REGISTRATION AND USE OF CARBOFURAN (FURADAN®) IN SOUTHERN PINE SEED ORCHARDS

G. L. DeBarr 1/

In the early 1970's, tree improvement workers and seed orchard managers were hampered by the almost complete lack of registered insecticides for use in seed orchards. Forest entomologists had shown that insects often destroy more than half the seed crop in orchards across the South. Applied controls were sorely needed, but none were available.

In September 1972, an ad hoc committee called the Southern Seed Orchard Pest Committee was organized. The members of this committee had recognized that only through a united effort would it be possible to collect the extensive efficacy data required by the Environmental Protection Agency and register commercial insecticides for use in seed orchards.

Our first chairman was Loyd Drake, an entomologist with State and Private Forestry. Bob Weir, North Carolina State University, assumed the role of chairman in 1974. Other members and the agency or interest they represent included:

Larry Barber, U.S. Forest Service, State and Private Forestry;
Paul Barnett, Tennessee Valley Authority;
Dr. Walter Beers, University of Florida Tree Improvement Cooperative;
Terrell Brooks, states not in cooperatives;
Dr. William Neel, university forest entomologists;
William Tuttle, U.S. Forest Service, Region 8;
Dr. Hans van Buijtenen, Western Gulf Tree Improvement Cooperative;
and myself, U.S. Forest Service, Southeastern Forest Experiment Station.

The first task our committee undertook was to obtain efficacy data to support an extension of the registration for Guthion®' which was limited to slash pine orchards. Dr. Lawrence Abrahamson, pesticide specialist with the *USFS, assisted the* committee *in* this effort. In *1974* the EPA registered Guthion® for coneworm control on all species of southern pines.

Registration of Furadan®

Even before the Guthion® registration had been extended, we set out to find an alternative for Guthion® We felt that finding a substitute for Guthion® was of major importance because of its high toxicity and the necessity for 3 to 5 Guthion® applications each year. Carbofuran (Furadan®) had shown promise for coneworm control in several 1973 research tests and was less hazardous when absorbed through the skin. The committee decided that testing should be initiated using a standardized study plan designed to evaluate the effectiveness and phytotoxicity of Furadan® in southern pine seed orchards.

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2/ Mention of trade names is solely to identify materials used and does not constitute endorsement by the U.S. Department of Agriculture.

Cooperators installed tests in 11 seed orchards in 1974, [3] and in 1975 the Southwide Furadari[w] tests were expanded with 19 additional orchards. [4] In late March 1976, I completed the summary and analysis of data from two years of testing. Chairman Weir forwarded these data to the manufacturer, and by mid April, FMC had applied for an amended registration of Furadan® 10G granules to control coneworms, seedbugs, coneborers, and the white pine cone beetle in seed orchards. In late July 1976, almost 4 years after the formation of the Southern Seed Orchard Pest Committee, the EPA registered Furadan for seed orchard use. The tentatively approved label reads as follows:

> Directions for Use: Southern pine seed orchards for control of seedbugs, coneworms, and coneborers. Use Furadan® 10G granules at 4 to 8 ounces per inch of tree diameter. Broadcast within the drip area of the tree and incorporate with a suitable device. Make 1 application in winter or early spring. In white pine seed orchards for the white pine cone beetle, use Furadan® 10G granules at 8 ounces per inch of tree diameter. Do not graze or feed orchard plants or plant parts.

Use of FuradarP in Seed Orchards

If you plan to use Furadan® send for a copy of the Furadan® technical bulletin. It may be obtained by writing to FMC Corporation, Agricultural Chemical Division, Middleport, New York 14105. The following facts may be of interest.

Furadar$[9] (common name = carbofuran) is a systemic insecticide. It is applied to the soil, absorbed by the tree, and translocated to the actively growing shoots, needles, and strobili. Furadan® is manufactured by FMC-Niagara Chemical Co. Chemagro also distributes it.

Furadan® is formulated as 10G granules; it is heavy because the 10% active ingredient is coated on a sand carrier. It is not as dusty as Thimet® but a respirator is still required. The purple color is due to a dye, not to the toxic ingredient. The dye is added to make spilled granules readily visible. The current price is between $.50 and $.75 per pound of 10G.

Furadan® is used extensively to protect agricultural crops. It is used for corn insect control in the Midwest and is registered for insect control on peanuts, rice, soybeans, and tobacco. Other forestry registrations include control of elm and cottonwood leaf beetles, cottonwood twig borers, and clear-wing borers; and pales weevil and pitcheating weevil control in southern pine plantations. Of the soil systemic insecticides commercially available, Furada419 is one of the least hazardous to handle and one of the most effective materials for use on trees.

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[3] 1974 Cooperative Tests of Thimet[(a)] and Furadan[w] for Cone and Seed Insect Control. A Study Plan by G. L. DeBarr, SEFES, USDA Forest Service.

[4] 1975 Cooperative Test of Carbofuran for Control of Insects Attacking Cones in Southern Pine Seed Orchards. A Study Plan by G. L. DeBarr, SEFES, USDA Forest Service, and W. W. Neel, Mississippi State University.

[5] 1974-1975 Cooperative Tests of Carbofuran for the Control of Insects Attacking Seeds and Cones in Southern Pine Seed Orchards. A Final Report by G. L. DeBarr, SEFES, USDA Forest Service.

How Does Furadan Compare to Other Insecticides Used in Seed Orchards in Terms of Relative Hazard?

Thimet and Guthion are organophosphate insecticides. They are highly toxic when absorbed through the skin or taken orally. They poison by disrupting the vital enzyme cholinesterase. Furadan is a carbamate. Carbamates also inactivate cholinesterase in insects and mammals, but carbamates are considered less hazardous to workers applying them because the enzyme readily reactivates itself. This characteristic reversibility of enzyme inhibition makes carbamates relatively safe to handle; Chronic depression of cholinesterase rarely occurs with Furadan or other carbamates, as it does with organophosphates. Practically, this means the effects of Furadan do not accumulate, as they do with organophosphates.

Symptoms of poisoning by organophosphates and carbamates include headache, weakness, light-headedness, constriction of pupils, and nausea. Unlike the organophosphates (Guthion® for example), symptoms appear early with carbamate insecticides and give a warning of overexposure before absorption reaches a dangerous level. The onset of symptoms of poisoning with Furadan are rapid, usually a few minutes to an hour after exposure. The larger the dose, the more intensive are the symptoms. If you experience these symptoms, you should avoid further exposure and get immediate medical attention.

Dermal hazard with Furadan 10G is low, i.e., Furadan is about 50 times safer to handle than Guthior# and about 200 times safer than Thimet. Remember, however the oral toxicity of all insecticides is high. If you swallow Furadan®, it will kill you with just as small a dose as will Guthion® or Thimet®,

Furadan® is Not a Panacea for Seed Orchard Insect Problems

Furadan® is not a cure-all and in fact, as is often the case with pesticides, using it may create new problems. Some of the more obvious disadvantages include:

(1) A large amount of Furadan® is required.

(2) the only other insecticide registered for cone and seed insect control in southern pine orchards.

(3) Soil systemics, such as Furadan®, require the proper rainfall pattern in order to work effectively.

(4) Carbamates are very toxic to wildlife. Furadan® is extremely toxic to birds.

Furadan® used in seed orchards must be incorporated into the soil. Broadcasting Furadan® in an orchard without attempting to incorporate it is dangerous. Failure to incorporate Furadan into the soil is a violation of the label specifications. Such violations are subject to a maximum criminal penalty of a $25,000 fine, 1 year in prison, or both.

Registration of pesticides is under constant review of State as well as Federal agencies. Before using Furadan®, obtain the latest application instructions and restrictions from the regulatory agency in your state.