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Slime and punishment

Voracious slugs and snails are no match for an integrated battle plan



No matter how small, gastropods such as this amber snail (*Oxyloma sp.*), shown crawling next to a dime, can cause huge headaches for growers. There are many ways these pests can be managed and eliminated.

By Robin Rosetta

Few creatures are held with such revile by horticulturists as those pests who destroy our plants, profits and peace of mind. Add slime, and even gentle souls grab weapons of mass destruction.

When living in harmony with snails and slugs is no longer an option, plant protectors have several tactics at their

disposal to dispense with these phytophagous adversaries.

Snails and slugs are mollusks, and are loosely related to octopi and oysters. Their particular taxonomic class is called gastropoda (from the Latin roots *gastro*, meaning stomach, and *poda*, meaning foot). Depending on the species, these animals are well adapted to devouring a range of foodstuffs, includ-

ing living and dead plants, fungi, small dead animals, and sometimes, live prey.

Slugs and snails are really the same animals. Slug evolution diminished their shell to a legacy of a shell hidden underneath their hump-like mantle. This adaptation enabled slugs to move through tight spaces and down into the soil, where they find both refuge and food.

Snails are hampered from such movement, but instead use their shells to their benefit, allowing them to escape enemies and inclement conditions within the safe harbor of their domicile.

Snails and slugs can be both direct pests and shipping contaminants in plant production. Many snail species, once detected, can trigger quarantines in nurseries. A common species inducing this reaction is brown garden snail, *Cornu aspersum*, originally a European species, now established in many areas of North America.

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Even species that are not actionable by regulatory authorities can harm horticultural businesses. Close inspection of plant shipments, particularly those crossing state or international borders, can save a grower much expense and headache associated with a plant rejection, destruction, or treatment order.

Hunting for gastropods

Detection is a key principle of any pest management program. We all wish our quarry would lay prone in a clearing in broad daylight, but it usually doesn't work that way. Slugs and snails prefer darkness or dim light provided by evenings, or overcast or rainy days.

Slugs lurk in dark, moist places protected from the desiccating sun. Lift pots. Look under rims. Check debris piles, weed mats, and the edges of

fields. Going out at night to monitor snail and slug populations is a particularly effective way to find them.

Trapping is another option, either using commercial or homemade traps. We've all heard of the beer-baited traps gardeners often use. This is easy, but not always appropriate for a nursery setting.

We experimented with homemade traps, designed to fit between containers and protect the bait from moisture. They were loaded with either of two baits: a liquid metaldehyde/carbaryl combo bait, or a solid metaldehyde-only bait. The combo product captured slightly more slugs, especially when the weather was wet or post irrigation.

Look for other signs of activity. Slime is indisputable evidence of their presence. Gastropod grazing leaves

long, stringy fecal remains. Rasp-like feeding damage, particularly in the interior of a leaf versus the edge, distinguishes snail and slug damage from caterpillar feeding.

A good integrated pest management program involves a range of tactics.

Don't leave out the cultural side of control. Knowledge of the biology of snails and slugs enables one to understand their vulnerabilities and preferences.

Snails and slugs have basically one layer of epidermal cells to separate them from death by desiccation. Anything that can be done to enhance drying the surfaces where plants are kept can be useful. Timing of irrigation can have a major impact.

In research reported by Speiser and Hochstrasser (1998) on cabbage, leaf loss was compared in plots with evening irrigation and no treatment (40-60 percent); evening irrigation and snail bait (6-12 percent); and morning irrigation, no bait (6-12 percent).

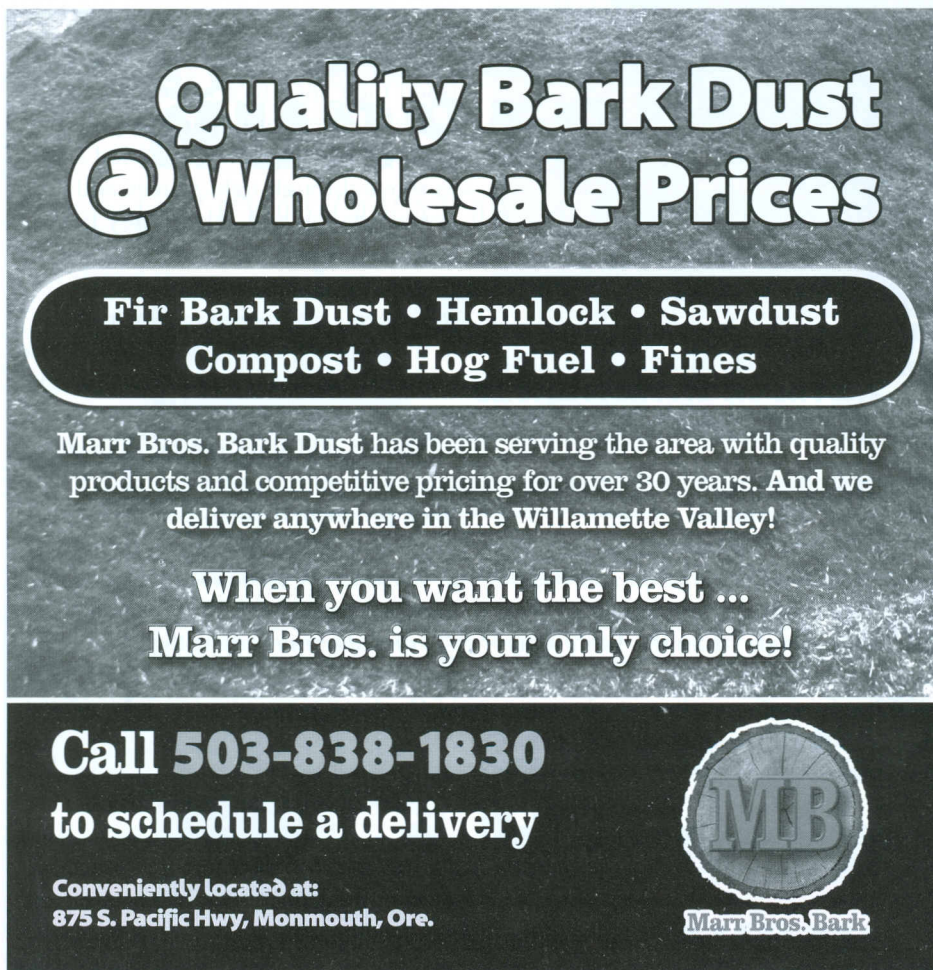
Most snails and slugs are decomposers. Feeding them leaf debris and cuttings will increase their survival. Cultivation is very disturbing for slugs, tossing their world askew.

Physical barriers are used by both home and commercial producers. Wood ashes and diatomaceous earth deter slugs and snails, but only until the next irrigation or rain reduces their efficacy. A more permanent solution is the use of copper strips.

At least one large nursery in brown garden snail territory has wrapped their entire production facility with these copper strips. Yes, that is lots of pennies, but the cost is justified under certain levels of pressure.

Smaller areas can be treated, such as wrapping the legs of greenhouse benches. In Europe, copper-treated weed matting is used with similar repellent properties (as well as direct toxicity).

Biological control agents should be encouraged. Snakes, amphibians,



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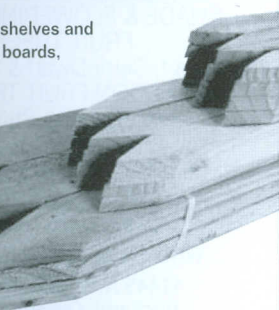
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▲ SLIME AND PUNISHMENT



Snails, such as this ordinary brown garden snail, can cause problems for homeowners and gardeners as well as production nurseries.

shrews, birds, predacious beetles and sciomyzid flies all have an effect on populations. Note that two commercially available natural enemies — a nematode, *Phasmarhabditis*, and the decollate snail — are not legal to use in the United States (except for the decollate snail in a small region of California).

Chemical control

Chemical control almost always comes into the equation at some point. Of the molluscides, as snail and slug pesticides are known, carbamates have shown to have the greatest effect on snails and slugs and still dominate our list of control options.

This includes the active ingredient, metaldehyde (used in bait formulations in the form of pellets, mini-pellets, coarse meal, and liquids). It is toxic both by contact and ingestion. It affects the cells involved in mucus production, leading to eventual dehydration and death. It works best in conditions when snails have been out feeding (warm periods with high humidity), followed by hot, dry weather. It breaks down rapidly in moisture or sunlight.

Snails and slugs might recover if wet conditions reduce their dehydration. In that event, bait aversion can occur. As animals like dogs are sensitive to this poison, colorants and bitter agents are added to reduce poisoning.

Methiocarb (Mesurol) is another carbamate used to control snails and slugs. It interferes with the nervous system. This molluscicide works better under cool, damp conditions but is a

restricted-use pesticide.

Iron phosphate (Sluggo) has proven to have good efficacy against snails and slugs. They must ingest the bait, which causes immediate feeding inhibition. The poisoned animals generally crawl away and eventually succumb to starvation after several days. Treatment effectiveness is evaluated by damage reduction versus dead and dying carcasses. The product is less susceptible to moisture or sunlight, and has low mammalian toxicity.

Recently, researchers have worked with several botanical molluscicides to investigate their effect on amber snails. Limonene (Orange Guard) and a combo product with capsaicin and mustard oil (Dazitol) both showed high levels of activity with direct contact on the snails when evaluated 24 hours after application.

Repellent products are another option. There are registered products with garlic extract, cinnamon oil, and copper being used to repel gastropods. Development of products with anti-feedent activity is also in the works. Extracts from plants in Apiaceae and Chenopodiaceae are being investigated; extracts from neem plants may have activity as well as a sesquiterpene from *Artemisia* plants.

While the ultimate escape from slugs and snails is desert living, in our frequently moistened environment one generally must contend with a constant supply of these slithering slime bags. Appreciate our native snails and slugs in our forest, as they play an important role. But if compelled to slaughter the many exotic gastropods eating their way through your livelihood, use an integrated approach and you may just win this shell game. ☺

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Contents

DIGGER

April 2011
Vol. 55 No. 4

COLUMNS

- 7 President's Message
- 15 What I'm Hearing
- 49 Growing Knowledge
- 54 Director's Desk

DEPARTMENTS

- 8 Calendar
- 10 Northwest News
- 17 Member Profile
- 45 Classifieds
- 48 Advertisers Index
- 48 New Members
- 51 Digger Marketplace
- 53 Digger Marketplace



Cover: *Hosta* 'Loyalist' is a form of the variegated *H. 'Patriot'*, which was *Hosta* of the Year in 1997. But instead of being white-margined like 'Patriot', it is white at the center. Many gardeners have a strong passion for all the *hosta* selections that are available. See our article on Page 27. Photo courtesy of Blooming Nursery.

This page: An amber snail (*Aplysia* sp.) appears to admire its reflection in the side of a plastic container at the North Willamette Research and Extension Center. Researchers there are exploring new ways of managing the tiny pests. Photo by Curt Kipp.



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- 49 **SLIME AND PUNISHMENT**
Are slugs and snails making life difficult for you and your plants? Robin Rosetta looks at options for mollusk management.
- 17 **A FOCUS ON CUSTOMERS**
OBC Northwest owners Tracy Boyce and Ray Scesa believe in serving customers, and the rest will take care of itself.
- 21 **SUSTAINABLE CONTAINERS**
Researchers keep looking at alternatives to the plastic nursery pot.
- 27 **FOR THE LOVE OF HOSTAS**
Some people's passion for these leafy perennials defies any semblance of logic. We look at some favorite selections.

Other Features

- 37 **NOT YOUR FATHER'S GREENHOUSE**
Advanced controls can improve the growing climate for plant production, while reducing costs.
- 43 **SUCCEEDING AT SUCCESSION**
It takes careful planning to protect the legacy, and ensure the future, of your family business.