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Characteristics of Cogon Grass Rhizomes and its Perforation of a Maiden Cane Rhizome

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Abstract: Cogon grass (*Imperata cylindrical*) is one of the most aggressive grasses world wide and spreads by an extensive rhizome system. This study adds observational detail to growth of cogon grass rhizomes and provides for a mechanism by which cogon grass is able to perforate other species of plants. During a competition study between *I. cylindrical* and native grasses, where the plants were grown in 30 cm pots, under greenhouse conditions, the underground systems were harvested by removing the root ball from the pot, then removing the potting mixture in order to un-potted for determination of length and weight of rhizomes and roots. In one pot, a unique situation was observed where a rhizome of cogon grass had perforated and traversed a rhizome of maiden cane. Aside from the physical damage, the rhizome of the maiden cane did not appear to be diseased. This study describes the rhizomes of the two plants and documents penetration. While cogon grass can penetrate other below ground parts of other species of plants, it does not appear to provide for major damage.

Key words: Cogon grass, rhizome, spear grass, competition

INTRODUCTION

Cogon grass (*Imperata cylindrical* Beauv.), family Poaceae, is an invasive, rhizomatous, aggressive C₄ perennial grass that has become one of the most serious invasive species in Florida and other Gulf Coast States (MacDonald, 2004; Onokpise *et al.*, 2007). Rhizomes are underground horizontal stems that can penetrate the soil for long distances (Beard, 1972; Esau, 1977). Cogon grass produces a very aggressive rhizome that has a very sharp and point tip. This has led to the common name of spear grass in Nigeria (Chikoye *et al.*, 2000). Cogon grass has been reported to penetrate other plant species such as Bahiagrass (Holly and Ervin, 2006) although they concluded that cogon grass was more likely to perforate itself. Holly and Ervin (2006) indicated that most of the reports of perforation are from field studies that are not well documented and infer about the damage created.

Normally, plants are regarded as separate entities during studies. Cogon grass is a highly competitive species and its rhizomes permit colonization of substantial volumes of soil relative to the initial origin. Many times, the characteristics and interaction of the below ground

parts between different species is overlooked due to the difficulty in separating these systems from the soil environment.

During a recent potted plant study of competition between cogon grass and other amenity grasses (muhly grass, switch grass and maiden cane), it was possible to observe the interaction of the below ground systems between cogon grass and the other grasses. This note provides observational data on cogon grass rhizomes and the penetration of a rhizome of maiden cane (*Panicum hemitomom* Schult citrus).

MATERIALS AND METHODS

Cogon grass was harvested from a natural infestation in Tallahassee, FL. Maiden cane citrus was obtained from field grown plants. Plants were dug up with adherent rhizomes and as little soil as possible. The roots and rhizomes were then trimmed to approximately 1 cm in length and the leaves (culms) were trimmed to approximately 15 cm in length. These were then placed into #72 pro trays (3.8 cm diametex5.9 cm deep, Landmark Plastic Corporation, Akron, OH) and filled with commercial potting mix (Jungle Grow® : composted pine bark, peat

moss, vermiculite, perlite, horticultural grade charcoal, 0.25-0.12-0.12 N-P-K, Piedmont Pacific, Statham, GA 30666). Plants were held on a greenhouse bench under mist (5 sec every 15 min) for 7 d and then moved to greenhouse benches where they were watered daily. Plants were grown for approximately 4 weeks in these smaller containers before being transplanted into the greenhouse pots.

These plants were planted in various combinations in Accelerator model AP-3 pots filled with 80% bark, 10% sand and 10% peat (Graco Fertilizer Co, Cairo, GA). Plants were grown on greenhouse benches and watered every other day. Water was withheld 3 days before harvest, which permitted the soil mass to dry. On the harvest date, the plant mass was removed from the pot, the potting mix removed by teasing the root ball apart and shaking the dry mix out. These observations deal with cogon grass rhizomes alone and in combination with maiden cane rhizomes.

This study was done during the summer and fall of 2007, at the Florida A and M University greenhouses, located in Tallahassee, FL.

RESULTS

The rhizomes of cogon grass are slender (1-1.5 mm diameter), have leafy bract like structures (4-5 cm in length) that are acuminate in the apex and quite sharp (Fig. 1). With continued growth, the leafy bract like structure opens. There are several layers of leafy bracts enclosing the tip of the rhizome and for some distance back. Each bract arises from a distinct node. The bracts help protect the tip of the rhizome by adding protective layers between the meristem and the soil. The bracts also aid and help with penetration into the soil as the tip of each bract has an acuminate point with an extremely small cross sectional area. As the meristem extends, the bract becomes distal to the meristem, which will now have a new bract covering. The ability of the rhizome to penetrate soil is dependent on the sharpness of the tip. Since, the small cross sectional area acuminate point of the cogon grass rhizome is due to a bract, the tip of the rhizome point will always retain its sharpness as if something damages the point on the bract (Fig. 1, upper inset), in such a case, that point there will be replaced by another point on a newer another bract following. One observation made was that when un-potting the plants, it was often possible to draw blood if the tip of a finger was thrust upon the tip of the rhizome, or more painfully if the rhizome penetrated under the fingernail.

The rhizome extends into the soil by means of expansion of the intercalary meristem between nodes



Fig. 1: Rhizomes of cogon grass that grew outside of a pot. The acuminate point on the rhizome and the scaly bracts that covering the rhizome (lower inset). The close up of note the pointed apex on the close up of an individual the upper bract (upper inset) indicates how it tapers down to a needle like tip



Fig. 2: Penetration of the rhizome of maiden cane by the rhizome of cogon grass

(Esau, 1977). Each bract arises from a single node. The expansion of the rhizomes is complete at distances of 3-7 cm distal to the apex. The distance between nodes was found to be 1.58 cm (n = 45) with a range from 1.2 to 2 cm. A single cogon grass plant at 24 weeks of age, grown under these conditions was found to have 2312 cm of length. At an average distance of 1.6 cm between nodes, this would indicate the production of over 1400 nodes, hence the potential for invasiveness.

During harvest, a rhizome of cogon grass was observed having penetrated a rhizome of maiden cane (Fig. 2). The maiden cane rhizome was much thicker (up to 5 mm) and much more succulent than the cogon grass rhizome. Interestingly, the maiden cane rhizome appeared

split and did not appear to have other damage. There were no symptoms of necrosis, or indication of pathological damage. The cogon grass rhizome was flattened at the areas of penetration and several bracts were still visible at the site of penetration.

DISCUSSION

Holly and Ervin (2006) provided the only empirical evidence of the penetration of other below ground plant parts by cogon grass rhizomes. In their study, they indicated that cogon grass was able to penetrate rhizomes of Bahia grass (*Paspalum notatum* Flugge) and Bermuda grass (*Cynodon dactylon* L.). Bahia grass has a rather thick rhizome that is found in the upper few cm of the soil, while Bermuda grass has a wiry rhizome or stolon that is normally superior to the soil (Beard, 1972). However, Holly and Ervin (2006) indicated that cogon grass often penetrated other rhizomes of cogon grass much more frequently than they did below ground parts of other species. We did not observe penetration of cogon grass rhizomes, in present study.

Also, penetration by rhizomes has been assumed to open portals for pathogens (MacDonald, 2004). In present study, the opening that had been created by the penetration of the cogon grass rhizome showed and accumulation of suberin, which indicates healing of the tissue and sealing against pathogens. There was no discoloration of the tissue, indicating a lack of colonization by pathogens.

These observations on the characteristics of cogon grass rhizomes, with the description of the apex of the bract covering the rhizome, help support understand the common name of spear grass that is used in Nigeria and help provide insight into the aggressive nature of this plant species.

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REFERENCES

- Beard, J.B., 1972. Turfgrass: Science and Culture. Prentice-Hall, Englewood Cliffs, ISBN: 013933002X, pp: 672.
- Chikoye, D., V.M. Manyong and F. Ekeleme, 2000. Characteristics of speargrass (*Imperata cylindrica*) dominated fields in West Africa: Crops, soil properties, farmer perceptions and management strategies. Crop Prot., 19: 481-487.
- Esau, K., 1977. Anatomy of Seed Plants. 2nd Edn., Wiley, New York, ISBN: 0471245208, pp: 576.
- Holly, D.C. and G.N. Ervin, 2006. Characterization and quantitative assessment of interspecific and intraspecific penetration of below-ground vegetation by cogongrass (*Imperata cylindrica* (L.) Beauv.) rhizomes. Weed Bio. Manage., 6: 120-123.
- MacDonald, G.E., 2004. Cogongrass (*Imperata cylindrica*)-biology, ecology and management. Crit. Rev. Plant Sci., 23: 367-380.
- Onokpise, O.U., H. Dueberry, L. Reid, J.L. Norcini, J.J. Muchovej and S.K. Bambo, 2007. Comparative studies on the control of cogongrass (*Imperata cylindrica* L.). J. Environ. Manage. Restor., 3: 323-330.