TWO MECHANICALLY TRANSMISSIBLE VIRUSES IN CLOVER IN ALBERTA

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Abstract

Two viruses affecting clover in Alberta were tentatively identified as bean yellow mosaic virus and pea streak virus. They were found causing loss in clover breeding stocks, but they did not reduce winter hardiness. Pea streak virus was found to be widely distributed in the clover growing area, but neither virus appears to cause economic loss to commercial production at this time.

Introduction

Economic losses in clovers due to viruses have been reported throughout the world. In 1963 serious damage to seed production, presumably due to virus infection was noted in the field and greenhouse at Lacombe but symptoms were not widespread in commercial fields that year. In 1964 and 1965 surveys were conducted through central Alberta to determine the extent and distribution of viruses infecting clover. This report summarizes a study of the effect of viruses on overwintering of clovers and assesses their economic significance.

Materials and methods

Hosts listed in Table 1 were used to identify the viruses. The length and shape of the virus particles were determined by Dr. M.J. Pratt, C.D.A., Research Station, Vancouver. Infected plant material collected during surveys were inoculated into Chenopodium amaranticolor, Gomphrena globosa, and Vicia faba. Inoculum was prepared by grinding infected plant material in mortars with the addition of distilled water. The juice was then rubbed on the leaves of test plants, which had been dusted with carborundum or celite, with cotton pads. Symptoms on these three test plants and on clovers were considered sufficient for survey identification.

In the spaced-planted (2 x 3 ft) clover nursery, naturally-infected and healthy plants were labelled late in the fall of 1963 and 1964. The following spring the numbers of dead and live plants were recorded for the healthy and virus-infected groups.

Results and discussion

Two viruses were tentatively identified as bean yellow mosaic virus (BYMV), and pea streak virus (PSV) on the basis of host reaction and particle size, (BYMV - 7500 A, PSV - 6200 A). Inclusion bodies as described by McWhorter (4) were observed in Vicia faba inoculated with BYMV. The identifications were not verified by serological studies. Both viruses were found in red and alsike clovers (Trifolium pratense and T. hybridum). In addition, unidentified symptoms were occasionally found in white clover (T. repens), and sweet clovers (Melitolus officinalis and M. alba). The variability of the symptoms in red clover reported by Diachun and Henson (1) was confirmed (Fig. 1 - **A**). Clover plants infected with PSV showed very faint chlorotic leaf streaks (Fig. 1 - C). Symptoms were found both early and late in the season and appeared to be latent during mid-season.

Since it has been shown that some viruses reduce winter hardiness (*2*, **3**), a total of 2275 plants in 1963 - 1964 and 1180 in 1964 - 1965 were examined for the effect of virus infection on overwintering. No significant differences in survival between healthy and infected plants were found. However these were spaced plants in a vigorous condition not subject to competition and these observations may not be too applicable to field conditions.

The surveys in 1964 and 1965 showed that these viruses were widely distributed throughout the clover growing area of central Alberta (Fig. 2). Virus symptoms were also observed both years in the Peace River area but inoculations were not made.

Viruses were found in 15% - 20% of the fields examined. In all cases the proportion of infected plants was very low. Newly-established stands were not found to be infected and infection increased with the age of the stands. Pea streak virus was found to be more prevalent than BYMV and occasionally plants infected with both viruses were found.

The surveys indicate that these viruses are, at. present, not economically important in clover production.

Literature cited

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3. Oshima, N. and M. F. Kernkamp. 1957. Effects of viruses on overwintering of red clover in Minnesota. Phytopathology 47: 26.
4. McWhorter, F. P. 1957. Chlorazol fast pink b and trypanblue tests for virus and other proteinaceous inclusions. Stain Techn. 32: 135-138.

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Table 1. Symptoms observed on test plants inoculated with viruses from clover.

Host	Symptoms	
	BYMV	PSV
Trifolium pratense	Variable mosaic [a]	Faint leaf streak [a]
Trifolium hybridum	Variable mosaic	Faint leaf streak
Vicia faba	Systemic mosaic [a]	Necrotic rings [a]
Gomphrena globosa	None	Necrotic local lesions [a]
Chenopodium amaranticolor	Blotch or None	Chlorotic local lesions [a]
Pisum sativum		
'Perfected Wales'	Faint mosaic	Wilt and death
'Wisconsin Perfection'	None	Streak
Phaseolus vulgaris	Interveinal chlorosis	None
Glycine max	None	Chlorosis and stunting
Nicotiana tabacum	None	None

[a] Symptoms shown in Figure 1.

Necrotic rings [a]

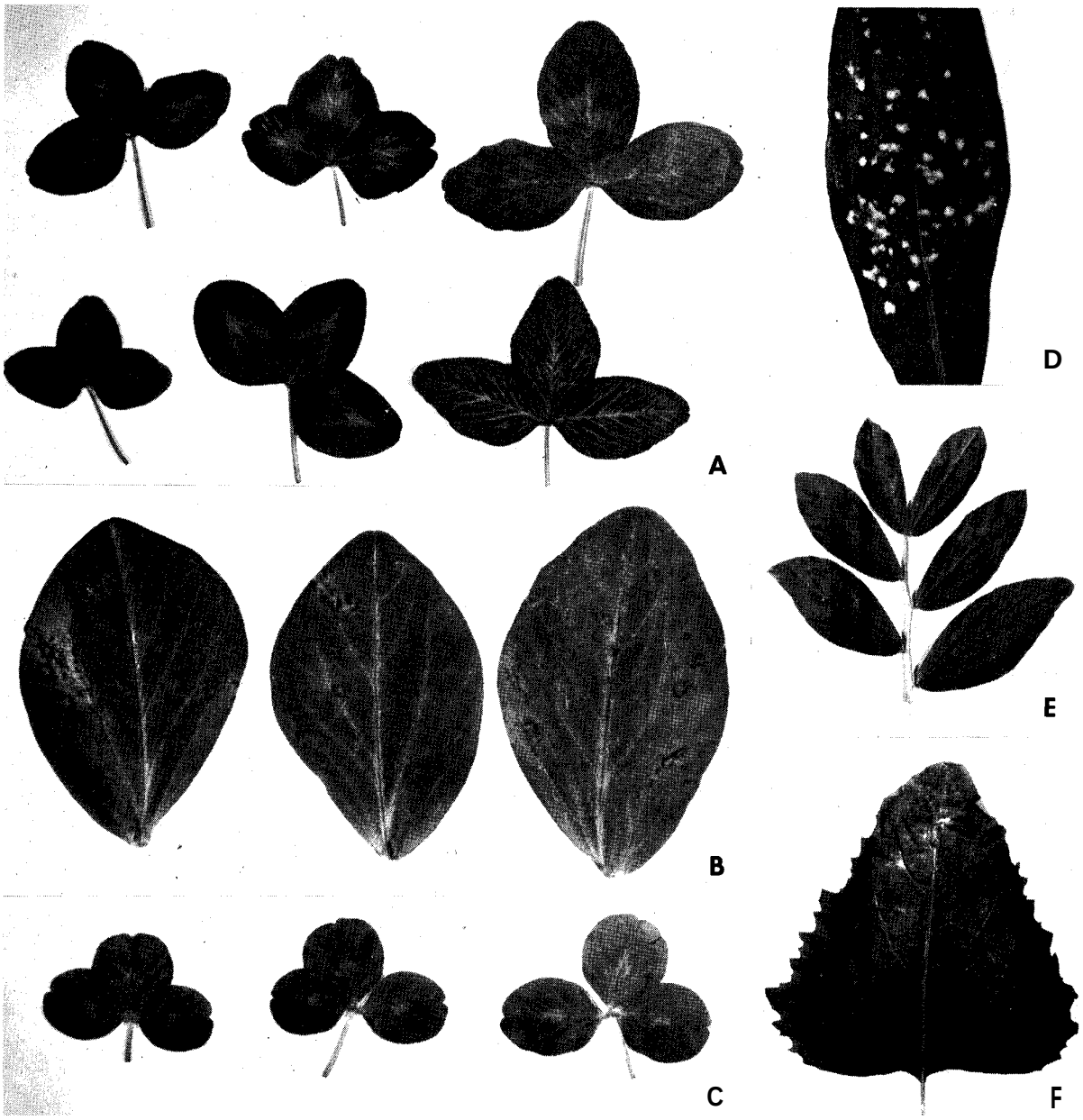

Figure 1. Virus symptoms on various host plants: A – Jrifolium protense infected with BYMV, B – *Vicia* foba infected with PSV showing necrotic rings, C – *Trifolium* protense infected with PSV, D – Gomphreno *globosa* infected with PSV showing necrotic local lesions, E – Vicio *faba* infected with BYMV showing mosaic symptoms, F – Chenopodium *amaranticolor* infected with PSV showing chlorotic local lesions.

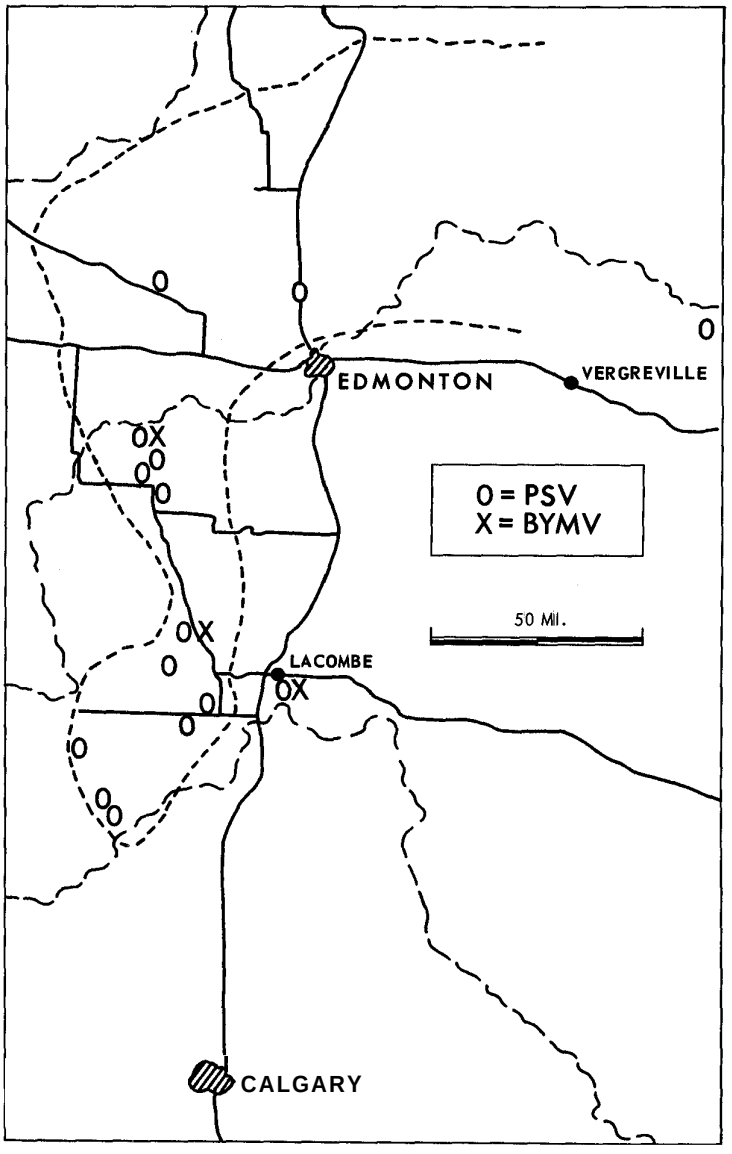

Figure 2. Distribution of viruses in central Alberta. Dotted line generally outlines the clover growing area.