

AN INVESTIGATION ON THE OCCURRENCE AND CONTROL OF DOWNY
MILDEW ON WINTER RAPESEED

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SUMMARY. The observation of many fields indicate that downy mildew occurred every year in autumn and in spring. In autumn, about 30% of leaves were infected. In spring, the incidence and severity of the disease were differentiated from 20-80%. Higher doses of potassium did not effect the severity of the disease, whereas nitrogen caused an increase. Ridomil was of high effectivity, other fungicydes had less or no effect. However, some of them increased the yield of seeds considerably even more than Ridomil.

INTRODUCTION

A common pathogen occurring on rape in Poland - *Peronospora parasitica* has not been thoroughly examined hitherto. According to the author's own observation /Sadowski 1987/ and reports of the Institute of Plant Protection, it occurs in various parts of Poland and frequently at high severity. However, there may be observed the lack of more precise information on its destructive effects under Polish weather conditions.

In other countries, there are also relatively few papers on the occurrence and severity of downy mildew on rape and some authors state that the disease is unlikely to cause major losses in yield, others notice the necessity of control /Downy and Bolton 1961, Rawlinson and Muthyalu 1979, Brokenshire and Prasanna 1984, Hornig 1985/. More attention was paid to incidence and control of *P. parasitica* on brassicas vegetable /Natti 1959, Davi-

son et al. 1962, D'Ercole 1975, White et al. 1984/.

The purpose of the investigation carried out was determining the intensity of downy mildew on winter oilseed rape in various parts of Poland, the determination of infection rate in monoculture and crop rotation, the effect of differentiated fertilizing as well as the possibility of control by using fungicides.

MATERIAL AND METHODS

The incidence and severity of the disease of many commercial crops in various regions of Poland were examined in the years 1983-86. In the autumn and spring there was estimated the healthiness of 200 plants selected at random on four various places and the infection of all mature leaves was recorded.

The infection of rape in monoculture and crop rotation was examined in the demonstration field at Bałcyny belonging to the Academy of Agriculture and Technology in Olsztyn and at Mochełek belonging to the Technical-Agricultural University in Bydgoszcz. The rotation of crops was as follows: sugar-beet, field pea, barley, rape, wheat and broad bean. The experiment has been conducted since 1968. At Mochełek, rape has been cultivated in a six-year rotation: sugar-beet, field pea, barley, rye, rape, wheat and in a three-year rotation: rye, wheat, rape and in monoculture as well. The experiment has been conducted since 1965.

The occurrence of *P. parasitica* in relation to fertilization was observed in the demonstration field of the Agricultural Chemistry Department situated at Wierzchucinek. In the year 1982/83 there was observed the effect of differentiated nitrogen and potassium fertilization, and in the year 1983/84 four ways of fertilization: the cultivation of rape in the second year after manure without mineral fertilization; NPK at a dose of N-200 kg, P_2O_5 -160 kg, K_2O -200 kg; the cultivation at a full dose of manure and accompanied by mineral fertilization as listed above and a combination without fertilization.

The effect of fungicide sprays on the incidence of downy mildew was examined in the years 1984-86 in the demon-

strations field at Mochełek, with four replications on plots of 16 m². Since, during the first year of the experiment there was obtained a higher yield of seeds also in the plots where fungicides mildly limiting incidence of *P. parasitica* were sprayed, than in the plots where no sprays were applied, the number of fungicides selected according to the control other diseases, was increased in the following years. Besides, there were carried out three experiments on the effect of control *P. parasitica* in autumn on wintering of rape.

In each of the experiments there was estimated the severity of infected mature leaves on 50 plants from the plot according to 0 - 5 scale /Sadowski 1987/.

RESULTS AND DISCUSSION

Observation of many commercial crops indicate that downy mildew occurred in autumn and spring every year. Severity depended on rainfall and temperature. In dry periods the development of the pathogen was reduced. In spring the incidence and severity of the disease were differentiated in particular years. In 1983, the number of mature leaves infected by the fungus reached 25% and 0.5 degree; in 1984 - 80% and 3.0; in 1985 - 90% and 2.9; in 1986 - 20% and 0.5 degree.

Higher doses of potassium did not have any effect on the disease severity, while nitrogen caused its increase. In autumn, in the field with no fertilization there were more leaves with the disease symptoms as compared to the plants cultivated in the field where dung and mineral fertilizers were applied, whereas in spring a more severe infection was noticed in the plots fertilized.

In autumn plants growing in monoculture for many years were infected more severely than those grown in the rotation of crops. In spring, no differences were noticed:

In 1984, the pathogen was nearly completely controlled by Ridomil /metalaxyl/ and the compounds of the symbols IPO /experimental compounds produced by the Institute of Organic Industry in Warsaw, Poland/ applied twice. The effect of Dithane M-45 and Cynkomiedzian was low. However, it

should be noted that IPO compounds acted phytotoxically. This negative effect on plants is seen in the seeds yield. It was as follows: Ridomil - 2.76 t/ha, IPO 2584 C - 2.47 t/ha, IPO 2584 A - 2.25 t/ha, Dithane - 2.65 t/ha, Cynkomiedzian - 2.40 t/ha and without spray - 2.46 t/ha. The differences among particular fungicydes were not proved statistically but there was noticed a tendency to a yield increase when Ridomil or Dithane were used.

An increase in yield obtained as the result of applying Dithane which, practically, did not cause an infection decrease, offered a possibility of further sprays in the following years against other disease. The fungicydes and their effect on downy mildew and the seeds yield are presented in Table 1.

Table 1.

Effect of fungicydes on downy mildew and yield of winter rapeseed in 1985

Treatments ^x		% L	DI	Yield t/ha
Ridomil MZ 58 WP	metalaxyl +mankozeb	19	0.20	3.60
Ridomil Plus 45 WP	metalaxyl+oxy- chloride copper	20	0.20	3.58
Ronilan	vinclozoline	65	1.91	3.46
Rovral	iprodione	74	1.12	3.39
Dithane M-45	mankozeb	52	1.06	3.14
Cynkotox	zineb	69	1.87	3.07
Untreated	-	82	1.87	3.07
LSD /P=0.05/		15.1	0.36	0.22

^xFoliar sprays applied on 9 May and 30 May; % L - percentage of leaves infected; DI - disease index, see text

The fungicydes containing metalaxyl reduced very efficiently the incidence of downy mildew. Other fungicydes

had a poor effect. However, despite their poor effect, the fungicides Ronilan and Rovral resulted in considerable increase in seeds yield as compared to the plants grown in the plots with no sprays.

The results obtained in 1986 are presented in Table 2.

Table 2

Effect of fungicides on downy mildew and yield of winter rapeseed in 1986

Treatments ^x		Number of sprays	% L	DI	Yield t/ha
Rovral	iprodione	2	7	0.08	5.23
Sportak/Tilt	prochloraz propikonazol	2	9	0.10	4.96
Ronilan	vinclozoline	2	9	0.10	4.92
Cynkomie- dzian	zineb+oxychloride copper	2	9	0.10	4.79
Dithane M-45	mankozeb	2	2	0.08	4.78
Euparen/Bay- leton	dichlofluanid, triadimefon	2	3	0.03	4.74
Sportak	prochloraz	1	8	0.08	4.74
Tilt	propikonazol	1	6	0.07	4.66
Ronilan	vinclozoline	1	11	0.12	4.61
Dithane M-45	mankozeb	1	3	0.03	4.63
Rovral	iprodione	1	4	0.04	4.60
Ridomil Plus 45	metalaxyl+oxychloride copper	2	0	0	4.58
Ridomil Plus 45	metalaxyl+oxychloride copper	1	2	0.03	4.51
Cynkomie- dzian	zineb+oxychloride copper	1	5	0.06	4.54
Untreated	-	-	6	0.07	4.31
LSD /P=0.05/			8.1	0.09	0.28

^xFoliar sprays applied on 6 May /1/ or 6 and 22 May /2/;

% L - percentage leaves infected; DI - disease index;
see text

It may be clearly seen that pathogen severity was slight.
It was probably caused by little rainfall and higher than

usually air temperatures in June and July. However due to the use of fungicydes, a considerable yield increase was obtained. The highest yield was obtained when the fungicydes Rovral, Sportak, Tilt and Ronilan were applied twice. The increase was the result of significant reduction of the incidence of other pathogens, mainly *Alternaria*, *Botrytis* and *Sclerotinia*, by the use of the fungicydes.

The experiments with control downy mildew by the use of Ridomil in autumn once, twice or three times proved that this intervention had no significant effect on the better wintering rape. In spring, the number of plants on sprayed plots was similar to those which were not treated with fungicyde.

The observation of many commercial crops made us state that *P. parasitica* can occur commonly and at a high severity on rape in Poland. However, despite its high severity a decrease in yield is not always considerable which was proved by the research on fungicydes application. The yield on the plots where the pathogen was reduced evidently, was higher than in case of untreated plants, but it was still lower than on plots sprayed with Rovral or Ronilan which did not reduce the pathogen. Thus, downy mildew may be considered as a less dangerous disease in Poland despite its common occurrence. This is according with Rawlinson and Muthyalu's /1979/ suggestions about the disease in England.

A high efficacy of metalaxyl was found during the examination of the usefulness of some fungicydes for control *P. parasitica*. The fungicyde reduced almost completely the pathogen development and protected the plants from further infection. The statement regarding good results of metalaxyl in the control downy mildew is convergent with the opinions of other authors who use this compound in case of various brassicas /White et al. 1981, Evans and Gladders 1985/.

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