

Natural Occurrence of Sowthistle Yellow Vein Virus on Lettuce

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ABSTRACT

Sowthistle yellow vein virus (SYVV), described from California and the British Isles on *Sonchus oleraceus*, has been found in a high percentage of *Lactuca sativa* plants in some fields in the Salinas Valley. Symptoms induced by SYVV on field lettuce are characterized by veinclearing and vein yellowing, especially of the tips of affected leaves.

Field observations indicate that the virus can cause stunting of affected plants and crop loss. Sowthistle is the principal source of the virus and the vector, *Hyperomyzus lactucae*, from which lettuce is infected. There is no evidence that the virus is seed-borne in lettuce. *Phytopathology* 60:1383-1384.

Sowthistle yellow vein virus (SYVV), described from the Salinas and San Joaquin Valleys of California and the Salt River Valley of Arizona (2), induces a disease of sowthistle (*Sonchus oleraceus* L.) characterized by marked clearing of tissue in or adjacent to the veins. The veinclearing is associated with an irregular veinbanding which stands in marked contrast to the dark-green interveinal areas.

The persistent aphid-borne causal virus has transmission characteristics, many of which are similar or identical to those first described for plant-insect viruses transmitted by leafhoppers. These transmission characteristics strongly suggest the multiplication of the virus in its aphid vector (*Hyperomyzus lactucae* [L.] = *Amphorophora lactucae*).

Bacilliform particles, thought to be virus, found within the nuclei of cells of the salivary tissue of aphid vectors were interpreted by Richardson & Sylvester (5) to be additional evidence that SYVV multiplies in the vector.

Recently the virus was found to be widespread in Britain, although there are indications that it was not introduced recently (4).

It has been known for some time that lettuce (*Lactuca sativa* L.) is susceptible to SYVV, but no information on the occurrence of the virus in nature on this host has been obtained.

In studies on a potentially destructive virus disease of sugarbeet, beet yellow stunt (BYS) (3) which induces a destructive chlorotic stunt disease of lettuce, we have for several years indexed lettuce plants showing symptoms of BYSS. These studies have shown that a high percentage of plants in some lettuce fields are infected by SYVV.

MATERIALS AND METHODS.—SYVV, obtained from the Salinas Valley, was maintained in sowthistle aphids reared on virus-infected sowthistle plants. Inoculations with SYVV were made by transferring a large number of viruliferous aphids to healthy plants for an infection feeding period of 48 hr.

Nonviruliferous aphid colonies were maintained by rearing virus-free nymphs, obtained at birth from apterous aphids, on healthy sowthistle plants in cages in an insectary.

Recovery tests from field plants were made by selecting individual leaves in the field and bringing them

into the laboratory. The virus was recovered by feeding nonviruliferous sowthistle aphids on the detached leaves for 48 hr. The aphids were then transferred to healthy sowthistle plants and incubated on these plants for at least 3 weeks. Following the incubation period on healthy sowthistle plants, the aphids were again transferred to healthy sowthistle seedlings for a 48-hr infection feeding interval. Nonviruliferous aphids from each colony used in recovery tests were tested on healthy sowthistle plants and incubated simultaneously with the recovery tests. In no instances were viruliferous aphids found in the stock aphid colonies.

RESULTS.—*Symptoms.*—Greenhouse inoculations of Great Lakes 118 and Calmar lettuce plants with SYVV-induced mild veinclearing and very slight veinbanding symptoms on the tips of affected leaves. The plants exhibited little stunting, and the disease appeared to be of minor significance on infected plants.

Symptoms induced by SYVV on field lettuce are characterized by veinclearing and vein yellowing, especially of the tips of affected leaves. The leaf tips fail to develop normally and take on a truncated appearance. The distal leaf veins are close together in the dwarfed or compressed leaf tip. Most of the secondary veins become cleared, and many show yellowing when viewed by reflected light. Veinbanding occurs on many of the secondary veins, but is quite restricted to the area just adjacent to the veins. Field observations over the last several years indicated that the virus can cause stunting of affected plants, and in some instances can cause crop loss.

Symptoms induced by SYVV in lettuce are readily distinguished from those induced by the lettuce big vein virus (LBVV) on this host by the absence of the broad light-green veinbanding symptoms and the absence of leaf margin ruffling. Veins of leaf tips affected by SYVV are yellow when viewed by reflected light and show strong contrast to the green appearance of LBVV-affected and healthy plants (Fig. 1, 2).

Field recovery.—Recovery of SYVV from field lettuce plants showing symptoms typical of the disease was attempted from over 50 plants from various locations in the Salinas Valley. All plants indexed had SYVV. Several of the plants had BYSS, although the plants were not yet showing obvious symptoms induced by this virus. Most of the field lettuce plants

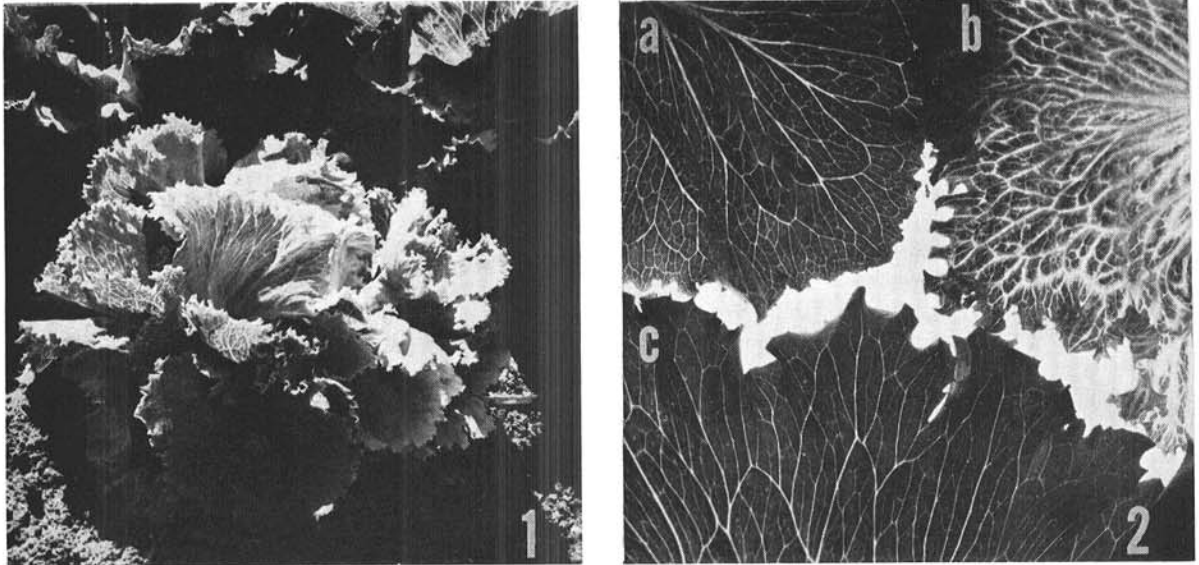


Fig. 1-2. 1) Field lettuce plant showing vein clearing, vein yellowing, and stunting induced by sowthistle yellow vein virus (SYVV). 2) Detached lettuce leaves viewed by transmitted light showing symptoms induced by the indicated virus under field conditions. a) SYVV. b) Lettuce big vein virus. c) Healthy leaf.

selected as having typical symptoms of SYVV also showed beet western yellows virus (BWYV) symptoms (1).

Symptoms typical of SYVV in lettuce were observed throughout the Salinas Valley. In some fields, the incidence approached 100% infection, although in many fields only an occasional diseased plant was observed.

Epidemiology.—Sowthistle is the principal source of the virus from which lettuce is infected. It is also the principal naturally occurring host of the vector, *Hyperomyzus lactucae*. There is no evidence that the virus is seed-borne in lettuce.

Sowthistle is commonly found infected with SYVV at all times of the year. The vector transfers the virus to lettuce, on which it feeds transiently. The aphid apparently does not reproduce on lettuce. For these reasons and other observational evidence, it appears that the disease is unlikely to reach serious proportions, except where large concentrations of sowthistle are found in neglected areas.

DISCUSSION.—The effects of the virus on lettuce under field conditions seem to be significant, although field inoculations were not carried out to verify this. The disease apparently has a more serious effect on lettuce plants under field conditions than in the greenhouse. The reasons for this are not fully understood. Temperature, light conditions, and other entities may play a role.

The disease has certainly been confused in the past with the complex of virus diseases common in lettuce in California. In areas of the Salinas Valley, for in-

stance, it is not uncommon to have lettuce mosaic virus, turnip mosaic virus, BWYV, BYSV, LBVV, and SYVV in the same field.

The widespread occurrence of SYVV in commercial lettuce is of twofold significance. The disease is common in important lettuce-growing areas of California, and under certain field conditions can induce serious losses. SYVV has many similarities to lettuce necrotic yellows virus (6). Both are bacilliform viruses which apparently multiply in both plants and insects. The viruses are both transmitted by the sowthistle aphid and infect sowthistle and lettuce. The epidemiology of both virus diseases is remarkably similar. It is a distinct possibility that the entities are related.

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