Dark Leaf and Pod Spot (*Alternaria brassicae)* on Oilseeds (*Brassica napus*) in Lithuania

I. BRAZAUSKIENE and E. PETRAITIENE*

Plant Protection Department, Lithuanian Institute of Agriculture, Academy Dotnuva, LT-5051, Kėdainiai District, Lithuania

**E-mail: brazausk@lzi.lt*

Abstract

Dark leaf and pod spot caused by *Alternaria brassicae* (Berk.) Sacc. is a serious problem both in winter and spring oilseed rape (*Brassica napus* L.) in Lithuania. According to ten years' data, the spread of this disease on winter oilseed rape siliques was 31.2–100%, and the severity 3.4–25.0%. The cultivars Ceres, Accord and Kasimir were used in the trials. Through the years 1997–2001 the incidence of *Alternaria* blight on spring oilseed rape (cv. Star and Maskot) was 94.5–100% and the severity 1.5–20.5%. Every year the severity of the disease was highly influenced by the meteorological conditions – precipitation and temperature. Fungicides, used at the end of flowering stage (DC 69) or when the first spots of the disease appeared on pods, were effective against dark pod spot.

Keywords: *Alternaria* blight; incidence and severity; prochloraze; tebuconazole

INTRODUCTION

Dark leaf and pod spot caused by *Alternaria brassicae* (Berk.) Sacc. is one of the most important fungal diseases of oilseed rape in Poland, Germany, England and other countries (DAEBELER *et al.* 1988; FRENCEL *et al.* 1991). The incidence and severity of this disease is largely dependent on the air temperature and humidity. If several weeks before oilseed rape harvesting optimal conditions for the appearance of *Alternaria* blight infection occur, or if these conditions are close to optimal, a disease epidemic can arise (HONG *et al.* 1996). Optimal conditions for the disease development at this stage often occur in India (AWASTHI & KOLTE 1989). Oilseed rape plants are completely non-resistant to this disease, therefore its control is based on soil and crop management practices and fungicide use (HONG & FITT 1995; DUCZEK *et al.* 1999). Numerous studies have been conducted in various countries with a view to determining the efficacy of fungicide application against various fungal diseases of rape (ANSARI *et al.* 1990; BOLTON & ADAM 1992), however, there is no unanimous opinion concerning fungicide application timing against black spot. This article presents the data on black spot incidence and severity on winter (WOSR) and spring oilseed rape (SOSR) siliques in Lithuania in relation to meteorological factors such as temperature, precipitation and relative air humidity, as well as the data on fungicide efficacy against this disease.

MATERIALS AND METHODS

Field experiments were carried out at the Plant Protection Department, Lithuanian Institute of Agriculture during 1991–2001. The trials were conducted with WOSR and SOSR. Net plot size was 22 m^2 (2.2 ×10 m, 12.5 cm between rows), with four replications. Two fungicides – Sportac 45% (a. i. prochloraze) and Folicur 25% (a. i. tebuconazole) were tested for the efficacy. Dark leaf and pod spot incidence (% of diseased siliques) and severity (% of the silique surface covered with disease) were assessed using a scale of KRÜGER (1991) on 30 siliques from each plot. Meteorological data (daily temperature, precipitation and relative air humidity) were taken from the Dotnuva weather station, located aprox. 500 m from the experimental field. The following morpho-physiological traits were measured on plants from each plot: (1) disease incidence and severity on siliques (weekly after first spots

appeared), (2) growth stage of plants, (3) days from first spots appeared on siliques to complete ripeness (harvesting), (4) seed yield in kg/ha, (5) 1000 seed weight in g.

RESULTS

Over a 10-year period the incidence of *Alternaria* blight on siliques of WOSR at the ripening stage in all experimental years, except 1993 and 2000, was 95–100%. The disease severity in individual years differed more than the disease incidence and ranged from 3.4 to 25.0%. In SOSR during a 5-year period only 1997 was noted as extremely unfavourable for the development of this disease (Table 1). Experimental evidence suggests that the first spots of black spot appear on both WOSR and SOSR siliques at growth stage 75, in some years even later, at growth stage 79 or even 81 (Table 2). The period from the appearance of the first spots of *Alternaria* blight on siliques to complete ripeness is 32–40 days, only in 2000, when cool weather prevailed during ripening stage, the period on WOSR lasted for as long as 53 days. There were great differences between mean daily air temperature, amount of precipitation and relative air humidity during the period of disease development on both WOSR and SOSR siliques. The year of 1997 was extremely warm and dry. During the whole period from the appearance of the first spots of *Alternaria* blight on WOSR and SOSR siliques to full ripeness the air temperature was above 15°C, in WOSR there were 23, in SOSR 26 days without rainfall, and the

Table 1. Intensity of *Alternaria* blight occurrence (%) and disease severity (%) on winter and spring oilseed rape siliques in 1991–2001

	Winter rape			Spring rape		
	Cultivar	Incidence	Severity	Cultivar	Incidence	Severity
1991	Ceres	97.5	16.1	–	–	–
1992	Ceres	31.2	3.4	–	–	–
1994	Ceres	97.5	11.1	–	–	–
1995	Ceres	100	9.6	–	–	–
1996	Ceres	95.5	8.2	–	–	–
1997	Accord	91.0	12.5	Star	94.5	1.5
1998	Accord	100	25.0	Star	99.0	18.6
1999	Accord	100	15.5	Star	100	13.9
2000	Accord	55.8	6.1	Maskot	100	13.4
2001	Kasimir	100	8.2	Maskot	100	20.5

Table 2. Appearance of first spots of *Alternaria* blight on siliques of winter and spring oilseed rape and time to harvesting in 1997–2001

	Winter rape			Spring rape		
	first spots on siliques		time from first spots to harvesting (days)	first spots on siliques		time from first spots to harvesting (days)
	date	growth stage		date	growth stage	
1997	06.27	79	35	07.31	75	33
1998	06.19	81	34	07.30	79	40
1999	06.14	75	36	07.12	79	38
2000	06.02	81	53	08.07	79	37
2001	06.18	79	32	07.23	75	30

Table 3. Effect of fungicide treatment at the end of flowering on severity (%) of *Alternaria* blight on siliques and seed yield (kg/ha) of spring and winter oilseed rape in 1997–2001

Rape		1997	1998	1999	2000	2001
Disease severity						
Spring	prochloraze	1.04 a	12.35 a	7.01 b	7.42 b	3.67 b
	tebuconazole	0.29 b	5.83 b	0.70 bc	6.03 b	2.64 b
	control	1.46 a	18.65 a	13.90 a	13.39 a	12.05 a
Winter	prochloraze	7.20 b	11.25 a	4.18 b	2.94 b	3.42 b
	tebuconazole	6.15 b	10.45 a	1.06 bc	2.18 b	2.16 b
	control	13.50 a	15.46 a	9.86 a	12.62 a	8.25 a
Seed yield						
Spring	prochloraze	2510 a	2861 b	2482 b	1922 a	1594 b
	tebuconazole	2580 a	3012 b	2556 b	1940 a	1898 bc
	control	2282 a	2331 a	2320 a	1951 a	1203 a
Winter	prochloraze	2759 a	3464 b	3427 b	2713 a	2514 a
	tebuconazole	3222 b	3627 b	3290 b	2855 b	2735 a
	control	2560 a	2651 a	2766 a	2559 a	2452 a

mean daily air humidity during the greater part of the period was below 70%. In 1998 and 2000 cooler weather (mean daily temperature 10–15°C) prevailed during the period of *Alternaria* blight development on siliques, however, more abundant precipitation and mean daily relative air humidity above 70% had a positive effect on disease severity on winter and spring rape siliques. According to 5 years' data the spray application of prochlorase or tebuconazole gave a statistically significant rape seed yield increase in three years out of five (Table 3). Having sprayed with prochlorase at the end of owering winter rape seed yield increased statistically significantly only in two years out of five experimental years, and having sprayed with tebuconazole the yield significantly increased in four years out of five.

DISCUSSION

The experimental evidence suggests that under Central Lithuania's growing conditions, *Alternaria* blight can be harmful for both winter and spring oilseed rape, but its development on siliques greatly depends on temperature, precipitation and relative air humidity. Meteorological factors had a more marked effect on the disease severity than on the incidence. The significance of the length of temperature and moisture period on *Alternaria* blight infection and disease severity has been confirmed by the experiments of HONG and FITT (1995), HONG *et al*. (1996), carried out under controlled and glasshouse conditions. The period from the appearance of the first spots on siliques in the cool year of 1998 was 10 days longer than in 2001, which also had a positive effect on the incidence of disease on siliques. With a view to reducing the harmfulness of black spot some researchers recommend cutting oilseed rape plants in swaths, which shortens ripening period (DUCZEK *et al*. 1999). Very diverse meteorological conditions occur during winter and spring rape ripening stage every year. They vary every day, and various combinations of these factors occur within a day, which makes forecasting of the disease difficult. This fact has also been acknowledged by HONG and FITT (1995). The use of fungicides is economically sound only in the years when favourable conditions for *Alternaria* blight incidence and development on siliques occur.

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