IMPROVEMENT OF CRAMBE FOR AGRONOMIC PROPERTIES

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Introduction

Crambe (*Crambe abyssinica*) is a cruciferous oilseed crop, cultivated for its high level (55-58%) of erucic acid (C22:1) in the seed oil. Erucic acid and its derivatives can be used in a range of industrial applications, e.g. erucamides and lubricants. Crambe is adapted to cool climatic conditions and has good agronomic features. In the USA the area cultivated with crambe increased in 1993 to 24.000 ha (Anonymous, 1993). In the Netherlands a pilot project of 300 ha/year was carried out in 1992 and 1993. Future cultivation of crambe requires improved varieties adapted to specific environmental conditions (van Soest et al., 1993).
Crambe was first introduced in The Netherlands in 1986 and breeding research to improve agronomic and quality characteristics started in 1990 (Mastebroek et al., 1994).

Material and methods

Two late flowering old European varieties with glabrous and two early flowering American breeding lines with pubescent leaves were crossed following a semi-diallelic scheme. 100 F2 plant progenies (F3 lines) of each cross were evaluated in 1992 together with 25 plant progenies (parental lines) of each parent. Per line two replicates of one row of three metres including 60 plants were planted. The row space was 50 cm.

Results and discussion

* The population means (F3 lines) for the characteristics earliness, plant height, relative leaf height, number of primary branches, length of the top branch, 1000 seed weight and oil content of the seeds did not considerably differ from the mid-parent values. These results suggest that these characteristics have an intermediate inheritance.
* The average seed yield of five crosses significantly exceeded the

Table 1. Average seed yield (g/m2) of 100 F3 lines and 25 lines of both crossing parents of six crosses among four crambe genotypes

cross	parents		mid-parent	
	P1	P2	value	F3
1 X 2	288	178	233	270
1 X 3	288	252	270	280
1 X 4	288	228	258	284
2 X 3	178	252	215	250
2 X 4	178	228	203	230
3 X 4	252	228	240	276

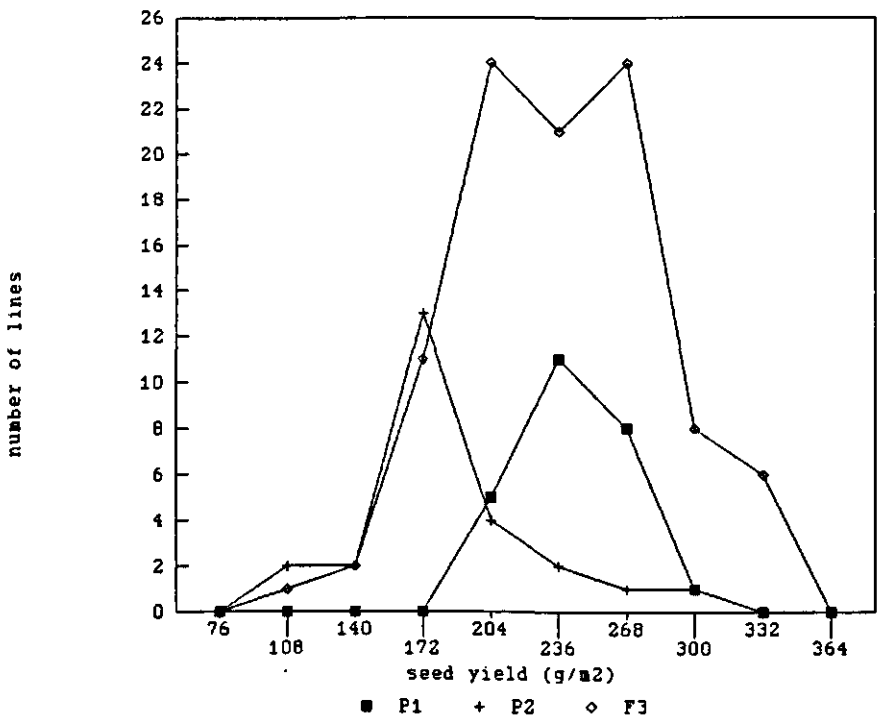

Figure 1. Variation for seed yield of 25 lines of both parents and 100 F3 lines of the cross 1 X 4. LSD $_{0.05}$ 96 g/m² (3 classes).

mid-parent values and equalled the yield of the highest yielding parent (Table 1). This suggests that seed yield is inherited in a dominant way.

* The variation for seed yield exceeded that of the parents in four of the six crosses. It is expected that higher yielding genotypes can be selected from these four crosses. Figure 1 shows the variation for seed yield of the 25 parental lines of both crossing parents and 100 F3 lines of the cross 1 X 4.
* In all six crosses average number of seeds per area exceeded the mid-parent values. Seed number was highly correlated with seed yield (r= 0.91), indicating that seed yield was highly determined by seed number. This can be expected in a stand with a low plant density of 40 plants per m^2.
* No strong relation was found between seed yield and the other evaluated characteristics.
* Evaluation of the four crosses which segregated for a glabrous and a pubescent habit, showed that glabrous lines on average Yielded 9% higher than pubescent lines. Segregating lines were just in between. This difference depends on the number of seeds produced. No relation was found between pubescense and any of the other investigated characteristics.

Conclusions

Intermating morphological different crambe genotypes increased the variation for seed yield considerably.

The apparently dominant inheritance of seed yield may slow down selection progress when lines are selected for seed yield in early generations.

Literature

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