BUILD UP OF DISEASES WITH INTENSIFICATION OF OILSEED RAPE IN ENGLAND

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INTRODUCTION

The area of the oilseed rape crop in England and Wales has expanded from 24.5×10^3 ha in 1974 to 55.0×10^3 ha in 1977. Survey work was initiated in south-east England (where about 30% of the crop area is located) in the season 1975-76 to determine the incidence and severity of diseases in winter oilseed rape. The survey was continued during 1976-77 and 1977-78 seasons and was accompanied by observations on the epidemiology of the three major diseases - downy mildew (Peronospora parasitica), canker [Leptosphaeria maculans (Phoma lingam)] and light leaf spot [Pyrenopeziza brassicae (Cylindrosporium concentricum)] to attempt to provide a logical basis for their control.

METHODS

In each county a number of crops proportional to the area of oilseed rape was examined. Crops were visited in autumn/early winter, GS 2.0-2.8; early- to mid-flowering, GS 3.3-4.2 and at pod-ripening, GS 5.3 (5).

On the first two visits 50 plants were collected at random on a "W" transect of the crop. At pod-ripening 50 plants were collected at random inside the periphery of each crop.

Disease assessments were carried out as below and expressed as a mean disease index (MDI)

Leaf Diseases were assessed on a whole plant basis using the key:

0 - No infection, 1 - Scattered lesions, 10% or less bract and leaf area infection, 2 - >10-25%, 3 - >25-50%, 4 - >50-75% and 5 - >75% leaf and bract infection.

Stem Diseases were recorded on a presence or absence basis for each plant. Severity of canker on the stem base (lower 15 cm of stem) at GS 5.3 was assessed as 0 - No infection; 1 - Slight lesion(s) encircling less than half the stem; 2 - Moderate infection, lesion(s) encircling at least half the stem; 3 - Severe infection, lesion(s) girdling the stem.

Pod Diseases were recorded on a presence or absence basis.

In 1976-77 seed samples were collected from 15 crops at harvest so that 1000 seed weight could be determined. The level of L.maculans infection was also checked using a standard blotter test (10) following pre-treatment with sodium hypochlorite (6).

An attempt was also made to assess loss of yield following canker infection. Samples of fifty plants showing nil, slight moderate and severe infection respectively were collected at random from a crop of Primor at GS 5.4. The number of pods per plant was counted. Infloresences were then dried for 10 days at 20°C when pods were hand threshed and seed yield measured for each plant.

During the spring of 1976 weekly assessments were carried out on the level of light leaf spot infection on labelled plants in one crop of Sept. sown Expander and an attempt was made to relate this data to weather conditions.

RESULTS

The results of the surveys are summaried in Table 1.

TABLE 1

INCIDENCE AND SEVERITY OF DISEASES ON OILSEED RAPE IN S E England 1975-78

Season Assessment stage	No. of crops	% Crops infected *P. paras.*	*L. maculans*	*C. cons' m*	MDI *P. paras.*	*L. maculans*	*C. conc' m*
1975 - 76							
GS 2.1-2.5	33	94	67	9	0.53	0.03	0.01
GS 3.1-4.3	37	95	35	89	0.31	0.03	0.36
1976 - 77							
GS 2.1-2.8	40	98	98	8	0.81	0.21	0.02
GS 3.3-4.2	29	100	100	84	0.80	0.62	0.26
1977 - 78							
GS 2.3-2.5	30	100	100	0	0.93	0.30	0.03

Downy mildew was widespread each autumn and often caused severe infection of young plants. Infection was occasionally recorded on pods and in 1977 was associated with superficial reddish brown necrosis and epidermal splitting of the stem in cv. Primor.

Canker leaf spot was prevalent in 1975-76 but infection remained at a low level and was not accompanied by development of stem base lesions although the disease was noted on the upper stems. The only evidence of severe stem canker was in a second successive rape crop adjacent to a surveyed first year crop (both cv. Primor). Canker leaf spot was recorded in most crops at the rosette stage in 1977 and 1978. Infected plants appeared to be dis tributed at random throughout crops with no obvious signs of disease foci. Highest levels of leaf spot were generally recorded in crops adjacent to the previous years infected rape stubble. A gradient of canker leaf spot infection (based on 100 plant samples) was demonstrated in relation to infected stubble in one crop cv. Primor in Oct. 1977 (Table 2). The crop grown from seed treated with a slurry of 1.25 benomyl + 2.5g thiram/kg seed was drilled in late Sept.

During 1976-77 the main development of stem canker occurred in the 3-4 weeks following petal-fall when stem lesions first seen at early flowering increased in severity and the disease spread to the pedicels and pods (Table 3).

Lodging and premature ripening were present in 28 of the 30 crops examined in 1977, and high levels of canker infection on pods was correlated with low 1000 seed weight. Levels of *L. maculans* seed infection ranged from 0 to 5.8 per cent. Yield loss data for canker infection on the crop of cv. Primor is shown in Table 4.

Table 2

GRADIENT OF L. MACULANS LEAF SPOT IN CV. PRIMOR

Distance from edge of stubble (m)	Mean no leaf spots/plant	% plants infected
540	4.8	85
610	2.6	78
680	2.9	83
750	1.8	75

TABLE 3

SEVERITY OF L. MACULANS INFECTION AT POD-RIPENING 1977

No. of crops	MDI	No. of crops with:- MDI		
		<1.0	1.0-2.0	>2.0
30	1.54	2	22	6

TABLE 4

EFFECT OF L. MACULANS ON YIELD COMPONENTS OF OILSEED RAPE CV. PRIMOR 1977

L. maculans stem infection category	Mean No. of pods/plant	Mean yield (g)/plant
Nil	81.5	7.3
Slight/Moderate	72.2	5.7
Severe	51.3	3.1

Low levels of light leaf spot were present in most crops at flowering, the main development of the disease having occurred following wet weather in March - April during both 1976 and 1977. Study of disease progress and rain fall data suggested that infection increased about 3 weeks after periods of rainfall in the week ending 15 March, 19 and 26 April 1976.

Club root (*Plasmodiophora brassicae*) was confirmed at a low level in one crop (third rape crop in twelve yr) in 1977. *Alternaria alternata* or to a lesser extent *A. brassicae* were associated with premature ripening of pods. *A. alternata* appeared to colonise pods damaged by seed weevil (*Ceutorhynchus assimilis*) or brassica pod midge (*Dasineura brassicae*). Stem rot (*Sclerotinia sclerotiorum*) was not recorded at any of the survey sites although it has been noted in the UK. Stem rotting due to *Botrytis cinerea* was recorded in crops at GS 3-4.2 in 1975 and 1976.

DISCUSSION

The rapid increase in the area of oilseed rape in south-east England has been accompanied by a progressive build-up of canker (L. maculans). Under UK conditions this disease caused lodging and premature senescense of plants with severe stem base infection reducing yields by up to 58% of infected plants. Yield loss was partially attributed to a reduction in pod number. Similar losses have been reported from France (1), Germany (4) and Australia (9).

Loss of yield from severely infected plants is likely to be offset to some extent by compensatory growth of neighbouring healthy plants or of those with slight infection. Studies of canker by a number of workers (2, 3, 8) indicate that seed infection can be important in introducing the disease into a new cropping area but may be only of minor significance where the fungus is widely distributed on stubbles. Under those circumstances air-borne ascoppres are considered to be the major source of inoculum. This assertion is supported by our surveys which showed that the highest levels of canker were recorded in crops sown on or adjacent to fields growing rape the previous year. Crop residues appear to play a very important role in the development of canker infection.

Current recommendations for the control of this disease in the UK take the form of advice to:-

Chop and/or burn rape stubble immediately after harvest and to bury the remaining debris by deep ploughing;

Use fungicides treated seed - the majority of seed sown in S E England in autumn 1977 was treated with benomyl + thiram;

Adhere to a strict rotation, allowing at least a five year "break" between successive crops of rape or other susceptible brassicae.

Further research is required on the epidemiology of the disease under English conditions, on the breeding of more resistant cvs and the use of fungicides applied either to seed and or the growing crop.

Progress studies on light leaf spot suggest that an increase in infection occurs approximately three weeks after rainfall. Conidia of C.concentricum are believed to be dispersed by rain splash. Although these observations provide a working hypothesis it is clear that further studies are necessary on the relationship between infection and weather conditions. Such data might eventually provide the basis for timing of fungicide sprays.

S. sclerotiorium and P. brassicae are as yet of little economic importance. This is possibly due to sound rotational practice and the production of rape predominantly on land of relatively high pH. As the area of rape expands, however, less suitable land is likely to be used and the risk of club root infection increased.

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