Variety Development in UK Oilseed Crops

S.P.J. KIGHTLEY
NIAB, Cambridge, England

Introduction

Variety turnover in UK oilseed crops remains very rapid and the flow of new entries into variety trials is at its highest ever level. Oilseed rape, for both autumn and spring sowing, remains the species with the most active development and hybrids are contributing a significant, though not yet dominant, proportion of new entries. Varieties with transgenic modifications have been included in trials for the last two years.

However, there are new indications of yield progression in spring linseed, and winter linseed has become, with the 1996 autumn sowing, a significant crop. Low linolenic-high linoleic, edible oil linseeds have been commercialised and a further development of the linseed crop has been a move into combinable flax.

Sunflowers remain for the majority of British growers an unreliable option because of harvest difficulties and few varieties are entered in each season.

A small number of varieties of oil crops specifically for pharmaceutical use (borage, evening primrose) pass through official tests and more species are undergoing selection by plant breeders in order to provide further niche market crops. UK testing authorities are actively participating in an EU project on the development of false flax (*Camelina sativa*) as a potential agricultural crop for both autumn and spring planting.

Variety numbers entering official trials

Table 1 lists variety number entering National List Year 1 performance trials in the UK over the current five year period, for the harvest year indicated and shows the clear predominance of winter oilseed rape.

Table 1 National List entries, 1994-97

Crop	1993	1994	1995	1996	1997
Winter oilseed rape	46	61	48	60	62
Spring oilseed rape	28	19	30	20	33
Winter turnip rape	0	1	1	3	0
Spring turnip rape	0	6	14	7	4
Spring linseed	14	12	17	11	10
Winter linseed	0	2	1	1	2
Flax	0	1	1	2	5
Sunflower	12	6	14	7	1

Three varieties of evening primrose and two varieties of borage have entered the plant breeder's rights scheme during the period.

Species Summaries

Oilseed rape (*Brassica napus*)

The yield rankings of both the Recommended List of winter oilseed rape and the Descriptive List of spring oilseed rape are now headed by hybrids (Table 2). The first hybrid to be added to the Recommended List for 1996 was the varietal association, Synergy, based on the Ogura CMS system. The 1997 List saw the addition of a further two restored hybrids, Artus and Pronto, both using the Lembke male sterility system.

Table 2 Yield rankings of UK Recommended varieties of winter oilseed rape

Variety	Relative yield	Year listed	Variety	Relative yield	Year listed
Artus	114	1997	Gazelle	103	1994
Synergy	113	1996	Falcon	102	1990
Pronto	113	1997	Cobra	102	1988
Licrown	107	1997	Arietta	102	1996
Herald	107	1997	Amber	101	1995
Lipton	106	1997	Lizard	101	1996
Meteor	106	1997	Apex	100	1993
Lightning	104	1997	Inca	98	1994
Contact	104	1997	Bristol	98	1992
Capitol	103	1996	Commanche	98	1995
Alpine	103	1996	Express	98	1993
Jazz	103	1996			
Control mean	4.24 t/ha				

All three, with very similar yield ratings, have a clear economic advantage over conventional varieties, even when taking the additional cost of seeding into account. In the UK conventional varieties are typically sown at 120 seeds/m^2. Advice for hybrids is to sow 70 seeds/m^2 which makes hybrid planting more expensive by £10/ha. Several points should be noted however:

Firstly testing authorities have ongoing reservations over the reliability of cross pollination, at the field scale, in varietal associations. There is some experimental evidence showing differential reduction of seed set in the sterile hybrid compared with the pollinator and there has been rather variable performance when flowering is hit by cold weather. Secondly, none of the hybrids listed attain the very high oil contents achieved by some of the conventional varieties. Thirdly, UK growers have remained very cautious of varietal associations with only an estimated 5-8 % of the market so far taken up by Synergy in its second commercial season whereas new top yielding varieties would normally expect to take a 40% share in their first season. The UK market, especially in England, remains dominated, for a third season by the conventional variety Apex.

In spring rape a similar situation prevails, with a restored Polima CMS hybrid, Superol heading the Descriptive List followed closely by the varietal association, Triolo (Table 3).

Table 3 Yield rankings of UK Descriptive List spring oilseed rape varieties

Variety	Relative yield	Year listed	Variety	Relative yield	Year listed
Superol	110	1997	Solar	101	1995
Triolo	109	1997	Sprinter	101	1996
Liga	106	1997	Global	101	1989
Rebel	104	1996	Spok	101	1995
Liaison	103	1997	Summit	100	1997
Maskot	103	1996	Acrobat	100	1995
Star	103	1996	Melodi	100	1995
Aries	103	1993	Mars	100	1993
Marinka	103	1994	Starlight	99	1993
Licosmos	101	1996	Nimbus	98	1995
Control mean	2.62 t/ha				

The economic advantage of these over conventional varieties is much more marginal than is the case for winter rape hybrids but both have very good early vigour and Superol in particular has very good earliness of maturity.

Genetically modified varieties are present in trials of both spring and winter rape. They include modifications for herbicide tolerance (glyphosate, gluphosinate-ammonium) and altered fatty acid profiles. The first GMO to satisfy National List standards was cleared for Listing in autumn 1996 but was subsequently withdrawn, with trial yields below the best conventional varieties. This was a spring rape with gluphosinate-ammonium tolerance from the Belgium-based Plant Genetics Systems programme.

It should be noted that non-transgenic herbicide tolerant and modified fatty acid types are also present in the trial programmes.

Table 4 provides a summary of the current breeding effort by breaking down total current trial entries into types.

Table 4 Oilseed (swede) rape in trials for 1997 harvest

Variety type	**Winter**	**Spring**
Total	121	66
Conventional	91	41
Hybrid varietal association	18	10
Restored hybrid	5	5
Non GM hericide tolerance	-	2
Non-GM modified fatty acid	-	4
Genetically modified hybrid	2	7
High erucic	3	-

Turnip rape (*Brassica campestris*)

Four varieties of winter turnip rape have been added to the UK National List, but with very little performance data available, commercial up-take has not been rapid. Claimed advantages include earliness of harvest compared with swede rape, tolerance of later drilling and less susceptibility to winter grazing by pigeons.

Spring turnip rape is thought to supply up to half the spring rape market in Scotland where its earlinesss of harvest (three weeks ahead of swede rape) is considered to offset its lower yield (85% of spring rape). Variety progress, as indicated, by a very small trials programme is slow, with very few sources of genetic material.

Linseed (*Linum usitatissimum*)

During the 1991-93 period the spring linseed crop expanded rapidly to 150,000 ha but fell back to about 50,000 ha after difficult, late harvests in 1993. Yields of new varieties have shown little progression since the entry into trials of Barbara in 1990, but this is likely to change in the next year or two. Three linseeds for edible oil use are included in the Spring Linseed Descriptive List, the best (Windermere) with a yield deficit of 10% compared with the highest yielding linseeds for industrial use, but with 2.5% higher oil content. Winter linseed is in its first full commercial season with an estimated area of 28,000 ha. Three varieties have been added to the National List, showing good winter hardiness.

Flax as a combinable crop is being pioneered in the UK. The aim is to provide fibre for non- textile applications, while giving growers better seed yields than could be obtained from conventional flax varieties. The first combinable flax (Klasse) was added to the National List in 1997.

Sunflowers (*Helianthus annuus*)

Sunflowers, because of the depth at which they can be sown emerge more reliably than small grained oilseeds from rapidly drying spring seed beds and grow well in the UK climate. Achieving harvest maturity may be difficult in cool seasons and disease is often a problem. The dwarf variety Allegro shows very good earliness but has not been taken up widely. Growers have shown a preference for rather taller varieties with medium maturity such as Vincent. The majority of recent entries have shown harvest maturity slightly later than Vincent. One high oleic acid variety, Sarah, is listed by NIAB.

Summary

Breeding activity in swede rape, as indicated by entries into official trials, remains at a very high level, with an increasing diversity into hybrids and novel traits, with and without transgenic modification. Variety progress in linseed has been relatively slow but here again considerable diversity of breeding direction can be seen. Numbers of turnip rapes and sunflowers are at a low level, reflecting perhaps, the more limited regions of the UK in which they are competitive with swede rape or linseed.