Introduction

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Summary

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Assessing the risks of wind pollination from fields of genetically modified Brassica napus ssp. oleifera

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Summary

Intensive research over the past 10 years has produced many genetically-modified lines of oilseed rape with market potential. Assessment of these lines in statutory trials prior to their release as cultivars is necessary, owing to concern over the likelihood of transgene escape from such crops. Here, we examine the movement of airborne pollen grains from oilseed rape fields and assess their capacity for long-range geneflow.

Pollen dispersal from isolated rape fields was monitored over two seasons and related to the distribution of fields and ‘feral’ (domesticated plants growing outside cultivation) populations of the crop in Tayside and North East Fife regions of Scotland. Airborne pollen density declined with distance and at 350 m was 10% or less of that at the field margin. Pollen counts of 0–22 pollen grains m⁻² were observed 1.5 km from source fields and apparently were sufficient in number to allow seed set on unsowned crop plants. Oilseed rape pollen has greater capacity for long-range dispersal than had been suggested by small-scale field trials. Mean separation of oilseed rape fields in the survey area was 410 m and the mean distance from ‘feral’ populations to commercial fields was 700 m. Sixty percent of ‘feral’ populations with more than 10 plants occurred downwind and within 2 km of an oilseed rape field.

Provided that the flowering biology of genetically-modified oilseed rape does not differ from the conventional crop, these data suggest that transgene movement to non genetically-modified fields or ‘feral’ populations is likely following commercial release.

Introduction

Annual production of oilseed rape (Brassica napus ssp. oleifera) has grown dramatically in recent years and 232,190 million tonnes were produced worldwide in 1992 (Anon 1993). Development of a transformation system for the crop (Gomi et al., 1985) has enabled the production of modified lines containing transgenes for herbicide resistance (Miki et al., 1990; Mariani et al., 1991), increased methionine in seed meal (Altenbuch, 1992), male sterility and restorer genes (Mariani et al., 1990, 1992, respectively), heavy metal tolerance (Mira & Gedamu, 1989) and antibiotic resistance (Arno et al., 1992).

The performance of genetically-modified oilseed rape under agricultural regimes has been assessed in numerous small-scale experimental field trials (e.g. Gressel & Ben-Sinai, 1985; De Greef et al., 1989; Arnoldo et al., 1992). Eighty-two such field releases were approved worldwide by 1992 (Chassery & Dueing, 1992; Dale et al., 1993), and the number submitted for approval is rising annually. Attention is now focused on the prospects for commercial release of genetically-modified oilseed rape. Crawley et al. (1993) identified three areas of concern associated with the release of genetically-modified crops:

i. genetically-modified plants themselves may become weeds and/or invade natural habitats

ii. the release of genetically-modified crops may enable the sexual transfer of the inserted genes to neighbouring commercial or natural populations whose offspring may then become more weedy or invasive