

Effect of Selfpollination on the Seed Yield in the Following Generation of Double-low Winter Rape (*Brassica napus* L.)⁽¹⁾

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The choice of the most efficient method for rape seed breeding is still an open question. This plant is treated as an autogamous plant in France and England and inbreeding is used there commonly.

Many studies conducted on heterosis effect by winter rape showed that crosspollination had a significant strong influence on rapeseed plant growth and on their hardiness to unfavourable conditions and diseases and thus on the seed yield. Winter rape is a partially allogamous plant in natural conditions and it is no problem with seed setting by inbreeding.

Seed yield depression after selfing is not so rapid and strong as by turnip rape / *Brassica campestris* / or cabbage / *Br. oleracea* /. Many winter rape breeders believe that effect of this depression could be compensated by proper selection. Described below investigations were done to clear up the problems connected with self pollination by double low winter rape and its influence on the seed yield in following generation.

Methods

All trials were conducted on strains and lines of double low / low erucic low in glucosinates / winter rape / *Brassica napus* L. / taken from breeding program of Oil Crop Department in Poznan. This double low material was obtained by multiple crossings and selection. The genetic source of low glucosinolate content was spring rape of Bronowski variety. The seeds from 92 strains and from 261 single plants were used for sowing trials. The seed yields of progenies of 133 single plants were compared in two combinations. First combination was sown with seeds from open pollinated branches and will be called lines. The second combination sown with seed produced on the same plant by self-pollination will be called inbred lines.

Trials were conducted on experimental field at Poznan in 1983/84. Randomized complete block design with standards put every fifth plot was used. One row plots were 1,6 sqm / 0,4 m x 4 m / in size.

Results and Discussion

The first comparison was made between inbred lines and lines from open pollinated seeds.

Results are given in table 1 which is a frequency table for seed yields of inbred lines represented in per cent of yields of corresponding lines.

Table 1 – Effect of selfpollination on seed yield in following generation of double low winter rape

Yield of inbred lines %	n
10 - 20	1
20 - 30	0
30 - 40	1
40 - 50	2
50 - 60	6
60 - 70	10
70 - 80	21
80 - 90	22
90 - 100	29
100 - 110	26
110 - 120	8
120 - 130	5
130 - 140	2

\bar{x} 89,07 %
s 20,47 %

Average yield of open pollinated : 26,89 q/ha
Average yield of selfpollinated lines : 23,95 q/ha
Average effect of selfpollination : 10,93 %
Average effect of open pollination : 12,27 %

Responses to inbreeding were very differentiated for examined lines. Only 30 per cent of inbred lines / 41 / was equal or better in seed yield than lines.

(1) This paper was also lectured at the Eucarpia Meeting 1985. Cordoba (Spain).

The selfpollination caused an average decrease of yield by 10.9 per cent. Some lines were very susceptible to inbreeding.

The examined lines originated from strains and lines which differed in degree of inbreeding. The next comparison was done to find the influence of this factor on seed yield. Results of calculations are given in table 2 which is a frequency table for inbred lines grouped according to inbreeding level. Obtained results indicated that there was lack of significant differences among the groups. This phenomenon suggested that there was observed rather an increase of seed yield as a consequence of open pollination than a decrease of yield following inbreeding.

Table 2 – Effect of selfpollination on seed yield in following generation as dependent to inbreeding degree of the line

Yield %	S ₁	S ₂	S ₃	S ₄
10 - 20	1			
20 - 30	0			
30 - 40	0	1		
40 - 50	2	0		
50 - 60	4	0		2
60 - 70	4	4		1
70 - 80	16	2	1	3
80 - 90	10	2	3	7
90 - 100	16	5	2	6
100 - 110	15	4	1	5
110 - 120	6	0		3
120 - 130	4	0		1
130 - 140	1	1		
n	79	19	7	28
\bar{x}	88,9	86,0	90,3	91,3
Decrease %	11,1	14,0	9,7	8,7
Increase %	12,5	16,3	10,1	9,6

Table 3 contains the seed yields of initial strains and selected from them lines and inbred lines. The seed yields are given as per cent of standard. The selection of single plants was efficient because 48 per cent of lines and 25 per cent of inbred lines were better than standard when only 20 per cent of strains exceeded the value of standard. The strains were represented by different numbers of lines so to obtain more exact results all seed yields of lines and inbred lines were calculated as per cent of yields of initial strains. Obtained frequency table is represented in table 4. Average seed yield of lines is higher than average seed yield of inbred lines, but inbred lines were more differentiated and their coefficient of variability was about 30 per cent higher.

Conclusions

1. The open pollination was followed by mean increase of seed yield in next generation by about 12 per cent.

Table 3 – Comparison of seed yield of lines and initial strains

% of standard	Strains	Open pollinated lines	Inbred lines
30 - 40			1
40 - 50			3
50 - 60		4	3
60 - 70	3	3	6
70 - 80	7	8	15
80 - 90	11	14	8
90 - 100	19	26	11
100 - 110	4	32	12
110 - 120	4	14	2
120 - 130	2	5	1
130 - 140			1
n	50	106	63
above standard	20 %	48 %	25 %

Table 4 – Seed yield of open pollinated lines and inbred lines in per cent of seed yield of initial strains

%	Open pollinated lines	Inbred lines
40 - 50	1	2
50 - 60	2	6
60 - 70	2	5
70 - 80	12	8
80 - 90	12	5
90 - 100	11	9
100 - 110	21	12
110 - 120	16	5
120 - 130	8	5
130 - 140	8	3
140 - 150	6	3
150 - 160	2	
n	101	63
\bar{x}	104,8 %	93,9 %
s	22,9	26,6
C of V	21,8 %	28,3 %

2. Inbreeding was followed by decrease of average seed yield but was connected with bigger differentiation of breeding material than selection of open pollinated single plant.
3. Inbred lines had lower mean seed yield than initial strains but higher per cent of inbred lines was better than standard.
4. Mean value of seed yield for lines showed that single plant selection gave small but significant genetic gain.
5. Method for double low winter rape breeding for better seed yield should connect profits of higher as selection efficiency given by the inbreeding and at least partial utilization of heterosis effect.