

EFFECTS OF PESTICIDE AND FERTILIZER INPUT REDUCTION ON PLANT DISEASES AND YIELD IN OILSEED RAPE

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ABSTRACT

In 1993 and 1994, field trials were carried out as a part of the "IOBC working group on integrated control in oilseed rape" to investigate the effects of a reduction of fungicides, insecticides and nitrogen fertilizer in different susceptible varieties. The experiments were conducted lead through with three different seed densities (42, 84 and 126 seeds/m²). The most important disease was blackleg (pathogen: *Phoma lingam*), and the earliest stage to score clear differences in the susceptibility of the varieties with respect to blackleg was in DC 85 (ripening stage). SAMOURAI was the most, MAXOL the least susceptible variety. Fungicide applications lead to a reduction of blackleg, and an increase in yield was estimated. The yield response varied depending on the level of susceptibility of the variety. In 1993, higher plant densities lead to a slight reduction of blackleg without any effects on yield. In 1994, a stronger infestation of downey mildew (*Peronospora parasitica*) was observed, and an increase of the infestation was supported by a higher level of nitrogen fertilization.

INTRODUCTION

Decreasing prices require a reduction of all cost factors in oilseed rape production. The input of fungicides, herbicides and insecticides has to be reduced, as much as the input of fertilizer and seed quantity must be optimized. The effects on pests and diseases and the yield response must be investigated under these new conditions.

MATERIALS AND METHODS

Field trials were carried out in two successive years. The experiments had three replications, the plot size was 36 m². Pests and diseases which occurred were scored with the frequency of scoring depend on the appearance of the pathogens in generaling and

averaging five. For the control of fungal diseases in autumn and spring FOLICUR (1,2 l/ha, a. i. 250 g/l Tebuconazole) was used. For the control of fungal diseases in the flowering stage with special regard to *Sclerotinia sclerotiorum* VERISAN (3 l/ha, a. i. 255 g/l Iprodion) was used. The fungicide treatments were spring application, spring + flowering application and autumn + spring + flowering application. Nitrogen was applied at 150 kg/ha and 200 kg/ha. The seed densities were 42 seeds/m², 84 seeds/m² and 126 seeds/m². The grown varieties were ENVOL, FALCON, IDOL, LIRAJET, MAXOL, SAMOURAI and ZEUS.

EXPERIMENTAL

Fungicide effects in varieties with different susceptibility are shown in table 1. In 1994, the appearance of blackleg was higher than in 1993, and so were the effects of fungicides on the degree of the infestation and the yield response. The strongest effects on blackleg were obtained with the combined application in autumn, spring and at the flowering stage. The highest decrease of the intensity of blackleg symptoms and the highest yield response were obtained in SAMOURAI. The yield increase was caused not only by reducing blackleg but also lodging.

TABLE 1: Effect of fungicide treatments in oilseed rape on blackleg (pathogen: *P. lingam*) and the yield, Braunschweig 1993

	TREATMENT			
	CONTROL	SPRING	SPRING +	AUTM. +
SPRG.+				
disease index blackleg			FLOWERG.	FLOWERG.
scoring 1 - 9/ Ø varieties	3,9 a	3,6 b	3,5 c	3,2 d
SAMOURAI	4,7 a	4,3 b	3,9 c	3,6 d
MAXOL	3,3 a	3,2 a	3,2 a	3,0 b
ZEUS	3,9 a	3,7 a,b	3,4 b,c	3,2 c
yields in dt/ha (91 % dry matter)				
Ø Varieties	39,0 c	41,6 b	43,7 a	43,7 a
SAMOURAI	35,4 c	40,0 b	42,4 a,b	43,6 a
MAXOL	39,7 b	43,5 a	44,2 a	44,6 a
ZEUS	41,3 b	40,7 b	43,7 a	44,2 a

In 1993, blackleg symptoms were reduced by increasing plant densities. On the average of the varieties the disease index was reduced from 3,9 (42 seeds/m²) to 3,5 (84

seeds/m²) and 3,4 (126 seeds/m²). The plants in the variants with lower plant density showed a higher infestation by insects causing stem damages. A promotion of blackleg by the stem damaging beetles seems possible (table 2).

TABLE 2: Effect of different seed densities in oilseed rape on blackleg (*P. lingam*) and the incidence of stem damaging insects (Braunschweig 1993, Scoring date 03.06.93, values of the average of the varieties)

	SEED DENSITY		
	42 seeds/m ²	84 seeds/m ²	126 seeds/m ²
blackleg (root collar, scoring 1 - 9)	3,2 a	3,0 b	2,9 c
incidence stem damaging in %	26,8 a	16,5 b	16,4 b
blackleg (stem, scoring 1 -9)	2,7a	2,3 b	2,1 c

The level of nitrogen fertilizer had no obvious effect on blackleg, whereas downey mildew (*Peronospora parasitica*) was influenced. The reduction of the nitrogen input reduced the incidence and severity of downey mildew (table 3). The varieties had a different susceptibility, FALCON and ZEUS showed a higher degree of infestation by *P. parasitica*. An effect on the yield caused by downey mildew could not be observed.

TABLE 3: Infestation of oilseed rape with downey mildew (*P. parasitica*), Braunschweig 1993, scoring date 07.06.93; Incidence (INC) in % plants with symptoms and severity (SEV) in % leaf area with symptoms

nitrogen level	VARIETY						
	ENVOL	FALCON	IDOL	SAMOURAI	LIRAJET	MAXOL	ZEUS
150 kg N/ha							
INC	66,3 b	80,4 a	62,9 b	63,3 b	63,8 b	52,1 b	82,5 a
SEV	5,1 b	9,9 a	4,9 b	4,9 b	6,0 b	3,8 b	10,9 a
200 kg N/ha							
INC	78,7 b	93,4 a	79,6 b	80,4 b	78,8 b	67,5 b	90,8 a
SEV	9,8 b	19,0 a	9,8 b	9,7 b	9,4 b	5,9 b	19,7 a

The investigations prove the importance of growing varieties with low susceptibility against fungal diseases. The results indicate that the effect of a reduction of the seed density and the nitrogen level on diseases on oilseed rape is of lesser importance.