Barley stripe mosaic in the Canadian prairies, 1974-75[1]

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In southern Alberta, southwestern Saskatchewan, and southeastern Manitoba, respectively, barley stripe mosaic (BSM) was detected in 41.1%, 20.0%. and 20.0% of the fields of two-row barley ***(Hordeurn distichum)*** surveyed in 1974 and in 45.2%. 30.0%, and 25.2% of those surveyed in 1975. The incidence of affected plants in these fields varied from a trace to 40%. In both years, the disease was encountered at generally low levels in a few fields of six-row barley ***(H. vulgare)*** in southern Alberta, but was not observed elsewhere in this crop. Evidence is presented which suggests that BSM in southern Alberta is widely distributed in Betzes barley, the most commonly grown two-row variety in this region.

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Dans le sud de l'Alberta, le sud-ouest de la Saskatchewan et le sud-est du Manitoba respectivement, la strie virale de l'orge a ete decelee dans 41.1, 20.0 et 20.0% des plantations d'orge a deux rangs ***(Hordeurn distichurn)*** echantillonnees en 1974, et dans 45.2, 30.0, et 25.2% respectivement de celles echantillonees en 1975. La frequence des plants atteints a varie de tres faible a 40%. Au cours des deux annees, la maladie a ete observee a des niveaux generalement bas dans quelques plantations d'orge a six rangs (H. ***vulgare***) du sud de l'Alberta, mais pas ailleurs pour la même culture. Tout porte a croire que la strie virale de l'orge du sud de l'Alberta est largement répandue chez l'orge Betzes, la variete à deux rangs la plus cultivée dans cette region.

Surveys for the seed-borne virus disease barley stripe mosaic (BSM) were conducted in southern Alberta, southwestern Saskatchewan, and southeastern Manitoba from July 1 to 26, **1974,** and in the same regions and in southwestern Manitoba from June **27** to July **15, 1975.** Fields of either two-row barley ***(Hordeurn distichum*** L. emend. Lam.) or six-row barley (H. ***vulgare*** L. emend. Lam.) in the early tillering to soft dough stage were generally examined at intervals of about 5 miles along preselected routes. In **1975,** however, only fields of two-row barley were examined in southwestern Saskatchewan and southwestern Manitoba. The surveys in southwestern Saskatchewan were confined to a single route, primarily along Highways 1 and **13** between the Alberta-Saskatchewan border and Assiniboia. In southwestern Manitoba a single route along Highway **2** between the Saskatchewan - Manitoba border and Holland was surveyed. The most intensive surveys for BSM were conducted in southeastern Manitoba and southern Alberta, since previous surveys (2, **3, 4)** suggested that the disease was most common in these regions. In southeastern Manitoba surveys were made along routes passing through Crop Reporting Districts **3, 4,** 5, 6, and **12** (7), while in southern Alberta they were made along routes passing through Agriculture Reporting Areas 1, **2,** and **3 (1).** In each field where BSM was detected leaf samples were collected from plants with symptoms, and the presence of barley stripe mosaic virus (BSMV) was verified by infectivity and serological tests (3).

Data on acreage occupied by specific barley varieties were obtained from reports prepared by the three Wheat Pools. Since a small acreage of barley in these reports is listed under the category of "other varieties", statistics calculated from these data and reported in this paper should be considered approximations.

The results of surveys for BSM in **1974** and **1975** are summarized in Table 1. In two-row barley, the disease was observed in all regions surveyed except southwestern Manitoba. It was detected most frequently in this crop in southern Alberta, where the average proportion of affected plants in surveyed fields was 2.6% and **1.6%** in **1974** and **1975,** respectively. In six-row barley, BSM was detected in a few fields in southern Alberta but was not observed elsewhere.

The distribution of BSM in fields of two-row barley in southern Alberta in **1975** is shown in Fig. 1. The disease was detected throughout the region surveyed and differed little in its distribution from the previous year. The proportion of acreage of two-row barley occupied by different varieties in southern Alberta in **1974** and **1975** is presented in Table **2.** These data, compared with the proportion of two-row barley fields in which BSM was detected in southern Alberta in these years (Table 1), strongly suggests that the disease was encountered primarily in fields of the variety Betzes.

BSMV has been detected in breeder seed of Compana barley **(4)** and, therefore, it is likely that BSM occurs in most, if not all, commercial fields of this variety. The proportion of acreage of two-row barley occupied by Compana in southern Alberta, however, was much too low to account for the relatively high proportion of two-row barley fields in which BSM was detected in this region in **1974** and **1975.** BSMV has not been detected in breeder seed of any other barley variety currently grown commercially in Canada **(4,** and Chiko, unpub-

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Table 1. Occurrence of barley stripe mosaic (BSM) in fields of two– and six–row barley in the Canadian prairies in 1974 and 1975

Region, type of barley and year of survey	No. fields examined	No. fields affected*	% fields affected	No. fields in each infection category (% of plants with BSM)				
				Tr	I–5	6–10	11–20	21–40
Southern Alberta								
2–row 1974	56	23	41.1	9	5	5	2	2
2–row 1975	73	33	45.2	18	7	4	3	1
6–row 1974	29	3	10.3	2		1		
6–row 1975	26	3	11.5	3				
Southwestern Saskatchewan								
2–row 1974	5	1	20.0					1
2–row 1975	10	3	30.0	1	2			
6–row 1974	10	0	0.0					
Southwestern Manitoba								
2–row 1975	7	0	0.0					
Southeastern Manitoba								
2–row 1974	115	23	20.0	15	5		2	1
2–row 1975	107	27	25.2	16	5	2	3	1
6–row 1974	25	0	***0.0***					
6–row 1975	29	0	***0.0***					

* BSMV transmitted to Black Hulless barley and reacted with BSMV antiserum.

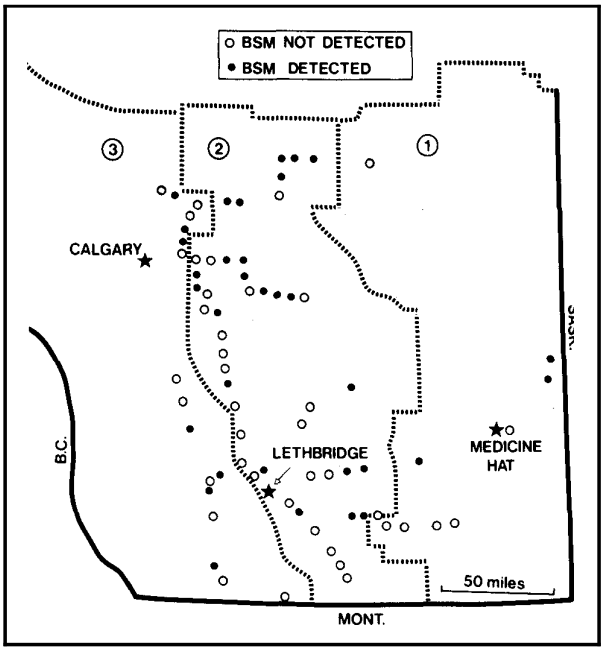

Figure 1. Distribution of barley stripe mosaic in fields of two-row barley in southern Alberta in 1975. Numerals designate Agriculture Reporting Areas, which are delimited by broken lines.

lished), and thus its origin in most growers' fields is unknown. Several possible ways in which the virus might contaminate previously virus-free barley crops have been discussed (4). With respect to the possibility of infected wild grasses serving as sources of contamination, it may be worthy to note that BSMV was recently found to occur naturally and to be seed-borne in wild oats (*Avena fatua* L.) (6).

In Manitoba almost all the two-row barley grown in recent years has consisted of the varieties Herta and Fergus, which were licensed for sale in Canada in 1956 arid 1968, respectively. In 1971, BSM in two-row barley in this province appeared to be confined to the older variety Herta (3), but traces of the disease were detected in a few fields of Fergus the following year (4). Changes in the occurrence of BSM in two-row barley and in the varietal composition of the crop in southeastern Manitoba from 1971 to 1975 are shown in Fig. 2. From 1971 to 1973, a decline in the proportion of acreage of two-row barley occupied by Herta was accompanied by a decline in the proportion of two-row barley fields with BSM. The proportion of acreage occupied by Herta continued to decline in 1974 and 1975 but this was accompanied by increases in the proportion of two-row barley fields with BSM (cf. Fig. 2A and 2B). These increases could be attributable to the

Table 2. Percentage of acreage of two–row barley occupied by different varieties in southern Alberta in 1974 and 1975

Variety	Date licensed	% of acreage* 1974	1975
Betzes	1960	85.8	83.3
Palliser	1960	8.8	7.8
Compana	1949	3.7	–
Hector	1973	0.8	7.3
Centennial	1967	0.8	1.6

* Combined estimates for Agriculture Reporting Areas 1, 2, and 3.

disease recently becoming more common in fields of Herta or Fergus, or both. From 1971 to 1975 there has been a slight upward trend in the average proportion of two-row barley plants with BSM (Fig. 2C). Results of a survey for BSM in Manitoba in 1970 (2) were not included in Fig. 2 because a relatively small number of two-row barley fields were examined that year, and because disease incidence was based on rough approximation rather than on counts of plants (5), which were made in all succeeding years.

In North Dakota, where BSM was very common in the 1950's and early 1960's, the disease was eradicated by rapid changes to new virus-free barley varieties (8). In Manitoba, varietal changes probably had little effect on the occurrence of BSM in two-row barley because such changes were gradual and incomplete. Even rapid changes to new virus-free barley varieties may not permanently eliminate the disease, however, as evidenced by the fact that BSM was recently again encountered at low levels in North Dakota (R. G. Timian, personal communication).

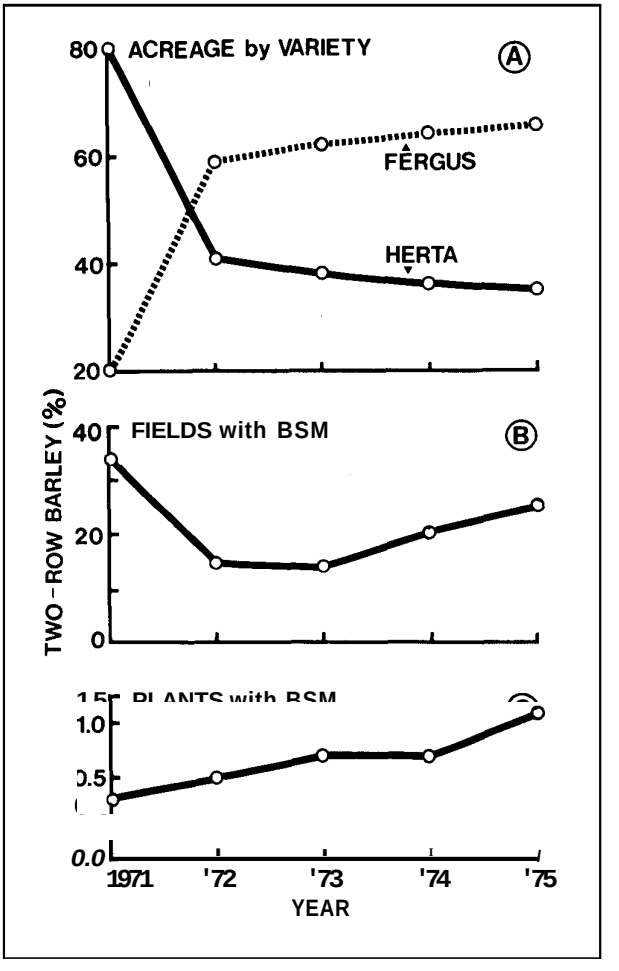

Figure 2. Varietal composition of and barley stripe mosaic (BSM) incidence in two-row barley in southeastern Manitoba from 1971 to 1975. A) Percentage of acreage of two-row barley occupied by the varieties Herta and Fergus (combined estimates for Crop Reporting Districts 3, 4, 5, 6, and 12). Other varieties, which occupied a small amount of acreage in some years, have been disregarded. B) Percentage of surveyed fields of two-row barley in which BSM was detected. C) Average percentage of two-row barley plants with BSM in surveyed fields. Data for 1971 to 1973 in B and C were obtained from previous reports (3, 4, 5).

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