

Rapeseed Breeding Progress in Britain, 1984

K. F. Thompson
Plant Breeding Institute, Cambridge (U.K.)

Oilseed rape breeding within the Agricultural and Food Research Council, which is confined to the Plant Breeding Institute, Cambridge, has been increased in the last two years. Mr. W.G. Hughes has transferred from working on wheat to breeding oilseed rape and Mr. J.P. Taylor is now working full-time on the crop as the kale programme has been concluded. Dr. Eileen S. Scott has finished two years on an EEC grant to study methods of screening for resistance to *Sclerotinia sclerotiorum* and club-root, *Plasmodiophora brassicae*. In the private sector the breeding team of Mr. M. Pickford and Mrs. J. Skelton J. has been strengthened at Twyford Ltd, Banbury and the programme has expanded a little at Nickerson RPB Ltd, Rothwell, Lincoln (Dr. J.G. Bowman) with a main trial ground near King's Lynn as well as a breeding field and local trials at Rothwell. Breeding is also in progress at R.L. Thomas (and Associates) Ltd. (Dr. R.L. Thomas) and has been started in the last year by Charles Sharpe and Co. Ltd, Sleaford, Lincolnshire (Mr D.M. Betts), but Miln Marsters, King's Lynn, have stopped breeding this crop.

In spite of lower yields in 1983 the area of rapeseed continues to increase and 261 000 ha have been sown for the 1984 harvest. The new French variety, Bienvenu, provisionally recommended by the National Institute of Agricultural Botany (NIAB), probably occupies 40 per cent of the acreage with the majority of the remainder divided fairly equally between Rafal and Jet Neuf. The German varieties, Fiona and Korina, are provisionally recommended while the French variety Darmor is provisionally recommended for special use as a zero erucic acid, low glucosinolate "double low" variety and about 4 000 ha are being grown this year.

High erucic acid variety

R.L. Thomas (and Associates) Ltd. entered a high erucic acid winter rape variety, Heruicson, into National List Trials (NLT) for 1983-1984. It has a high oil content with 55 per cent erucic acid in the oil.

Zero erucic acid winter rape

The Plant Breeding Institute entered a homozygous diploid line, 79/95, from a naturally occurring haploid, into NLT for the 1982-1983 season. A drought in most parts of the country in late June and July prematurely ripened the later maturing varieties such as Jet Neuf. Mean seed yields for Jet Neuf from NLT were low averaging 2.1 t/ha. Generally the earlier maturing varieties, such as Rafal and 79/95, yielded more. Line 79/95 was the highest yielding variety for oil in NLT, outyielding the next highest variety, Rafal by 7 per cent and Jet Neuf by 21 per cent. However from 1980-1982 Rafal and Jet Neuf gave almost identical mean yields in NLT, so the relatively poor performance of Jet Neuf in 1983 should be regarded as exceptional. Line 79/95 had 1 per cent more oil in the seed than any other variety and 2.5 per cent more than Rafal or Jet Neuf. With some rain in late June and July in the Cambridge area, Jet Neuf gave from 3.0 to 3.5 t/ha of seed in five Institute trials at three off-station sites in 1983 and line 79/95 still gave a mean oil yield of 18 per cent more than Jet Neuf. Line 79/95 is one of the most resistant cultivars to light leaf spot, *Pyrenopeziza brassicae*, in NLT and is more resistant to stem canker, *Leptosphaeria maculans*, than Jet Neuf. In a field experiment, grown by Dr. F.M. Humpherson-Jones, National Vegetable Research Station (NVRS), using highly virulent strains of canker, line 79/95 had significantly ($P < 0.01$) less leaf infection and a significantly ($P < 0.01$) lower canker rating than Jet Neuf. Line 79/95 was the most resistant variety in NLT to lodging and was not lodged by heavy rains during or after flowering. Considerable commercial interest has been shown in the variety. The National Seed Development Organisation is currently making arrangements for marketing the variety.

The first two high glucosinolate lines from the Nickerson RPB Ltd. programme entered UK NLT in 1983. R.L. Thomas (and Associates) Ltd intend to enter three zero erucic acid lines into NLT in 1984. Another zero erucic acid line, 79/20, will enter NLT in 1984 from the Plant Breeding Institute. This line

makes vigorous autumnal growth and produces tall, thick, lodging-resistant stems. In 1982 and 1983 it averaged 11 per cent more oil than Jet Neuf from six trials, three each year and at three sites. While yielding more than Jet Neuf in every trial, it gave the highest yields, relative to Jet Neuf, on lighter soils. Thus it complements line 79/95, that is short-stemmed, less competitive and yields well on richer, heavier soils. However line 79/20 has only moderate resistance to canker.

Low glucosinolate, zero erucic (00) content in winter rape

This is the main breeding objective in most programmes, although at Nickerson RPB Ltd a major part of the programme continues to be devoted to zero erucic, high glucosinolate material. Twyford Ltd entered one of their own low glucosinolate varieties, based on Jet Neuf, in NLT in 1983. The Plant Breeding Institute will not enter an 00 winter variety into NLT until 1986 at the earliest. It had been suggested that it might not be possible to combine low glucosinolate content with resistance to light leaf spot, but three German low glucosinolate entries in NLT in 1982-1983 were resistant to this disease.

Variation in glucosinolate content in material grown in trials

The National Institute of Agricultural Botany (NIAB) reported that higher glucosinolate values were obtained more frequently from seed of low glucosinolate winter varieties produced in trials than from seed of the same varieties, supplied for trial (Parnell et al., *J. Niab* 16 (207), 1983). Genetic drift was not responsible as Twyford's Ltd. found glucosinolate values for Darmor did not increase during seed multiplication. Work is in progress at NIAB to test whether the degree of maturity at the time of cutting the crop influences the glucosinolate content of the seed.

Haploids from anther culture

Anthers are cultured to obtain haploids for use in the breeding programme by Nickerson RPB Ltd and the Plant Breeding Institute while Twyford's Ltd is starting to use this technique. However the yield and general performance in the field of the first homozygous diploid lines derived from anther culture by Nickerson RPB Ltd was poor. Dr. J. Dunwell,

John Innes Institute, Norwich, is studying means of increasing the number of embryoids/anther. Research on the use of secondary embryoids from anther culture of oilseed rape to test for resistance to *Alternaria brassicae* is being attempted by Dr. M. McDonald and Dr. D.S. Ingram at the Botany School, Cambridge.

Pathology

By controlling insect larvae with insecticide the incidence of canker on the upper parts of stems of winter rape was considerably reduced when compared with plants, untreated by insecticide (Newman and Plumbridge, *Cruciferae Newsletter*, 8, 30-32, 1983) at the Plant Breeding Institute. Dr. E. Scott, Plant Breeding Institute, found the most effective method of inoculating rape plants with *Sclerotinia sclerotiorum* in the field was to place infected barley grains in leaf axils and to secure with parafilm. All varieties were susceptible. However, using seedlings of six varieties in the glasshouse, a limited term inoculation procedure, in which the inoculum was removed after 48 or 72 hours, gave disease symptoms that were least severe on Doral and line 79/95 and most severe on Jet Neuf. With increasing cultivation of winter rape in Northern England and Scotland, clubroot, *Plasmodiophora brassicae*, may become a problem on oilseed rape, grown on soils where forage Brassicas and swedes have been grown in the past. Current screening procedures for clubroot are unreliable as they employ populations of *Plasmodiophora brassicae*, which consist of mixtures of pathotypes. Such populations often give inconsistent results when tested with the European Clubroot Differential (ECD) host series. Dr. E. Scott obtained seven single spore isolates of clubroot, using the method developed by Jones et al., *Plant Pathology*, 31 (1982). These isolates were multiplied and showed a range of differential reactions using the EEC host series. Studies of inoculation of tissue cultures from oilseed rape with single resting spores have continued (Scott and Loh, *Cruciferae Newsletter*, 8, 1983).

Dr. J.A. Walsh and Dr. J.A. Tomlinson (NVRS, Wellesbourne, Warwick) have tested several winter oilseed rape varieties for susceptibility to turnip mosaic virus (TuMV). Jet Neuf and Bienvenu were susceptible, but resistance (immunity) to TuMV was found in some plants of Rafal. Selfed plants from the resistant Rafal plants were all resistant. Susceptible plants in the glasshouse produced either a mosaic-type reaction after mechanical inoculation or a systemic necrosis, that eventually killed the plants.