ADVANCES IN BREEDING AND CULTIVATION OF WINTER RAPE IN POLAND

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Winter oilseed rape became the dominant oil crop in Poland after the Second World War. The development of the crop following the war is illustrated in Figures 1 and 2. Considerable progress made in that time was due to the development of new and better varieties as well as a gradual improvement in cultivation techniques and insect control. The average annual increase of seed yield has been about 44 kg/ha.

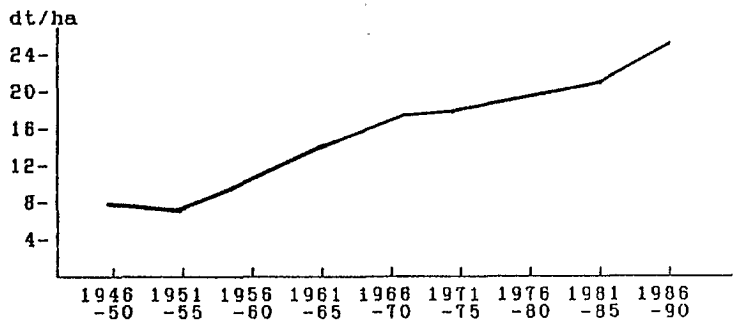

Figure 1. Trends in seed yield of winter oilseed rape in Poland, 1946-1990.

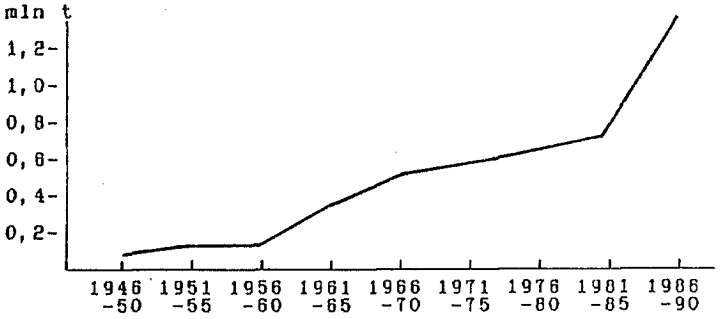

Figure 2. Trends in production of winter oilseed rape in Poland, 1946-1990.

DOUBLE LOW VARIETIES

The change over to double low varieties of winter oilseed rape in Poland started in 1985. It was based on Polish varieties bred by the IHAR Oil Crop Department in Poznan in cooperation with the IHAR Experimental Stations in Borowo, Malyszyn and Bakow.

The first Polish double low variety was Wipol licenced in 1972. However, it did not meet the canola standard. Erucic acid

content was 10 per cent, and the glucosinolate content was about 60 μM/g oil extracted meal.

The first true double low variety which met canola standards was the variety Start. It was first tested in official trials in 1979 but was not licenced because of insufficient winter hardiness.

The licenced Polish varieties of double low winter rape with canola quality are as follows:

- Jantar (1985)
- Bolko (1989)
- Mar (1991)

According to the Polish standard the allowable contents of alkenyl glucosinolates in fat free matter of seed are:

- breeder seed 14 μM/g
- certified seed 16 μM/g
- commercial seed 30 μM/g (25 μM/g anticipated in the future)

The quality of rapeseed meal is crucial to the Polish livestock and poultry sector. Rapeseed (canola) meal forms about 50 per cent of the high protein components available for use in animal feed formulations. Feeding experiments conducted on nonruminant animals demonstrated that any increase in glucosinolate content had a negative influence on feeding value. Only meal produced from seed with aliphatic glucosinolate levels below 20 μM/g oil extracted matter can be used as the only protein source in animal diets.

During the changeover to double low varieties several measures were applied to obtain high quality commercial seed as soon as possible.

First, the standards for alkenyl glucosinolates in breeder and certified seed were established at such levels that even up to 10 per cent of volunteer plants in a commercial planting could be tolerated. The official Seed Testing Station in Poznan strictly controlled the glucosinolate and erucic acid contents of all pedigree seed.

Second, every farmer that contracted for rapeseed production received full information about double low rapeseed and instructions concerning cultivation of the new varieties. The critical points of instructions were:

- certified seed must be used.
- rapeseed must not have been grown on the production field for at least the three previous years, and the field should have been free of volunteer rape the year prior to sowing.
- the changeover to double low varieties on all farms in a given region should be done simultaneously.

Third, producers were required to submit evidence prior to seed delivery that they had bought certified seed for sowing. Purchasing units, facilities for seed drying, cleaning and storing, elevators and transport vehicles were organized to avoid mixing of the different kinds of rapeseed. The lots of purchased seed were randomly monitored and controlled using the test tape method for glucosinolate content. Full analyses were performed in oil mills using the GLC or NIRS methods.

Area of cultivation, production and yield of winter rape in Poland since 1985 is shown in Table 1. The progress in change over to double low quality is presented in Table 2. Since 1989 the total rapeseed area in Poland has been sown to double low varieties. The exception has been 10,000 ha in northeastern Poland where traditional high erucic rape is cultivated for industrial purposes.

Table 1. Area of cultivation and production of winter oilseed rape in Poland, 1985-1990.

Year of Harvest	Area of Cultivation (ha)	Seed Yield (t/ha)	Seed Production (t)
1985	467,000	2.30	1,073,000
1986	515,000	2.52	1,296,999
1987	499,000	2.38	1.186,000
1988	470,000	2.55	1,200,000
1989	570,000	2.78	1,585,000
1990	500,000	2.34	1,170,000

Table 2. Changeover to double low varieties of winter oilseed rape in Poland 1985-1990.

Year of Harvest	Total Area Harvested (ha)	Double Low Area Harvested (ha)	Per Cent of Double Low
1985	467,000	3,386	0.7
1986	515,000	18,053	3.5
1987	499,000	41.647	8.3
1988	470,000	97,505	10.7
1989	570,000	236,718	41.5
1990	500,000	490,000	98.0

Information given in Tables 1 and 2 shows that the changeover to double low winter rapeseed was well prepared and implemented successfully.

RESEARCH PROBLEMS

Presently the primary aim of research and breeding programs on winter oilseed rape in Poland is to improve the winter hardiness, yield ability and resistance to fungus diseases. Breeding is also ongoing to reduce antinutritive components (e.g. cellulose, indol glucosinolate, sinapine) or to adapt the fatty acid composition for different purposes.

Different sources of CMS are under investigation to develop a system for hybrid seed production. Biotechnology is represented by tissue culture (androgenesis, callus and embryo culture) and by preliminary studies to initiate protoplast fusion and rape plant transformation.

It was found that processing technologies used by the seed crushing industry have a substantial influence on the feeding value of rapeseed meal. Investigations on this problem will be undertaken in the near future.