Sclerotinia contamination of Alberta-produced rapeseed, from 1976-1981

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Variation in the shipment of carlots of Alberta rapeseed contaminated with ***Sclerotinia*** occurred between and within the years 1976-1981. The number of shipping points delivering contaminated seed varied from 6 in 1978 to 28 in 1980. Shipping points in an area north and west of Edmonton generally delivered contaminated seed in each year studied, but the areas around Red Deer and southeast of Edmonton shipped high numbers of carlots with contaminated seed in 1980 and 1981 only.

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Entre les années 1976 à 1981 on retrouve de la variation dans les expeditions de graine de colza contaminée par ***Sclérotinia***. Le nombre de point d'expédition ayant des chargement contarnines passe de 6 en 1978 à 28 en 1980. Les points d'expedition situés dans la region au nord et à l'ouest d'Edmonton ont généralement expédié des chargements contaminés chaque année étudiée tandis que ceux situés dans les regions autour de Red Deer et au sud-est d'Edmonton n'en ont expédié un nombre élevé qu'en 1980 et 1981.

Introduction

High levels of contamination of Alberta rapeseed by sclerotia of ***Sclerotinia sclerotiorum*** (Lib.) de Bary were reported by the Canadian Grain Commission (CGC) in the mid 1970's (2). The increased levels of contamination were presumably due to increases in the severity of Sclerotinia stem rot of rapeseed. The CGC reports indicated that certain areas in Alberta were producing more contaminated rapeseed than others; these reports were used to study variation in production of contaminated seed between locations within each year, and from yeartoyear, from 1976-1981.

Materials and methods

The CGC reports list the carlot origin, number of sclerotia/500 gm sample and date of sampling for all carlots received at the Vancouver terminal. These data were used to calculate the average number of sclerotia/sample for each shipping point in Alberta, on an annual basis. The crop year ran from August 1 to July 31, thus some carry-over of crop from year to year occurred. Also, as rapeseed is frequently stored on the farm for a year or more, it was impossible to guarantee that shipments were made in the harvest year.

All shipping points that delivered rapeseed with an average of 10 or more sclerotia/500 gm sample were considered to produce seed of a high contamination level. The tolerance limit set by Plant Products Division, Agriculture Canada, for all No. 1 rapeseed (Foundation, Certified and Canada) is 1 sclerotium/50 gm seed, thus carlots containing more than 10 sclerotia/500 gm would not qualify as No. 1 seed.

The shipping points delivering contaminated seed were plotted on separate maps of Alberta for each year (Figure 1, A-F). Only shipping points delivering 5 or more contaminated carlots in one year were included, thus each square on the map represents a minimum of 272 tonnes of contaminated rapeseed (assuming an average carlot weight of 54.4 tonnes) delivered to Vancouver. Information on the contamination levels of rapeseed delivered to other terminals, or used in the crushing industry was not readily available, and therefore was not included. Farmers whose rapeseed is badly contaminated with sclerotia may clean the seed before sending it to the elevator, and this factor also was not taken into account.

Results and discussion

The number of shipping points in Alberta delivering rapeseed to Vancouver, and the total number of carlots shipped, declined in 1977 and 1978, increased in 1979 and 1980 and then declined in 1981 (Table 1). The percentage of points shipping contaminated seed and percentage of contaminated carlots declined in 1977 and 1978, and increased in the next three years. The total provincial production figures are not necessarily a direct reflection of production from specific districts and the increase in percentage of contaminated carlots in 1981, when overall rapeseed production declined, could be caused by at least three circumstances: 1) an increase in rapeseed production in areas with a Sclerotinia problem with a decline in production in other areas less favourable for disease 2) a decline in production in areas less favourable for disease 3) an overall increase in disease levels.

The incidence of contaminated seed production varied with location, both within and between years. The six shipping points delivering contaminated seed in 1978, also delivered contaminated seed in almost all years (Fig. 1). These localities seemed to be favourable for disease development every year. The area north of Edmonton appeared more favourable for disease development than the area south of Edmonton in 1976-1979, but in 1980 and 1981 large amounts of contaminated seed were shipped from the Red Deer area and the area southeast of Edmonton. When the annual production and contamination levels are considered for shipping points that delivered contaminated seed in 1980 and/or 1981, it can

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be seen that both total number of carlots shipped and percentage of carlots delivering contaminated rapeseed increased dramatically in those two years (Table 2). In 1976-1979 the average number of sclerotia/sample for all carlots shipped each year from both areas, was less then 10 sclerotia. Four shipping points in the Red Deer area did deliver contaminated seed in 1976-1977, but seed from the majority of the shipping points was not considered contaminated. The

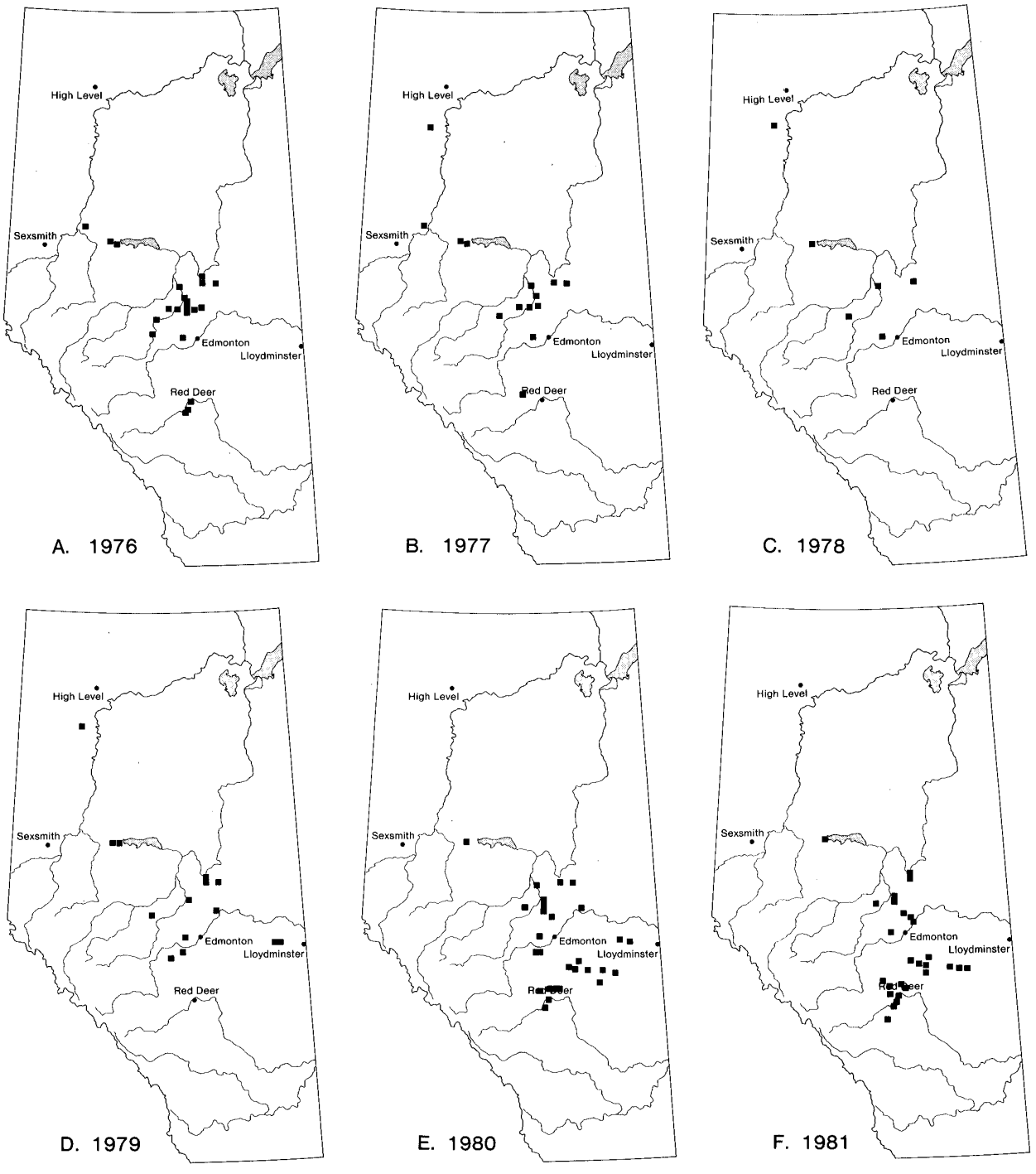

Figure 1. Areas in Alberta shipping contaminated rapeseed; A-F, 1976-1981. Each ■ represents a shipping point that delivered 5 or more carlots, having an average of 10 or more sclerotia/500 gm sample, to Vancouver.

increase in the average contamination level of rapeseed from the Red Deer area in 1981 and the increase in percentage of carlots delivering contaminated seed from both areas in 1981 suggests that contamination levels do not merely reflect changes in production levels.

Table 1. Annual variation in origin and amount of rapeseed production in Alberta, and percentage of shipping points and carlots with contaminated seed.

Year	No. of points shipping rapeseed	% points shipping contaminated rapeseed	Total no. carlots shipped	% contaminated carlots
1976	145	14.5	1131	34.1
1977	126	11.1	780	31.8
1978	127	4.7	703	17.1
1979	134	10.5	889	27.8
1980	153	18.3	1051	33.5
1981	129	20.9	797	55.0

The variation in production of contaminated seed each year is most likely related to weather conditions during the growing season. Weather conditions, which included soil temperature, rainfall, number of days of rain and sunshine were reported to have a tremendous influence on the severity of stem rot of rapeseed in Germany (3). High humidity and presence of petals and/or pollen are both essential for infection of beans by S. *sclerotiorum* (1) so rainfall during the flowering period is likely to have a critical effect on infection of rapeseed. Unfortunately the lack of detailed rainfall data for shipping point localities in Alberta makes it difficult to study the correlation between rainfall patterns and contaminated seed production.

The mapping of annual production of contaminated seed is useful in predicting areas where Sclerotinia stem rot may be a problem. When large amounts of contaminated seed are produced in one area the number of sclerotia in the soil after harvest will be high. If conditions favourable for ascospore production occur during the flowering period of the crop in the following year then severe disease levels are probable. However it appears that severe outbreaks of disease can occur in areas where previous production of contaminated seed has been neglibible; this is demonstrated by the high level of contaminated seed production in the area southeast of Edmonton in 1980. In 1979 the ascospore levels of S. *sclerotiorum* in the south east area were considered sufficient to cause appreciable levels of disease if climatic conditions suitable for infection occurred (4). The low levels of average sclerotia/sample (Table 2) would probably be sufficient to produce the ascospore inoculum necessary to initiate high levels of disease in 1980.

The maps presented here have been reported, in modified form, at Canola Industry and Growers meetings in Alberta, and at the Oilseeds and Special Crops Sub-committee meeting in Saskatoon, 1982, to indicate where Sclerotinia stem rot has been a problem in past years, and where it may occur in the future.

Table 2. Annual total carlot delivery, percentage of carlots with contaminated seed and average number of sclerotia/carlot sample for areas around Red Deer and southeast of Edmonton.

	Red Deer area[a]			Southeast of Edmonton area[b]		
Year	Total carlot delivery	% carlots with contaminated seed	Av. no. sclerotia/carlot sample	Total carlot delivery	% carlots with contaminated seed	Av. no. sclerotia/carlot sample
1976	66	69.7	5.8	27	0	5.7
1977	62	0	5.8	7	0	2.9
1978	51	0	4.1	35	0	3.4
1979	14	0	4.5	44	0	4.5
1980	115	88.7	11.4	119	85.7	13.3
1981	267	99.2	26.7	94	90.4	13.2

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