

## Woody Gall of Sweet Orange

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### ABSTRACT

A newly reported woody gall disease affecting demi sweet orange trees was observed in Libya. Woody galls develop on the trunks and limbs of the affected trees. This abnormality was bud-transmitted to young trees of demi sweet orange. Galls developed on the inoculated trees at the bud-union. Bud-inoculated Mexican lime seedlings did not develop vein-enation.

### INTRODUCTION

Fawcett and Bitancourt (1) reported an abnormality found on sweet orange (*Citrus sinensis* (L.) Osbeck) trees which they described as knobby bark. This disorder was later reported (2) also on lemon (*C. limon* (L.) Burm F.). Fwacett (unpublished) was not able to transmit this disease to sweet orange.

Frazer (3) described a woody gall disease on rough lemon and was able to transmit the virus by grafting to rough lemon. She reported that presence of this disease in rough lemon seedlings suggests that the causal virus has an insect vector.

Wallace (6) observed woody galls on rough lemon in a citrus nursery in Peru. Woody galls were found (5,6) to be associated with vein-enation virus which could induce woody galls on rough lemon, and Mexican lime (*C. aurantifolia* (Christm.) Swing.) young trees in California. Vein-enation virus disease was reported also from New South Wales (3) and South Africa (4).

Galls were first noted in Libya by N. Abudabbah (Unpublished report, 1954) on the trunks and limbs of demi sweet orange trees (local blood orange). Later, the authors found that this disease was confined to this local variety of blood sweet orange. The present study was undertaken to describe the symptoms of this disease and to try to transmit the causal agent by grafting.

### MATERIALS AND METHODS

Grafts from a demi sweet orange seedling tree were grafted on sour orange seedlings. A year later, the demi sweet orange scion was bud inoculated from the demi sweet orange

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trees exhibiting the galls. Also Mexican lime seedlings were bud-inoculated with the same source exhibiting the galls.

## RESULTS

### Symptoms of Woody Gall Disease

At first, rounded galls develop on the trunk of the infected sweet orange scion close to the bud-union. As the tree grows older new galls develop on the trunk, main limbs, and branches of not less than 3 years old. As the gall gets older it enlarges and flattens with its surface taking the shape of a volcanic crater (Fig. 1A). Cutting through a newly developed gall, the gall was found to be formed mainly from the stimulation and out growth of the xylem tissues, and ensheathed with very thin bark (Fig. 1B). Galls were not observed on the sour orange rootstock.

Anatomical studies showed that the bark of the gall is very thin (Fig. 2A). The vascular elements of the gall take a more or less concentric pattern throughout the gall (Fig. 2B,C).

No bacteria had been noticed to be present in the normal wood or gall tissues.

### Transmission Trials

Young trees of a new line of demi sweet orange grafted on sour orange rootstock were bud-inoculated from gall-infected sweet orange trees. Rounded galls started to develop three years after inoculation. The galls developed at the edge of the budinoculum (Fig. 1C). Examination of the internal tissues at the bud-union revealed that the tissues

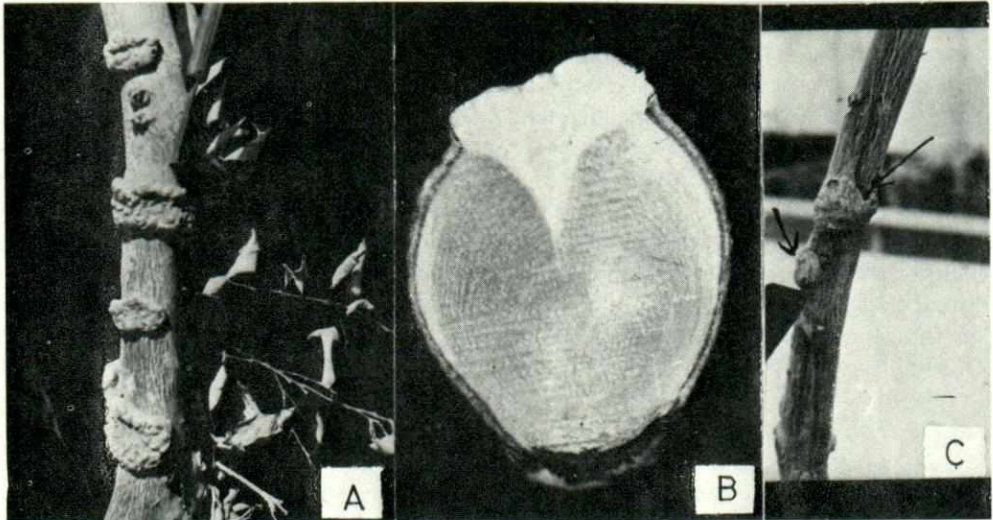


Fig. 1. (A) Woody galls developing on a limb of a sweet orange tree. (B) A cross-section through a gall from the wood cylinder and taking the 'V' shape. (C) Sweet orange seedling bud-inoculated from a woody gall source. Note the development of galls at the edge of the bud-inoculum (arrows).

of the gall is formed from woody tissues initiating from the bud as well as from the inoculated demi sweet orange tree.

Inoculated Mexican lime seedlings did not develop any vein-enation.

### DISCUSSION

Symptoms of woody gall disease of demi sweet orange is quite different from that of knobby bark of sweet orange and lemons described in California (1,2). Galls of the knobby bark disease is separated from the normal wood by a definite margin and leaves a crater-like opening when cut out. On the other hand, galls of woody gall of sweet orange is an abnormal continuous growth of the normal wood. Moreover, woody gall of sweet orange had been reproduced by bud-inoculating demi sweet orange trees.

Mexican lime seedlings inoculated with buds from a sweet orange tree infected with woody gall did not produce any vein-enation symptoms. This suggests that the causal agent is different from vein-enation or woody gall disease reported from California (6).

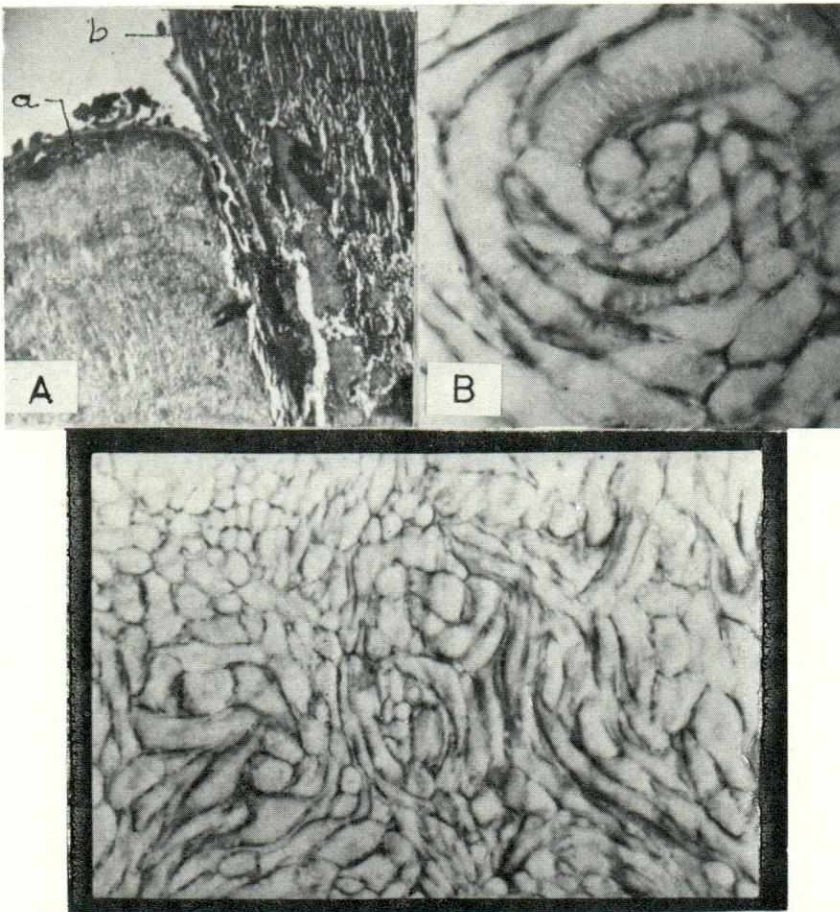


Fig. 2. (A) Cross-section through the woody gall (a), and the main stem (b). (B) and (C) show the concentric patterns of the vascular elements of the wood of the gall.

The general symptoms of the disease and the absence of any bacteria in the tissues of the diseased material suggests that the causal agent may be a virus.

#### LITERATURE CITED

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