

MAJOR FUNGAL DISEASES OF OILSEED RAPE (*BRASSICA NAPUS*) IN LITHUANIA

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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 fifteen years' data, the incidence of this disease on winter oilseed rape siliques ranged from 4.8 to 100 % and the severity from 0.05 to 25.0%. Through the years 1997-2006 the incidence of *Alternaria* blight on spring oilseed rape was 20.0-100% and the severity 0.2-20.5 %. Each year the severity of the disease was highly influenced by the weather conditions - precipitation and temperature. The second important disease was phoma stem canker (*Phoma lingam*, teleomorph *Leptosphaeria maculans*) on winter and spring oilseed rape stems. The largest number of affected winter oilseed rape stems was identified in 2004 and 2005 (83.2 and 81.0%, respectively). Other fungal diseases, such as downy mildew (*Peronospora parasitica*), sclerotinia stem rot (*Sclerotinia sclerotiorum*), grey mould (*Botrytis cinerea*), occurred in WOSR and SOSR crops only in separate experimental years.

Key words: *Alternaria* blight, phoma stem canker, winter and spring oilseed rape

INTRODUCTION

Oilseed rape is a major oil crop whose cultivation area is increasing annually in Lithuania. The largest oilseed cultivation area and the highest yields are obtained in the regions of Central Lithuania. However, oilseed rape productivity is still insufficiently high and part of rapeseed yield is lost annually to diseases.

Various literature sources provide information on the incidence and severity of *Alternaria* blight (*Alternaria brassicae*) in Canada (Tewari, 1991), India (Kolte et al. 1987), Bangladesh (Meah et al. 1988). In European countries involved in oilseed rape production this disease is also very common – such evidence was obtained in Poland (Sadowski et al. 2003), France (Brun et al. 1987), Great Britain (Fitt et al. 1999). It is noteworthy that *Alternaria* blight is a serious problem in Denmark and Switzerland, however, it is not relevant in Sweden, Germany or the Netherlands (Bromand, 1990). Weather conditions, especially air temperature and precipitation, have a great effect on *Alternaria* blight severity in different years (Awasthi and Kolte, 1989).

Phoma stem canker or dry stem rot (*Phoma lingam*, anamorph – *Leptosphaeria maculans*) is often found in oilseed rape crops (Hall et al. 1993). The disease is more widespread in Australia, Canada, England, France, and Germany - large oilseed rape producers, where the weather conditions are conducive to the occurrence of this disease (West et al. 2001). In our neighbouring countries - Poland, Denmark, Sweden this disease is widespread but is not very destructive (Jedrzycka et al. 1999; Kuusk et al. 2002).

Downy mildew is considered a less harmful oilseed rape disease (Sadowski et al., 2002), however, it is very widespread and harmful in vegetable *brassicas* (Coelho and Monteiro, 2003).

Sclerotinia stem rot occurs worldwide (Howlett et al. 2001). In Sweden this pathogen is very important in *Brassica napus* and *Brassica rapa*. In the case of heavy infection the yield reduction amounting to 60% may be incurred (Twengstrom and Sigvald, 1998).

Based on research conducted at the Lithuanian Institute of Agriculture some data have been already published on the spread and harmfulness of fungal diseases and efficacy of their control measures (Brazauskiene, 1998; Brazauskiene and Petraitiene, 2003, 2004). This research was designed to identify the main fungal diseases in winter and spring rape crops grown in Central Lithuania, to estimate their incidence and severity on stems and siliques.

MATERIAL AND METHODS

Observations were done for fifteen years (1991-2006) in the central part of Lithuania on winter oilseed rape (WOSR) and for ten years (1997-2006) on spring oilseed rape (SOSR) stands. The experiments were done with the WOSR varieties Ceres (1991-1996), Accord (1997-1999), Kasimir (2000-2002, 2005), Casino (2003-2004) and Libea (2006) and the SOSR varieties Star (1997-1999), Maskot (2000-2004) and Landmark (2005-2006). The crops were grown following LIA's technologies approved for this crop.

These observations were carried out at two growth stages. At development of fruit (BBCH 70-79) disease occurrence was assessed on siliques and at ripening (BBCH 80-89) on stems. Growth stages were identified according to the scale described by Lancashire et al., 1991.

To estimate the incidence and severity of fungal diseases stem samples were pulled at a representative place of a field (10 stems per place, in total 100 stems per field). Silique samples were also picked - 5 earliest-formed (lower) siliques from the main stem of 50 plants (in total 250 siliques per field). All stem and silique samples were analysed in the laboratory.

Alternaria blight severity on stems and siliques was estimated according to the scale described by Conn et al., 1990, (0, 1, 5, 10, 20, 30 and 50% of stem or silique surface area is covered by *Alternaria* blight spots).

The severity of Phoma stem canker was estimated according to 0-4 score scale, where 0 – stem without visible Phoma stem canker symptoms, 1 – Phoma dry rot covers less than half of the root neck perimeter, 2 – the rot covers more

than half of the perimeter, but root neck is incompletely girdled by Phoma rot, 3 – root neck is completely girdled by Phoma rot but the plant is not broken, 4 - root neck is completely girdled by Phoma rot, the plant is broken at Phoma stem canker lesion place, and is precociously mature (Chigogora and Hall, 1995).

RESULTS

During our research the most damaging disease on WOSR and SOSR was *Alternaria* blight. The disease symptoms were observed both on leaves, stems and siliques. However, the disease occurrence was higher on siliques than on leaves or stems. Long-term experimental evidence indicates that *Alternaria* blight occurs on WOSR and SOSR siliques at the end of silique formation stage (BBCH 79) – beginning of ripening stage (BBCH 81) when the weather conditions are especially conducive to the disease development on siliques.

Over a 15-year period the incidence of *Alternaria* blight on siliques of WOSR at the ripening stage in all experimental years, except for 1992-1993, 2000 and 2006, ranged from 55.8 to 100% (Table 1). The disease severity in separate years differed more than the disease incidence and ranged from 0.05 to 25.0%. In SOSR during a 10-year period only 2006 was noted as extremely unfavourable for the development of this disease. In 1998-2001 the severity of *Alternaria* blight was higher than in the other experimental years.

Our experimental findings suggest that both winter and spring rape crops were equally susceptible to *Alternaria* blight. No significant differences in susceptibility to this disease were identified between different varieties.

Table 1. The incidence (%) and severity (%) of *Alternaria* blight on WOSR and SOSR siliques in 1991-2006

	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	Kasimir	55.8	6.1	Maskot	100	13.4
2001	Kasimir	100	8.2	Maskot	100	20.5
2002	Kasimir	65.8	1.7	Maskot	64.2	0.8
2003	Casino	99.2	2.1	Maskot	99.8	1.8
2004	Casino	76.4	1.5	Maskot	100	11.0
2005	Kasimir	100	4.72	Landmark	100	6.4
2006	Libea	4.8	0.05	Landmark	20.0	0.2

The second important disease on WOSR and SOSR was phoma stem canker on stems.

Phoma stem canker was found every experimental year on stems of WOSR and SOSR, but the disease incidence was not very high (1994-2003) (Table 2).

Table 2. The incidence % of phoma stem canker on stems of WOSR and SOSR in 1994-2005

	Winter rape		Spring rape	
	Cultivar	Incidence	Cultivar	Incidence
1994	Ceres	25.0	-	-
1995	Ceres	34.2	-	-
1996	Ceres	8.9	-	-
1997	Accord	4.2	Star	0
1998	Accord	30.0	Star	27.8
1999	Accord	37.9	Star	22.3
2000	Kasimir	36.5	Maskot	30.0
2001	Kasimir	35.4	Maskot	2.5
2002	Kasimir	18.2	Maskot	13.4
2003	Casino	36.7	Maskot	37.5
2004	Casino	83.2	Maskot	35.2
2005	Kasimir	81.0	Landmark	44.0

Over the 10-year period the weather conditions were unfavourable for the development of this disease. Disease symptoms on WOSR and SOSR stems appeared only at ripening stage, therefore they did not do any considerable harm. Experimental evidence suggests that the disease affected from 4.2 to 37.9 % of winter rape stems and from 2.5 to 37.5 % of spring rape stems, except the year 1997 when this disease was not found in the SOSR on stems.

The incidence of Phoma stem canker in WOSR and SOSR crops has been rapidly increasing lately. The largest number of affected WOSR stems was identified in 2004 and 2005 (83.2 and 81.0%, respectively). The disease incidence on SOSR stems was recorded in 2005, it amounted to 44.0%. Our experiments suggest that spring oilseed rape was more tolerant to phoma stem canker, compared with winter oilseed rape.

Other fungal diseases such as downy mildew (*Peronospora parasitica*), sclerotinia stem rot (*Sclerotinia sclerotiorum*), grey mould (*Botrytis cinerea*) occurred in WOSR and SOSR crops only in separate experimental years. Downy mildew symptoms were observed at early growth stages and only on bottom leaves of WOSR and SOSR but at low intensity. All experimental years were unfavourable for the development of stem rot, except for 1997 and 1998 when sclerotinia rot affected WOSR stems accounted for 29.2 and 30.0%.

CONCLUSIONS

Alternaria blight is one of the most important fungal diseases of winter and spring oilseed rape in Lithuania. Our experimental findings suggest that both winter and spring rape crops were equally susceptible to *Alternaria* blight.

Spring oilseed rape was more tolerant to phoma stem canker, compared with winter oilseed rape.

It is likely that the steadily increasing winter and spring rape cultivation area may result in the occurrence of other diseases specific to these crops.

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