

Heterosis in Summer Oilseed Rape
(Brassica napus L.)

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The seed yield advantage of F1 intercultivar hybrids of summer oilseed rape (Brassica napus L.) was examined in replicated trials from 1980 to 1982 (Sernyk and Stefansson, 1983).

In 1980 seven cultivars, in 1981 four cultivars and in 1982 two cultivars of B. napus were reciprocally topcrossed to the Canadian canola cultivar Regent (Table 1). F1 hybrid seed was produced in the greenhouse by emasculation and bud pollination. To ensure adequate sampling of the variability in each cultivar, at least 40 plants of each cultivar were used to produce the seed of each F1 hybrid. The cultivars were maintained by self-pollination of the same plants used to produce the hybrid seed. Breeders seed of Regent was added to the trials to check for inbreeding depression in the topcross cultivar.

Randomized complete block field designs were used in all years. Each block included two Regent Breeders seed plots, two plots sown with Regent self-pollinated seed and one plot of each of the other cultivars, the F1 hybrids and the reciprocal F1 hybrids. Treflan (trifluralin) was applied to the plot areas in the fall. Seeding of the plots was done in late May or early June using seeding rates adjusted to give a 2.5 cm spacing between plants in the rows. The four row plots were 5.8 m long with 30 cm spacing between rows. Furadan 10G and 11-48-0 fertilizer were applied with the seed. Irrigation was necessary in 1980 and occasional spraying for flea beetle control was necessary in all three years.

Agronomic, yield and quality characteristics were determined for all entries. No differences were observed between reciprocal crosses and no inbreeding depression was apparent in one generation

of self-pollination of the cultivar Regent. The hybrids involving the three Japanese cultivars did not mature under the conditions of these trials.

The yield responses of the F1 intercultural hybrids relative to the Canadian cultivar Regent are given in Table 2. The two better hybrid combinations are Gullivar x Regent and Karat x Regent. Both Gullivar and Karat are of Swedish origin, Gullivar being low in erucic acid and Karat being low in both erucic acid and glucosinolates. The performance of these two hybrids is summarized in Table 3. A yield advantage of 24 to 43% over Regent is attainable with these hybrids with only a one day delay in maturity. This delay in maturity is derived from the Swedish cultivars which mature four days later than Regent. These two hybrids are somewhat taller than Regent and have superior resistance to lodging. The oil and protein contents of the seed from these two hybrids are comparable to those for Regent. Karat x Regent is also a low erucic acid, low glucosinolate hybrid.

The results obtained in these trials agree with those found by others investigating heterosis in rape (B. napus) (Schuster and Michael, 1976; Shiga, 1976; Morice, 1978; Buson, 1980; Guan, 1980; Lefort-Buson, 1982). All of these investigations indicate that on the basis of yield and agronomic performance, F1 hybrids of oilseed rape have real potential. However, a mechanism for the production of hybrid seed has to be developed before F1 hybrids can be commercialized.

References

- Buson, M. 1980. Heterosis and genetic parameters in winter rape (Brassica napus). Cruciferae Newsletter No. 5. pp. 13-14.
- Guan, C. 1980. The preliminary investigations on heterosis and early prediction in heterosis selection of hybrids of rapeseed (Brassica napus). (Chinese with English summary.) Acta Genetica Sinica 7:63.
- Lefort-Buson, M. 1982. Heterosis in summer rapeseed (Brassica napus L.). Cruciferae Newsletter No. 7. pp. 16-17.
- Morice, J. 1978. The selection of rape for the improvement of yield. Proc. 5th Int. Rapeseed Conf. Malmoe, Sweden.
- Schuster, W. and Michael, J. 1976. Investigations into inbreeding depressions and heterosis effects in rape (Brassica napus oleifera). (German with English summary.) Z. Pflanzenzuchtg. 80:277-298

Sernyk, J.L. and Stefansson, B.R. 1983. Heterosis in summer rape (Brassica napus L.). Can. J. Plant Sci. 63:000-000.

Shiga, T. 1976. Studies on heterosis breeding using cytoplasmic male sterility in rapeseed, Brassica napus L. (Japanese with English summary.) Bull. Natl. Inst. Agric. Sci. Series D. No. 27. 101 pp.

Table 1

Cultivars of summer oilseed rape (B. napus) used in the hybrid trials, their countries of origin, and years in the trials.

Cultivar	Country of origin	Years in trials
Regent (topcross cultivar)	Canada	1980-82
Asahi-natane	Japan	1980
Chisaya-natane	Japan	1980
Norin 16	Japan	1980
Bronowski	Poland	1980
Kosa	Germany	1980
Schuster 75-01	Germany	1980-81
Gullivar	Sweden	1980-81
Karat	Sweden	1981-82
Marnoo	Australia	1981-82

Table 2

Yields of F1 intercultivar hybrids
of oilseed rape (B. napus).

Hybrid	Year	Yield (% of Regent ^a)
Bronowski x Regent	1980	98
Kosa x Regent	1980	107
Schuster 75-01 x Regent	1980	115
	1981	118
Gullivar x Regent	1980	140
	1981	143
Karat x Regent	1981	143
	1982	124
Marnoo x Regent	1981	138
	1982	107

^a average yield of Regent: 1770 kg/ha.

Table 3

Performance of the two better oilseed
rape (B. napus) hybrids.

Hybrid	Yield (% of Regent)	Days to Maturity ^a	Height (cm)	Lodging ^b (1-5)	Oil ^c (%)	Protein ^c (%)
Gullivar x Regent	140-143	98	119	1.8	45.1	26.0
Karat x Regent	124-143	98	123	1.8	45.3	27.1
Regent	100 ^d	97	107	2.5	45.6	26.7

^a from seeding.

^b 1 = no lodging; 5 = completely lodged.

^c percent of seed dry weight.

^d average yield of Regent: 1770 kg/ha.