THE PERFECT STAGE OF PYRENOPEZIZA BRASSICAE ON OILSEED RAPE AND ITS AGRICULTURAL IMPLICATIONS

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Introduction

Light leaf spot of brassicas, caused by *Pyrenopeziza brassicae* Sutton and Rawlinson (Rawlinson, Sutton & Muthyalu, 1978), has been common for a decade on oilseed rape (*Brassica napus* spp. *oleifera*) crops in the United Kingdom and is now regarded by some as the most important disease of rape in the United Kingdom. The disease occurs on oilseed rape elsewhere in Europe, and recently there have been severe attacks in France. Spread of the disease was thought to occur over only short distances by rainsplash of conidia (Rawlinson, Sutton & Muthyalu, 1978). The perfect stage of *P. brassicae* has previously been reported only on brassica crops in Ireland (Staunton & Kavanagh, 1966) and New Zealand (Cheah, Hartill & Corbin, 1980). We report the natural occurrence of the perfect stage of *P. brassicae* on an oilseed rape crop in the United Kingdom and discuss the possible implications for disease spread. A full account of the experimental procedures has been given by McCartney, Lacey & Rawlinson (1986) and Lacey, Rawlinson & McCartney (1987).

Identification of the teleomorph of *P. brassicae*

During the spring of 1986 leaf debris was collected from the soil surface beneath an infected oilseed rape crop, cv. Jet Neuf. Samples were placed in a large wind tunnel and spores, mainly in groups of four, were trapped 3 m downwind. Spores were also found when samples were suspended over a microscope slide in a small enclosed chamber. The debris was examined microscopically and small apothecia (80 µm in diameter) with asci containing spores were found on the leaf laminae. Although the apothecia were much smaller than those described from culture of the type (Rawlinson *et al.*, 1978), and lacked the dark outer excipulum, the asci and ascospores were similar to those of other records (Table 1).

Table I. Measurements of apothecia, asci and ascospores of *Pyrenopeziza brassicae* found on oilseed rape compared with the type culture.

Source	Apothecia diameter (mm)	Asci length x width (µm)	Ascospores length x width (µm)
Type (culture) (Rawlinson *et al.*, 1978)	1	80-100 x 7-9.5	12.5-18.5 x 2.5-3
Oilseed rape this study	small 0.03-0.1	33-63 x 4.2-8.4	7.5-15.1 x 1.8-2.8*
	large 0.13-0.58	44-89 x 5.2-8.9	7.9-13.1 x 1.8-2.8*
			9.4-18.8 x 1.8-3.7[a]
			9.4-18.8 x 1.8-3.2[b]

* Measurements taken mostly from spores remaining within the ascus.
[a] Released in laboratory. [b] Caught in Burkard trap.

As the season progressed more debris was examined and larger apothecia (up to 0.58 mm diameter) were found on veins and petioles (Fig. 1). The apothecia were black, cup-shaped structures with a pale margin. Asci within the hymenium measured 33-89 µm x 4.2-8.9 µm and contained eight ascospores. Paraphyses were hyaline, septate, as long as the asci and 2 µm in diameter. The ascospores were hyaline, cylindrical, straight or slightly curved with rounded ends and were sometimes septate. The structures from oilseed rape differed little in size from those recorded on other brassica crops.

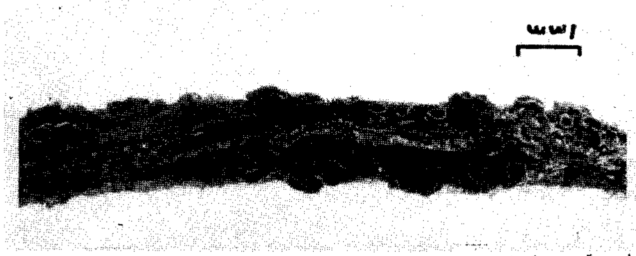

Fig. 1: Apothecia of *P. brassicae* on a decaying petiole of oilseed rape cv. Jet Neuf.

Apothecia with immature asci developed on cultures of *P. brassicae* grown from mass isolates of conidia taken from natural acervuli on rape leaves. Cultures typical of the *P. brassicae* anamorph were also produced by allowing ascospores from apothecia on a petiole to discharge on to agar in an inverted petri dish. After 56 days in an incubator at 15°C these cultures produced apothecia with asci containing differentiated ascospores. Conidial suspensions from these cultures were sprayed onto rape plants (cv. Jet Neuf) and produced typical light leaf spot lesions thus confirming the identity of the teleomorph.

Dispersal of ascospores

P. brassica spores were caught using a seven day recording volumetric spore trap (Burkard Manufacturing Co. Ltd., Rickmansworth, U.K.), placed in the centre of an infected crop. The trapped spores were frequently in groups of four similar to those caught in the wind tunnel.

Comparison of daily rainfall with daily average spore concentration, (Fig. 2) showed that periods of spore liberation and dispersal were closely associated with periods of rain. However, the largest spore concentrations did not necessarily coincide with days with the highest rainfall. Indeed, spores were present in the air on days when no rainfall was recorded. A more detailed examination of spore catches showed that spores were airborne several hours after rain. Maximum spore concentrations were often found within 12 h of rain and in the early morning, suggesting that the crop must be wet, either from rain or dew, to initiate spore liberation.

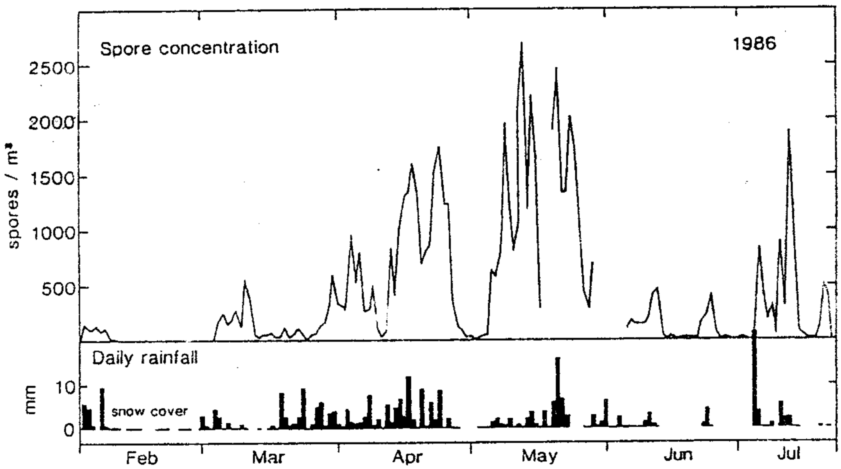

Fig. 2: Average number of spores m^{-3} sampled over 24 h (0900-0900 GMT) in the Burkard trap and total rainfall for the same period from 1 February to 20 July 1986.

Ascospore concentrations at five heights above and four distances downwind of the infected crop were measured using rotorod traps on several occasions during the summers of 1985 and 1986. Spore concentrations decreased with downwind distance from the crop. The pattern of decrease was approximately exponential, concentration near the ground decreasing by half in a distance of between 7 and 10 m from the field edge, typical of dry windborne spores. Spore concentration also decreased with height above the crop, showing that the spores originated within the crop. The concentration at between 1 and 1.5 m above the crop was about half that at the top of the crop.

A gradient transfer model of spore diffusion was used to investigate the implications of the observed ascospore concentrations for spore dispersal away from the crop (McCartney, Lacey & Rawlinson, 1986). Ascospore concentrations up to 100 m downwind of the field were calculated. The calculations suggested that the spore plume would have dispersed so that at least 50% of the spores carried beyond the edge of the field would have still been airborne 100 m downwind of the field edge. Then spore transport over distances of several km would have been possible.

Agricultural implications

Our discovery of the teleomorph of *P. brassicae* and of the possibility of long distance spore dispersal, may help explain the increase in light leaf spot seen in vegetable brassica crops grown near oilseed rape (Gladders & McPherson, 1985). If the telemorph becomes common on other cultivars of oilseed rape and on vegetable brassicas, there will be important consequences for agriculture and horticulture arising from the greater potential for genetic variation both in pathogenicity and in sensitivity to commonly-used fungicides (Ilott *et al.*, 1986). The possible consequences should now be investigated further in view of the importance of oilseed rape in Western Europe and the high cash value of vegetable brassicas. Wider searches for the teleomorph in crops in other locations must precede a full evaluation of the agricultural and horticultural significance of our finding.

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