DISEASES OF RAPE, MUSTARD AND CRUCIFEROUS WEEDS IN THE PRAIRIE PROVINCES

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Introduction

Rape acreage in the Prairie Provinces in 1966 was 3% lower than in 1965. However, due to an 11% increase in yield, to 17.4 bushels per acre the estimated total seed production is 24.1 million bushels, greater than in 1965 by 1.5 million bushels. In Saskatchewan, a record 620,000 acres were sown to rape which has now replaced flax as most extensively grown oilseed crop in the province. Saskatchewan rapeseed production is expected to be 12 million bushels in 1966 *(2)*.

Precipitation in early spring was generally below average. However, from June to August most centers visited during the main disease surveys received above-normal rainfall, particularly during August. Slightly subnormal temperatures were recorded during July and August over much of the rape-growing area (1).

Materials and methods

Several disease surveys were made during the period from June to mid-October. The area included in the main surveys made in August extended from north-central Alberta through Saskatchewan into northwestern Manitoba. Sixty fields of crucifers, including 52 of rape and eight of yellow mustard were rated for disease. Routine isolation of fungi and tests for pathogenicity were rnade in the same manner as in previous years (3).

Results and discussion

Ratings for the major diseases found on rape during the general survey are presented in Table 1 in which comparisons with 1965 figures have been made.

Leaf, stem and pod spots caused mainly by Alternaria brassicae (Berk.) Sacc. were much more in evidence than in 1965. In late June and early July the lower leaves of rape in many fields in the Humboldt-Melfort area bore numerous greyish spots. In August, black stem and pod spots were plentiful, particularly in fields in the Swan River area of Manitoba, where seed infestation is likely to be considerable. Yellows (aster yellows virus) was again noticeable, especially in some rape plots at Saskatoon. Mycosphaerella brassicicola (Duby) Lind., the cause of ringspot of rape, while occurring in a larger number of fields, was generally less severe than in the previous summer. Many fields across the Prairies were seeded late in 1966, and fields of widely varying maturity could be found in most districts. A strong impression was obtained that ringspot attacks older, senescent plants to a greater extent than younger ones. This is why the earlier-maturing Polish rape varieties such as 'Arlo' and 'Echo' appear to be more susceptible than the later-maturing Argentine varieties such as 'Golden', Nugget' and 'Tanka'.

Table 1. Rape disease Survey, 1966. Disease rating for 52 fields. (The 1965 figures are given in brackets for comparison.)

Disease organism	Tr.	Sl.	Mod.	Sev.	% of total fields infected
Albugo cruciferarum	15* (25)	25 (25)	29 (10)	10 (5)	79 (65)
Peronospora parasitica	2 (2.5)	8 (2.5)	10 (0)	2 (5)	22 (10)
Sclerotinia sclerotiorum	13 (12.5)	12 (5)	10 (5)	4 (5)	39 (27.5)
Alternaria spp. (A. brassicae & A. raphani)	13 (--)	38 (--)	17 (--)	4 (-)	72 (--)
Mycosphaerella brassicicola	27 (10)	27 (12.5)	15 (35)	0 (7.5)	69 (65)
Yellows (aster yellows virus)	33 (22.5)	6 (5)	6 (2.5)	0 (0)	45 (30)

*Figures in each category are % of fields sampled.

Albugo cruciferarum S.F. Gray, the cause of white rust and staghead, was again one of the most destructive pathogens encountered. Some plots near Saskatoon, as well as fields near Duck Lake and Wakaw in Saskatchewan, and Morinville, Redwater and Vermilion in Alberta were particularly badly infested. Slightly raised, brown stem lesions about two centimeters long containing typical Albugo oospores were frequently found on rape, especially in a few Alberta fields. In several instances where these occurred on some of the larger stems it appeared that they may have been responsible for a greater reduction in yield than that attributable to individual medium-sized hypertrophies at the tops of inflorescences. A variety of pathogens, of which Peronospora parasitica (Pers. ex Fr.) Fr., Fusar-

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ium spp., Alternaria brassicae, and A. raphani Groves and Skolko were the main ones were found in association with Albugo on rape hypertrophies. The conidial stage of Peronospora was more conspicuous than it has been for several years.

Although relatively few fields of yellow mustard (Brassica hirta Moench) could be examined, some interesting observations were made. Sclerotinia stem rot (Sclerotinia sclerotiorum (Lib.) de Bary)' was by far the most noticeable disease. In the August surveys it occurred in 63% of the fields, with 38% of these being rated "moderate" to "severe". In a few fields near Annaheim and Middle Lake, Sask., at least 75% of the stems were severely rotted in low-lying areas. Ascospore infection was suspected in many instances where lesions had started high up on the stems. The staghead disease (Albugo cruciferarum) was not found in any mustard fields examined. Yellows (aster yellows virus) and Alternaria (A. brassicae and A. raphani) occurred in trace amounts in about 25% of these fields. A basal stem rot caused by Fusarium spp. in association with Rhizoctonia solani Kühn was recorded on B. hirta collected near Cudworth, Sask., also in trace amounts. Fusarium acuminatum (Ell. & Ev.) Wr. and F. poae (Pk.) Wr. were isolated. Fusarium acuminatum was also found causing a foot rot of rape near Saskatoon. In former years, F. acuminatum, F. poae, F. equisiti (Cda.) Sacc. and F. solani (Mart.) App. & Wr. emend. Snyder & Hansen have been isolated from rape in Saskatchewan.

Pycnidia of the blackleg fungus Plenodomus lingam (Tode ex Fr.) Höhn. (=Phoma lingam (Tode ex Fr.) Desm.) were extremely abundant on overwintered zero erucic acid rape stubble (Brassica napus L.) at Saskatoon in May of this year. Both the "rape" and "Sisymbrium" types (3) were obtained in culture. The fungus still persisted on surface trash in October. Blackleg was found once again in 1966 experimental plots at several sites near Saskatoon. The yearly field survey for P. lingam was centered in the Annaheim-Lake Lenore area of Saskatchewan, the region in which it continues to be most prevalent on cruciferous crops. Blackleg was, however, less prevalent on stubble than it was last fall, perhaps due to drier conditions in September of this year. Although it was found in 71% of the fields examined, including all five fields of B. hirta from which samples were taken, ratings were only in the order of "trace" to "slight". On the other hand, the "Thlaspi" type (3) was again found on stems of T. arvense in most centers of rape production in Saskatchewan and Alberta. In addition, plants with prominent leaf spots from which the "Thlaspi" strain was isolated were collected in late June and early July at Saskatoon and several locations near Melfort. This is the first time that conspicuous leaf symptoms have been observed in the field. The whitish-brown lesions, dotted with numerous small black pycnidia, were commonly a centimeter or two in length, oval or irregular in shape, and without sharply-defined borders. With age they enlarge to destroy entire leaves, the withered remains of which often clasped the stems, frequently giving rise to further lesions there.

Many miscellaneous collections of cruciferous plants yielded rape parasites. These observations have been brought together in Table 2. Of special note are the severe infestation of yellows (aster yellows virus) on Brassica kaber var. pinnatifida and the occurrence of Alternaria brassicae and A. raphani as moderately severe pod and stem spots of Thlaspi arvense.

Damage caused by 2, 4-D drift was of two types (Fig. 1), the particular symptom observed depending upon the degree of development of the rape crop at the time the spraying was carried out. Proliferation of tissue at the stem base, the most common type of damage, often results from spraying of nearby cereal fields in June when the rape plants are still quite young. This symptom was observed at several locations in the course of the summer. In addition, young plants with basal and apical stem enlargements were received from a field near Lloydminster in July. At flowering time the upper portions of the flower stalks may be rendered sterile by 2, 4-D drift which may result from spraying for brush control. This was observed in a field near Margo, Sask., in which about 40% of the plants had their potential seed yield reduced by one- to two-thirds. It was also observed in a field near Swan River, Manitoba.

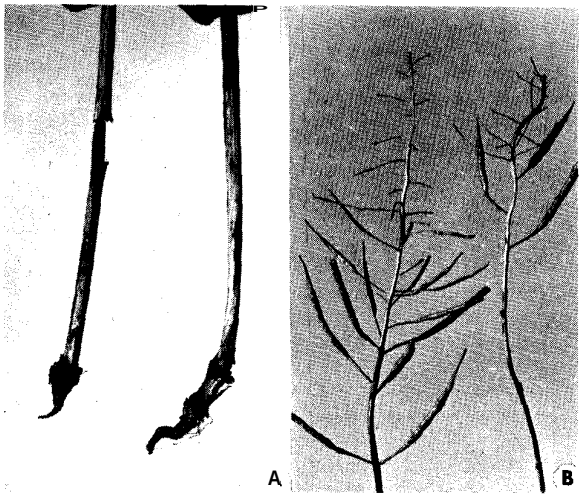

Figure 1. Two types of 2, 4-D damage on rape. Left—Proliferation of tissue at the stem base. Right—Sterility of upper portions of flower stalks.

In many fields a much milder form of sterility at the apices of rape plants was attributed to heat and lack of moisture at a critical stage in development.

Small whitish-grey raised areas uniformly distributed over the leaves of rape plants appeared in the Humboldt area in June (Fig. 2). They appeared to occur at the bases of epidermal hairs and were believed to be intumescences resulting from water congestion of the tissue. Sections prepared from affected leaves did not reveal tissue alteration sim-

Table 2. Miscellaneous disease observations, 1966.

Host	Disease	Severity	Location
Brassica kaber (DC.) L.C. Wheeler var. pinnatifida (Stokes) L. C. Wheeler.	Yellows (aster yellows virus)	Sev.	Rape field, near Margo, Sask.
	Albugo cruciferarum	Tr.	Mustard field, near Annaheim, Sask.
Capsella bursapastoris (L.) Medic.	Peronospora parasitica	Mod.	.Margo, Sask.
Thlaspi arvense L.	Sclerotinia sclerotiorum	Tr.	Rape field, Warspite, Alta.
	Yellows (aster yellows virus)	Tr.	Mustard field, Cudworth, Sask.
	Alternaria brassicae and A. raphani	Mod.	Pod and stem spot, near Melfort, Sask.
Lepidium sp.	Alternaria brassicae	Tr.	
Chinese cabbage (Brassica pekinensis (Lour.) Rupr.)	Yellows (aster yellows virus)	Sev.	Saskatoon.
Radish (Raphanus sativus L.)	Alternaria raphani	Sl.	Irrigation plots, Saskatoon.

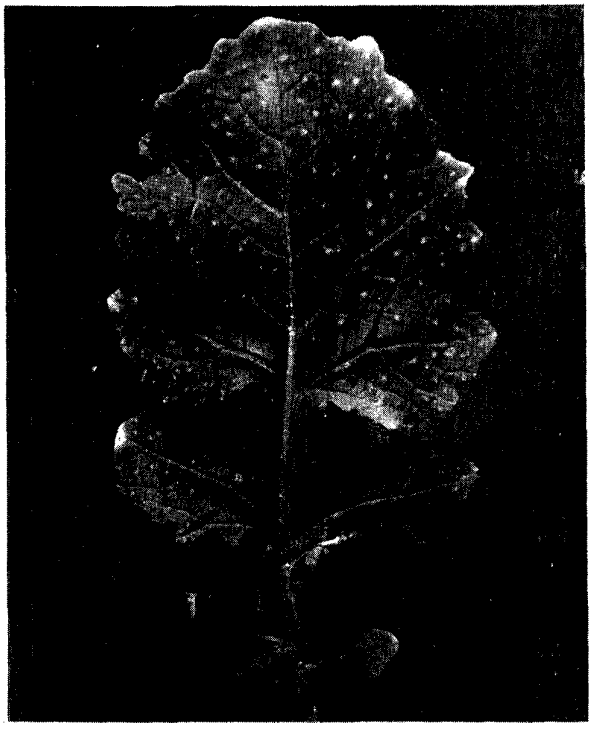

Figure 2. Intumescences on a rope leaf.

ilar to that described by Wolf **(4)** and further studies of them are being made.

It may be clearly seen from the survey results that the majority of the common rape diseases have increased in severity since 1965, which was itself a year very favorable for disease development. The persistence and spread of rape diseases on weeds, although perhaps not yet a major factor in the disease situation, should nevertheless be mentioned once again, as it appears to be definitely increasing on the Prairies. All the important rape pathogens have been collected on at least one common weed species during the last twoyears. White rust, blackleg, sclerotinia stem rot, and alternaria black spot are good examples of diseases having wide host ranges on weeds.

Acknowledgment

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