m (4.8 ft) or more long and 4 to 10 mm (0.15 to 0.4 in) wide. Blades are flat to slightly corrugated, smooth to hairy at base, and with sharply scabrid (rough margins). The inflorescence is solitary, terminal, 3 to 20 cm (occasionally to 60 cm) long and 0.5 to 2.5 cm in diam; it is a cylindrical, distally tapered, dense, tightly branched panicle of spikelets. Spikelets are 2.9 to 6.1 mm long, oblong lanceolate, and obscured by conspicuous, silky, silvery white or cream colored hairs; these hairs are up to 1.8 mm long.

The glumes are equal to subequal in length, lanceolate to oblong, with 3 to 9 nerves, long hairs on the lower side, and a callus base. Lemmas are 1.5 to 4.1 mm long, transparent, ovate, or oblong ovate, nerveless, with fine hairs, and often toothed; paleas are 0.8 to 2.1 mm long, very broad, toothed, and with fine hairs. Each floret has two stamens; anthers are 2.0 to 4.1 mm long on slender filaments. The achenes (caryopses) are 0.9 to 1.3 mm long, solitary, oblong, and brown.

This grass belongs to the Tribe Andropogoneae, named for the broomgrass genus, *Andropogon*, several of which are weedy (18). Other genera, including *Sorghum* and *Rottboellia*, in the Andropogoneae possess additional species of the world's worst weeds, most notably itchgrass [*Rottboellia cochinchinensis* (Lour.) Clayton # ROOEX] and johnsongrass [*Sorghum halepense* (L.) Pers. # SORHA].

There are nine species of *Imperata* worldwide[4]. Historically in the southern United States, records of *Imperata* have been attributed to two closely associated species, cogongrass and Brazilian satintail (*Imperata brasiliensis* Trin. # IMPBR). According to Gabel[4], cogongrass is the most morphologically variable and wide-ranging species in the genus *Imperata*. Brazilian satintail is endemic to South America, Central America, southern Mexico, Cuba, and Florida[4], whereas all

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[3]Letters following this symbol are a WSSA-approved computer code from Composite List of Weeds, Revised 1989. Available from WSSA, 309 W. Clark St., Champaign, IL 61820.

[4]Gabel, M. L. 1982. A biosystematic study of the genus *Imperata* (Graminae: Andropogonae). Ph.D. dissertation. Iowa State Univ., Ames, IA. 90 p.

Figure 1. Illustration of *Imperata cylindrica* (A-G) and *I. braziliensis* (H-I). A. Habit of *I. cylindrica*; B. Panicle and culm of *I. cylindrica*; C. Sheath of *I. cylindrica*; D. Panicle of *I. cylindrica*; E. Flowering spikelet of *I. cylindrica*; F. Fruiting spikelet of *I. cylindrica*; G. Caryopsis of *I. cylindrica*; H. Flowering spikelet of *I. braziliensis*; I. Caryopsis of *I. braziliensis*.

cogongrass was introduced into the New World. Like cogongrass, Brazilian satintail is spreading as a weed, and it has been reported in Alabama (21) and Louisiana (2, 3). These two taxa are morphologically similar and are often confused. Cogongrass is reported to be larger, with taller culms, inflorescences, and leaves, than Brazilian satintail, but the major difference is reported to be the number of stamens per flower[4]. Cogongrass has two stamens and Brazilian satintail only one. Hall[5,6] has synonymized the two species. He found frequent evidence of hybridization and he felt that stamen number had little taxonomic value.

Because cogongrass has many forms in the old world (1, 20), Hall stated that it was reasonable that Brazilian satintail is but one of the old world forms. Additional research is needed to resolve the true identity and putative sources of introduction of *Imperata* in the Southern United States. The use of isozyme analysis could provide taxonomic information and help determine the origin of introductions into the United States and elsewhere.

DISTRIBUTION, HABITAT, AND BIOLOGY

Cogongrass usually grows in warm or tropical areas and is widely distributed on all continents (Africa, Asia, Australia, Europe, North America, and South America) except Antarctica (19, 20). It occurs as far north and south as Japan and New Zealand at latitudes of 45 degrees in the northern and southern hemispheres, respectively (19, 20). This species is found from sea level to altitudes of 2700 m in Indonesia. Cogongrass reaches its maximum development in good soils (19) and it is most weedy in moist to wet tropical and subtropical areas with 75 to 500 cm of annual rainfall.

Its habitats are quite diverse, including the coarse sands found in desert dunes or along shorelines, as well as the fine sands or sandy loam soils of swamps and river margins. Cogongrass is adapted to full sun, but can thrive under the moderate shade of savannahs (19, 20). It is less frequently found on soils with low nutrient levels. Cogongrass is a rapid invader of abandoned or disturbed areas following cultivation and row crop production, establishment of orchards, or along rights-of-way of railroads, highways, utility lines, and pipe lines. It can withstand dry periods or tolerate waterlogged heavy clay soils. Frequent deep tillage in row crop production seems to prevent or inhibit its establishment in some areas of the world.

Cogongrass reproduces asexually by rhizomes and sexually by seeds. The central cylinders of cogongrass rhizomes and roots possess mechanisms to conserve water and resist breakage and disruption (19). Roots and rhizomes are also remarkably resistant to fire and are able to survive in plantations where other weeds are destroyed by controlled burning. Rhizomes may penetrate soils up to 1.2 m deep but most occur within the top 0.15 m in heavy clay soils and 0.4 m of sandy soils. Soerjani and Soemarwoto (29) discovered that 1- to 5-cm-long and 2- to 5-cm diam pieces of rhizomes were viable and sprouted from depths of 15 cm or less.

Cogongrass phenology and frequency is variable throughout its range and seems to be dependent on genetic and environmental factors (19, 20). In Europe, cogongrass flowers from March to August near the Mediterranean Sea, but flowering occurs year round in the Philippines. In the United States, flowering has been documented in the spring from March to May or in the fall following a frost and occurs year round in central and south Florida[7]. The stimulation of flowering has also been attributed to addition of nitrogen and stress factors, such as slashing, burning, defoliation, and grazing (19, 20).

Cogongrass is a prolific seed producer with up to 3000 seeds produced by a single plant (19, 20). Although the plumed seeds are capable of traveling long distances over land or bodies of water, its average flight at plant height is about 15 m. The hairy seeds tend to catch on nearby vegetation[4]. Indications are that seed viability is extremely short-lived. Seedlings develop most frequently in open disturbed areas such as fallowed lands, plantations, and rights-of-way or following fire and natural disasters (tornados and tropical storms).

Rhizome production from a seedling plant takes about 4 wk (30). Soerjani (30) reported as many as 4.5 million shoots, more than 10 metric tons of leaf material and more than 6 metric tons of rhizomes produced from a single hectare. Rhizome length per plant decreased as plant density increased (24). In several cogongrass selections from the United States, shading

[5]Hall, D. W. 1978. The grasses of Florida. Ph.D. dissertation, Univ. Florida, Gainesville. Univ. Mich. Microfilms International No. 7913279, Ann Arbor, MI 49801.

[6]Hall, D. W. 1983. Weed watch. . .Cogongrass. Florida Weed Sci. Soc. Newsl. 5:1–3.

[7]Willard, T. R. 1988. Biology, ecology, and management of cogongrass [Imperata cylindrica (L.) Beauv.] Ph.D. dissertation, Univ. Florida, Gainesville. 129 p.

reduced cogongrass biomass; therefore, there is little evidence that the United States introductions contain sun and shade ecotypes (28).

Cogongrass is readily controlled by cultivation, and little regrowth from rhizomes occurs under simulated field cultivations (17, 27). Wilcut et al. (32) postulated that cogongrass spread is limited by lack of axillary bud formation on most of the rhizome and by the inability of rhizomes to send up new shoots at depths of 8 cm or more. Cogongrass growth is reported to be better in low pH soils (pH 4.7) than in soils at pH 6.7[7].

Since its introduction over 8 decades ago, cogongrass continues to spread in the southern United States (Figure 2). Based on current evidence and the range of variability now present in the U.S.[6] (25), spread of cogongrass is unlikely outside the lower coastal plains of the Gulf Coast States due to its reduced competitiveness under cooler environmental conditions and its lack of low-temperature tolerance (26, 33).

In Florida, results from a recent survey showed that cogongrass had the highest frequencies in counties where it had been used for storage and soil stabilization during the 1950s[7] (34). Many large populations in Florida are the result of attempts by private land owners to enhance forage and erosion control. Cogongrass dispersal in Florida into widely scattered infestations was attributed to establishment during extensive roadway construction and routine maintenance with cogongrass rhizome-contaminated fill soil.

Likewise, the senior author has observed cogongrass establishment and movement in Alabama and Mississippi in areas of recent roadway construction or where nursery plants have been introduced along rights-of-way. Movement westward in Louisiana (3) has been attributed to construction and maintenance areas along highway and railroad rights-of-way. Cogongrass was collected in Hampton County, South Carolina by Nelson in 1987 along highway U.S. 278 (22). Additional plants were not observed during the following two years. The species may not be able to withstand winter temperatures at this location.

Because cogongrass was spreading rapidly along highways and railroad rights-of-way and in pastures and cropland in southeastern Louisiana, a survey was initiated in 1990 followed by an eradication program in 1991[8]. Cogongrass control in Louisiana has been effected with glyphosate [*N*-(phosphonomethyl)glycine] or glyphosate + sulfometuron {2-[[[[(4,6-dimethyl-2-pyridimidinyl)amino]carbonyl]amino]sulfonyl] benzoic acid} depending on label area use restrictions.

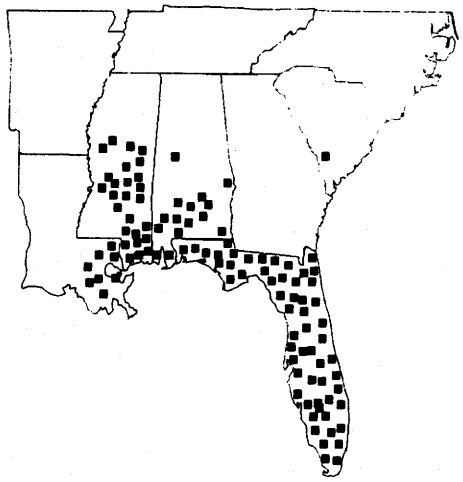

Figure 2. Distribution of *Imperata braziliensis* and *I. cylindrica* in the Southeastern United States based on herbarium specimens and field observations (one dot per county).

Cogongrass is difficult to control when established. Mowing alone does not effectively control cogongrass but two mowings per year reduced cogongrass height, rhizome, and foliage by 31, 39, and 8%, respectively (35). Single applications of a soil sterilant provide acceptable but expensive control, and multiple applications of herbicides can significantly reduce stands of cogongrass (11). Repeated applications of systemic herbicides, such as glyphosate, markedly reduce cogongrass stands 1 yr after application. However, complete eradication may take 1 yr or more.

Three native North American skipper butterfly species (Hesperiidae), *Ancyloxypha numitor* (Fabricus), *Atalopedes campestris* (Boisduval), and *Hylephila phyleus* Drury, have been reported to feed on cogongrass (7, 8). In caged greenhouse experiments, a single larva of *A. campetris* per 10-cm diam pot reduced cogongrass foliage by as much as 45 to 50% (8). However, it is unlikely that these butterfly species can be used as biological control agents alone or in conjunction with herbicide applications because the larvae also feed on several grass crop species including bermudagrass [*Cynodon dactylon* (L.) Pers.], corn (*Zea mays* L.), johnsongrass and St. Augustine grass

[8]Dearl Sanders. 1993. Personal communication. Coop. Ext. Serv., Louisiana State Univ., 261 Knapp Hall, Baton Rouge, LA 70803.

[*Stenotaphrun secundatum* (Walt.) Ktze.]. Each also has numerous native natural parasites and predators.

This pernicious weed has the potential to extend its range northward and westward in the United States especially if more winter-tolerant biotypes are introduced. A special concern is that several nurseries are now selling a cultivar of cogongrass. 'Japanese Blood Grass' or 'Red Baron', in the United States (16, 23). If additional populations are found outside of the existing range, please contact the authors, the U.S. Department of Animal and Plant Health Inspection Service, or the appropriate state agency.

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