Mesurol 75% Seed Treater as a Bird Repellent Seedcoat Treatment

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Bird damage to planted ponderosa pine seeds was significantly reduced in alternate-treated versus control nursery plots with Mesurol 75% Seed Treater (1 percent methiocarb active ingredient). Coating with Mesurol at levels up to 4 percent active ingredient did not effect germination of ponderosa or lodgepole pine or Engelmann spruce seeds.

Bird predation of newly planted conifer seed is a serious problem in bare-root nurseries, especially with the larger conifer seeds. Many seed protection methods have been tested to control this problem. Protection generally falls into four categories: (1) Physical barriers, (2) frightening devices, (3) poisonous chemicals, and (4) repellent chemicals. Most methods have some drawback that precludes their wide acceptance as an effective control agent.

Physical barriers constructed of polyethylene netting properly supported over seedbeds after sowing can virtually eliminate bird depredation, but are expensive both in materials and labor *(1)*. Frightening devices such as exploding shotgun shells and noise bombs *(8)*, scarecrows, and predator calls initially have some success, but birds often become accustomed to them. Also, noisemaking devices may be impractical when a nursery is located near residential areas. Avicides may be effective, but are usually nonselective and can often result in killing of nontarget birds. Furthermore, the use of poisonous chemicals is restricted by pesticide regulations and many nursery managers are reluctant to use them in their seedbeds. Repellent chemicals, however, have obvious benefits over other seed protection methods.

Because of the high cost of researching, developing, manufacturing, and registering pesticides, relatively few nontoxic chemicals are available as bird repellent seedcoat treatments. Arasan 42-5 (42 percent tetramethylthiuram disulfide) and anthraquinone are currently the only two nontoxic chemical seed treatments being widely used on conifer seed *(1)*. Although Arasan and anthraquinone are currently registered for forest tree seed treatments, there is some question about their effectiveness as bird repellants *(14)*. Many nursery managers are also concerned about possible phytotoxic effects on succulent young seedlings. Because of these concerns about effectiveness and chemical phytotoxicity, many nurseries are not currently using any bird repellants and are consequently suffering considerable seed losses.

Past tests indicate that certain carbamate insecticides show some effects in reducing bird damage to agricultural crops *(4, 5, 12, 15)*. Mesurol (3,5-dimethyl-4-[methylthio]phenol methylcarbamate) has shown bird repellent properties on several agricultural crops *(6)* and is currently registered for use on corn seed and in cherry orchards *(13)*. While Mesurol may be toxic to birds if enough treated seeds are ingested, birds are apparently repelled through a learned aversion (i.e., A bird consumes a treated seed and then feels sick. On the next encounter with treated seed, the bird associates the initial sickness with the taste of the chemical) *(9)*.

The purpose of this investigation was to test the practicality of Mesurol 75% Seed Treater as a conifer seed treatment against bird predation. The investigation evaluated possible phytotoxic effects of Mesurol Seed Treater on the laboratory germination of three Rocky Mountain conifer species; and a field trial was conducted on ponderosa pine *(Pinus ponderosa* Laws.) seeds to test its effectiveness under actual nursery conditions.

Materials and Methods

Laboratory test. Potential phytotoxic properties of Mesurol Seed Treater were tested on three conifer species commonly grown at nurseries in the Rocky Mountain

[1] The author thanks David Otis for his assistance in statistical analysis of these data.

Region. The seed was provided by Mt. Sopris Tree Nursery, Carbondale, Colo, and consisted of: (1) Ponderosa pine lot no. PIPO-04-05-000-075-65; (2) lodgepole pine *(Pinus contorta* Engelm.) lot no. PICO-12-01-496-105-64A; and (3) Engelmann spruce *(Picea engelmannii* Engelm.) lot no. PIEN-02-03-432-095-74. The seeds were taken directly from long-term storage to Lakewood, Colo., and stored at 2°C ± 1°C until used. The methods of pesticide evaluation employed are those recommended by the American Phytopathological Society (2).

The formulation of Mesurol used was 1254-1 (batch 1030216) provided by Mobay Chemical Corp. Before treatment, seeds were soaked for 24 hours in tap water to aid in germination *(3)*. The chemical was applied to about equal numbers of seeds as a slurry at 0.25, 0.5, 1.0, 2.0, and 4.0 per cent active ingredient with a water control with no active ingredient. After chemical application, seeds were spread out on filter paper and air-dried for 24 hours to dry the seed surface and prevent seed clumping.

Approximately 500 seeds per treatment for all three species were germinated on moistened filter paper in petri plates. The experimental design consisted of three replications for each species. Plates were placed inside a growth chamber and incubated for 8 hours of light at 30° C and 16 hours of darkness at 20°C per day for 4 weeks. Starting on day 7, seeds were observed at 2- to 3-day intervals to monitor germination. Seeds with radicles twice the seed length and with all essential structures intact were considered germinated. Germinated seeds were tallied and removed from the petri plates. After a 4-week germination period, all remaining seeds were examined, both externally and internally, to determine cause for germination failure.

Data analysis utilized an analysis of variance coupled with Tukeys' honestly significant difference *(10)*. Statistical tests were completed using both the percentage of seeds germinated and emergence index *(11)*. Phytotoxicity would have been indicated by a significant reduction in the percentage of seeds germinated or by a significant increase in the mean number of days required for seedling emergence (emergence index) of 1 to 1½ days (7).

Field test. A field trial to test the effectiveness of Mesurol Seed Treater for repelling birds from ponderosa pine seed was conducted at Mt. Sopris Tree Nursery, Carbondale, Colo. Ponderosa pine seed from the same lot used in the phytotoxicity test was used in the field trials.

After a 24-hour water soak, the seed was coated in a 1 percent active ingredient Mesurol Seed Treater slurry and air dried for 24 hours. A control batch was soaked, but untreated. Study plot layout (fig. 1) consisted of four beds, each 76.2 meters (250 ft) long by 1.21 meters (4 ft) wide, which were established within unit 13 of block 2. Five 9.2-meter (30 ft) subplots were selected in each bed, with each subplot separated by a 6.1-meter (20 ft) fallow area. The treated plots and 10 control plots were assigned locations within the seedbeds at random. Seed was sown in six rows per bed to generate a growing density of 269 seedlings per square meter (25 per ft^2). Control seeds were sown first to eliminate hopper-contamination with Mesurol. Seedbeds were mulched with 0.63 centimeter (¼ in) sawdust and irrigated according to normal nursery procedures. Wire bird exclusion cages (106.6 by 45.7 by 7.6 cm) (42 by 18 by 3 in) were placed across every subplot at systematic intervals of 2.1 meters (7 ft) and 4.26 meters (14 ft) (fig. 2). After 4 weeks, a measurement of seedbed density was obtained by counting the seedlings in two randomly selected 20.3-centimeter by 2.1-meter (8 in by 4 ft) quadrats outside of exclusion cages and one quadrat inside each caged area. A one-tailed, unpaired T-test was used to test for differences between treatments.

Results and Discussion

Laboratory test. The seed germination trials did not show any

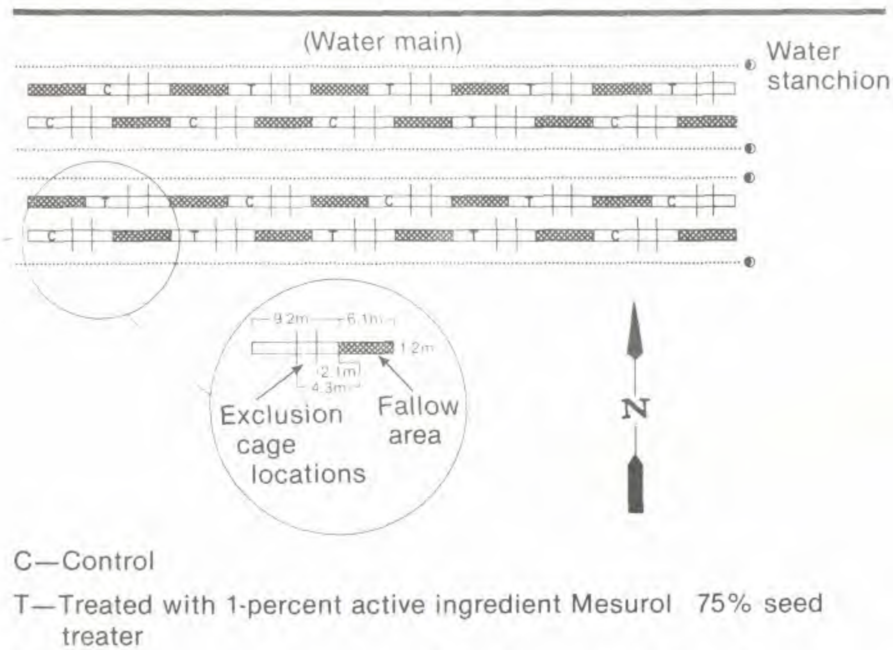

Figure 1—*Design layout for Mesurol Seed Treater field trials at Mt. Sopris Tree Nursery, Carbondale, Colo., block 2, unit 13.*

Figure 2—*Wire bird exclusion cages were randomly located in each plot.*

adverse effects of Mesurol at concentrations up to 4 percent active ingredient (fig. 3). Neither the germination rate nor the seedling emergence index differed significantly from the control at the 0.05 probability level. Considering that the label's application rate is between 0.5 and 1.0 percent active ingredient per 100 pounds of seed, the potential for phototoxicity appears to be slight.

Field test. A pilot study was established in 1981 in block 1 at Mt. Sopris Nursery using the same design, but a different formulation (Mesurol 75% Wettable Powder) applied at 0.5 percent active ingredient. Birds consumed all treated and untreated seed that was outside the exclusion cages. It appears, however, that the poor results were caused by either one or a combination of the following factors: (1) The chemical had leached off the seed after it was sown in the beds because of the daily irrigation practices used at the nursery; (2) the low concentration of active ingredient (0.5 percent); and (3) the formulation. After the 1981 trials, Mobay Chemical Corp. indicated they realized a problem existed with the formulation; and in 1982, a new wetting agent was prepared.[3]

[2]Doyle Cohick, Manager of Insecticide Research, Agricultural Chemicals Division, Mobay Chemical Corp., Kansas City, Mo. Personal communication. 1982.

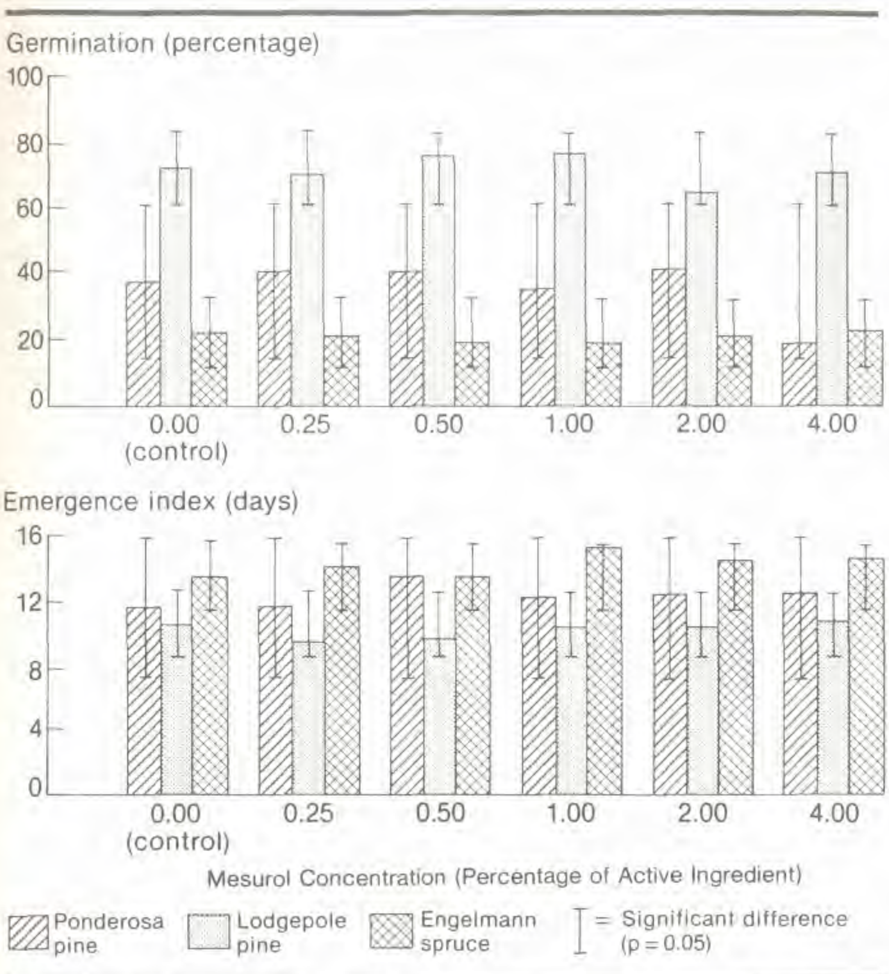

Figure 3—*Effects of Mesurol on seed germination and emergence rate of three Rocky Mountain conifers.*

The 1982 field trial used the formulation of Mesurol Seed Treater that was developed for rice seed. This new formulation apparently solved the leaching problems, and 1982 results were much improved over 1981. Therefore, nursery personnel should be advised to use Mesurol 75% Seed Treater only as used in rice seed application.

Seedbed density data from the field trials demonstrated that the Mesurol-treated seed suffered significantly less bird predation than the untreated seed. Statistical analysis also shows evidence *($t_{18} = 1.908$, $p = 0.036$)* that the Mesurol treatments effectively reduced bird predation of seeds and seedlings (table 1). There were no statistically valid differences between the caged plots in the control beds and either the caged or uncaged plots in the seedbeds sown with Mesurol-treated seed, which indicates little consumption of the Mesurol-treated seed.

Even though the uncaged control plots contained significantly fewer seedlings than the other treatments, the overall bird damage was evidently low this season compared to 1981 when all plots were completely devastated by birds. This low bird pressure was supported by field observations of bird population levels.

The primary seed eater at Mt. Sopris Nursery was the mourning

Table 1—*Comparison of seedling densities between caged and uncaged plots in Mesurol-treated and control seedbeds*

Treatments	Average seedling density	Average difference (standard deviation)
Mesurol—caged plots	66.3	−2.4 (15.79)
Mesurol—uncaged plots	63.9	
Control—caged plots	62.4	19.6 (23.73)
Control—uncaged plots	43.0	

dove *(Zenaidura macroura).* This species is also a problem with other agricultural crops where Mesurol has proven to be an effective deterrent. Because other conifer nurseries may have problems with other bird species, further field tests are warranted to test the effectiveness of this treatment against all types of seed-eating birds. On corn, rice, and soybeans, Mesurol has been proven to be a broad spectrum compound effective against red-winged blackbirds *(Agelaius phoeniceus*), ring-necked pheasants *(Phasianus colchicus),* common grackles (*Quiscalus quiscia),* brown-headed cowbirds (*Molothrus ater),* and common crows (*Corvus brachyrhynchos),* as well as doves *(6, 8, 12, 14, 15).*

Mesurol appears to be an economically feasible treatment for reducing bird predation in conifer seedling nurseries. Actual economic data were not collected in this study, but the cost-benefit ratio of this chemical should be quite high considering the per-acre value of conifer seedlings compared to agricultural crops.

Conclusions

It is clear that Mesurol 75% Seed Treater, as tested, is nonphytotoxic to the three conifer species evaluated. No adverse effects could be detected even when the Mesurol Seed Treater was applied at four times the recommended dosage rate.

The use of Mesurol Seed Treater as a 1 percent active ingredient seed dressing increased the number of surviving ponderosa pine trees in the first 4 weeks after sowing by 49 percent. This represents a significant increase over the number of surviving trees from untreated seeds.

Mesurol has proven to be a broad-spectrum repellant, which is effective for use on several different crops and against several species of birds. Mesurol 75% Seed Treater also appears to be able to protect the nursery's investment by reducing seed losses to bird depredation. The treatment has a potentially high cost-benefit ratio because conifer tree nursery crops, on an acre-per-acre basis, are worth far more than most agricultural crops. Nursery managers should be aware that Mesurol is currently being sold as an insecticide and not as a seed treatment; the seed treatment is still an experimental label. The possibility of registering Mesurol for use on a minor nonfood crop is being investigated.

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