

Recent Advances in Fungicides for Vegetable Disease Control

A number of new fungicides are now being tested for use in vegetable disease control. Some are wide-spectrum protectant materials, but many are systemics with a narrow range of efficacy within a small group of pathogenic fungi.

One material receiving a great deal of attention is metalaxyl (Ridomil). This material, previously code-named CGA-48988, is a systemic acylalanine with efficacy against phycomycetes. It has been tested widely against downy mildew fungi as well as *Pythium* and *Phytophthora*. The largest number of tests in 1981 were with potatoes (*Solanum tuberosum*) for control of *Phytophthora infestans*. Tests in Wisconsin, Maine, and North Carolina using metalaxyl tank-mixed with maneb or mancozeb on a 14-day schedule gave good control, while those in New York and Ohio were less successful. Data on metalaxyl alone, applied on a 14-day schedule, indicate that rates being tested are on the borderline of efficacy. Tank-mixing metalaxyl with maneb or mancozeb seems to improve efficacy, but use of low rates may encourage development of resistance, especially when EBDC residues decline in the second week of the spray interval. Lack of activity of metalaxyl against *Alternaria solani* further complicates its use on potatoes.

Studies in Delaware indicated that a single application of metalaxyl applied at flowering, or a smaller dose applied biweekly beginning at flowering, gave good control of potato pink rot (*Phytophthora erythroseptica*). Soil applications at hilling, flowering, and 2 weeks before harvest were also successful. Soil application tests in New Jersey showed that a drench of metalaxyl over the row, after the setting of pepper (*Capsicum annuum*) transplants, gave good control of crown rot caused by *Phytophthora capsici*.

Foliar applications of metalaxyl controlled downy mildew (*Phytophthora parasitica*) on turnip (*Brassica rapa*) in Ohio and *Pseudoperonospora cubensis* on cucumber (*Cucumis sativus*) in North Carolina. In Delaware, a metalaxyl seed treatment was ineffective against downy mildew (*Phytophthora phaseoli*) of baby lima beans (*Phaseolus limensis*), while soil treatments at planting were only slightly effective. In North Carolina, a single application at early bloom effectively controlled cottony leak (*Pythium aphanidermatum*) of cucumber.

Unless resistance problems develop, metalaxyl should be a major asset in control of downy mildews and related diseases.

Much interest has been shown in the sterol inhibitors, especially for control of tree fruit diseases. In vegetables, interest is primarily in control of powdery mildews. Triadimefon (Bayleton, Bay MEB 6447) is a systemic material with efficacy primarily against powdery mildews and rusts. Bitertanol (Baycor, Bay K WG 0599) is a protectant with some locally systemic activity against a range of ascomycetes and basidiomycetes. Tests with triadimefon in Utah in 1981 indicated that application every 14 days to tomato (*Lycopersicon esculentum*) gave excellent control of powdery mildew caused by *Leveillula taurica*. Studies in New Jersey and Virginia showed that applications every 7 days gave excellent control of powdery mildew (*Erysiphe cichoracearum*) of cucumber but little or no control of anthracnose (*Colletotrichum lagenarium*). Similar results were observed with bitertanol. In Nebraska and Idaho studies, bitertanol applied once at bloom gave only poor to moderate control of white mold (*Sclerotinia sclerotiorum*) on dry bean (*Phaseolus vulgaris*).

Two other sterol inhibitors available for testing are propiconazol (Tilt, CGA-64250) and ectaconazole (Vangard, CGA-64251), similar systemic materials with a wide spectrum of activity against many fungi outside the phycomycetes. In 1981 in Utah, propiconazol showed excellent control of tomato powdery mildew when applied every 14 days, but a study in Michigan indicated no efficacy against *A. solani*, *Septoria lycopersici*, or *Colletotrichum coccodes* on tomatoes. A Virginia study using this material on a 7-day schedule showed excellent control of cucumber powdery mildew. A single application of propiconazol to cucumbers just before vine running gave fair control of belly rot (*Rhizoctonia solani*) in Mississippi.

In New Jersey, weekly applications of ectaconazole gave excellent control of cucumber powdery mildew. A study in New York utilized the vapor activity of this material to provide complete control of powdery mildew caused by *Sphaerotheca fuliginea* and *Erysiphe polygoni* on cucumber and bean, respectively, in a greenhouse.

Although these sterol inhibitors show great promise for control of powdery mildews, none is labeled for use on vegetable crops. Because of undesirable growth-regulator activities on solanaceous

crops, it is unlikely either propiconazol or ectaconazole will be developed for use on potatoes or tomatoes.

Vinclozolin (Ronilan, BAS 352) is a wide-spectrum, nonsystemic protectant fungicide active against *Botrytis*, *Monilinia*, and *Sclerotinia*. Work with vegetables in 1981 centered on uses on onions, lettuce, and beans. In Oregon, in-furrow application at planting provided effective control of *Sclerotium cepivorum* on onion (*Allium cepa*), while application at bulbing was less effective. A similar test in New Jersey indicated good control on fall-seeded onions with application of vinclozolin in both fall and spring. In another New Jersey test, drop (*Sclerotinia minor* and *S. sclerotiorum*) was controlled on lettuce (*Lactuca sativa*) with three applications of vinclozolin at 10-day intervals. Four studies were reported on white mold (*S. sclerotiorum*) on bean. A test in Nebraska on dry beans showed only moderate control with a single application at bloom in mid-July. An Idaho test gave similar results with applications at early and full bloom. Two tests with snap bean in Oregon and New York, with applications at early and full bloom, gave nearly complete control of white mold. Vinclozolin is now registered only on turf, ornamentals, and strawberries, but a label for lettuce drop is expected within a year.

Iprodione (Rovral, Chipco 26019), another wide-spectrum, nonsystemic protectant fungicide with a similar range of activity, was generally tested with vinclozolin in the same studies. In Oregon, application to onions at planting gave good control of *S. cepivorum*, but application at bulbing was somewhat less effective. In New Jersey, applications in both spring and fall to fall-seeded onions gave good control of this disease. In a New Jersey lettuce drop test, application of iprodione three times, at 10-day intervals, gave fair control. A dry bean test in Idaho resulted in poor control of white mold with a single application at full bloom. In snap bean tests with white mold, applications at early and full bloom gave good control in both New York and Oregon. Iprodione is not labeled for any use on vegetable crops.

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