

# VIRUS AND VIRUS-LIKE DISEASES IN COMMERCIAL STRAWBERRY CULTIVARS IN ISRAEL

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## Abstract

A study of strawberry plants for the presence of viruses was started in 1980 in Israel. Plants of imported cultivars and of the Israeli cultivar 'Nurit' were indexed by leaf graft procedures. It was found that strawberry mild yellow-edge virus is very common in 'Aliso', the dominant cultivar grown in the country at present. The green-petal disease was found in strawberry plants in a few locations in the early winter season of 1981-1982. Mycoplasma-like bodies were found by thin-section electron microscopy in plants showing typical green-petal symptoms. The presence of aphids was checked routinely in commercial fields. *Aphis gossypii* was found in many instances and in large colonies. *Chaetosiphon fragaefolii* was not found in this study, despite an intensive search for this aphid species.

## 1. Introduction

Strawberries are grown in Israel primarily as a winter season crop, aimed at the European fresh fruit market, to which they are at present shipped mainly by air. Choice of cultivars, locations, and growing methods were developed to allow harvesting from late November through the winter season until late May. The California cultivars 'Aliso', 'Fresno' and 'Tioga', and the new early-fruiting Israeli cultivar 'Nurit' (Izsak, 1978), are the major cultivars grown in the country at present. Commercial strawberry plots in Israel are generally relatively small (0.2 - 0.3 ha) and very frequently adjoin other strawberry plots, orchards or vegetable fields. Farmers maintain their own nurseries from plants dug out in the winter and held in cold storage until the planting date of the nurseries (Abdulraziq, 1979). The Israeli strawberry industry was recently described by Converse (1981).

In recent years, degenerated, slow-developing and low-yielding plants have been observed in commercial fields in Israel. A study of virus diseases in strawberry fields was undertaken in 1980. This paper presents the results and observations made so far.

## 2. Materials and Methods

The strawberry virus indicators *Fragaria vesca* (clones UC-4, UC-5 and UC-6), *F. virginiana* (clones UC-10 and UC-11) and 'Alpine' seedlings (*F. vesca* var. *semperflorens*) were used for leaf-graft indexing. Two leaves on each plant were grafted and the ungrafted leaves were removed. Indicator plants were maintained below 25°C and examined for virus symptoms at regular intervals for 2 months.

Thermotherapy was done with well-established, pot-grown strawberry plants for 6 weeks at 37°C. Meristems were cut from heat-treated

plants within a few days after heat treatment.

### 3. Results and Discussion

Plants of the cultivars 'Aliso', 'Fresno', 'Tioga' and 'Nurit' were collected from the main growing areas and used for leaf-graft indexing on indicator plants. Severe symptoms typical of mild yellow-edge virus (MYEV) were observed commonly following grafting of leaves of the 'Aliso' cultivar. Milder symptoms were observed at low frequency following grafting of leaves of cvs. 'Fresno' and 'Tioga'. Stocks of 'Nurit' indexed so far, appeared to be free of virus and virus-like diseases detectable with the indicators used. However, there is a possibility that the virus was transmitted to 'Nurit' at a frequency low enough to escape detection, or occurred at a titer too low to be detected with present conventional indexing methods. Strawberry mild yellow-edge virus was previously reported in Israel in the imported California cultivar 'Lassen' (Leshem *et al.*, 1962). Growing this cultivar was discontinued when new cultivars became available.

Typical strawberry green-petal symptoms were observed at a few locations early in the winter season of 1981-1982. Mycoplasma-like organisms were observed in sieve tubes of petal and sepal tissues of diseased plants by electron microscopy. Strawberry green-petal was once a threat to the Israeli strawberry industry (Zelcer *et al.*, 1972). In recent years green-petal disease was not found, probably because of improved control of putative leafhopper vectors and the practice of delaying the planting time of the nurseries (early summer rather than late spring). The reappearance in 1981 of the green-petal disease, in spite of spraying for leafhoppers, emphasizes the need to identify the vectors which at present are unknown in Israel.

The presence of aphids in strawberry fields and nurseries is now recorded routinely throughout the rather long growing season. During the winter season, when the aphid population is very low, aphids were collected with a suction pump along rows of strawberry plants in the field. Since 1980, the main aphid vector of many strawberry virus diseases, *Chaetosiphon fragaefolii*, was not detected although it was previously reported to occur occasionally in Israel (Bodenheimer and Swirski, 1957; Leshem *et al.*, 1962). It seems unlikely that this aphid species has disappeared from this region. The observed reduction in the density of this aphid species might have been caused by a change in the biological balance of the local aphid population. *Aphis gossypii* was regularly found on strawberry foliage throughout the growing season, occasionally in large colonies on the lower side of old leaves. During the spring the aphids collected mainly from young foliage were *Macrosiphum euphorbiae*, *Aulacorthum solani* and *Rhodobium porosum*. In one instance a few *Acyrtosiphon pisum* were found in a strawberry field adjoining a clover field. The rarity of *C. fragaefolii* is a great advantage for controlling virus spread in the field, but other aphid species may serve as vectors of virus diseases. Information regarding possible aphid vectors is of great importance for the estimation of natural infection in the field.

In an attempt to obtain high-quality, commercial propagation material for Israel, a program was undertaken to obtain virus-tested plants of major cultivars and selections by using thermotherapy followed by shoot-tip culture. All plants obtained are kept under strict phytosanitary conditions and are tested for virus infection by the leaf-

graft technique to indicator plants during a 2-year period in which indexing is repeated several times at regular intervals (Converse, 1979). A breeding program aimed at developing early-fruiting cultivars is being carried out under the leadership of Mrs. Eva Izsak and Dr. S. Izhari at The Volcani Center. Plants with the desired horticultural properties obtained in this program are indexed for viruses as well as other plant pathogens. The influence on fruit yield and quality of large-scale replacement of existing plant material with new virus-tested plant stock will be determined in 1983.

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