The Influence of Nitrogen Fertilization on the Severity of Psorosis Bark Scaling

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PSOROSIS SCALY BARK was first noted in Spain by H. S. Fawcett in 1929. Four years later, lesions were observed on citrus trees in the valley of Carcer. From 1936 to 1939, the disease became more serious and spread through the provinces of Valencia, Castellon, and North Alicante. According to Gomez-Clemente (1) the rapid increase could have resulted from neglect of the orchards during those tragic times. On the other hand, many farmers believed that the shortage of fertilizers from 1940 to 1945 caused the rapid spread.

The influence of nitrogen fertilization on the appearance of symptoms of other virus diseases has been recognized (4). The purpose of this experiment was to investigate the relation of nitrogen applications to the development of psorosis bark scaling.

Materials and Methods

The trees used in this experiment were the Washington navel variety of sweet orange [*Citrus sinensis* (L.) Osb.] budded on sour orange (*C. aurantium* L.) seedlings in July, 1936, and planted in 5.5 x 5.5 m spac-

ing in March, 1938. The rootstocks were grown from seeds of 1 tree and were selected for uniform size and vigor. The buds came from 4 parent trees, and the progeny of each tree were so marked.

The experimental design for nitrogen fertilization of Herrero de Egana (3) as modified by Gonzalez-Sicilia (2) was adopted, as follows. (a) A randomized-block design with 8 plants per treatment plot was used; 2 trees were propagated from each parent tree and randomly arranged in the plot. There were 11 plots per block, and there were 4 blocks. Each

TABLE 1. AMOUNTS OF NITROGEN APPLIED YEARLY TO EACH PLOT

	Amount of fertilizer per tree per year		
Treatments	Spring kg of $(NH_4)_2SO_4$	Summer kg of $Ca(NO_3)_2$	Total kg of N
1	0.0	0.0	0.00
2	0.5	0.5	0.17
3	1.0	0.0	0.20
4	1.0	1.0	0.34
5	2.0	0.0	0.40
6	2.0	2.0	0.68
7	4.0	0.0	0.80
8	3.0	3.0	1.02
9	6.0	0.0	1.20
10	4.5	4.5	1.53
11	9.0	0.0	1.80

plot was separated from the other by a guard row. (b) Treatments as shown in Table 1 were applied in the spring and in the summer. Thus, every tree received 2 kg of superphosphate and 1 kg of potassium sulfate twice per year. Applications were begun in 1959 when the trees were 21 years old, at which time bark scaling was detected on 5 trees.

Results

In April, 1966, foliar symptoms of psorosis were found on all trees in the experiment. In July, 1966, the bark lesions were examined, and the trees were rated on a scale of 0 through 5 according to the severity of the lesions (Table 2). Four independent observers rated the trees. The results were averaged to yield the figure for each tree, and the tree figures were averaged to provide the plot average.

The figures (average severity of psorosis lesions) for the plots were subjected to analysis of variance to determine whether the differences among the treatments were significant.

The average lesion rating of each plot and the calculated mean ratings

are shown in Table 2. The lesion ratings are highest for controls and those treatments which received the least nitrogen, especially treatments 1 and 2. However, the differences are not significant at the 5 per cent level.

Discussion

The lesion severity figures were arrived at by estimation and not by measurement, although four independent observers were used and 352 trees were examined. Thus, the rating system estimates, but does not measure, the spread of lesions.

TABLE 2. SEVERITY OF PSOROSIS BARK SCALING IN WASHINGTON NAVEL TREES, UNIFORMLY INFECTED WITH PSOROSIS, 28 YEARS AFTER PLANTING, AND AFTER 7 YEARS OF DIFFERENTIAL NITROGEN APPLICATIONS

Treatment blocks	kg of N per year	Plots				Lesion rating average
		1	2	3	4	
1	0.00	2.5	2.4	3.2	2.2	2.57
2	0.17	2.2	3.2	2.9	2.5	2.70
3	0.20	2.9	1.8	2.3	1.7	2.18
4	0.34	2.7	1.9	1.6	2.5	2.18
5	0.40	2.0	2.1	1.5	1.3	1.73
6	0.68	2.0	1.6	2.0	1.6	1.80
7	0.80	2.0	1.9	1.9	1.2	1.75
8	1.02	0.9	2.8	1.6	1.5	1.70
9	1.20	2.7	1.6	2.0	1.3	1.90
10	1.53	1.2	2.5	2.5	1.8	2.00
11	1.80	1.6	2.4	2.8	1.3	2.03

In spite of reservations expressed as to the value of the method of evaluation, nitrogen fertilization appears to have had no effect on the occurrence of psorosis bark lesions on the Washington navel orange trees up to the present time. However, the nitrogen treatments have been in progress for only seven years.

Literature Cited

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