DO WE RECOMMEND PCNB FOR THE CONTROL OF DAMPING-OFF AND ROOT ROT OF VEGETABLES?

No...and that about answers it for any other indicated use in vegetables, if we are to rely on research of our Florida Agricultural Experiment Stations. We intend to continue doing so.

However, since it is difficult to separate the wheat from the chaff, we feel that you as a group should be currently well briefed on the material. We've talked to many of you individually and are presenting it to agent training sessions. This is in nature of a summary and reference. More detail can be supplied.

First. Dr. W.D. Moore, USDA at Ft. Lauderdale, gives the following recommendation for the use of the material, and this at best was qualified recently under some very definite limitations: "on beans on soils known to be heavily infected with Rhizoctonia, and with the possibility that Pythium is not a factor in the root rot complex, then I would recommend PCNB. But with the reservation that we do not know what effect it will have upon yields. Some farmers just want the disease controlled and in those cases it is O.K." Specific application rates and methods accompany these limitations.

Now note very closely that Dr. Moore's recent account carries a suggestion for only one crop, for only one organism damaging in the absence of another, and with the reservation that there is not known what yield effect will be derived. Further comment would reveal that Rhizoctonia and various species of Pythium are associated with this root rot complex, and that there are distinct possibilities of other organisms. PCNB may control Rhizoctonia, but "in no instance have we found PCNB to be of apparent value in controlling Pythium." Dr. Moore also says in effect that the Rhizoctonia population is only reduced, PCNB does not eradicate the mass of organisms throughout the soil, Pythium can cause serious damage acting alone and may be a factor in aggravating the activity of Rhizoctonia, there are 5 different species of Pythium, and 15 or more strains of Rhizoctonia in South Florida...and also influences by such factors as temperature, moisture, and organic content of the soil.

All of the above seems to add up to the fact that even to recommend its use on beans, the one crop, you would have to predict that only the organism Rhizoctonia would be active in the root rot complex, and then even if you could be accurate in this, you would not be able to say that from this data controlling the organism would have any effect on yields. There may be some other "ifs" but we feel that these define what would appear to be a rather precarious position for you as a county agent.

WHAT RESEARCH IS THERE ON COMBINING PCNB WITH OTHER MATERIALS FOR SOIL TREATMENT?

Your next logical question from the above might go something like this: "Granted that PCNB controls Rhizoctonia but not Pythium, and that in the past 'root rot' was loosely attributed to Rhizoctonia whereas now it looks like Pythium was definitely in the picture, what about combining some materials and controlling both?"
That was some of the thinking developed during the course of Dr. Moore's work, too. He says, "On the basis of one test captain and vincocide 51 looked most promising in combination with PCNB from an all-round standpoint; i.e., appreciable reduction in disease without any apparent effect on germination and early growth of beans. In addition to these materials the comparisons included nabam, crah 5,100, dowicide A, thiram and chloranil. There is no data on what proportions of the various materials would be effective combinations."

Note particularly 'one test,' and 'no data on what proportions.'

GOING BACK TO EFFECT OF RHIZOCTONIA CONTROL ON YIELDS, IS THERE RESEARCH ELSEWHERE IN THE FLORIDA STATIONS?

Since we have about narrowed this down to PCNB and beans, here is possibly a good place to follow in with some work by Dr. Bob Conover at the Sub-Tropical Station. Good control of Rhizoctonia stem cankers, following specific methods of application, is reported in four replicated tests and several commercial fields. In these tests 3 or 5 pounds active PCNB per acre gave good control; 10 lbs. caused "injury" but was not reflected in decreased yield while 20 lbs. caused a short delay in germination, but apparently not in stand. The material is not recommended for general use by the Sub-Tropical Station.

In light of the lack of yield data mentioned above you will be particularly interested in Dr. Conover's following comment: "Control of Rhizoctonia stem cankers did not result in a yield increase in one experiment (only yield experiment made) even when 57% of the check plants were rated as severely infected, i.e., had girdling lesions, or elongated lesions exposing vascular elements. While these results tempt one to think that the damage caused by stem canker has been underrated, one should remember that Rhizoctonia can cause a loss in stand sufficient to necessitate replanting. On the other hand, since root rot is a complex disease caused by several organisms, it is possible that the control of one component of the complex might result in heightened activity of the other components with the result that over-all damage is about equal."

Dr. Conover relates a situation showing the complexity of the problem: "In one experiment in a commercial field it was very plain that PCNB is specific in its action. Emergence of beans in this field seemed to be affected by a complex involving several organisms. PCNB at 1 lbs. (active) per acre did not improve the stand at all whereas captan applied as a seed treatment produced approximately 100% increase in stand. Within a short time the captan-treated plants were badly damaged by stem cankers but the PCNB-treated plants were singularly free of them."

WHAT HAS BEEN THE EXPERIENCE OF RESEARCH WITH PCNB AS SOIL TREATMENT AT OTHER STATIONS?

In citing the instances below in such a general fashion, we want it realized that more specific information can be given, such as rates and methods of application. We present it in this fashion as a means of expressing the experience of the research people when using the material according to information at hand, and to indicate why research experience over the state indicates that we should not recommend PCNB at this time. These remarks include other "combination" materials mentioned above as promising.

At the Belle Glade Station, Dr. R.S. Cox has been checking PCNB and captan for possible use in celery seedbeds. In before seeding tests, as mixed in soil or drench, captan gave stand reduction and PCNB was ineffective. In after seeding tests, both materials were among the best for Rhizoctonia post-emergence damping-off control, neither gave control of Fusarium-Pythium root rot or Bacterial leaf blight, PCNB gave slight and captan severe injury to seedlings.
In an attempt to use the material where he could not get a tomato stand on second-season planting, Dr. C.M. Coe at the Ft. Pierce station, tried PCNB as a pre-emergence application. No control of damping off resulted; Pythium was the primary offender. Under hot weather conditions some injury to "crock" occurred.

At Bradenton, Dr. Walter does not report any advantages in terms of final stand counts of pole beans from PCNB applied before or after planting or captan applied after seeding. In a more recent observation of PCNB he relates an instance of resulting poor emergence of pole beans....valuable seed stock, we believe. Mr. Don Burgis, also at the Gulf Coast Station relates instances of phytotoxicity from PCNB, vanicide 51 and captan to eggplant and peppers, and phytotoxicity to cabbage and tomatoes from captan.

WHAT OTHER USES OF PCNB HAVE BEEN EXPLORED BY THE STATIONS?

Transplant water treatments for damp-off control?

Dr. Moore, USDA, says very limited trials indicated Rhizoctonia may be controlled on pepper and tomatoes by application in the transplanting water at the time of setting. He refers to this work as hardly worth mentioning.

Dr. Conover at the Sub-Tropical Station says since study of the operation of tomato transplanters made it rather plain there is no practical way for the starter solution to be applied to both roots and the area affected by Rhizoctonia, experiments with these mixtures were discontinued. He indicates loss of transplants due to Rhizoctonia has not been serious enough to justify either the cost of control or work on the problem.

At the Ft. Pierce Station, Dr. Coe to date observes that PCNB in the tomato transplanting solution appears no better than the check, that zineb and panogen appeared to give a measure of control, and that captan ranked first. Early losses were due to Pythium and later to Rhizoctonia. He's currently repeating the test for closer study and analysis.

In testing several rates of PCNB in setting water applied by a continuous stream cart, Dr. Sowell at Bradenton indicates no reduction of damping-off sufficient for practical control. Rhizoctonia was consistently isolated from seedlings, but he says this does not eliminate possibility that such trouble was caused by Pythium, although this would not seem likely.

As a control of Sclerotinia?

Dr. Moore, USDA, indicates he does not have enough information to even suggest a recommendation, but after this year hopes to have a little dope on the subject.

Dr. Conover at the Homestead station has what appears to be some very pertinent remarks. PCNB broadcast and disked in to the soil at 75 to 150 lbs. (active) per acre significantly reduced the number of apothecia of Sclerotinia sclerotiorum appearing in treated areas. However, in the same experiment, calcium cyanamide was much more effective. Actual figures were (in numbers of apothecia per 36 sq. ft.): check, 29.2; PCNB (75#), 12.4; PCNB (150#), 12.8; calcium cyanamide (250#), 0.8; calcium cyanamide (500# or more), 0. According to Dr. Conover, 1 or 2 apothecia per 36 sq. ft. evenly distributed in a field would be ruinous. He has no experiments with PCNB to control Sclerotinia in a vegetative condition.

Dr. Cox at Belle Glade reports no data on Sclerotinia.

Dr. Sowell at the Gulf Coast Station has some phytotoxicity studies in conjunction with attempts to use PCNB directly on pole beans, lettuce and endive for Sclerotinia control. To date no disease or injury has developed in the plots as used.
As a control of soil rot on tomatoes?

Dr. Conover at Homestead reports that results of 2 experiments with PCNB show a significant reduction of soil rot of tomatoes when applied to the soil surface after "lay-by." The reduction was from 19% soil rot in the check, to 14% for the 8 lbs. (active) per acre dosage, and to 11% for the 32 lb. dosage. He states he is not one who considers a reduction of 30 to 50% as "control" even if significant. Furthermore, PCNB caused injury to fruit (inadvertently applied) where the spray collected in the depression around the stem. These experiments were discontinued 2 years ago.

Dr. Coe at Ft. Pierce is now taking data on PCNB applied as alternate pre- and post-layby application, mixed with nabam, and directed on plant foliage and soil around plants. To date no evidence of injury or retarding of growth, and PCNB appears compatible with nabam. Concerning soil rot, on first and second harvest no evidence of anything showing in the data to date.

As a control of gray mold on tomatoes?

Dr. Darby, now at the Central Florida Station, reports on some work done while he was back at the Ft. Pierce location. On applying PCNB 6 times as an alternate for zineb in a regular 22-application zineb program, wetting entire plant and soil surface by run-off, he reports no difference in marketable yield, slight reduction of gray mold on foliage and fruit, but no other disease reduction was noted. He adds it warrants further test but does not warrant suggestion it looks promising as control for gray mold or any other disease.

As a control of Helminthosporium on sweet corn?

Dr. Cox at Belle Glade reports that the material at 2 lbs./100 gallons was applied as a foliage spray in regular fungicide screening program. In his words, it was "absolutely ineffective."

Very truly yours,

F. S. Jamison
Vegetable Crop Specialist

12/20/54
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P.S. 12/21/54 Received this morning some results of current readings by Dr. John Darby, at the Sanford station. We appreciate this excellent cooperation in getting to us the latest data available. More details can be furnished, as indicated also on other preliminary reports, but these in general indicated:

Lettuce Drop Trial (Bibb): Testing PCNB at several rates and captan alone in drench mixed with top soil prior to transplanting; as of December 15 (month after transplanting) no phytotoxic symptoms apparent, no difference in number of dead plants per treatment, no disease present to date in check plot.

Celery Seedbed: Testing captan solution applications starting at germination, and at 1, 2, 3 or 4 weeks after germination. Applications have now been made at germination and at 1 and 2 weeks after germination. As of December 17 no phytotoxic symptoms apparent; no damping-off present; treatment starting at germination has received 3 applications to date with no ill effect apparent.