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Integrated control of snails and slugs

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This factsheet summarises the results of research in the first year of this project, funded jointly by HDC and DEFRA. The main snail and slug species found on HNS nurseries are described, their biology and plant damage is discussed and a summary of initial results with potential integrated control measures is given. A full factsheet will be provided to growers at the end of the third year of the project in June 2003.

Background

Snails and slugs damage a wide range of container-grown HNS species and are difficult to control with slug pellets. Feeding damage is very obvious and causes plant losses or downgrading. At a conservative estimate of 1% losses, difficulties in controlling snails and slugs are causing annual losses of at least £3 million to the HNS industry. This project, funded by HDC and DEFRA, aims to develop improved, integrated control strategies. Benefits to growers will be reduced plant losses, improved plant quality and marketability, and the development of a sustainable control strategy which will satisfy increasing customer demands for ornamental produce grown with minimal use of pesticides. This factsheet gives details of potential components of an integrated control strategy.

Oxyloma pfeifferi

Deroceras panormitanum

Snail and slug species

The main snail species found on ten HNS nurseries between June and October 2000 was a small semi-aquatic species, *Oxyloma pfeifferi* and the main slug species was *Deroceras panormitanum*. Of the total snails collected, 98% were *O. pfeifferi* and 58% of the total slugs collected were *D. panormitanum.* Both species were found on nine of the ten selected nurseries. *O. pfeifferi* adults are 9-12 mm long and juveniles are smaller. Shell colour varies from pale brown to almost black, often with darker markings on the paler forms. The shell is pointed at one end and has three spiralling whorls. *D. panormitanum* is a small, brownish-grey slug with a pale underside, up to 3.5 cm long.
The mantle (raised flap of skin behind the head) is usually paler than the rest of the body and the breathing hole on the right hand side of the mantle is surrounded by a noticeable pale halo.

Plant damage

Plants damaged on the ten nurseries included a wide range of herbaceous plants, alpines, shrubs, grasses and herbs, in plugs, liners and containers, both under protection and outdoors. Choisya was a commonly damaged shrub species, with others including Arbutus, Clematis, Cytisus, Daphne, Elaeagnus, Euonymus, Fatsia, Hedera, Houttuynia, Lavatera, Magnolia, Photinia, Sambucus, Syringa, Vinca and Yucca. Alpines and herbaceous plants damaged included Anemone, Ajuga, Aubretia, Campanula, Coreopsis, Hemerocallis, Hosta, Iris, Lupin, Nemesia, Osteospermum, Saxifrage, Scrofularia and Viola. Grass species damaged included Acorus, Cordyline and Phormium and herb species damaged included basil, mint, thyme and sage. Plant losses and downgrading of damaged plant species ranged from less than 1 to 100%.

Damage to Scrofularia

Damage to Hosta

Damage to Choisya

Biology and source of slugs and snails

Both the snail and slug species were considered to be endemic on many nurseries, although the original source was thought to be bought-in plants or liners.

Neither species has been studied before as pests of ornamental plants and little is recorded about their biology. *D. panormitanum* seems to occur all year round, whereas *O. pfeifferi* seems to be active between late spring and autumn and hibernates over the winter on the sides of pots and trays, and on the structure of polythene tunnels. Like other slug species, *D. panormitanum* tends to feed mainly between dusk and dawn, sheltering under plants, pots and trays during the day, whereas *O. pfeifferi* seems to be active during the day. Work in year 2 will fill relevant gaps in knowledge on biology.

Cultural control

Snails and slugs can feed and shelter amongst weeds, old unmarketable plants and trimmed off plant material. Checking bought-in plants for slugs and snails, and good nursery hygiene will reduce problems. Sometimes, *O. pfeifferi* seems to feed on algae on the substrate, compost or tunnel covering rather than on HNS species. Work in year 2 will investigate food preferences of the snails, to help identify the potential importance of algal control in an integrated control strategy.

***O. pfeifferi* on surface of compost with algae**

Biological control with nematodes

Parasitic nematodes, *Phasmarhabditis hermaphrodita* ('Nemaslug') have been available since 1997, but have been promoted mainly for the home/garden market, due to cost implications for large-scale commercial use. No previous research has been done with the nematodes against *O. pfeifferi* or *D. panormitanum*.

Nemaslug' was tested at three dose rates: high (2,500 per ml), recommended (150 per ml) and half-rate (75 per ml) against both the snail and slug species in the laboratory. Feeding damage by both snails and slugs was significantly reduced by all rates of nematodes when compared with the water-treated controls. The nematodes killed 100% of *O. pfeifferi* within 2-4 weeks, depending on dose rate applied. The numbers of *D. panormitanum* killed by the nematodes were difficult to interpret, as high numbers of slugs died in the controls, possibly due to the natural mortality of this species over the winter when the tests against slugs were done. Work in year 2 is planned to repeat the laboratory tests against younger slugs in the spring and to test even lower, more cost-effective rates of nematodes against the snails. Provisional results from HNS growers' trials with 'Nemaslug' against the snails look promising and the nematodes will be further tested against both slugs and snails under commercial conditions in year 3 of this project.

D. panormitanum **killed by 'Nemaslug'**

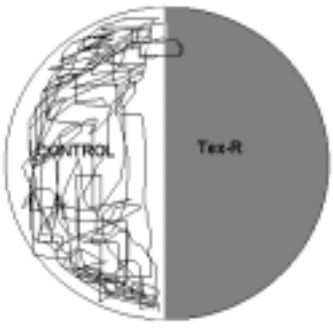
O. pfeifferi killed **by 'Nemaslug'** © Holt Studios

Chemical control

Slug pellets are widely used on HNS. However, growers consider them to give only partial control of slugs and little if any control of *O. pfeifferi,* possibly due to pellets failing to come into contact with snails feeding on the plants. In laboratory tests, where the slugs and snails had equal access to both pellets and plant material, methiocarb (Draza) at one pellet per 1 litre pot (equivalent to three times the recommended rate of 5.5 kg/ha) killed 60% of *D. panormitanum* and 40% of *O. pfeifferi* four weeks after two applications at 2-week intervals. Metaldehyde (Doff Horticultural Mini Pellets) applied at one pellet per 1 litre pot (equivalent to the recommended rate of 30 kg/ha) at the same intervals killed 60% of *O. pfeifferi* and reduced feeding damage by *D. panormitanum* by 70%, but were ineffective at killing the slugs under the test conditions used. Copper ammonium carbonate (Croptex Fungex) sprays were also tested, as although this product is not approved or recommended for snail or slug control, growers report some incidental control of the pests when applied for disease control. Croptex Fungex applied at the highest recommended rate of 6.25 ml per litre, reduced feeding damage by *O. pfeifferi* by 99% but did not kill either the snails or slugs under the test conditions used.

Barriers/repellents

Barrier or repellent treatments could have a role in an integrated control strategy by preventing slugs and snails from infesting new plants brought onto the nursery. Nine potential treatments were tested in the laboratory. Several of these both repelled and killed the snails and slugs. Provisional findings indicate that Tex-R (SpinOut) matting may currently have the most commercial potential as it is already available and was strongly repellent to both snails and slugs. When forced to move onto Tex-R, 90% of the slugs died within 10 hours and snail activity was reduced by 88% over a 14-hr period. On a nursery visited during the survey, use of Tex-R matting and capillary irrigation seems to have reduced the previously high numbers of slugs and snails. However, efficacy of Tex-R matting has not yet been fully tested under nursery conditions. Further work on the potential barrier treatments will be done in years 2 and 3.



Time-lapse video track of *D. panormitanum* when given the choice of T-Rex or untreated (compost) areas over a 10-hour period

Work planned for year 2

- Revisit selected growers to discuss results of year 1
- Identify food preferences of the snails
- Identify hibernation period of the snails
- Identify seasonal life cycle and breeding period of both snail and slug species
- Confirm diurnal behaviour of both snail and slug species
- Re-test 'Nemaslug' against the slugs in the spring
- Test lower rates of 'Nemaslug' against the snails in the spring
- Test selected barrier treatments on a larger scale.

Further information may be obtained from the HDC Project Report available from the Office.

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