PEST STATUS OF *CERODONTA* spp. AND OTHER SHOOT FLIES IN WAIKATO PASTURES

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SUMMARY

Leaf mining damage to grasses by the wheat sheath miner *Cerodontha australis* is described. In a screenhouse experiment, infestations of ryegrass plants resulted in reduction of plant yield. A survey of 63 Waikato pastures showed ryegrass tiller infestations by sheath and leaf miners ranged from 1-21% in summer. The wheat sheath miner was the most common leaf mining insect in pastures. At these levels, leaf miners and shoot flies are not economic pests but contribute to the overall pest fauna in suppression of pasture growth.

INTRODUCTION

Dipteran leaf miners (Agromyzidae, Ephydriidae) and shoot flies (Chloropidae, Opomyzidae, Anthomyiidae) are important pests of cereals and grasses in many parts of the world. Sown pastures in New Zealand have a complex dipteran fauna of indigenous and introduced species, including potential pests (Cumber and Harrison 1959). Studies on their economic status have not been published. This paper reports on a damage assessment study of the wheat sheath miner, and a survey on leaf miners and shoot flies in Waikato pastures.

MATERIALS AND METHODS

Screenhouse experiment

Clonal material of 'Grasslands Tama' (*Lolium multiflorum*, endophyte free), 'Grasslands Manawa' (*L. multiflorum* x *perenne*, endophyte free), 'Yates Ellett' (*L. perenne*, endophyte free) and 'Yates Ellett' (endophyte infected) were grown in Horotiu sandy loam in 200 cm³ plastic pots. Female flies, caught by sweep netting pasture, were confined to a number of individual plants for 3 days. The flies were removed and the feeding punctures and ovipositions counted. The infested plants, and five uninfested plants of each ryegrass were then maintained in the screenhouse with natural light and temperature regimes, and regular overhead and capillary bed watering. Larval and pupal numbers per plant were recorded following full egg hatch and pupation respectively. Tiller numbers per plant were counted at approximately 12-day intervals, and herbage was clipped and weighed for each plant at 31, 49 and 77 days after initial infestation.

Field survey

Sixty-three ryegrass based pastures of known age and species composition were selected within a 20 km radius of Hamilton. In September 1982 the incidence of *Acremonium* endophyte infection in the ryegrasses was estimated by collection of 25 plants at random. Tiller sheaths were stained in lactophenol cotton blue, and examined for fungal hyphae with a compound microscope.

In early March 1983, live and dead tiller populations were estimated by taking fifty 48 mm dia. turf plugs from each pasture. For estimation of leaf miner damage, tillers were cut at ground level with motorised shears and representative subsamples of 200 dead and 200 live tillers were examined for larval mines. The composition of the dipteran fauna was assessed by collection of adult flies from 3 m² of pasture with an insect suction sampler.

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Fig. 1: Relationship between percentage of tillers infested by the wheat sheath miner and the dry weight yield of four ryegrasses.

RESULTS AND DISCUSSION

The wheat sheath miner, *C. australis*, is apparently native to eastern Australia and New Zealand. In the past it is misidentified as the Palaearctic species *C. denticornis* (Pz.) (Spencer 1973, 1976). It is one of the most abundant insects in New Zealand pastures and cereal crops (Morrison 1938; Hamilton 1947; Manson 1959; Cumber and Harrison 1959; Cumber 1962). The species is multivoltine, with larvae being most abundant during summer (Barker unpubl.). It is generally considered of no economic importance in New Zealand. This contrasts with Europe and North and South America where Agromyzidae including *Cerodontha* spp are significant pests (Spencer 1973).

Oviposition occurs in the leaf blades of grasses. The larvae mine down the leaf into the sheath and stem, where pupation takes place. Damaged leaves turn pale yellow in colour and eventually die back from the tip. Sheath mining by the second and third instar larvae causes progressive reduction in tiller vigour, but is often not apparent until

Fig. 2: Relationship between numbers of third instar larvae of the wheat sheath miner and the dry weight yield of ryegrass plants.

after completion of larval development and pupation. In some instances larvae penetrate the tiller, cause destruction of the innermost leaves and growing point or, destroy secondary tillers at the base of the originally infested tiller. Hamilton (1947) and Dumbleton (1956) noted penetration of flower stems in ryegrass seed crops, resulting in premature drying off and formation of whiteheads. The flag leaf is frequently affected in ryegrass and cereals. This damage could affect seed yield as flag leaves are important in the translocation of food to the developing seed.

Adult feeding intensity, egg deposition, larval numbers and pupation were similar for all four ryegrasses exposed to female flies in the screenhouse. First instar infestations ranged from 0.7/tiller (0.31/plant). Usually only one larva survived per tiller due to larval competition.

Because of the variable infestation rate achieved, the effects of larval mining on plant growth were subjected to regression analyses, presented in figures 1 and 2. In all ryegrasses,

plant yield over three harvests was negatively correlated with percentage tiller infestations and numbers of third instar larvae per plant. Mean yields of infested plants were 21-25% less than uninfested plants.

In the pasture survey, tiller infestations by agromyzids ranged from 1-21%. Regression analyses yielded no correlations between tiller infestations and tiller populations, incidence of *Acremonium* sp, or pasture age. Infestation levels were similar for both sheep grazed and dairy pastures.

The majority of leaf mines found in the Waikato are caused by *Cerodontha* spp and these mines were found in all grasses examined, namely ryegrasses, *Poa annua*, *P. trivialis*, Cocksfoot (*Dactylis glomerata*), couch (*Elytrigia repens*), sweet vernal (*Anthoxanthum odoratum*) and timothy (*Phleum pratense*). Suction sampling showed the wheat sheath miner to be the most common dipteran in the pastures during summer, as noted by Cumber and Harrison (1959). *Cerodontha angustipennis* was collected in small numbers from two dairy pastures. Yorkshire fog (*Holcus lanatus*) is a host of this species (Spencer 1976). Other agromyzids encountered during the survey were *Liriomyza brassicae*, *Phytomyza costata* and the beet leaf miner, *Liriomyza chenopodii*, all leaf miners of dictyotyledons.

Small numbers of black pasture fly larvae (*Hydrellia tritici*: Ephydriidae) were found in *Poa annua* and ryegrasses. It was collected from 45 sites (71%) in both sheep and dairy pastures. The black pasture fly is widespread in Australia and New Zealand. Larvae mine the leaves and sheaths of cereals and pasture grasses (Mathis and Wirth 1981; May 1960). A single specimen of *Hydrellia velutinifrons* was collected from a dairy pasture.

Cumber and Harrison (1959) found the grey pasture fly, *Scaptomyza fuscitarsis* to be widespread but not abundant in North Island pastures. The grey pasture fly occurred in most pastures, often in considerable numbers. Its host is not known but *Scaptomyza* spp (Drosophilidae) are regarded as leaf miner in grasses (Harrison 1959). *S. graminum* was recovered in small numbers at three sites. This species has been reared from brassicas (Barker, unpubl.).

Larvae belonging to the Chloropidae (shoot flies) are for the most part phytophagous and include a number of important pests of cereals and grasses. Adults of *Hippelates insignificans* were common in many Waikato pastures. The anthomyiid *Hylemyia deceptiva* occurred in small numbers at some sites, the larvae of which are commonly recorded from pasture and are regarded as both primary and secondary feeders on plant roots and stems.

At high infestation levels, the wheat sheath miner is capable of suppressing ryegrass growth. In Waikato pastures however, tiller infestations rarely exceed 20%. Production losses at these infestation levels, when they occur alone, are not significant. Agromyzidae, Drosophilidae, Chloropidae and Anthomyiidae all include damaging larval stages and probably contribute to the overall pest fauna of pastures. This should be considered in interpretation of yield responses to use of broad spectrum pesticides.

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