EFFECT OF DEFOLIATION DATE ON YIELD AND LEAF ROLL INCIDENCE IN POTATO

N. S. WRIGHT AND E. C. HUGHES

INTRODUCTION

Defoliating to control leaf roll virus is practiced commonly by growers of seed potatoes in North America (7) and Europe (18). Whether or not it is practical in a given area depends on whether the virus is spread before or after an economic yield is obtained. The time and rate of spread is determined by the availability of infected plants and the activity of aphid vectors, chiefly Myzus persicae Sulz.

The factors affecting the spread of aphid-borne potato viruses have been closely studied in Great Britain and the Netherlands. In England it has been shown that the leaf roll virus spreads mainly from source plants within potato crops early in the season when aphids are few, rather than in mid-season when they are numerous (2,5,9). Healthy plants were found to decline in susceptibility with time (4) and experiments showed that infected plants became less effective sources of virus as they aged (15). However, the reduced rate of spread late in the season in England has been attributed to decreased aphid activity and lowered plant susceptibility rather than to reduced effectiveness of virus sources (12).

Aphid surveys in north and north-east Scotland (8, 17) showed that M. persicae was more numerous near towns than in rural districts and that the main influx of alatae to potato crops occurred in those areas in early August. In eastern Scotland crops of spring cabbage, cabbage for seed and broccoli are important overwintering hosts for M. persicae because these plants persist long enough to allow the development and dispersal of alatae to spring-planted crops (10). The time and degree of infestation was correlated with the distance from over-wintering sites and also with summer temperatures (11). Other workers in Scotland (6) found that leaf roll virus was spread more extensively in late-planted than in early-planted crops but the amount of spread decreased rapidly with increasing age of the crop. Their results suggest that annual and regional variations in the extent of leaf roll spread reflect aphid activity during the 4 - 6 weeks after the potato plants emerge. In three successive years at least 25% of the spread of leaf roll occurred in late June and July which was before M. persicae could be detected by leaf counts or trapping. They found no evidence that leaf roll virus was introduced by aphids migrating into the crops but much evidence to show that the sources of infection were within the crops. Certification records and detailed surveys in Scotland (18) show that leaf roll spread is influenced more by climatic and topographical factors than by the proximity of crops to others containing infected plants.

1Accepted for publication November 20, 1963. Contribution No. 60 from Research Station, Research Branch, Canada Department of Agriculture, 6660 N.W. Marine Drive, Vancouver, B.C.

2Head, Plant Pathology Section, Research Station, and Assistant in Field Crops, British Columbia Department of Agriculture, New Westminster, B.C., respectively. The writers gratefully acknowledge assistance given by the Seed Potato Certification officials, Canada Department of Agriculture, Vancouver.
In the Netherlands the numbers and activity of *M. persicae* are used to set an arbitrary date each year for defoliating. The best grades of seed potatoes are not certified unless they are defoliated before this date. *M. persicae* overwinters almost exclusively in the egg stage in the Netherlands so that rapid increase is delayed and the main spread of leaf roll virus occurs in July. Local and long distance spread occurs and it is presumed (13) that the latter results from the initial long flight of alatae reared on infected potato.

Potato leaf roll is of considerable economic importance in the lower Fraser Valley of British Columbia. The most important variety, Netted Gem (Russet Burbank) is very susceptible to leaf roll net necrosis, a serious grade defect. Moreover, markets exist for crops of Netted Gem, Kennebec and other varieties which qualify as Foundation or Certified seed, and leaf roll is the major cause of crop rejection. In spite of early roguing and the regular use of insecticides which have kept seed crops practically free of secondary leaf roll infections and aphid colonies, a high incidence of current season infection often occurs before the crop matures. The defoliation experiments reported here were conducted to determine whether crops in the area could produce economic yields before the incidence of leaf roll become a limiting factor and if so to designate a date or a period after planting at which a crop should be defoliated.

**Materials and Methods**

The experiments were conducted in 1961 and 1962 in five fields on three privately-owned farms in the lower Fraser Valley of British Columbia. Plots were located in fields of Netted Gem and Kennebec in east and west Richmond, about 7 miles apart and in a field of Netted Gem in Cloverdale, a further 12 miles east. All fields were planted with Foundation seed which contained less than 1% leaf roll-infected tubers. Soils in both areas were well-drained clay loams in good tilth. All recommended production methods were practiced including early and regular roguing and stringent aphid control. Each test plot contained approximately 70 plants in four rows 20 feet long. Defoliant was applied in both years to duplicate plots in each of the 4 fields in Richmond and to quadruplicate plots in the Cloverdale field. A fresh plot in each replicate was defoliated each week. Since the Netted Gem fields in Richmond were planted on the same date the two sets of duplicate treatments were treated as four replicates each year.

**1961**

The Netted Gem test fields were planted in Richmond on May 21 and in Cloverdale on May 22. Defoliation treatments began on July 16, 58 and 57 days after planting and were applied weekly for 8 weeks until September 5. The Kennebec test fields were planted on May 1 in west Richmond and on May 18 in east Richmond. Defoliation of this variety began on July 4, 64 and 47 days after planting. Treatments were applied weekly for 8 weeks until August 22. One week after each treatment a single tuber was taken from each defoliated plant and stored. In the spring they were grown in field plots and the incidence of leaf roll in each sample was recorded. In mid-September the two center rows of each