Title: Fungicide trial against spruce cone rust (Chrysomyxa pirolata Wint).

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FUNGICIDE TRIAL AGAINST SPRUCE CONE RUST

(CHRYSMOXYXA PIROLATA WINT.)

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Chlorothalonil or triadimefon sprays at the time of pollination reduced the number of cones infected by spruce cone rust (Chrysomyxa pirolata Wint.) at Skimikin Seed Orchards, near Tappen, B.C. in 1985. Tests under more severe disease conditions are required before either fungicide can be recommended for use operationally.

Spruce cone rust (Chrysomyxa pirolata Wint.) commonly causes significant losses in spruce (Picea sp.) seed crops (Zitter, 1974). These losses are especially significant when they occur in high value seed orchards. Past work has shown that this rust can be controlled in seed orchards by applying 1 to 3 sprays of ferbam to cones at the time of pollination (Summers, et al., 1986).

A pest management program must have a number of alternative chemical controls to draw on when required. Product registrations for a particular pest may be cancelled, registration of the product itself may be cancelled for environmental or toxicological reasons or production of the product may stop because of a lack of demand. Pest resistance may make a product useless. For these reasons, a trial was designed to test the efficacy of fungicides other than ferbam against spruce cone rust.

Materials and Method

Chlorothalonil (Bravo 500R) and triadimefon (Bayleton R) were selected as candidate fungicides. Bravo is a widely used, broad spectrum, long-lasting fungicide (Miller and Craig, 1980) that is marketed in an easy to use flowable formulation. Bayleton is recommended against tree rusts in general and in particular for fusiform rust (Cronartium quercuum (Berk) Miyabe) on pines (Mobay, 1984). The rates used in this trial were derived from general label recommendations. Both fungicides were applied at a low rate and a high rate, these being 1 g a.i./L (a.i. - active ingredient) and 2 g a.i./L respectively for Bravo and 0.06 g a.i./L and 0.19 g a.i./L respectively for Bayleton.
At Skimikin seed orchard near Tappen, B.C., 50 cone bearing trees were assigned randomly to receive one of the treatments above or to receive no treatment and act as checks for the two trials (ie - 10 trees at each rate for each fungicide plus 10 check trees). Each tree was sprayed 3 times. The first spray was applied when most of the conelets in the orchard were bursting (May 13-14), the second was applied about 1 week later (May 18) and the third was applied after the pollination period (May 30). All sprays were applied to run-off to the cone bearing portions of the trees with a 15L backpack sprayer.

Diseased cones were picked, counted and discarded in July when the orange aeciospores were abundant and visible. Mature, healthy cones were picked and counted in August and then air dried for 2 months. The seed was extracted, cleaned, dewinged and bulked by treatment in October. The percentage of filled seed in each seedlot was determined by x-raying 16 random samples of seed from the seedlot and counting filled and empty seed in the x-ray. The filled seed was then separated out and germination tests (ISTA, 1976) were done for four 100 filled seed samples for each treatment.

For analysis, each fungicide was tested separately against the check trees. Chi-square tests were used to test for overall differences in the number of diseased and healthy cones and the number of filled and empty seeds between the high rate, the low rate and the checks. Following significant overall tests, paired comparisons within each fungicide group were made using the overall chi-square degrees of freedom to test for significance. Differences in germination were subject to analysis of variance and Duncan's multiple range test.

**Results and Discussion**

The low rate of Bravo seems to have reduced the incidence of rust somewhat however, this seems inconsistent with the results of the higher rate (Fig. 1A). A closer look at the data sheds some light on this. One tree in the high rate treatment had 23% of its cones diseased, much more than any other tree in the trial. Leaving this tree out of the calculations causes the percentage of diseased cones in the high rate group to drop from 4.8% to 2.8%. Ignoring that tree then, it would appear that Bravo reduced cone rust at either rate. Why that one tree had so much rust is unknown. It may be an extremely susceptible clone and/or it may have inadvertently been missed during one of the 2 critical sprays at pollination.

Bravo had no deleterious effects on seed germination and appears to have increased the amount of filled seed in both treatments (Fig. 1 B and C). As this is the percent of filled seed in healthy cones only, it is not known why this should occur however, at least one fungicide (triadimefon) has been shown to interact beneficially with the metabolism of some plants (Fletcher and Nath, 1984; Fletcher and Hofstra, 1985).

The high rate of Bayleton reduced the percentage of diseased cones and had no effect on germination (Fig. 1A and B). Both the high and the low rates increased filled seed (Fig 1C). Again, the reason for the increase in filled seed is not known but as noted earlier, this fungicide can apparently affect metabolism in some plants.
FIG. 1  Percent diseased cones (A), percent germination (B) and percent filled seed for Bravo and Bayleton efficacy trials at Skimikin in 1985. Bars with the same letter are not significantly different (Chi-Square, P=0.05 for A and C; Duncan's multiple range test for B).
Basidiospore production by the alternate host (Pyrola sp.) peaked several times between May 14 and May 22. (Fig. 2). The pollination period occurred between May 9 and May 17 and peaked May 15. This confirms previous observations that spruce pollination and basidiospore production by the alternate host coincide closely and that protection for the cones during this period is essential in order to control the rust (Summers, et al., 1986). Between 2 and 3 sprays are required in an orchard in order to overcome the asynchronous development of cones within or between trees.

Because of the low levels of rust in the orchard in 1985, it is hard to interpret how significant these findings are from an orchard management standpoint. There is not much to be gained from a 2% or 3% reduction in spruce cone rust. Both Bravo and Bayleton need to be tested under conditions more favorable to the disease before they are considered as operational alternatives.
Fig. 2 Basidiospore production over time based on spore count samples taken at Skimikin Seed Orchard during May, 1985. ↑ indicates spray date.
References cited


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