

BREEDING FOR INCREASED YIELD IN DOUBLE-LOW SPRING RAPESEED

By Hans Svensk
Weibullsholm Plant Breeding Institute, Landskrona, Sweden

In recent years rape seed breeders have concentrated their work on quality improvements. To meet the problems of decreasing yield and yield stability in the double-low varieties, an effective breeding strategy to overcome these problems is essential. Some experimental data and some suggestions for a better plant type is presented in this paper.

GROWTH RHYTHM

Most spring rape in Sweden is grown in the central parts of the country. Here earliness is very important. The earliness should be accomplished through shortening the period from emergence to flowering. Since most of the photosynthate used for seed formation is produced by the green pods and the green seeds, the time between flowering and maturity should, if possible, not be shortened. An example of this is the new low-erucic spring-rape variety Olga which originates from a cross between Oro and a high-erucic line. The Olga variety resembles Oro in most characteristics except yield and growth rhythm. These characteristics are shown below, (Yield figures are taken from the official extension service: "Sortval -78" by statsagr. A. Bengtsson, and the other data from own experiments.)

Variety	Days from seeding to flowering	Days from flowering to maturity	Yield, crude fat. Rel. fig.
CDA Oro	56	82	100
WW Olga	54	82	111

Olga is growing more vigorously than Oro in the initial stage and has a taller stem at flowering time in spite of its growing period being 2 days shorter. Olga is the highest-yielding variety on the official Swedish list of cultivars 1978.

BRANCHING HABIT

Important facts which influence the breeding strategy are the changed agricultural practices in Sweden. Most spring rapeseed is sown with a distance of 12 cm between rows. According to seed certification and reported acreage the mean seed rate for spring rape in Sweden in 1977 was 14 kg/ha. These changes to higher seed rates and narrower row space have been made mainly during the last five years. The advantages are higher seed yield, higher oil content and lower chlorophyll content. But also maturity has been earlier and more uniform, probably due to less branching. It is supposed that under the above-mentioned growing conditions a variety with few branches should give the highest yield. Some experiments with lines differing in branching habit are reported below.

EXPERIMENTS WITH BREEDING LINES DIFFERING IN GROWTH RHYTHM AND BRANCHING HABIT.

Most investigations into relationships among growth patterns, yield components and yield have been made on single-plant basis. But most of the yield components have a high compensating effect and some yield components can be compensated with a higher seed-rate. Here the yield from regular replicated yield trials has been compared for a number of breeding lines.

From a cross between a tall late variety and an early short variety a number of breeding lines differing in growth rhythm and branching habit were selected. These lines were also selected for good agronomic characteristics and except for the differences mentioned the phenotypic appearance were rather similar. The recorded characters of the lines are shown below. The yield figures are the mean of two trials in 1977, one in south and one in central Sweden. Each trial had five replications with a plot size of 25 m². The seed rate was 4,2 million seeds/ha (13-15 kg/ha). Flowering and maturity notes have been taken from observations of the entire plots. Seeds per pod and primary branches have been calculated from a number of randomly chosen plants.

Breeding line	Days from seeding to flowering	Days from flowering to maturity	Days from seeding to maturity	Primary branches per plant	Seeds per pod	1000-seed weight	Seed yield kg/ha
1	55	80	135	6,0	13,5	4,2	2959
2	54	80	134	4,3	13,5	4,5	3029
3	59	78	137	5,6	13,9	4,3	2839
4	58	75	133	5,0	13,2	4,4	2735
5	56	80	136	5,0	13,3	4,6	2758
6	59	78	137	4,0	13,4	4,7	2860
7	54	79	133	6,3	12,0	4,5	2380
8	57	79	136	6,0	13,4	4,3	2677
9	55	80	135	5,8	12,9	4,4	2856
10	55	79	134	5,3	13,8	4,4	2666

The highest yielding line (No.2) is very early at flowering and has a long seed-filling period. It has few branches, a rather high number of seeds per pod and a rather high 1000-seed weight.

Campbell and Kondra (1978) found a significant correlation between rapid initial plant development and seed yield.

The lowest yielding line (No. 7) has many branches and few seeds per pod.

A MODEL FOR A HIGH-YIELDING SPRING RAPESEED VARIETY.

For Swedish growing conditions it is suggested that a model for a high-yielding spring rapeseed variety, or an ideotype (Donald, 1968) should have the following characteristics:

Large and horizontal rosette leaves to get a quick ground covering.

Smaller and more vertical stem leaves.

Few branches with, if possible, a simultaneous development with the main shoot.

Little basal branching.

Early flowering.

A seed-filling period as long as possible, but the need of an early maturity will limit this period.

Better harvest index.

Dense pod setting with more vertical pods.

This plant type should result in a higher yielding variety with an even maturity, but it will need a more dense seeding.

LITERATURE CITED

Campbell, D.C. and Z.P. Kondra, 1978. Relationships among growth patterns, yield components and yield of rapeseed - Can. J. Plant Science 58: 87-93

Donald, C.M., 1968. The breeding of crop ideotype. - Euphytica 17: 385-403.