

BREEDING FOR OO-WINTERRAPE VARIETIES WITH HIGH YIELD AND GOOD RESISTANCE

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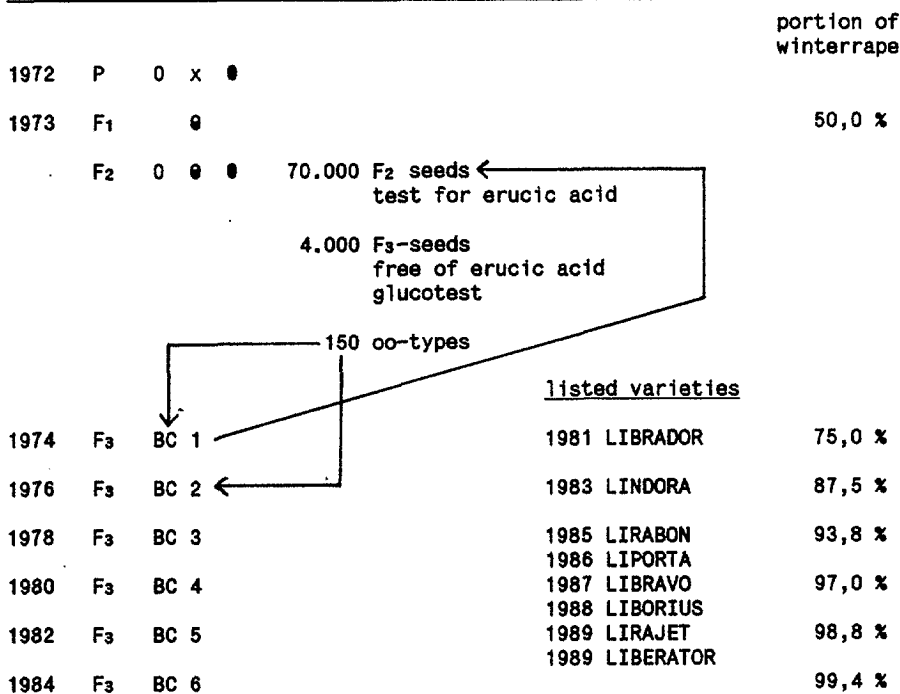
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INTRODUCTION

In the 70's breeders started to transfer the quality characters low erucic acid and low glucosinolate content from spring to winter oilseed rape. Main goal besides this transfer was to maintain and improve the seed yield and the already existing disease resistances. The disease *Phoma lingam* was of major interest because the possibility of chemical control did not exist.

MATERIAL AND METHODS

In order to introduce the OO-character into winter oilseed rape DSV transferred it from spring oilseed rape by repeated backcrossing and selecting the wanted character by current erucic acid and glucosinolate analysis. F1 and F2 is produced in one year by winter generations in the glasshouse.

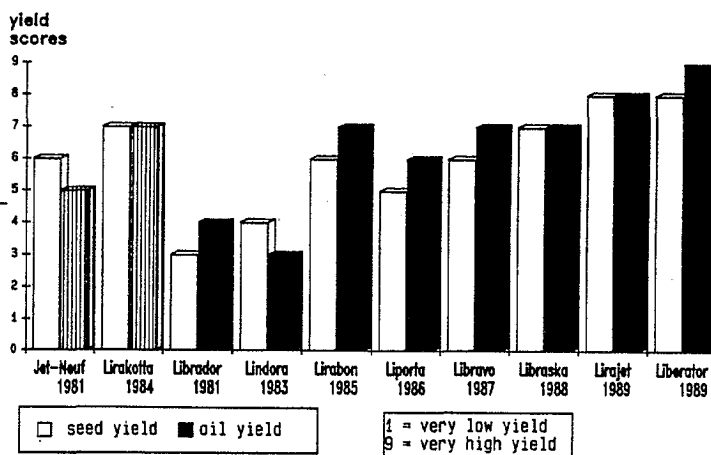


○ = spring rape Erglu OO (Oro x Bronowski)
● = winterrape varieties (Lenora, Liragold, Rapol, Markus, Jet Neuf, ...)

Fig. 1: DSV backcrossing breeding scheme for the development of double-low winter oilseed rape varieties

RESULTS AND DISCUSSIONS

The backcrossing made it possible to clearly increase the seed yield. Each backcross increased the yield about 5 - 8 %, which is explained by the scores of the Bundessortenamt official trials:



source: National list (FRG) 1981-1990

Fig 2: Seed and oil yield of DSV oo-varieties in comparison to the single-low control varieties Jet Neuf and Lirakotta

Especially the varieties firstly listed for sowing 1990 show a clear progress in seed and oil yield as well as oil content and surpass the old single-low standards.

Table 1: Oil yield, oil content and seed yield of the varieties inscribed for sowing 1990

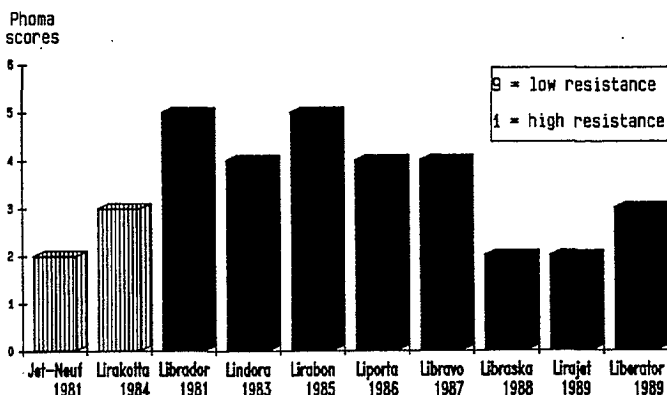
	breeder	seed yield	% oil content	oil yield
LIRAKOTTA +	DSV	105,0	39,9	104,0
Belinda -+	SEM.	100,0	40,1	101,0
Jet Neuf +	NPZ	95,0	39,1	94,0
LIRABON *	DSV	102,0	41,5	105,0
Ceres *	NPZ	103,0	41,6	107,0
LIRAJET	DSV	108,0	41,7	111,0
LIBERATOR	DSV	109,0	41,9	113,0
LIREKTOR	DSV	104,0	41,1	106,0
DOUBLLOL	DSV/Car	102,0	41,5	104,0
Falcon	NPZ	105,0	41,5	108,0
Collo	Eger	99,0	42,2	103,0
∅ yield dt/ha		39,6	39,7	15,8
no. of results		30,0	30,0	30,0

+ = single-low control varieties

* = double-low control varieties, tested for only 2 years

source: VCU tests of the Bundessortenamt Germany, 1987 - 89

After the listing of the first double-low variety Librador problems with winterhardiness and disease resistance occurred. Of great importance was the Phoma lingam resistance. By using a special procedure good success in Phoma lingam resistance breeding could be made. The natural infection pressure was increased by laying out Phoma lingam infected rapeseed straw in test plots in the generations F₂ - F₅.



Source: National list (FRG) 1982-1990

Fig. 3: Results of Phoma lingam resistance breeding

By using the methods described before DSV was able to reach the same level of resistance for Phoma lingam with the oo-varieties LIBRASKA (inscribed 1988) and LIRAJET (inscribed 1989) as the single low variety Jet Neuf had in 1981.

"Table 2" shows that Phoma lingam resistance is a horizontal resistance. The variety LIRAJET has the same level and structure of resistance as the variety Jet Neuf.

Table 2: Test for Phoma lingam resistance under artificial infection

score	numbers of attacked plants					classification mean
	strong attack 9	medium attack 7	medium attack 5	no attack 3	no attack 1	
Jet. Neuf +	-	7	11	10	12	3,7
LIRAKOTTA +	1	21	7	3	8	5,5
LIRABON *	3	14	7	1	15	4,3
Ceres *	5	16	11	-	8	5,5
Arabella *	6	5	8	4	17	4,3
LIBRAVO	4	17	4	3	12	5,0
LIRAJET	1	6	7	3	23	3,2
LIBERATOR	3	9	3	2	24	3,4
LIBORIUS	8	14	5	1	12	5,0
LIBRASKA	5	16	6	3	10	4,3

+ = single-low control varieties

* = double-low control varieties

source: DSV Thüle

Increasing surfaces of oilseed rape are automatically followed by an increase of diseases. This can especially be noted in the area of Schleswig-Holstein, the traditional rapeseed growing area of Germany.

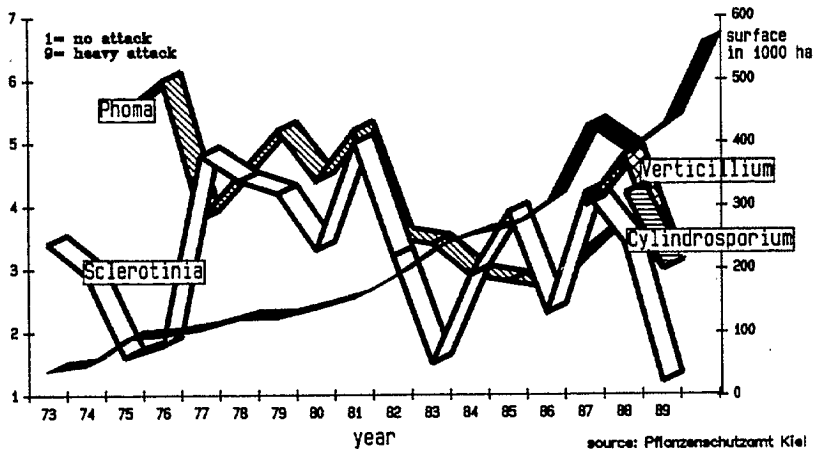


Fig. 4: Observations of oilseed rape diseases (mean of the sites Itzehoe, Lübeck, Flensburg, Husum, Kiel in Northern Germany from 1973-83)

But not only the Phoma lingam resistance breeding was successful, good resistances against some other diseases could also be obtained as the following table shows.

Table 3: Susceptibility to diseases of the varieties newly listed on the German National List for sowing 1990

	breeder	Phoma	Alter- naria	Sclero- tina	Botrytis	Cylandro- sporium	Verti- cillium	
LIRAKOTTA	+	DSV	3,0	3,8	3,4	4,3	3,6	3,9
Belinda	+	SEM.	3,4	3,7	3,6	4,5	4,3	4,2
Jet Neuf	+	NPZ	2,8	4,1	3,7	4,5	4,6	3,4
LIRABON	*	DSV	3,4	3,4		4,4	2,9	4,5
Ceres	*	NPZ	3,5	4,0		5,0	3,7	4,2
LIRAJET		DSV	2,8	3,3	3,0	3,4	3,0	3,5
LIBERATOR		DSV	3,0	3,5	2,8	3,1	2,6	2,9
LIREKTOR		DSV	3,2	3,4	3,1	4,0	2,8	3,3
DOUBLLOL		DSV/Car	3,2	3,7	2,9	3,6	2,7	3,5
Falcon		NPZ	3,2	4,2	2,8	4,5	4,1	4,4
Collo		Eger	3,3	3,6	3,1	3,8	3,3	3,4
no. of results			25	5	8	3	10	4

+ = single-low control varieties

1 = very resistant

* = double-low control varieties, only tested for 2 years

source: Summary of official VCU tests Germany, 1987 - 1989

Variation of these results is very small, because the mean was taken over 3 years and many locations.

A special success are the scores for *Sclerotinia sclerotiorum* and *Cylindrosporium concentricum* resistance which are better than for the single-low standards LIRAKOTTA, Belinda, Jet Neuf. Also the good results for the *Verticillium dahliae* resistance are outstanding.

In the following different results from Europe are shown which demonstrate the good disease resistance and high performance of the new generation of winter oilseed rape. Especially the variety LIBRAVO was - because of its good resistance to light leaf spot (*Cylindrosporium concentricum*) - very successful in the UK.

Table 4: Disease resistance scores in the UK

	Phoma	Cylindro- sporium	Perono- spora
Ariana *	6	5	6
Cobra *	3	4	7
LIBRAVO *	6	8	8
LIBERATOR	6	7	7
LINCOLN	6	6	7

* = double-low control varieties
9 = very high resistance

source: NIAB oil seed crops summary 1989/90

Also in France good results were shown.

Table 5: Yield and disease resistance results from France

	yield rel.	Phoma	Cylindro- sporium
Bienvenu *	106	2.4	4.8
Damor *	94	3.3	6.7
LIBRAVO	109	4.1	7.0
LIRAJET	96	3.5	7.8
LIBERATOR	115	4.1	7.5

* = single-low control varieties
9 = very high resistance

source: Cargill trials in France on 4 locations
- Aube, Boissay, Charente, Cher -

SUMMARY

As these results show, double-low winter oilseed rape varieties with high seed and oil yield could be obtained by special backcrossing and screening procedures. Good success is also shown in Phoma lingam resistance breeding as the level of the best Phoma lingam resistant single-low variety Jet Neuf was reached. Even better is the situation with the resistance breeding against *Cylindrosporium concentricum*: some of the new varieties have a higher resistance level than the single-low

control varieties had. Lirajet and Liberator also show a clearly lower susceptibility to the other diseases occurring in oilseed rape like *Alternaria brassicae*, *Botrytis cinerea* and *Sclerotinia sclerotiorum*. Remarkable is also the low susceptibility of Liberator against *Verticillium dahliae*, a disease which was of increasing significance in Germany during the last few years. Results from 1990 show that the breeding for resistance was also successful in other European countries.

This is demonstrating the possibilities of resistance breeding which will be furtheron persecuted in the future.

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