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CROWN GALL — NEW DISEASE OF AVOCADO

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During the past year a new disease was found on an avocado tree in the Fallbrook area. This paper reports this occurrence, and summarizes the research that established the cause of the disease.

In the fall of 1962 a Fuerte tree with a large swelling or gall at the ground level was brought to our attention on an avocado property in the San Luis Rey Heights section of Fallbrook. The 10-year old tree had a gnarled, irregularly cracked and swollen growth on the lower trunk at and just below the ground line (Fig. 1); according to the foreman the tree had been wounded in that area about a year previous to the appearance of the gall.

Fig. 1. Crown gall, new bacterial disease, on Fuerte tree in San Luis Rey Heights section of Fallbrook.

The growth had the appearance of a disease known as crown gall, caused by the bacterium agrobacterium tumefaciens. Descriptions of this disease have appeared in the literature on plant diseases for over 100 years. The casual organism was first described by a pioneer plant pathologist and bacteriologist in this country, Erwin F. Smith and his co-workers, C. O. Townsend, in 1907. The bacterium causes galls on a wide variety of plants, including rose, apple, pear, peach, cherry, other deciduous fruit trees, tomato, grape, willow, poplar, sugar beet, walnut, Pelargonium, and many others.

Crown gall has not been mentioned in any of the publications on avocado diseases to date. E. F. Smith did report in 1920, however, that he was able to produce "with difficulty" some galls on "Persea," which was probably Persea americana, the avocado (3). These inoculations were apparently made on seedling plants in his greenhouse, along with inoculations on a number of other plants. In 1945 G. R. Hoerner also reported obtaining galls on Persea americana by inoculating stems of seedling plants (1). He only obtained 2 galls from 6 inoculations, however, and the galls took 72 days to develop. C. O. Smith, working at Riverside, stated that he had obtained negative results in his attempts to inoculate avocado with the crown gall bacterium (2). No other attempts have apparently been made to inoculate avocado plants, and the bacterium has not been isolated from naturally-occurring galls on avocado prior to this report.

Material from the gall in Fallbrook was taken to Riverside and isolations made from it to determine whether the crown gall bacterium were present. Typical cultures of the bacterium were obtained on agar media and typical galls were produced on carrot slices in the laboratory.

Following this initial isolation of the bacterium, Topa Topa avocado seedlings and tomato seedlings were inoculated in order to determine the pathogenicity of the bacterium isolated from the avocado gall. Galls developed on all of the inoculated tomato plants in four weeks after inoculation (Fig. 2). These inoculations were made at the base of the plants. Inoculations at the base of the avocado seedlings were very slow to develop, and after five months only slight swellings were apparent on these plants.

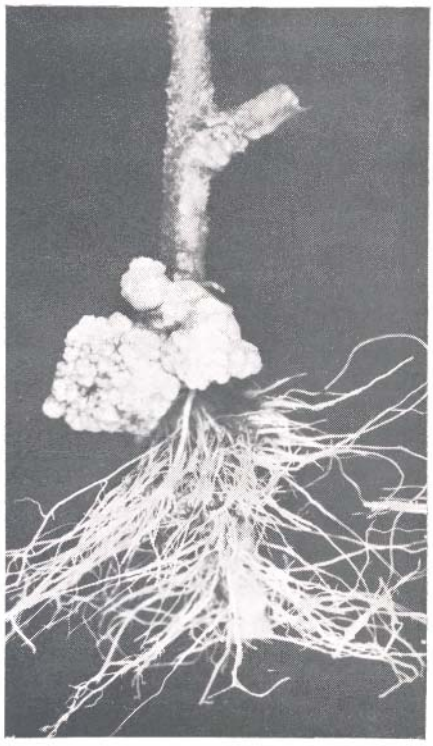

Fig. 2. Crown galls on tomato produced by inoculating stems with bacteria isolated from avocado gall.

Six other avocado seedlings were inoculated in younger stem tissue near the top of the

plants. In 13 weeks definite galls were evident on three of these plants. These stem galls slowly increased in size from a diameter of ⅛inch in 13 weeks to a diameter of ¼ to ⅜ inch in 19 weeks. Gall development was slower on tomato than that experienced in previous research on crown gall done in UCLA greenhouses. Since in laboratory experiments the bacterium ceases to grow at 87° F, it is probable that the high greenhouse temperatures at Riverside have partially restricted gall development. Reisolations of material from these galls resulted in typical growth of the crown gall bacterium in the laboratory, thus confirming that this organism is the cause of the avocado gall.

DISCUSSION

This is the first report of actual occurrence of the bacterial disease, crown gall, caused by Agrobacterium tumefaciens on avocado under natural conditions. Occasional swellings have been seen in the past on avocado trunks, but the condition is not common and this is the first instance of isolation of the bacterium in culture and reproduction of the disease on avocado and tomato seedlings in the greenhouse.

It is probable that avocado is quite resistant to crown gall, based on our difficulty in producing galls on plants receiving heavy inoculation. In addition, the early report by E. F. Smith of gall production on avocado by artificial inoculation noted that galls were produced with difficulty.

It is not anticipated therefore that this will be a significant problem on avocado trees. At the present time, no definite control measures are recommended other than avoiding wounds on the lower trunk of the trees which may facilitate entrance of the bacterium.

Nurserymen should be alert for any occurrence of the disease in the nursery; crown gall could become a problem in nurseries, as it has in the case of other types of nursery stock. If it does appear in planting stock, nurserymen should use measures that have been developed for control of the problem on rose and other woody plants, involving removal of diseased material and fumigation of soil and planting with disinfected pathogen-free planting stock. Details of the type of treatment necessary may be obtained from the Farm Advisor's office.

LITERATURE CITED

1. Hoerner, G. R. 1945. Crown gall of hops. Plant Disease Reported 29-98-110, Feb. 7, 1945.
2. Smith, C. O. 1912. Further proof of the cause and infectiousness of crown gall. Calif. Agric. Exp. Station Bulletin 235:531-537.
3. Smith, E. F. 1920. An introduction to bacterial diseases of plants, 688 pp., W. B. Saunders Co.