SHORT COMMUNICATION

# Potential Biocontrol Agents for Bermudagrass in Eastern Ethiopia

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## Abstract

Shoot flies, including *Atherigona laevigata* Loew, *Oscinella* sp and *Delia arambourgi* (Séguy) were identified as potential biocntrol agents of bermudagrass, *Cynodon dactylon* (L.) Pers. Shoot damage by these flies of as high as 80% was recorded in wet months. *Atherigona laevigata* was the dominant shoot fly that infested the weed throughout the year. Four other insect species and seven phytopathogenic fungi were also recorded from the weed. Infestation by the insects was dramatically increased by applying meat meal on he weed; treated plots showed an average of 58.6% "dead heart" compared with 24.9% for the untreated ones. Possibilities and potentials for use of these biocontrol agents are discussed.

## Introduction

Bermudagrass, *Cynodon dactylon* (L.) Pers., is one of the dominant weeds in coffee, sugarcane and field crops in Ethiopia (Getachew 1991, Taye 1991). In addition to its weed effects, it is known to produce allelopathic biochemicals in coffee (Mariga 1985) and harbour many insect pests, plant diseases and parasitic nematodes (Atu et al. 1988, Garrido & Trujillo 1992).

Cultural practices often fail to control bermudagrass adequately (Getachew 1991, Grichar 1995) and repeated herbicide applications may be required for adequate control. The use of insects, plant pathogens and other biological methods to control weeds offers a comparatively untapped source of technology for selective weed control (Wilson 1964, Andres 1982). This paper explores the possibility of using native insect natural enemies in the management of bermudagrass.

## Materials and Methods

The study was undertaken from 1992 to 1996 around Alemaya University of Agriculture. Weekly collections were made using a standard sweep net throughout the year to establish the seasonal incidence of shoot flies (Sileshi 1994, 1997). In addition, six 30 cm by 30 cm transacts laid on randomly selected sites were examined fortnightly from 1992 through 1993 and the mean percentage of 'dead hearts' was computed for each month. Other insects and pathogens attacking the weed were also recorded.

In 1995, a study was carried out to evaluate the effect of meat meal on the degree of infestation by *A. laevigata*. In the field, eight 1 m x 1 m plots were randomly selected and marked each month from June to December. Half of the plots were sprinkled with moistened meat meal and the rest were left as checks. The four plots in each case were used as replicates. Ten days later, 30 cm x 30 cm portions of all plots were examined and percentage of dead heart was computed. The data were then subjected to analysis of variance.

## Results and Discussion

Shoot flies attacking bermudagrass included *Atherigona laevigata* Loew (Diptera: Muscidae), *Delia arambourgi* (Séguy) (Diptera: Anthomyiidae) and *Oscinella* sp (Diptera: Chloropidae). Damage due to these flies as high

as 80% was recorded in wet months. All the shoot flies were active during the rainy season and infestation was often mixed. *Atherigona laevigata* was the dominant species in the shoot fly fauna of bermudagrass. This insect has been also recorded as one of the most abundant Diptera in pasture in Nigeria (Deeming 1971).

*Atherigona laevigata* attacked only *C. dactylon* and *Cynodon nlemfuensis*. It did not attack crop plants associated with the weed. The other shoot flies, however, attacked crop plants and many weedy plants (Table 1). *Atherigona laevigata* adults remained active throughout the year and the highest population was observed in the period between August to December. Infestation was higher in rainy months than drier ones in both 1992 and 1993. More adult catches were also made within a fortnight of rainy days. Attack by many of the insects was also high during this period.

Gravid females of *A. laevigata* were strongly attracted to meat meal. Infestation of bermudagrass by this insect was dramatically increased by application of meat meal. Treated plots had an average of 58.6% dead hearts while the untreated ones sustained 24.9%. Higher shoot damage was observed in treated plots in September and October. The fact that *Atherigona* are active throughout the year and that they are attracted to putrefying materials such as fish meal, meat meal and decaying eggs was also reported elsewhere (Mohan et al. 1993, Sileshi 1997). Management of the weed can be improved by taking advantage of this behaviour. *Atherigona* spp can be easily reared and mass cultured (Pritam Singh et al. 1983). Opportunities exist for mass production and release of *A. laevigata* to augment the natural population.

*Delia arambourgi* and *Oscinella* sp are pests of barley, wheat, tef (*Eragrostis tef*) at Alemaya (Sileshi 1994). These shoot flies may be valuable as biocontrol agents only in areas where barley, wheat and millet are not grown as major crops. Other insects and pathogens recorded from bermudagrass are given in Table 1. Some of the fungal pathogens listed were also recorded from bermudagrass in western Ethiopia (Stewart 1957). Quantitative data do not exist on the role of these insects and pathogens as biocontrol agents. Therefore, future studies must assess their role in biocontrol of the weed.

Many biotic and abiotic factors limit the value of biocontrol agents in the control of bermudagrass. Climate is obviously crucial and, linked with agricultural practices, it results in complex interactions which are poorly understood. Other factors such as host specificity are also very important in biological control. Parasitoids are probably the most important biotic factors which may reduce the efficiency of biocontrol agents like shoot flies (Sileshi 1997). In view of these facts, since biological control operates slowly, it should not be expected to replace cultural or chemical control but to supplement their judicious use.

Table 1. List of insects and pathogens of *Cynodon dactylon* recorded on other host plants at Alemaya, Ethiopia.

| Taxa | Other host plants recorded |
|---|---|
| **Insects** | |
| *Atherigona laevigata* | *Cynodon nlemfuensis* |
| *Oscinella* Sp. | sorghum, tef, wheat |
| Species indeterminate | *C. nlemfuensis* |
| *Delia arambourgi* | *C. nlemfuensis*, barley, |
| *Diopsis latifrons* Meigen | *Digitaria velutina*, wheat *C. nlemfuensis* |
| *Epilachna* sp | *Pennisetum* spp |
| *Rhopalosiphum maidis* Fitch | maize, sorghum |
| *Saccharicoccus* sp | *C. nlemfuensis* |
| **Pathogens** | |
| *Cerebella andropogonis* Ces. | *C. nlemfuensis* |
| *Colletotrichum graminicola* (Ces.) Wils | *C. nlemfuensis* |
| *Helminthosporium cynodontis* Marig. | *C. nlemfuensis* |
| *Phyllachora cynodontis* (Sacc.) Niessl. | *C. nlemfuensis* |
| *Puccinia cynodontis* Lacroix | *C. nlemfuensis* |
| *Sphacelia sorghi* McRae | *C. nlemfuensis* |
| *Ustilago cynodontis* (Pass.) Henn. | *C. nlemfuensis* |

## Acknowledgements

I would like to than Prof. R. Kumar Lakra (Chancellor College, University of Malawi) and Dr. Tsedeke Abate (Institute of Agricultural Research, Ethiopia) who helped and enthusiastically encouraged my studies on *Atherigona* from the beginning. My thanks are also due to Mr. J.C. Deeming and Dr. C. van Achterberg for kindly identifying my insect specimens.

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