COMPREHENSIVE RESEARCH ON PRUNES

Report January 22, 1974

PROGRAM AREA: Root and root zone problems.

PROJECT NUMBER & TITLE: CA-D*-NEM-(number to be assigned). The pathogenicity and control of nematodes parasitizing fruit and nut trees in California.

PROJECT LEADER: B. F. Lownsbery, Nematologist.

PERSONNEL: Hassan Mojtahedi, Staff Research Associate I; and A. L. Braun, Staff Research Associate I.

OBJECTIVES: To obtain a better understanding of the role of nematodes in prune dieback.

To determine the effect of nematodes on the development of bacterial canker.

WORK IN PROGRESS: Dieback. Plant parasitic nematode infestation was one of the characteristics measured in a survey of Sacramento and San Joaquin Valley prune orchards made last June and July. This will be correlated with other characteristics of these orchards which are being determined, including condition of orchard, potassium content of leaves, and availability of potassium in soil.

A study of the effect of the root lesion nematode, *Pratylenchus vulnus* on potassium in Myrobalan seedlings in in progress. The effect of ground and foliar applications of potassium on Myrobalan seedlings infected with either *P. vulnus* or the ring nematode *Criconemoides xenoplax* is also being studied.

Bacterial canker. Myrobalan and Marianna 2624 plants have been grown in soils 1) with no plant parasitic nematodes; 2) infested with the ring nematode, *C. xenoplax*; and 3) infested with the pin nematode, *Paratylenchus neoamblycephalus*. Tops of plants growing in these three kinds of soils have been inoculated with the bacterium *Pseudomonas syringae* to measure possible predisposition to canker by these nematodes.

EXPERIMENTS COMPLETED: In greenhouse experiments the pin nematode, *P. neoamblycephalus*, reduced growth of roots and tops of Myrobalan seedlings (Table 1). Potassium content of leaves of Myrobalan seedlings was raised by killing this nematode with Dowfume W85® or DD® (Table 2).

Similarly, experimental additions of ring nematodes, *C. xenoplax* to Myrobalan and Marianna 2624 plants reduced growth and lowered potassium content of their leaves (Tables 3 and 4).

Myrobalan 29C and Marianna 2624 made about equal growth in two seasons in a field infested with the root lesion nematode P. vulnus. In an earlier test at the same location Marianna 2624 grew better than Myrobalan 3J, White Damson, or St. Julien. Good growth of young trees was not correlated inversely with root lesion formation. Many lesions were found on roots of Marianna 2624, which is as vigorous as any of the rootstocks which have been tested. Feeder root destruction probably has a greater adverse effect on these young trees than lesion formation.

Growth of prune rootstocks in soil infested with P. vulnus was improved by preplanting soil fumigation with Dow Telone® but not by postplanting treatment with Chemagro Nemacur® painted on trunks or incorporated into the soil.

WORK PLANNED: Follow the development of bacterial canker in Prunus seedlings infected with nematodes or uninfected.

Determine the kinds and numbers of nematodes occurring in Dr. W. H. English's field trials of preplanting soil fumigation for control of bacterial canker.

Complete the study of the effect of P. vulnus on potassium in Myrobalan seedlings and the study of effect of foliar and soil applications of potassium on Myrobalan seedlings infected with either P. vulnus or C. xenoplax.

Resample prune orchards in dieback survey where more information is needed.

Measure the effect of the various irrigation systems to be tried in the Colusa County experiment on the plant parasitic nematodes occurring at that location.

Prepare some of the information obtained on this project for publication.

MAJOR ACCOMPLISHMENTS: We have obtained the first experimental evidence that two nematodes occurring commonly in California prune orchards, Paratylenchus neoamblycephalus and Criconemoides xenoplax, reduce growth and potassium content in Myrobalan seedlings or Marianna 2624 plants.

IMMEDIATELY APPLICABLE RESEARCH RESULTS: The effects of these nematodes on young prune trees can be avoided by preplanting soil fumigation plus use of planting material certified to be free of nematodes.

EVALUATION OF PROJECT: Research dealing with the kinds of nematodes present in prune orchards and their direct effects on prune rootstocks has been productive. The study of the effect of nematodes on bacterial canker will probably not yield quick answers. Parallel work with peach has yielded information very slowly.

PUBLICATIONS OR REPORTS: None.

Table 1. Fresh weights of Myrobalan seedlings grown 4 months with and without different numbers of pin nematodes (PN) and associated microorganisms (AM) and final numbers of nematodes.

Treatment	Fresh weight of plants (g)[1]	Final number of nematodes[1]
Control	26 a	0
AM	28 a	0
100 PN	17 b	150,060
1,000 PN	16 b	121,984
10,000 PN	13 b	105,571

[1]Averages of 6 replications. Averages followed by the same letter do not differ from one another at the 1% level of significance.

Table 2. Percent potassium in leaves of Myrobalan seedlings grown 5 months in pin nematode infested soil after treatment with two nematicides, or after no treatment.

Nematicide	Ml/pint of soil	% K[1]
None		2.33 ± 0.15 a
Dowfume W 85 ®	0.008	2.58 ± 0.11 a
Dowfume W 85 ®	0.08	2.63 ± 0.21 a
Dowfume W 85 ®	0.8	2.78 ± 0.13 b
DD ®	0.1	2.85 ± 0.10 b
DD ®	1.0	3.55 ± 0.48 c

[1]Average of 6 replicates and standard error. Averages followed by the same letter do not differ significantly from one another at the 1% level.

Table 3. Fresh weight and percent potassium in leaves of Myrobalan seedlings grown 80 days after inoculation with 1) an aqueous suspension of 20,000 C. xenoplax, 2) the same suspension with nematodes removed, or 3) tap water.

Treatment	Fresh weight of plants (g)[1]	% K in leaves[2]
20,000 C. xenoplax	13 ± 2[3]	2.53 ± 0.20[3]
C. xenoplax removed	31 ± 3	3.33 ± 0.09
Tap water	33 ± 2	3.50 ± 0.06

[1]Average of 9 replicates and standard error

[2]Average of 3 replicates, each a composite of leaves from 3 seedlings, and standard error.

[3]Significantly lower than the two controls.

Table 4. Fresh weight and percent potassium in leaves of Marianna 2624 plants grown 4 months after inoculation with 20,000 Criconemoides xenoplax or after no inoculation.

Treatment	Fresh weight of plants (g)[1]	% K in leaves[1]
20,000 C. xenoplax	53 ± 5[2]	1.82 ± 0.06[2]
Untreated control	85 ± 8	2.46 ± 0.04

[1]Average of 4 replicates and standard error.

[2]Significantly lower than the untreated control.