SELECTION CRITERIA OF WINTER RAPE SINGLE PLANT AND ITS SEED YIELD

Woyke Teresa
Chair of Soil Cultivation and Plant Husbandry,
University of Agriculture,
Poznań, Poland.

The seed yield per plant as well as the number of plants per hectare are the main structure elements of rape seed yield; the former is also the most important feature in rape breeding. But the use of other features describing the yield in the first step selection of plant is very popular. In this report features /$x_1 \ldots x_{11}$/ named in Table 1 were tested as correlated with single plant seed yield /y/.

Material and methods

Plants of 2 field variety trials /DW with 80 and DP with 108 plots/ were measured for 3 years, each cultivar 80 or 60 plants. Samples of 20 ripe plants were taken from a plot as 5 neighbour plants in 4 randomized places. When measured they were threshed by hand. Seeds were cleand up with a laboratory cleaning belt separator. Seed yield of single plant was weighed up to 0.1 g. In those field trials were 20 cultivars in DW /ten 0- and ten 00-cultivars/, 36 cultivars in DP /mostly 0- cultivars/. The character of the trials was: DW - preliminary, DP - comparative as a breeding trial.

Each year the linear correlation between the 11 features and seed yield of a plant was tested according to Harabasz J. S. and others /1972/. Then the 1st and 2nd degree correlation and regression significance was determined for 11 features using the method described by Malec E. and S. Mejza /1975/. When in most cases the

linear correlation with the yield /y/ was strong - which was found for 6 features /$x_{3,4,5,6,7,11}$/ - the differences of regression in the years were estimated according to Caliński T. and E. Malec /1976/, and when not significant, the equation of general regression was employed. - The calculations were made on the data of 2 trials and on those of 3 cultivars listed in Table 2b.

Results and discussion

As shown in Table 1 the correlation between the single plant seed yield and the features tested was mostly linear in the 2 trials. Similar results were for the cultivars.

Table 1

Linear correlation coefficient for measured features of plant and its yield; x significant at 0,05 level only.

Trial / Year / Morphological feature	DW			DP		
	1982	1984	1985	1982	1984	1985
1. Plant height	0,54	(0,49)	-	0,21x	-	0,46
2. The lowest branch height	-	-	(-0,24x)	-0,46	-0,33	-0,27
3. Stem diameter at ground level	0,43	(0,75)	0,54	0,56	0,31	(0,62)
4. Number of branches on a plant	(0,51)	0,77	0,51	0,69	(0,49)	0,64
5. Number of siliques on main stem	-	0,25x	-	0,37	-	0,51
6. Number of siliques on branches	0,70	0,78	0,47	0,80	(0,60)	0,69
7. Number of siliques on plant	0,69	0,79	0,40	0,80	(0,56)	0,73
8. Length of silique	-	0,31	-	-	-	-
9. Length of silique flap	-	0,28	-	-	-	-
10. Length of silique beak	0,34	0,22x	(-)	-	-	-
11. Number of seeds per silique	0,32	0,24x	0,24x	0,27	0,28	0,21x

( ) also the 2nd degree correlation significant, ( ) at 0,05 level only.

This yield was closely connected with the number of siliques on plant, which is well known and is in line with the opinion of Schrimpf D. /1954/ cited by Boelcke B. /1977/ that this number is the main yield structure element. Similarly, it was strongly correlated with the number of siliques on branches as shown by Boelcke B. /1977/, yet she did not calculate the correlation.

The correlation with the number of siliques on the main stem was irregular and rather weak as found by Boelcke B. /1977/, who also found it rather stable.

The most strongly positive correlation with the number of branches on plant /Table 1/ has not been described in literature, but the results by Boelcke B. /1977/ illustrate this connection.

There has also been no description of the correlation with stem diameter at ground level found here as mean or strong /Table 1/.

An irregular tendency to increase the yield with the plant height /Table 1/ was described by Baur G. /1939/, Stolle G. /1954/ and Schrimpf D. /1954/ cited by Andersson G. and G. Olsson /1951/ as a strong correlation.

The positive correlation with the number of seeds per silique was clear but weak, yet Baur G. /1939/ and Stolle G. /1954/ cited by the above mentioned found it strong /the former/ or mean /the latter/.

The irregular small tendency of single plant seed yield to decrease with the height of the I branch was not mentioned in literature.

The characters of silique had in fact no connection with the yield /Table 1/.

Consequently the 6 features listed in Table 2 were interesting for further studies on that problem. - The insignificance of differences between common regression equations in years for features 5 and 11 in both trials /Table 2a/ and for features 4, 6, 7 in DP proved that the regression lines were parallel in years; only the lines of features 6 and 11 had insignificant distances and could be shown as one line of general regression equation. Those results found for 3 cultivars /Table 2b/ were on

the whole similar but differed from trial to trial. There were found general regression equations of single plant seed yield on:

Table 2

Significance level for differences between the common regression equation for years /CRE/ and general regression equation /GRE/

a/ in trials

Trial	DW		DP	
Regression equation / Feature Nr	CRE	GRE	CRE	GRE
3	0,01	0,00	0,02	0,00
4	0,00	0,00	0,34	0,00
5	0,07	0,00	0,19	0,00
6	0,00	0,00	0,06	0,15
7	0,00	0,00	0,08	0,00
11	0,99	0,00	0,66	0,02

b/ in cultivars /only insignificant differences/

Cv.	Jet Neuf				Beryl				G-22			
Trial	DW		DP		DW		DP		DW		DP	
Reg.eq. / F. Nr	CRE	GRE	CRE	GRE	CRE	GRE	CRE	GRE	CRE	GRE	CRE	GRE
3					0,02						0,99	
4											0,01	
5	0,31		0,26	0,21	0,25	0,29			0,06		0,21	0,53
6			0,64		0,03	0,25			0,18	0,01	0,06	0,18
7			0,21		0,24	0,02			0,01		0,45	0,01
11	0,18		0,17		0,58				0,02		0,87	

- number of siliques on main stem /5/ for Jet Neuf in DP y=2.91+0.10x, for Beryl in DW y=3.24+0.23x, for G-22 in DP y=3.19+0.08x,
- number of siliques on branches /6/ for DP y=2.27+0.06x, for Beryl in DW y=1.02+0.11x, for G-22 in DP y=2.03+ +0.07x,
- number of siliques on plant /7/ for Beryl in DW y=-1,11+0,10x,
- number of seeds per silique /11/ for DP y=2.34+0.17x, for Beryl in DW y=-1,61+0.48x and in DP y=-0.88+0.31x.

The lines of equation for number of siliques on branches are shown in the figure.

Summary

The most important features in winter rape plant selection for seed yield are number of siliques on branches and their number on a plant. There is no possibility of using a general regression equation in those cases as it differs from trial to trial even for the same cultivar. The stem diameter at the ground level /3/ and the number of branches on a plant /4/ are useful in preliminary selection for single plant seed yield because of their stronger correlation with the yield as well as the number of siliques on branches, their correlation coefficients in trials being 0.33 - 0.75 for /3/ and 0.69 - 0.82 for /4/.

Literature

- Andersson G. and G. Olsson, 1961. Cruciferen-Ölpflanzen. Handbuch der Pflanzenzüchtung. Redactors Roemer-Rudorf, Berlin - Hamburg V: 1 - 66.
- Boelcke B., 1977. Einzelschotenertrag bei Raps in Abhängigkeit von Einzelpflanzenentwicklung und Insertionspunkt an der Pflanze. Tagungsbericht Akademie der Landwirtschaftswissenschaften der DDR - Berlin 175: 335 - 339.
- Caliński T. and E. Malec, 1976. Porównanie równań regresji wielokrotnej. Roczniki Akademii Rolniczej w Poznaniu, Poznań LXXXVI, z. 5: 165 - 185.
- Harabasz J.S. and B. Ceranka, Z. Kaczmarek, 1972. Obliczanie charakterystyk zmiennych i współczynników korelacji. Roczniki Wyższej Szkoły Rolniczej w Poznaniu, Poznań LXI, z. 1: 17 -26.
- Malec E. and S. Mejza, 1975. Badanie efektów w regresji krzywoliniowej. Roczniki Akademii Rolniczej w Poznaniu, Poznań LXXX, z. 4: 188 - 206.

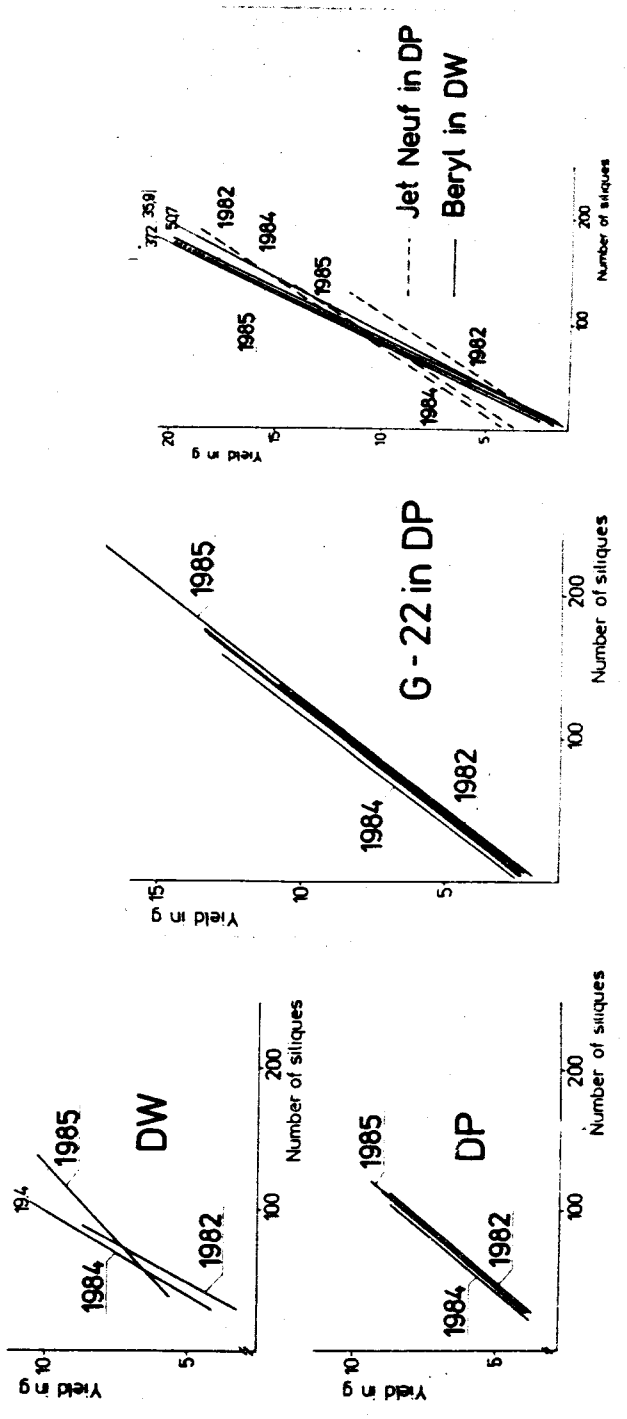

Fig. Regression lines of seed yield per plant on the number of siliques on branches /6/.