ASTER YELLOWS OF POTATO IN BRITISH COLUMBIA[1]

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Introduction

A disease of potato, known locally as haywire (3), has been observed on occasional plants in the Pemberton and Cariboo districts of British Columbia for several years. The symptoms agree with the published descriptions of aster yellows (1, 2). In 1966 the disease occurred to a greater extent than in any previous year on record. In a few fields as many as 25% of the plants were infected. The disease occurred also on several weeds and other cultivated species. Typical aster yellows symptoms were observed on common plantain (Plantago major L.), pineapple weed (Matricaria matricarioides (Less.) Porter), wild buckwheat (Polygonum convolvulus L.), carrot (Daucus carota L.), China aster (Callistephus chinensis (L.) Nees), zinnia (Zinnia elegans Jacq.), cosmos (Cosmos bipinnatus Cav.) and poppy (Papaver rhoeas L.) Infection was common in plants of the above species which were growing in or near the seriously affected potato fields. The aster leafhopper, Macrosteles fascifrons (Stål) was present in large numbers and presumably was responsible for spreading the virus.

The observations and experiments which are reported here were made several years ago but until 1966, the identity of the disease was uncertain.

Symptoms

Primary symptoms (Figure 1) consist of an upward rolling of the uppermost leaves, an intensification of pigment in the rolled leaves, aerial tubers, general stunting and premature death. Immature tubers from diseased plants are often soft or spongy. Primary symptoms of aster yellows cannot be distinguished with certainty from those of leaf roll or witches' broom, but secondary symptoms of leaf roll and witches' broom are distinctive and diagnostic. Plants with secondary symptoms of aster yellows simply lack vigour. Tuber seed pieces from the same diseased plant may produce plants which have normal vigour, others which are weak, and still others which have no growth above ground.

Graft transmission

Scions taken from a field-grown potato plant with early primary symptoms were grafted to the stems of 4 healthy 'Netted Gem' potatoes in the greenhouse. After 4 weeks the inoculated plants became chlorotic and developed axillary branches and aerial tubers. Control plants grafted with healthy scions remained normal. Several 1- to 4-ounce tubers were produced by each plant. These were held 5 months in cold storage and then planted. The difference in vigor between the plants produced by tubers from inoculated and control plants was not significant. However, aster yellows virus does not always reduce the vigor of tubers (1) and since none of the plants had leaf roll or witches' broom symptoms it seems probable that the virus transmitted by grafting was aster yellows, Similar grafts with scions from field-gmwnplants with secondary symptoms have failed to indicate the presence of aster yellows virus.

Figure 1. Primary symptoms of aster yellows on potato.

Effect on vigor

Observations were made on the vigor of plants produced by tubers from aster yellows-infected potatoes from the field. Forty-eight tubers, 4 ounces or more in weight, were harvested from 13 plants which showed primary symptoms. Varieties tested were 'Warba' and 'Netted Gem'. The following spring the tubers were each cut into 2 or 4 seed pieces and planted so that the seed pieces from each tuber were in a unit. Controls were 42 tubers of the same size and varieties taken from 12 plants which were free of aster yellows symptoms. The 48 tubers from diseased plants and the 42 control tubers were cut into 180 and 168 seed pieces respectively.

By the end of July when most of the plants were 18 inches high the vigor of each was rated "good", "poor" or "none". Those given the last rating had failed to produce any aerial growth. The uniformity of the plants produced by each tuber was also noted. The results, which are given in Table 1, show that the effect of the virus on vigor was approximately the same for each variety. One-third of the seed

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Table 1. The effect of aster yellows virus on potato plant vigor the year after infection

Variety	Plantr with vigor rated			Units in which vigor of plants was		
	Good	Poor	None	Good	Poor	Variable
Warba - Arter yellows	80	8	16	19	5	5
Netted Gem - " "	40	22	14	5	5	9
Totalr	120	30	30	24	10	14
Warba - Control	72	0	0	18	0	0
Netted Gem - "	96	0	0	24	0	0
Totals	168	0	0	42	0	0

Table 2. The marketable and total yield of 'Netted Gem' potato clones recovered from aster yellows

Clone	Kind of plants			Yield[1] (1955)	
	1953	1954	1955	Marketable	Total
I	Aster yellows	Weak	Normal	29.0	46.0
II	Aster yellows	Normal	Normal	30.2	46. 2
III		Aster yellows	Normal	30.5	44.2
IV	Normal	Normal	Norma 1	26.7	44, 2
		Significance (P=0, 05)		NIL	NIL

[1]Mean of 4 replicates expressed in pounds/plot.

pieces from the infected plants either failed to germinate, or produced plants of poor vigor. Only one-half of the 48 tubers from diseased plants produced units in which the vigor of the plants was uniformly good, Fourteen of the 48 tubers produced some plants which had good vigor and others whieh had poor vigor. The remaining 10 all produced plants of uniformly poor vigor. All seed pieces from control plants produced plants of good vigor.

The effect of aster yellows virus on the vigor of potato clones was temporary. The tuber progeny of plants with very low vigor produced some normal and some slightly dwarfed plants but all others produced plants of normal vigor. The yields were compared among 4 clones of 'Netted Gem', 3 of which had recovered from aster yellows. One clone was derived from plants which were weak the first year and normal the second year after infection; the second clone was derived from plants which were normal for two successive years after infection: the third clone war derived from normal plants one year after infection; the fourth clone was a control. Results are shown in Table 2. The total and marketable yields of the 4 clones were the same.

Summary and discussion

Aster yellows virus was diagnosed as the cause of a minor potato disease which has occurred for several years in the Pembertonand Cariboo districts of British Columbia. Diagnosis was facilitated in 1966 because, in addition to potato, the virus had spread on a few farms to clearly diagnostic weed, vegetable, and ornamental hosts.

Observations from previous years on the performance of tubers from individual plants indicated that about one third of the seed pieces derived from infected plants producedweak plants or missing hills. The effect on vigor, however, is temproary and the yield of tubers from recovered plants was not affected.

Isolation of potato fields from areas where the virus may overwinter in weeds or other hosts coupled with the eradicationof these hosts is expected to keep the disease incidence at a low level on farms in these areas.

Literature cited

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