A description of the plant structures of *Microlaena stipoides*, a grass species forming stolons and rhizomes

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Abstract

The native perennial grass, *Microlaena stipoides* var. *stipoides* is commonly found in grasslands of the temperate higher rainfall zone (> 500 mm AAR) of south-eastern Australia. This productive species yields highly digestible green growth year round and has the ability to persist through very hot dry summers. This study of the plant structures aimed to identify the plant's growth strategy and possible mechanisms for summer survival. Six random turves 100 mm x 100 mm, to a depth of 100 mm, were collected during active growth (winter 2009) from 8 locations in Victoria: a native pasture of unknown age at Chiltern; 1, 2, 3, 4 and 5 year old stands of cv Griffin at Tarrawingee; 3 year old stands of cv Indigo, Bendigo and Lig183 at Echuca. Plant material was washed and roots, reproductive tiller bases, rhizomes and stolons were visually assessed to describe plant structures. The morphological structures were consistent, irrespective of the age of plants or the collection location. Active growth arose from corm-like structures that were located approximately 20 mm below the ground surface. These results indicate that Microlaena has considerable potential to spread in grasslands via vegetative structures (clonally). Many patches of the grass seen in the landscape could be one genotype. The location of the active buds, depth of burial and the vegetative nature of this species may provide Microlaena with the ability to withstand very hot dry summers and have the potential to respond quickly to summer rainfall events producing herbage of high nutritive quality.

Key Words

Weeping grass, native grass

Introduction

The native perennial grass, *Microlaena stipoides* var. *stipoides* is commonly found in grasslands of the temperate higher rainfall zone (> 500 mm AAR) of south-eastern Australia. This productive species produces highly digestible green growth year round. Understanding the morphology and hence growth and development of this species is important to managing it sustainably in grazed native pastures. Characterisation of the morphology of intact plants of phalaris (Cullen et al. 2005a; b; c), perennial ryegrass (Brock and Fletcher 1993; Hume and Brock 1997), white clover (Brock et al. 1988), tall fescue (Brock et al. 1997; Hume and Brock 1997; Jernstedt and Bouton 1985) and cocksfoot (Brock et al. 1996) has increased our understanding of the perenneation of these species in pastures. This study of plant structures aimed to identify the growth strategy of Microlaena and possible mechanisms for summer survival. Understanding the structure of the plant is important in developing management systems that help achieve persistence of the species in pastures.

Methods

Six random turves 100 mm x 100 mm square, to a depth of 100 mm, were collected during active growth (winter 2009) from 8 locations in northern Victoria: a native pasture of unknown age at Chiltern (36?12'S, 146?35'E); 1, 2, 3, 4 and 5 year old stands of cv Griffin at Tarrawingee (36?25'S, 146?28'E); 3 year old stands of cv Indigo, Bendigo and Lig183 at Echuca (36?07'S, 146?27'E). The plant material was washed out, and then roots, reproductive tiller bases, rhizomes and stolons were assessed to describe plant structures. Rhizomes were defined as modified stems which remain underground and develop roots at the nodes (Renvoize 2002). Stolons are modified stems like rhizomes but are above ground (Renvoize 2002). Stolons can be distinguished from rhizomes by bearing complete, green leaves, whereas rhizomes develop only develop scale-like leaves (Hubbard 1968). Corms were defined as enlarged basal internodes (Jacobs et al*.* 2008).

Results

At the time of sampling all plants were actively growing as demonstrated by having numerous fresh, white shoots and tillers. The morphological structures were consistent, irrespective of plant age or location from which they were collected. Growth appeared to arise from corm-like structures. These corms were located approximately 20 mm below the ground surface. Active buds arose from the corms (Figure 1). In some of the older plants examined, these corms had formed dense interwoven mats. Some plants that were examined had growth arising from several different depths (Figure 2). Figure 2 illustrates a tiller arising from corm material at approximately 20 mm and in addition to this, tillers are visible arising 5 mm below the ground surface. The average length of the rhizomes was 20 mm and all plants assessed had them (Figure 1). Stolons were recorded on a number of plants. The stolons were longer, but narrower and had a more wiry appearance than that of the rhizomes. Stolon formation may be the result of aerial tillering as indicated in Figure 3.

Figure 1: Microlaena plant from Chiltern site, where R indicates rhizome, C indicates corm and T indicates tiller. The level of the ground surface is represented by the horizontal line.

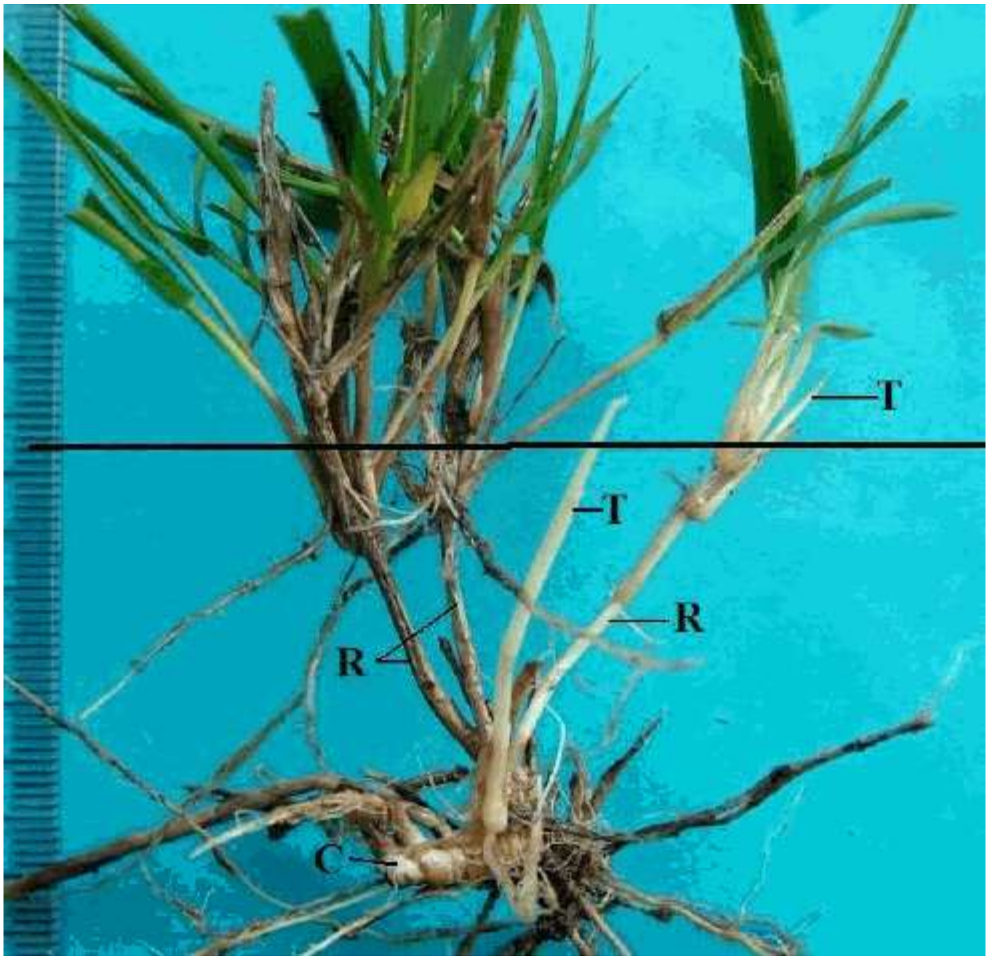

Figure 2: Microlaena plant from Chiltern site, where R indicates rhizome, C indicates corm and T indicates tiller. The level of the ground surface is represented by the horizontal line.

Figure 3: Aerial tillering in Microlaena, leading to the formation of stolons (where S indicates the stolons).

Conclusion

The presence and depth of burial of the corm in Microlaena may provide protection from adverse seasonal conditions, particularly hot, dry summers and hard grazing. The ability of Microlaena to survive drought by senescing back to sub-surface corm-like structure was noted by Johnston et al. (2001). These corms may also play a role in the storage of carbohydrates (Jacobs et al. 2008). The presence of both stolons and rhizomes demonstrates that Microlaena has the potential to spread vegetatively with some flexibility in the mechanism used. Plants with a mechanism for vegetative expansion can invade spaces effectively, allowing them to rapidly explore the environment (Humphrey and Pyke 1998). The rhizomatous growth habit may be why Microlaena is known to be tolerant of heavy grazing under favourable environmental conditions (McCusker 1982). As the rhizomes of Microlaena are only short, they may not have the function of enabling rapid vegetative expansion, but rather be the storage organ that allows survival during adverse seasonal conditions and enable the plant to maintain a dense mono-specific sward that is competitive against other species. Stolons are longer and possibly develop under more favourable conditions for plant growth to aid in the capture of a greater area more rapidly than rhizomes allow.

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