Rhizoctonia stem canker on beans

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Rhizoctonia stem canker is responsible for poor stands, reduced plant growth, and uneven maturation in beans produced in California. A common soil fungus, *Rhizoctonia solani* (Kuehn), is the cause of this disease. The water mold *Pythium* sp. can cause a seed decay and occasionally attacks older plants. Treatment therefore must include a fungicide to control both fungi. Fungicidal seed treatment usually ensures the establishment of an adequate stand under adverse conditions, allows the reduction of seeding rates, and theoretically should increase yields. A combination of chloroneb (formerly Demosan) and captan is the standard seed treatment; chloroneb is effective against *Rhizoctonia* for only the first 20 days after planting.

Since several new systemic fungicides have become available, we established plots at the University of California South Coast Field Station, Irvine, and in Ventura County fields to develop information on the effectiveness of these materials in controlling rhizoctonia and pythium seedling diseases. Furmecyclox (Epic) was tested as a seed treatment for control of rhizoctonia disease and metalaxyl (Apron) was included for pythium disease.

1982 trial, Irvine

In the 1982 trial at the UC South Coast Field Station, we inoculated the covering soil with *Rhizoctonia* at planting time to ensure maximum disease incidence. We obtained the *Rhizoctonia* inoculum by growing the fungus on previously sterilized water-soaked whole oats in glass jars at room temperature (about 21°C [70°F]) until it had totally colonized the oats in the jars. The oats were then air-dried, ground, and passed through a 2-mm mesh screen, after which they were stored in polyethylene sacks at 6°C (42°F) until used.

Seed treatment fungicides were applied at rates per 100 pounds of bean seed. On August 25, 100 pinto bean seeds were planted per plot, and each plot was replicated five times. *Rhizoctonia* inoculum was metered through a granular applicator and applied in the planting furrow as the seed were covered with soil.

Plant stand counts were taken on September 15 and disease incidence assessed on 10 plants on September 24 (table 1). Captan + furmecyclox, captan + chlor-

TABLE 1. Effect of fungicidal seed treatment on pinto beans, 1982

Treatment/ 100 lb seed	Plant stand Sept. 15*	Disease rating Sept. 24*†
captan 75W, 1.75 oz. + furmecyclox 46F, 2.66 fl. oz.	74 a	0.9 a
captan 75W, 1.75 oz. + chloroneb 65W, 4 oz.	81 a	1.1 a
metalaxyl 2EC, 2 fl. oz. + furmecyclox 46F, 1.7 fl. oz.	76 a	1.2 a
furmecyclox 46F, 1.7 fl. oz.	65 b	1.2 a
No treatment	51 c	2.0 b
captan 75W, 1.75 oz.	49 c	2.4 b
metalaxyl 2EC, 2 fl. oz.	47 c	2.4 b

*Duncan's multiple range test used at the 5 percent level. Treatment means followed by the same letter are not significantly different.
†Disease was rated on a scale of 0 to 3, with 0 representing no disease on the underground stem, and 3, lesions completely encircling the stem.

TABLE 2. Effect of fungicidal seed treatment on 'Fordhook' lima beans, 1983

	Plot 1*		Plot 2*
Treatment/ 100 lb seed	Plant stand June 23‡	Disease rating June 23†	Disease rating July 20
metalaxyl 25W, 2 oz. + furmecyclox 46F, 2 fl. oz.	288 a	0.1 a	0.6 a
captan 75W, 1.75 oz. + chloroneb 65W, 4 oz.	245 ab	1.0 b	1.5 ab
No treatment	210 b	1.3 bc	1.8 b
Trichoderma sp.	128 c	1.6 c	—

*Duncan's multiple range test, 5 percent level.
†See rating footnote (†) in table 1.
‡Plant stand count made on 100 feet of row per replicate.

TABLE 3. Effect of fungicidal seed treatment on 'Fordhook' lima beans, 1984

	Disease rating†			
Treatment/ 100 lb seed	Plot 1 July 2**	Plot 2 July 2**	Plot 3 July 10**	Plot 4 July 17*
metalaxyl 25W, 2 oz. + furmecyclox 46F, 1.75 fl. oz.	0.2 a	0.2 a	0.2 a	1.3 a
captan 75W, 1.75 oz. + chloroneb 65W, 4 oz.	1.1 b	1.3 b	2.0 b	2.5 b
No treatment	2.5 c	1.8 b	2.5 b	2.9 c

*Duncan's multiple range test, 5 percent level.
**Duncan's multiple range test, 1 percent level.
†See rating footnote (†), table 1.

oneb, and metalaxyl + furmecyclox significantly increased plant stands. All treatments containing furmecyclox or chloroneb provided excellent disease control, suggesting that *Rhizoctonia* was the primary pathogen in this trial.

1983 Ventura County trial

Procedures were the same in the 1983 Ventura County trial as in the 1982 trial, except that 'Fordhook' lima beans were planted in fields with a known history of rhizoctonia disease. Plot 1 was planted on May 25, and plot 2 on June 16. A plant stand count and disease rating were made on plot 1 on June 23, and a disease rating on plot 2 on July 20. In this trial, *Trichoderma*, a fungus that inhibits growth and activity of the pathogen, was also tested as a biological control seed treatment (provided by Arthur McCain, Extension Plant Pathologist, UC Berkeley).

Metalaxyl + furmecyclox significantly increased the number of plants when compared with no treatment and also provided the best disease control (table 2). The biological treatment significantly reduced the number of plants when compared with no treatment; control of the disease was not significantly different from no treatment.

1984 Ventura County trial

In seven plots planted in Ventura County during the 1984 season, procedures were the same as in the 1983 trials. Lima beans were planted in plot 1 on May 29, plots 2 and 3 on May 30, and plot 4 on June 8. The other three plots were planted during the same period but were discarded because they did not produce enough disease for evaluation. Ten bean plants were dug per replicate on July 2, 10, and 17 and disease incidence rated on a scale of 0 to 3 as before.

Metalaxyl + furmecyclox provided significantly better disease control than the standard captan + chloroneb chemical control (table 3). Only two of the four captan + chloroneb treatments were significantly better than no treatment.

Conclusions

Three years of data show that metalaxyl + furmecyclox (Apron + Epic) could serve as an excellent alternative or replacement for captan + chloroneb for controlling rhizoctonia seedling disease in southern California bean fields. Apron is registered in California for use on beans, but Epic has not received federal registration and is not available for use at present.

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The fragmented California farm labor market

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Not all commodities would respond in the same way to farm labor reforms

Wages are the largest production expense of California farmers, totaling $2.2 billion in 1982 and accounting for 29 percent of farm production expenses, according to the 1982 Census of Agriculture. Wage expenses are spread unevenly across commodities. Livestock and poultry, for example, accounted for 35 percent of California farm sales but only 13 percent of total wages, while crops generated 65 percent of sales and accounted for 87 percent of wages.

Fruits, vegetables, and specialty commodities such as mushrooms and flowers accounted for 70 percent of crop sales and 81 percent of crop wages in 1982. Wages were the largest expense for most fruit and vegetable growers, accounting for 30 to 60 percent of total production expenses. The labor markets for these crops are diverse: jobs are year-round in some and only seasonal in others; growers of some crops depend on illegal or undocumented workers and others do not; and some are on the verge of mechanizing labor-intensive tasks.

We have examined three crops that illustrate how a variety of economic, labor, and technological trends are fragmenting California's farm labor market. Year-round mushroom jobs pay $5 to $7 hourly and $15,000 annually to workers in unionized facilities, owned mainly by large corporations, in the Monterey area. Some Napa vineyards rely on single male undocumented workers for part of the harvest work force despite high wages, because seasonal farmworker families cannot afford housing in the area. Most of Stockton's fresh tomato harvesters are legal immigrants from Mexico who earn $5 to $8 hourly picking tomatoes; undocumented workers are only a supplemental work force.

The case studies summarized in this article were conducted by a variety of methods. They analyze the factors that make each commodity and its labor market unique. An important conclusion is that a statewide policy change designed to affect the labor market would not affect all commodities equally. For example, an increase in the minimum wage would have few effects on mushroom wages, but an immigration reform might affect 30 to 50 percent of the work force. Farmers, workers, and policymakers must be sensitive to this labor market fragmentation when evaluating changing labor market conditions.

Mushrooms

California is the leading producer and consumer of fresh mushrooms in the United States. In 1984, the state's 40 mushroom farms, on only 425 acres of farmland, produced 100 million pounds with a farm value of $100 million, making mushrooms a higher valued commodity than avocados. The Monterey area produces about 40 percent of the state's mushrooms.

Four companies — Castle and Cooke, Amfac, Campbell's Soup, and Ralston Purina — produce 70 to 80 percent of the state's mushrooms. Mushroom production is a labor-intensive process of year-round planting and harvesting in darkened facilities. Monterey-area producers employ about 1,000 year-round workers to hand-pick mushrooms, which are sorted mechanically. A mechanical picker has been developed but is not now in use.

Mushroom workers are settled or local Mexicans and Mexican-Americans, a change from a mostly white work force in the early 1970s. Pickers are 30 to 40 percent of a facility's work force, and most