

## How oilseed rape was made the second most important oil crop of the world

### Breeding high quality oil and meal.

Rapeseed is today the second or third most important oil crop of the world. In old days rapeseed oil was of minor importance and mostly used for lamp oil and certain industrial purposes in Western countries. However, on the Indian subcontinent rapeseed oil and similar oils from close relatives have been used for food for centuries.

### Improving the oil quality

Before 1970 rapeseed contained high amounts of erucic acid, around 50 % of total oil. Based on observations in rats, erucic acid was considered to be quite harmful to humans. For this reason researchers tried to find exotic sources of rapeseed with another fatty acid composition.

However, more recently firm evidence has shown that this fatty acid is more of a threat to rats than to humans and erucic acid is now considered to be neutral to moderately detrimental.

In 1959 Canadian plant breeders thus discovered a few mutants in the German spring oilseed rape variety LIHO containing low levels of erucic acid. This was a ground-breaking discovery. A program of backcrossing and selections was initiated to transfer the low-erucic trait into agronomical adapted cultivars. This led to the release of the first low-erucic-acid rape (LEAR) cultivar of *B. napus*, ORO, in 1968. Since then this type of oilseed rape rapidly took over the market. Simultaneously the area of cultivation expanded a lot and already in 1971 LEAR varieties covered 160.000 ha in Canada.

Today 9.3 million ha of Canola™ is grown in Canada. This includes oilseed rape as well as its very close relative: Spring turnip rape. The oil and meal quality of the two species is very similar. Spring turnip rape matures faster than spring oilseed rape (SOSR); this reduces its yield but it can be grown on more northern latitudes than SOSR.

In Europe where winter oilseed rape (WOSR) is king the conversion to low erucic acid rape (LEAR) took longer time because the basis for LEAR was spring oilseed rape. The University of Göttingen and the breeder Norddeutsche Pflanzenzucht were key players. Based on the LIHO mutants the first LEAR variety LESIRA became listed in Germany in 1973.

## Towards a better protein fraction (meal) in rapeseed

Rapeseed meal (press cake) is the by-product of the extraction of oil from rapeseed. It is a protein-rich ingredient that is widely used to feed all classes of livestock. Old varieties of rapeseed, before ca. 1975, contained high amounts of glucosinolates (90 – 150  $\mu$ moles per g seed). Glucosinolates were considered detrimental in rapeseed meal fed to poultry, pigs and ruminants. Its hydrolyzed products, isothiocyanates and other sulfur-containing compounds, were shown to interfere with the uptake of iodine by the thyroid gland, contribute to liver disease, and reduce growth and weight gain in animals.

A Polish spring rape variety BRONOWSKI was identified by Canadian researchers to have a low-glucosinolate trait. Canadian breeding efforts were made to introduce this trait into low-erucic lines. University of Manitoba developed the first low erucic acid, low glucosinolate variety TOWER in 1974. The term "**double low**" is used to describe varieties with low erucic acid and low glucosinolate levels. Already in 1980 approximately 80% of the total Canadian rapeseed acreage consisted of double low cultivars. The name "Canola" was registered as a trademark by the Western Canadian Oilseed Crushers in 1978 for oil made from double low varieties.

In Denmark, cultivation of spring oilseed rape (SOSR) took off around 1979 and in 1984 194.000 ha of double low SOSR was grown.

In Europe in general, because rapeseed is primarily winter types, the development of double low varieties took longer time as compared to Canadian spring oilseed rape. Researchers at the University of Göttingen contributed a lot to the pre-breeding of double low oilseed rape in Europe. The first double low winter oilseed rape (WOSR) varieties appeared on the market in 1985. On the whole the transition was completed around 1990.

## 2019

Today the quality of the oil is very similar for spring and winter oilseed rape. Still the content of glucosinolates in WOSR is higher as compared to SOSR. The content of glucosinolates in the European Union is now below 18  $\mu$ moles per g seed (mostly WOSR) whereas in Canada (mostly SOSR) the content is below 12  $\mu$ moles, regulated by law or subsidies.

All in all, during the last 30 years almost only low erucic acid varieties have been grown in the European Union and most other countries. Low erucic acid per definition: Less than 2 % of total

fatty acid. In reality rapeseed oil contains less than 0.5 % and thus erucic acid is of no health concern at all.

High erucic acid varieties are grown on some ha's for industrial purposes. A high level of erucic acid makes the oil useful in the production of plastics, lubricants, lacquers, and detergents.

Also varieties with other fatty acid profiles bred for specific purposes, such as oil for deep-frying, exist on the market.

The fatty acid composition for "normal" rapeseed oil (canola oil) is shown in the table, source Wikipedia "Canola".

Compound	Family	% of total
Oleic acid	n-9 ( $\omega$ -9)	61 %
Linoleic acid	n-6 ( $\omega$ -6)	21 %
Alpha-linolenic acid	n-3 ( $\omega$ -3)	11 %
Saturated fatty acids		7 %
Palmitic acid		4 %
Stearic acid		2 %
Trans fat		0.4 %
Erucic acid		< 0.5 %

An oil with a fatty acid composition as shown in the table is now considered to be one of the healthiest for human nutrition.

*Through plant breeding rapeseed has been transformed from a disregarded oil plant to a plant whose seeds supplies one of the healthiest oils on the market together with a protein rich meal having a nutrition values on level with soy meal. This has made rapeseed the second most important oil crop of the world today.*