SHORT COMMUNICATION

STRAWBERRY, CLOVER, AND PEA AS HOSTS OF BIG BUD VIRUS*

By Katie Helms†

Frazier and Posnette (1956, 1957) showed that the virus causing phyllody of clover in England produced symptoms of green petal disease in strawberry. In Australia, clover virescence (or phyllody) was found to be caused by the big bud virus (Hill 1943), and as strawberry plants with green flowers have been reported to occur occasionally in commercial crops in southern Queensland (B. L. Oxenham, personal communication), it was of interest to determine if strawberry was a host of the big bud virus.

Clover has been described also as a host of a disease legume "little leaf" which seems closely related if not identical to big bud (Hutton and Grylls 1955). Tests were therefore made to confirm the identity of the disease causing phyllody in clover.

All of the following transmission tests were made with *Cuscuta campestris* Yuncker, on glasshouse-grown plants.

Strawberry Transmission Tests

Two sources of inoculum were used: (1) big bud virus which originally came from field-infected lucerne and was known to produce typical symptoms of proliferation and gigantism on tomato; and (2) virus from field-infected clover showing symptoms of phyllody. Both produced identical symptoms on strawberry. The disease was transmitted to 5 of 27 strawberry indicator plants, *Fragaria vesca* L., clones EMS–1 and UC–1, and to 7 of 19 plants of the cultivated strawberry, cv. Climax.

Vegetative symptoms on *F. vesca* indicator plants and Climax were essentially similar (Plate 1, Figs. 2 and 3), and were first recognized 3–4 months after dodder was attached. Early symptoms were observed on young leaves which were small and chlorotic with yellow margins and with short petioles. Leaflets of some leaves were markedly irregular in size. Mature leaves were harsh in texture and petioles became necrotic; leaflets of Climax were often reddened and cupped inwards. All diseased plants became extremely stunted; old leaves collapsed leaving small central leaves that soon became necrotic. *F. vesca* indicator plants produced chlorotic stolons with short internodes. Daughter plants from these formed rosettes of small leaves and survived only a few weeks. Stolons and daughter plants of Climax were relatively sturdy, but with dwarfed chlorotic leaves.

No flowers developed on infected *F. vesca* indicator plants which died 1–2 months after first symptoms were observed. Infected plants of Climax survived 2–4 months and most produced flowers (Plate 1, Fig. 1). Petals were small and green, and sepals

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were enlarged. Some receptacles were small and shrivelled, whereas others expanded slightly and developed large achenes that gave the fruit a seedy appearance. All fruit shrivelled before maturity.

Legume Transmission Tests

To confirm that field plants of *Trifolium repens* L. with symptoms of phyllody were infected with the big bud virus, transmission tests were made from a naturally infected clover plant to tomato. Three of 12 plants tested developed typical big bud symptoms.

In the following tests, big bud virus that originally came from lucerne was transmitted to 2 of 10 clonal plants of *T. repens*, 2 of 8 seedlings of *T. pratense* L., and 3 of 6 seedlings of *Pisum sativum* L. cv. Canner 75. Green flowers were recognized in *T. repens* 6 weeks after infected dodder was attached and plants later developed chlorotic, small, rounded leaves, and extreme proliferation of shoots. Some leaves became reddened along the margins. Symptoms on *T. pratense* were essentially similar with the exception that older leaves developed pronounced bronzing. Symptoms of the disease on clover closely resembles those described for aster yellows on clover in California (Halisky *et al.* 1958).

Pisum sativum was recorded as a host of the big bud virus in the Sydney metropolitan area in 1958 (Plant Disease Survey, New South Wales Department of Agriculture 1958), and pea plants with green flowers which were suspected of being infected with big bud have since been observed in commercial crops in New South Wales. The present data provide experimental confirmation that pea is a host of the big bud virus. Symptoms in glasshouse-infected plants which recently had been cut back were observed 3 months after infective dodder was attached. The first symptom was the shrivelling of improperly developed flower buds which was followed by development of green proliferating flowers. At this time young leaves were reduced in size and were chlorotic. Diseased plants produced a few axillary shoots and survived only a few weeks.

Discussion

The experiments show that strawberry is a host of the big bud virus. Vegetative and floral symptoms of the disease appear to be essentially similar to those described for strawberry infected with aster yellows in the United States of America (Frazier and Thomas 1953) and green petal in England (Posnette 1953). However, Frazier and Posnette (1957) were unable to prove that aster yellows and green petal of strawberry were due to the same virus since there were differences as well as similarities in respect of host range and vectors. Similarities of symptoms of aster yellows and big bud on several hosts have been described previously (Helms 1957). The finding that strawberry is a host of big bud, together with the confirmation that *T. pratense* and *T. repens* are also hosts of the disease, provide further evidence of common hosts and similar symptomology between big bud and aster yellows.

Several legumes are now known to be hosts of the big bud virus in Australia. In addition to *T. repens*, *T. pratense*, and *P. sativum*, legumes shown experimentally to be susceptible to the big bud virus are *Lathyrus pubescens* Hook & Arn. (Hill 1943),

Crotalaria goreensis Guill. & Perr., and *Medicago sativa* L. (Helms 1957). Legumes shown experimentally to be susceptible to legume "little leaf" (Hutton and Grylls 1955), are *T. pratense*, *T. subterraneum*, *M. sativa*, *Desmodium uncinatum* DC., *D. sandwicense*, E. Mey (C.P.I. 11740), and *Lotononis bainesii* Baker. There appears to be no experimental evidence which would distinguish legume "little leaf" from big bud. Vegetative symptoms of the two diseases are similar, and although green flowers were not observed in field plants identified as infected with legume "little leaf", the disease produced green flowers characteristic of big bud on experimentally infected plants of *Datura stramonium* L. and tomato; in addition *Orosius argentatus* (Evans) is the only known vector in Australia of big bud and of legume "little leaf" (Hill 1943; Hutton and Grylls 1955).

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Explanation of Plate 1

Fig. 1.—Strawberry plant, cv. Climax. Normal flower (right) and two flowers with green petals from a big bud infected plant.

Fig. 2.—Strawberry plant, cv. Climax. Big bud infected plant with small chlorotic central leaves with yellow margins. On the left is a short stolon with a daughter plant consisting of small curled leaves.

Fig. 3.—*F. vesca* indicator plant. Big bud infected plant showing twisted and shrivelled old leaves and small curled young leaves with short petioles.

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