NONTRANSMISSIBLE, VIRUS-LIKE DISORDERS OF POME FRUITS IN ONTARIO

Wayne R. Allen'

Abstract

Apple trees with fluted or striped fruits and chlorotic leaf patterns, and a pear tree with sickle-shaped fruits, rouqh bark, and chlorotic leaf patterns were observed in Ontario. These conditions were not transmitted by grafting and, therefore, are not considered to be virus-induced.

Introduction

Orchard surveys in Ontario for disorders of pear and apple revealed three that in part or totally resemble known virus diseases. This paper provides descriptions of these disorders and reports the failure to transmit them by graftinq.

Occurrence and symptoms

Fluted and misshapen apple fruits - An apple deformity (Fig. 1) very similar to "flute fruit" (3) has been described (1). It was observed in young apple trees of the varieties McIntosh, Golden Delicious, Red Delicious, Cox's Orange Pippin, Idared, Rome Beauty, Melba, Spy, Cortland, and Jonadell from 1965 to 1968 in the Collingwood and Milton areas of Ontario. The trees made good growth and had normal shape and good leaf and bark color. At the time of the investigation, no possible causes other than low temperature injury or virus infection could be suggested.

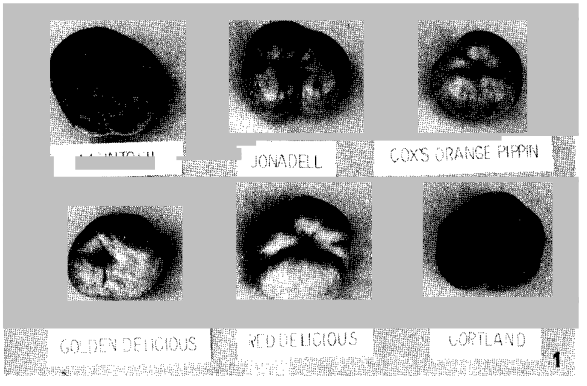
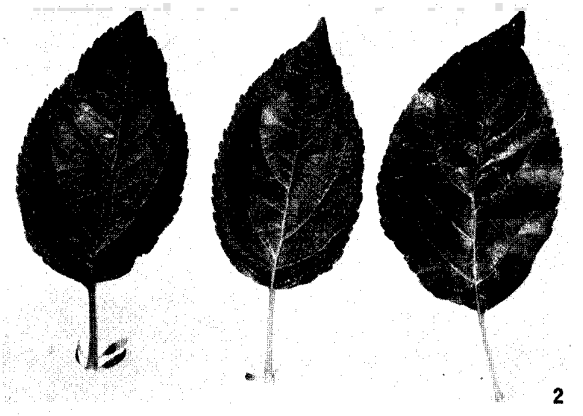
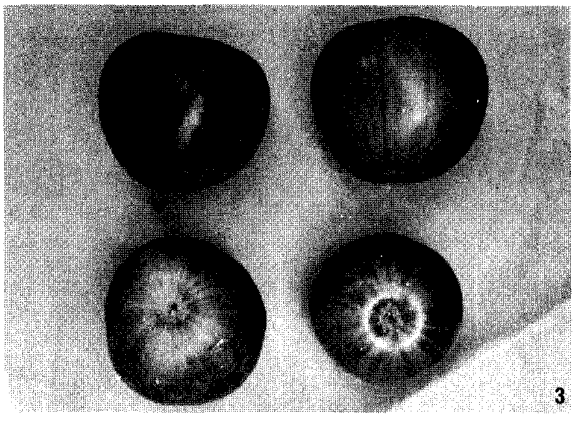


Figure 1. Apple fruits showing deep flutes or grooves and asymmetric development.

Fruit stripe and leaf pattern in apple - In 1966, a Northern Spy apple tree was found at Alymer, Ontario, with fruits that exhibited vertical green stripes (Fig. 3). Stripes were both continuous and broken; they varied in width and regularity, and were apparent in both green and mature fruits. In the latter, both the red and yellow background areas retained green stripes. Fruit size and shape were normal, but the color-break was so striking that fruits were unmarketable. Striped fruits were restricted to specific limbs.

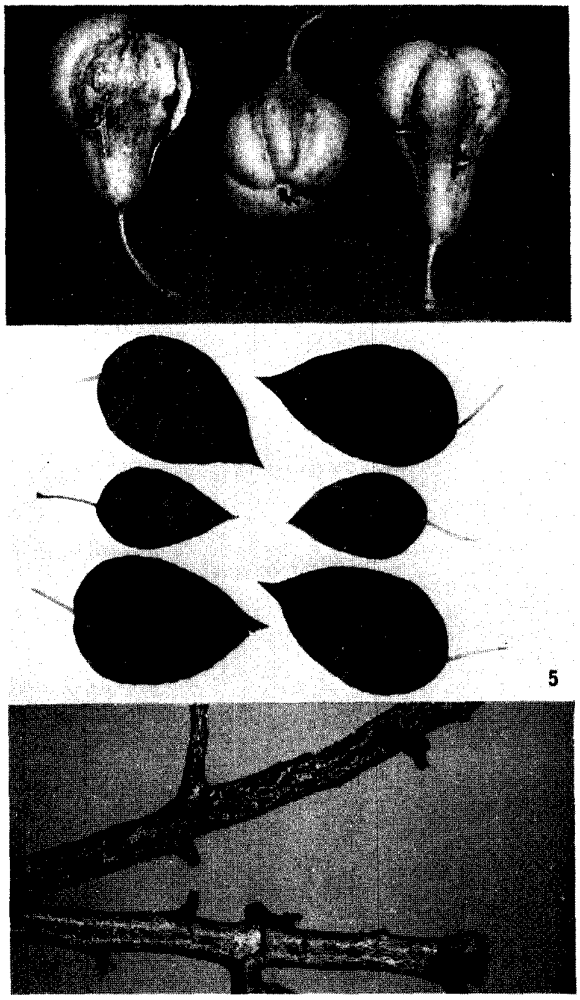




Figures 2 and 3. Northern Spy apple. 2) Leoves with chlorotic patterns from tree with striped fruits; 3) Fruits exhibiting varying degrees of striping.

'Research Station, Agriculture Canada, Vineland Station, Ontario. LOR 2E0.

Leaf symptoms (Fig. 2) consisted of liqht green areas along the midrib and major veins; they strongly resembled those of the leaf pucker disease (4). In some cases, the chlorotic areas were confined to the veins, but in others the chlorotic areas coalesced and occupied the major part of the leaf surface. The development of chlorotic areas resulted in, some leaf distortion. Chlorotic leaves were scattered throughout the tree. No texturing, scaling, or cracking of the bark was apparent.



Figures 4-6 Bosc pear. 4) Fruits with sickle shape and severe fluting and cracking; 5) Leaves with chlorotic patterns from trees with sickle shaped fruits, leaves at right are from a normal tree; 6) Rough bark on tree with sickle shaped fruits, branch ot bottom is from a normal tree.

Sickle-shaped fruit, rough bark, and leaf pattern of pear - In 1968, an unfamiliar condition in a Bosc pear tree was observed in a Vineland, Ontario (Niagara Peninsula), orchard. Almost all fruits were sickle-shaped (Fig. 4) due to uneven tissue development in specific areas, Deep flutes extended from the blossom end to near the stem, and cracks often developed revealinq corky, discolored tissue. Most affected fruits reached normal size.

Severe bark symptoms occurred on wood of all ages (Fiq. 6) and resembled those reported for "rough bark" (2), thouqh symptoms of the latter disease appeared less uniform.

Most leaves were chlorotic to some degree, but there was little or no leaf distortion. Chlorotic areas developed along the midrib and lateral veins, with larger areas coalescing to give the leaf a largely chlorotic appearance (Fig. 5).

Transmission

Fluted and misshapen apple fruits - Affected trees of Golden Delicious, Cox's Orange Pippin, Idared, Red Delicious, and McIntosh from the Collinqwood or Milton orchards were transplanted in the spring of 1968 to the generally warmer region near Jordan, Ontario (Niagara Peninsula). Each tree was covered with an insect-proof caqe. In the same year, buds from each variety were grafted to isolated, mature Red Delicious and Cortland trees growinq in the Jordan area.

The fluted condition persisted on caged trees in 1968 and was again in evidence in the Collingwood area. However, from 1969 through 1971 no fluting or other abnormalitv was evident at either locality. At no time over a 4-year period did fruit fluting develop in either the Red Delicious or Cortland trees that had received buds from affected trees.

Fruit stripe and leaf pattern in apple - Fourty-three seedlings grown from seed of striped fruits of Northern Spy in 1967 failed to produce leaves with chlorotic symptoms in the ensuing 5 years. Twelve seedlings from the same fruits grafted in 1967 with buds from areas of the tree affected with leaf chlorosis also failed to develop leaf symptoms up to 1971. However, leaves on snoots from graft buds did express typical symptoms. A bearing Northern Spy tree in the original orchard failed to develop either fruit or leaf symptoms in the 6-vear period following bud grafting from the affected tree. Several shoots from graft buds on this tree did, however, develop leaf symptoms but fruit did not develop.

sickle-shaped fruit, rough bark, and leaf pattern of pear - In 1968, 9 and 10 buds, respectively, from the affected tree were grafted into two trees of same varietv two rows distant from the donor tree. Only two buds on one tree failed to become established. No change in symptoms occurred on the affected tree and no symptoms developed on the grafted trees through 1972 except where graft buds were forced; these shoots developed the bark and leaf symptoms

but fruit was not produced.

Discussion

The large number of varieties simultaneously affected by the fluting condition of apple in the Collingwood orchard suggests causes other than virus. Further, the condition appeared to be most severe in low areas of the planting. The appearance of symptoms on transplanted trees only in the year of transplanting, and the failure to induce the condition in bearing trees of the same varieties after grafting, further indicates that viruses likely are not involved. Low temperature injury is the most probable cause of this disorder. Further, it seems possible that the injury is associated with the juvenile stage of growth or with size-controlling understocks or both.

The relatively uniform distribution of leaf symptoms associated with fruit stripe of Spy, and the more restricted distribution of striped fruit, initially suggested that the conditions might be due to separate causes. The failure to induce either condition in normal trees by grafting indicates that viruses are not involved. Whereas evidence of bud perpetuation was obtained for the leaf symptom, fruit were not formed on shoots from graft buds. However, the sectored nature of the fruit symptom suggests that it, as well as the leaf pattern, is caused by a genetical disorder.

The uniform distribution of leaf, fruit, and bark symptoms associated with the sickle-shaped fruit condition of pear suggests a single cause. The demonstration of bud perpetuation of bark and leaf symptoms from the same graft supports this view. The failure to induce fruiting on grafts, however, leaves doubt regarding bud perpetuation of the fruit condition. As with the stripe condition of apple, the definite and rather uniform sectoring in pear fruits is characteristic of genetical disorders.

Literature cited

1. Davidson, T. R., and W. R. Allen. 1966. An apple deformity of unknown etiology. Can. Plant Dis. Surv. 46:7.

2. Kristensen, H. R. 1963. Rough bark of pear. In Techn. Commun. Bur. Hort. East Malling 30:107-108.

3. Welsh, M. F., and F. W. L. Keane. 1961. Diseases of apple in British Columbia that are caused by viruses or have characteristics of virus diseases. Can. Plant Dis. Surv. 41:123-147.

4. Welsh, M. F., and F. W. L. Keane. 1963. Apple leaf pucker and associated fruit disorders. In Techn. Commun. East Malling 30:13-15.