protectant (Table 1) and there is a 24c (local need) label for that use in Washington and Oregon.

Our current research effort is in the study of the reasons for different susceptibility of various *Rhododendron* species and hybrids to feeding by adult root weevils, in the hope that we may be able to exploit any differences we find for protection of existing plants and/or development of resistant new hybrids.

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CHEMICAL CONTROL OF ROOT WEEVILS

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Root weevils, the black vine and strawberry, continue to be a serious problem of nursery stock in British Columbia. Since the loss of pesticides such as chlordane and aldrin from our market, weevils have been increasing in population. Weevils infest almost every species and cultivar of plant from rhododendrons to maple and arborvitae.

Leaf notching caused by adult feeding is unsightly and renders an infested plant unsaleable. The larvae feed on roots of both established plants and liners, restricting uptake of nutrients and water. High mortality in liners results from girdling at the crown by larvae.

There is *usually* only one generation of weevils per year. The adults emerge from pupae in late May to early June and begin laying eggs in 2 to 3 weeks. Eggs are laid throughout July, August and September. The insect overwinters as a larvae and pupates in May.

We are now finding that with container growing, the use of heated propagating benches and polyethylene covered houses, more than one generation of weevils may occur in one year. Therefore populations, in these circumstances, increase very rapidly.

Adults, pupae, and young adults, as well as larvae, have been found simultaneously in polyethylene-covered houses in early spring.

If a larval infestation in containers is to be prevented, control measures must be aimed at the adults. Control measures must be taken in the 2 to 3 weeks between adult emergence and the start of egg laying, making the timing of insecticide application critical. The first foliar application of an insecticide must occur when the first leaf notch appears, and must be continued until the last adult has emerged. Adults emerge in British Columbia from the last week of May to mid-July. Ideally, an insecticide with residual activity lasting for six weeks or more would require only one application.

A field trial was conducted this summer on a local nursery to test the efficacy of Belmark, Orthene and Guthion for control of adults. Belmark, a new synthetic pyrethrin, provided excellent control. Orthene provided good control and Guthion fair control. All three insecticides significantly controlled adults compared to the control (See Table 1).

Although a second application was applied at three weeks, only one may be required. Other studies have shown Belmark (Pydrin as it is known in the U.S.) to have residual activity for up to 70 days (1).

Table 1. Efficacy of foliar sprays applied May 19 and June 20 to *Rhododendron* spp.

Material	Rate (lb ai /100 gal)	3 weeks after first application	3 weeks after second application	Total at six weeks
Belmark (EC)	0.2	1.5	1.1	2.7
Orthene (S)	0.75	4.3	4.0	8.3
Guthion (50 WP)	0.5	12.2	5.0	17.2
Check		30.5	33.7	64.2

Larvae are more difficult to control than adults. Most soil drenches tested for controlling larvae have not been effective. Norm Tonks (Agriculture Canada Research Station, British Columbia) is having good results with Orthene, Furadan, Diazinon, Permethrin, Thiodan and others when the drench is applied early, and the larvae are very young. Treatments begin in mid-July and continue through fall. So far, Furadan is showing the most promising results giving up to 18 weeks residual control. Orthene provided control for 1 month. No control was obtained when insecticides were applied in spring.

The key to effective control of weevils is the timing of spray application. Close observation of the insect is required to regulate the timing properly. Calendar dates can only be used as a guide. The life cycle must be closely monitored where the environment is altered with heating cables or polyethylene-covered houses.

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WEED CONTROL IN ORNAMENTALS WITH GLYPHOSATE[1]

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The herbicide glyphosate is well established as an important chemical for controlling many kinds of perennial weeds. These include Canada thistle (Cirsium *arvense*), field bindweed (Convolvulus *arvensis*), Japanese knotweed (*Polygonum cuspidatum*), mugwort (*Artemesia vulgaris*), bracken fern (*Pteridium aquilinum*) leafy spurge (*Euphorbia esula*), nutsedge (*Cyperus esculentus* and *C. rotundus*), and many perennial grasses such as quackgrass (*Agropyron repens*), Johnsongrass (*Sorghum halapense*), and Bermudagrass (*Cynodon dactylon*).

This report will not attempt to review in detail the great amount of work that has been done with glyphosate for weed control in ornamentals. Instead it will call attention to certain aspects that may influence successful use of this herbicide *when it becomes available for use on ornamentals*, and may account for some variability that is observed in weed control and crop response.

Timing of applications. To properly evaluate the effectiveness of a translocated herbicide such as glyphosate, observations should be made on regrowth after initial kill of weed foliage. What happens later in the year, or next year? Glyphosate is relatively slow acting. What is important is not how quickly the weed dies down, but how completely the root or rhizome system is killed, as measured by regrowth later.

On the basis of such an evaluation, the most effective time to apply glyphosate on Johnsongrass is in late summer or early fall when the grass is in the boot or full head stage of growth

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[1] Scientific Paper No. 5249. College of Agricultural Research Center, Washington State University, Pullman. Project No. 1423.