ETIOLOGY OF BLACKLINE DISEASE OF WALNUT TREES


Annual surveys of two commercial walnut orchards to determine possible patterns and rates of natural spread of blackline continued in 1978. These surveys definitely showed natural spread of blackline within the orchards. Typically, the spread of blackline occurred from a diseased to an adjacent healthy walnut tree. The number of infected trees increased by 11 and 33% in the two surveyed orchards. In one of the two orchards surveyed for the last three consecutive years, the number of infected trees increased from 58 to 113. In 1976 and 1977 six different experiments were established to determine the efficiency of graft-transmission of blackline from diseased to healthy walnut trees. Bark patches from 2-4-year-old branches of naturally blackline infected walnut trees were used to inoculate 1-year-old trees in a greenhouse experiment and 2-3-year-old trees in the field at UCD. The indicator plants were Ashley on Northern California Black (greenhouse experiment), and Trinta on Northern California Black or Northern California Black on Eureka seedling rootstock (field experiment). The indicator plants which received bark patches from diseased trees developed blackline at the union between rootstock and scion within 1 year in all 6 experiments. The percentage of indicators with blackline at the union ranged from 10 to 100% depending on the experiment and inoculum source. No blackline developed in the indicators that received bark patches from healthy walnut trees. These experiments confirm results from our previous experiments. Therefore, we conclude that blackline of English walnut trees is a specific and infectious disease which can be naturally spread and/or disseminated with propagation material. Thus, graftwood from infected trees can play an important role in the introduction of blackline from infected into healthy orchards or walnut-producing areas. A virus was recovered from walnut trees affected with blackline by mechanical inoculation of several herbaceous plants. The virus associated with blackline-affected walnut trees was mechanically transmitted to cucumber, tobacco, cowpea, bean, and Chenopodium plants. No virus was recovered from healthy walnut trees. When examined under the electron microscope, ultrathin sections of cucumber plants experimentally inoculated with the virus from blackline-affected walnut trees revealed that the virus is a small isometric particle. This is the first report to demonstrate the association of a virus with blackline-affected walnut trees. Experiments are in progress to identify the virus and to determine its causal relationship to blackline disease in English walnut trees.