PATHOGENS OF THE SEEDLING BLIGHT OF CANOLA IN ALBERTA

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INTRODUCTION

Seedling blight of canola (Brassica campestris and B. napus), which is a pre- and post-emergence damping-off disease, has been a serious problem in Alberta for the past many years. While precise loss estimates through this disease have not been made, the disease can destroy up to 100 per cent of a canola crop or it could partially thi. it out. The losses may result from mortality of the seedlings and through reduced vigor of the surviving plants. Many farmers over-seed to compensate for the effects of seedling blight.

While several reports on this disease have been published from Saskatchewan, little information is available from Alberta (Acharya et al., 1984; Kaminski and Verma, 1985; Yitbarek et al., 1987). This paper reports on the isolation and identification of the causal agents of the seedling blight of canola in Alberta. A few brief reports on this work have been published (Calman and Tewari, 1984, 1987; Calman et al., 1986; Furuya and Tewari, 1985).

MATERIALS AND METHODS

During 1984, canola seedlings were collected from a total of 73 fields located in northern, central and southern Alberta. In each field, collections were made from 20 equidistant locations at 1 meter intervals along an inverted V-shaped transect. To reduce boundary effects, the initial and the final sampling sites were no closer than 10 meters from the field boundary. From each field, 40-50 canola seedlings showing the blight symptoms were collected. The seedlings collected belonged to the growth stage 1 (Harper and Berkenkamp, 1975) and up to the formation of the first set of true leaves. Using standard methods, the pathogens were isolated on broad-spectrum and selective media for isolation of fungi.

Pathogenicity experiments were conducted with many isolates of the presumptive pathogens. The methodology (including inoculum production, determination of inoculum density, etc.) was standardized using B. campestris cv. Candle. Finally, the pathogenicity experiments were conducted in growth cabinets using B. campestris cvs. Candle and Tobin and B. napus cvs. Altex and Westar.

For anastomosis group (AG) typing of Rhizoctonia solani isolates, about 3 mm^2 of the colony was cut from the margin of an actively growing colony and placed on 2% water agar plate opposite a similar inoculation of a tester AG strain. Most isolates were purified by single hyphal isolation before testing. The tester AG strains (AG1, AG2-1, AG2-2, AG3, AG4 and AG5) were kindly supplied by Dr. N.A. Anderson, Dept. of Plant Pathology, University of Minnesota. Each test was run in duplicate and rated for fusion and killing reactions (Anderson, 1982).

RESULTS AND DISCUSSION

A number of fields surveyed showed patchy distribution of canola seedlings (Fig. 1). The disease symptoms included small to up to a few cms long brownish to blackish lesions and constrictions on the hypocotyl (Fig. 2), tapering of the hypocotyl and evidence of lesion formation and rotting of the roots.

Of the 2,299 cultures isolated from the field collected diseased seedlings, 777 (33.8%), 404 (17.6%) and 134 (5.8%) belonged to the genera Rhizoctonia, Fusarium and Pythium, respectively (Table 1). The remaining cultures (984 or 43.1% of the total) have been grouped as 'Others' in Table 1. These belong to many diverse groups of fungi. Some of these are deemed to be contaminants during isolation while others have been shown to be mycoparasites of the three pathogen genera (Tewari and Furuya, unpublished data).

Pathogenicity testing with most of the presumptive pathogens has satisfied Koch's postulates. However, the degrees of virulence varied considerably among the isolates. Highly virulent strains were present in all the three genera tested. The pathogenic species, so far identified, include Rhizoctonia solani, Fusarium avenaceum, F. acuminatum, Pythium paroecandrum, P. sylvaticum, and P. sp. Group G. Of the isolates of R. solani tested for AG affiliations, 183 (95.8%) belonged to AG2-1, four (2%) belonged to AG4 and affinities of five (2.6%) isolates are still inconclusive (Table 2).

Table 1. Number of Various Fungi Isolated from Diseased Canola Seedlings Collected from Alberta during 1984

Census Division	Number of Fields Sampled	Total Number of Seedlings Plated	Total Number of Cultures Isolated	Numbers of Cultures of Fungi Isolated			
				Rhizoctonia	Fusarium	Pythium	Others
2	7	276	135	35	14	6	80
5	9	320	313	142	4	17	110
6	2	46	13	5	2	0	6
8	2	76	56	20	2	1	33
10	12	342	218	88	26	22	82
11	18	681	425	166	42	30	187
13	1	28	11	7	1	2	1
15	22	880	1128	314	273	56	485
Total	73	2649	2299	777	404	134	984

Table 2. Anastomosis group typing of Rhizoctonia solani isolates from canola seedlings in Alberta.

No. of fields from which R. solani was isolated/no. of fields sampled	No. of R. solani isolates obtained	AG affiliations of the isolates			
		No. of isolates tested	AG2-1	AG-4	Inconclusive
22/22[a]	272	72	69	1	2
26/31[b]	270	64	60	3	1
15/18[c]	167	56	54	0	2
Total 63/71	709	192	183	4	5

Fields located in northern (a), central (b) and southern (c) Alberta.

The results presented here give information on the pathogens that become associated with canola seedlings after they have emerged from the ground, as seedlings mostly in the post-emergence phase were sampled from the field during this study. There is evidence that Pythium spp. may be preferentially associated with the pre-emergence phase of the disease (Calman and Tewari, 1987).

This study has indicated that the seedling blight of canola in Alberta is caused by multiple pathogens and that control measures, to be adequate, must address to all these pathogens belonging to diverse groups of fungi. The preponderance of AG2-1 isolates of R. solani in Alberta may explain the high incidence of the seedling blight of canola in this province.

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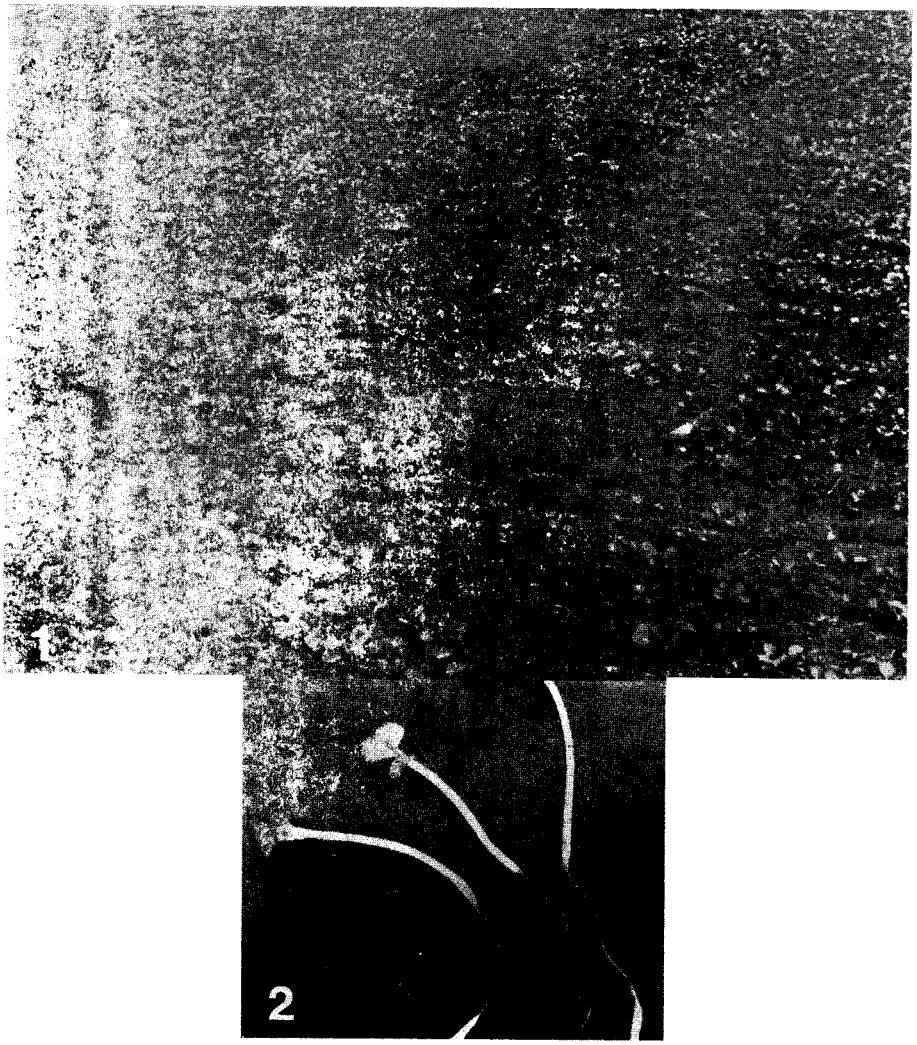
LEGEND

Fig. 1. A canola field near Vegreville, Alberta showing patchy distribution of plants associated with the seedling blight disease.

Fig. 2. Seedlings of canola showing lesions and constrictions on the hypocotyls due to the seedling blight disease.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