Seed Treatment of Lima Beans

combination fungicide-insecticide seed treatments protect plants against soil-borne pests and permit increased yields

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Seed treatment of lima beans with fungicides—effective protection against seed decay caused by soil-borne fungi—does not protect against the attacks of wireworms, seed maggots, and springtails. Wireworms bore into the parts of the germinating seeds and into the roots, causing stunting, disfigurement, or death of the plants.

The seed-corn maggot—*Hylemya cilicrura* (Rond.)—remains one of the important pests of beans. The maggots bore into the cotyledons, plumules and roots, not only causing primary damage, but also allowing for the entrance of other organisms. The beans may be killed prior to emergence or plumule damage may result in baldheads.

Seed springtails—*Onychiurus* spp.—feed on the roots of the beans causing stunting and delayed growth, and in addition feed upon the plumules so that they later appear ragged or shot full of small holes.

Growers of large limas—particularly Concentrated Fordhook and Venturas—have been confronted recently with several problems; the choice of an insecticide because there is specificity in the effect of each material on a specific pest; chemicals controlling a pest in one area do not control it in another region; and most of the materials in common use are not too effective in protecting against damage from springtails which have become more prevalent in recent years.

The insecticides and fungicides chosen should be applied simultaneously to the beans as slurries or as liquid fixation treatments. Slurry treatment is the usual method and means the application of a thick suspension of the insecticide-fungicide mixture to the seeds by means of a slurry treater. The newer types of slurry machines do not injure germination if they are operated correctly. The machines should be carefully calibrated and only correct amounts of chemicals used, as overdosages may injure the seed.

Liquid fixation is the application of dry powders to seeds, and the introduction of enough moisture—0.5% for beans—to stick the chemicals to the beans. Wettable powders can be used as they possess adequate wetters and stickers. Only a small amount of seed is treated in this fashion.

The application of dry powders to beans has not proved as effective in most instances as slurry or liquid fixation, as it is more difficult to apply stipulated amounts and have them remain on the seeds with subsequent handling.

The two insecticides commonly used for seed treatment are lindane and dieldrin. Proprietary combinations of these materials with fungicides are available on the market and should be used according to the manufacturers' specifications.

The insecticides listed below in this column have been satisfactorily combined with either thiram or captan as slurry or liquid fixation treatments. The 75% materials for slurry treatments—such as Arasan SF-X and Orthocide seed protectant—are used at the rate of two ounces per 100 pounds of beans.

In a few areas of the state growers prefer dust applications with chloranil—for example Spergon.

Lindane applied as a slurry using one third ounce of 75% wettable powder per 100 pounds of beans, with an adequate fungicide, remains one of the best materials for all-around insect control. It has a rapid effect on wireworms which is desirable, and adequately controls the seed-corn maggot. At the specified rate, lindane killed from 88% to 96% of the wireworms in the seed zone in experimental plots. A reduction to one sixth ounce of 75% material reduced the kill to about 68%.

Aldrin, dieldrin, and heptachlor seem to give about the same results in protecting seeds against insect attack. All give excellent control of the seed-corn maggot, although in some tests heptachlor gave quicker kills of wireworms. Tests have been run over a seven-year period with these materials, and although occasional failures occur, the results are uniformly good.

More limited tests with endrin and isodrin indicate that they are the only materials capable of controlling springtail injury to germinating lima beans. Also, endrin—in particular—seems to possess good possibilities for control of the seed-corn maggot and wireworms.

Seed treatments are usually ineffective for the control of cutworms and the garden centipede.

In the Santa Clara Valley, aldrin, dieldrin, heptachlor, endrin, and isodrin have all given better protection against the seed-corn maggot than lindane. Several years tests in the Sacramento Valley, however, have given just the reverse—better control with lindane. The reason for the difference is not fully known as occasional tests in the Santa Clara Valley show lindane to better advantage. The difference may result in part from a greater overlap in generations of the maggot in the Santa Clara Valley—resulting in maggots of all stages in the ground at the time of planting. The infestations in the Sacramento Valley may

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Seed Treatment Materials

Insecticide (as 75% wettable powder)	Rate per 100 Pounds of Bean Seed*
Aldrin	⅔ oz.
Dieldrin	⅔ oz.
Endrin	⅔ oz.
Heptachlor	⅔ oz.
Isodrin	⅔ oz.
Lindane	⅓ oz.

* Equivalent to a per acre rate of application of from one quarter ounce to one half ounce of actual chemical.

Value of seed treatments in test planting of Fordhook lima beans; *center left row*, lindane alone; *right*, lindane and Arasan SF-X

When used during November through February, the amount of 25% wettable powder should be increased to five pounds per acre and applied in dry weather. It is difficult to immediately determine whether or not the scales have been killed by the winter treatment until 10 days to two weeks later.

Excellent control of the scale is possible with a 3% dormant oil emulsion applied as a thorough coverage spray. To avoid injury to trees this treatment can be used only in the full dormant season, from December 20 to February 15.

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BLACKBERRY

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There was no evidence—throughout the season—of plant injury following spraying even on those plants that received four applications at 10-day intervals.

Further experimentation must be conducted before the best timing, the number of applications needed and the most effective concentration for large-scale applications can be determined.

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PRUNES

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two to four weeks before the beginning of pit hardening. One orchard in San Benito County was sprayed with 25 ppm 2,4-5-T on May 3, about a month before the pits began to harden. About 30% of the fruit dropped before they were mature. Of the fruit that remained on the tree until mature 75% were cracked.

In a Sonoma County orchard 51 trees were sprayed with 40 ppm on May 5, about two weeks before the beginning of pit hardening. Approximately half of the sprayed prunes dropped to the ground before they were mature. This fruit and that under the check trees were disked under before harvest. The fruit from the sprayed and unsprayed trees was kept separate through harvesting, dehydrating, and grading. Of the sprayed prunes harvested 30% were offgrade compared to 10% of the unsprayed fruit. Even with the severe preharvest loss and the offgrade fruit, the increased size of fruit—62 prunes per pound compared to 98—made up for this loss. Deducting the cost of hand sorting and 2,4,5-T treatment, the return per tree after the second payment was the same for the sprayed as the unsprayed. No doubt many sprayed fruits which appeared normal may have shown some internal injury. The effect such an early application will have on the next year's crop of flower buds is not known.

Growers who may find it profitable to apply 2,4,5-T to apricots are cautioned to go easy on any trials with prunes. More work is needed to determine if a safe, effective time and concentration can be found for the French prune.

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Farm Advisors Edward Bowles, Santa Clara; Jack Foott, Tulare; Roy McCallum, San Benito; Fred Petersen, Sutter; Wallace Schreader, Tehama; Enoch Torpen, Sonoma, cooperated with growers in their counties in testing 2,4,5-T.

SEED TREATMENT

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be more severe, but tend to be more uniform with most eggs hatching at about the same time.

Area differences with fungicides seem to occur. Captan in some trials was more effective in areas where cool conditions and early plantings occurred. Chloranil showed up to good advantage in certain parts of southern California. The reasons for the differences are not readily apparent.

Insecticides should always be used with adequate fungicides because insecticides used alone on seeds may increase the incidence of seed decay from *Pythium ultimum*.

The full effects of the storage of seeds treated with the several chemicals have not been determined, and for this reason only seed of high germination should be treated and then, as close as possible to date of planting. Storage of seed for periods up to three months—under conditions not adverse to viability—is considered safe.

Tests have indicated some varietal susceptibility—of different kinds of lima beans—to damage from seed treatments. Concentrated Fordhooks seem to be the most sensitive to chemical injury, Venturas more tolerant, and baby limas the least sensitive to treatments.

Seed treated with these chemicals should not be used for food for either human beings or for domestic animals.

Some of these chemicals are quite toxic to warm-blooded animals and operators handling the chemicals should follow the necessary safety precautions suggested by the manufacturers.

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APRICOTS

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acute moisture deficiency, but six days later the foliage had completely recovered and the trees appeared normal.

Of the four growth regulators used in these tests, 2,4,5-T is superior to the others. Although 2,4,5-TP and 2,4-D brought about increases in fruit size, hastening of maturity and control of preharvest fruit drop, 2,4,5-TP significantly increased fruit cracking and 2,4-D killed the terminal portions of the shoots. NAA neither controlled fruit drop nor increased fruit weight to the extent obtained with 2,4,5-T.

The responses of the Stewart variety to 2,4,5-T are typical of those obtained with other commercial varieties produced in California. Although preharvest fruit drop of the apricot is a problem only with specific varieties or under certain environmental conditions, 2,4,5-T has proven to be an effective agent for its control. Whether or not the problem of preharvest fruit drop exists, the application of 2,4,5-T at the critical time brings about increase in fruit size and hastening of maturity.

Five years of experimentation with 2,4,5-T on the apricot has led to rather definite conclusions regarding the optimum time of application and the concentrations to use. To obtain maximum benefits from 2,4,5-T it should be applied at the beginning of pit hardening. The effectiveness of a particular concentration progressively decreases with successively later applications.

Hardening of the pits begins at the blossom end of the fruit and can be determined by cutting through the fruit from the blossom end toward the stem end. When the knife blade meets some resistance at the tip of the pit, it is time to apply the spray, generally 30 to 40 days after full bloom. The foliage should be sprayed to the point of slight drip as thorough coverage is important.

The proper concentration of 2,4,5-T to apply depends upon several factors, the primary one being the general area in which the orchard is located. In coastal valleys—where the period from pit hardening to maturity is relatively long—concentrations above 25 ppm

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