References

1. COX, R.S. and N.C. HAYSLIP. 1957. Recent developments on the control of foliar diseases of tomato in South Florida. Plant Disease Reptr. 41: 878-883.
2. NEWHOOK, F. J. and R.M. DAVISON. 1957. Incorporation of fungicides in fruit setting sprays for control of Botrytis fruit rot in greenhouse tomatoes. I and II. N. Z. Jour. Sci. and Tech. 38: 166-183.

SUSCEPTIBILITY OF SAIA AND FULGHUM OAT VARIETIES TO SOME STRAINS OF BARLEY YELLOW DWARF VIRUS

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Introduction

Breeding cereals for resistance to barley yellow dwarf virus (BYDV) is being undertaken in the United States, Canada and New Zealand. A basic requirement for success in this work is a knowledge of the relative resistance of the varieties of cereals being used as a source of resistance to different strains of BYDV,

The most comprehensive field observations on the relative resistance of oat varieties to BYDV have been recorded in the United States (3, 4). There, the variety Saia has quite consistently been moderately resistant while Albion, Fulghum, Newton, Putnam and Kanota have been slightly resistant. The resistance of Saia was confirmed for two seasons in New Zealand, but in the 1960-61 season this variety was severely affected by BYDV. Field evidence of the breakdown of BYDV resistance in wheat was also noted in New Zealand in 1960-61, when resistant selections from Arawa an Aotea proved to be no more resistant than the original variety. The existence of strains in BYDV has been recognized by many investigators. They have been clearly demonstrated on oat varieties in greenhouse experiments by Allen (1) and Slykhuis et al. (5) and on different host species by Bruehl and Toko (2). Strain differences have also been shown by Toko and Bruehl (6), Rochow (4), and Watson and Mulligan (7) to exist when different aphid vectors were used.

The existence of strains of BYDV that can cause severe infection on crop varieties now being used as sources of resistence in plant breeding has not yet been reported. The purpose of this paper is to show that such strains do exist and to suggest that more extensive surveys for the occurrence of BYDV strains, especially in relation to the resistant varieties, should be undertaken.

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Methods

The BYDV isolates used were as follows:

(1) V5: isolated from a plant of Phleum pratense and maintained at Ottawa by J. T. Slykhuis. It was previously used and described by him (5) as producing very severe symptoms on Clintland oats. This strain has consistently been transmitted efficiently by Rhopalosiphum padi (L.) and less efficiently by Macrosiphum avenae (Fab.).

(2) MGV: isolated by W. F. Rochow (U. S. D.A. and Cornell University), This strain was transmitted efficiently by Macrosiphum avenae and rarely By Rhopalosiphum padi.

(3) RPV: also supplied by W. F, Rochow. This strain was transmitted efficiently by Rhopalosiphum padi but very poorly by Macrosiphum avenae,

RPV and MGV had been maintained on Californian Red oats at Cornell, while V5 was transferred to the oat variety Clintland 60. A standard 2-day aquisition feed, on detached oat leaves in glass tubes which contained a strip of moist blotting paper, was used in all transmission tests, After the aquisition feed, five aphids were transferred to each plant before the emergence of the second leaf. Four plants each were grown in 5-inch clay pots of sterilized potting soil in a greenhouse kept at 70°F. After the aphids were transferred, the plants were covered with a inverted glass jar for 2 days and kept out of direct sunlight, The plants were then uncovered and sprayed with TEPP (0.05%) to kill the aphids.

Symptoms of BYDV were recorded after 14-18 days. The oat varieties used were Saia, Albion, Fulgham and Florikee grown from seed supplied by H. Jedlinski (U.S.D.A. and University of Illinois). The first three had been described, by several observers, to be field resistant to BYDV. The varieties Clintland 60, Californian Red and Florikee had been described to be very susceptible.

Results and Discussion

BYDV infection was scored on the basis of a 0-4 scale, described as follows:

0 - no symptoms
1 - discoloration of 2nd and 3rd leaf with no stunting.
2 - discoloration of 2nd leaf and slight stunting of 2nd and 3rd leaf.
3 - discoloration of 1st and 2nd leaves and slight to moderate stunting of 2nd and 3rd leaves,
4 - collapse of 1st leaf and severe stunting or distortion of successive leaves.

Table 1. Reaction of oat varieties to three strains of BYDV

	C.I. No.	Illinois* BYDV	v5 ex Phleum	RPV	MGV
Clintland 60	7234	- **	4	1	0
Californian Red	1026	4	1	3	3
Fulghum	1833	4	-	0	3
Fulghum	3067	4	-	0	3
Saia	186606	1	-	0	3
Florikee	4637	4	-	0	0
Albion	729	1-2	-	0	0

* Based on data supplied by H. Jedlinski
** Not tested

These results show clearly that one strain of BYDV produced moderate infection on the oat varieties Saia C.I. 186606 and Fulghurn C.I. 3067 that had been described as field resistant to the virus in Illinois. The other interesting result was the different reaction of the Ottawa strain (V5) and the Cornell strains (MGV and RPV) on the varieties Clintland 60 and Californian Red. This result may be related in some way to the fact that Clintland 60 is used as the test variety at Ottawa while Californian Red is used at Cornell.

Rochow (4) has shown that the MGV strain of BYDV was the predominant one isolated in New York over a 2-year period; consequently, this strain, should it produce severe symptoms in the field, could menace the work on breeding oats resistant to BYDV. Strains of BYDV transmitted by Macrosiphum avenae have already been recorded from several areas including Washington, Mississippi, New York and England. This would suggest that they are probably widespread and could become quite prevalent when large areas of crops susceptible to these strains are grown,

It is likely that BYDV strains that are transmitted by Rhopalosiphum padi and that can severely affect Saia, already exist. In the oat resistance trial in New Zealand, where Saia was severely affected. the plants were artifically inoculated by using R. padi. The strain of BYDV in New Zealand is not efficiently transmitted by Macrosiphum avenae.

Literature Cited

1. ALLEN, T.C. 1957. Strains of barley yellow dwarf virus. Phytopathology 47: 481-490.
2. BRUEHL, G.W. and H.V. TOKO. 1957. Host range of two strains of cereal yellow dwarf virus. Plant Dis. Reptr. 41: 730-734.
3. ENDO, R.M. 1957. Evaluation of resistance in oats to the barley yellow dwarf virus. (Abstr.) Phytopathology 49: 744-748.
4. EPIDEMIC OF BARLEY YELLOW DWARF ON OATS IN 1959, THE 1959, Plant Dis. Reptr. Suppl. 262.

5. SLYKHUIS, J.T., F. J. ZILLINSKY, A.F. HANNAH and W.R. RICHARDS. 1959, Barley yellow dwarf virus on cereals in Ontario, Plant Dis. Reptr. 43: 849-854.
6. TOKO, H, V. and G. W. BRUEHL. 1957. Strains of the cereal yellow dwarf virus differentiated by means of the apple grain and English grain aphids (Abstr.) Phytopathology 47: 536.
7, WATSON, MARION A, and T. MULLIGAN. 1960. The manner of transmission of some barley yellow dwarf viruses by different aphid species. Ann. Appl. Biol. 48: 711-720.

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