Adapting Brassica juncea to Southern Australia

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Compared with the two rapeseed species, B. juncea (Indian mustard) has:

- much greater resistance to the blackleg fungus,
- twice as much linoleic acid in the oil of zero erucic genotypes (1), and
- more drought and heat tolerance, at least in Canada, U.S.S.R. and China.

B. juncea also is non-shattering. It should be a useful cool season crop in Australia, provided genotypes with low glucosinolates in the seed and early maturity can be created. Progress towards these goals is reported here.

Seed glucosinolate content

Two hundred accessions have been screened by the hammer test (2), but none had a low glucosinolate content. Seeds of a zero erucic line containing predominantlg_oallyl glucosinolate (Zem 1) were treated with 60 kilorads of y rays from a Co source. Seed samples from 22000 M_2 plants were hammer- tested. Three mutants were found with glucosinolate contents about 20% below wild type levels. These have been treated again with y rays or ethyl methanesulphonate. A somaclonal variant with a 40% reduction has been developed by the State Chemistry Laboratory of Victoria (M. Palmer et al., pers. comm.). However, the variant has deformed flowers and is partially sterile. No gross chromosomal abnormalities were detected at metaphase I in its pollen mother cells. Seeds have been y-irradiated and additional glucosinolate mutants will be sought in M_2. The variant also has been crossed with the y ray mutants to determine whether fertile recombinants with a further reduction in glucosinolates can be recovered in F_2.

Early maturity with high seed yield

The China-East European form of B. juncea requires long days for floral induction. It yields well only in late winter or spring sowings in south-western W.A. (N.N. Roy and A.G. McKay, pers. comm.) and Griffith, N.S.W. (E.K.S. Harrigan, pers. comm.), or in cool districts. The Indian form is daylength insensitive, but also tends to be too tall and late maturing. It is susceptible to Pseudomonas leaf blight. These traits cause yield instability, as is shown by accessions 85054 and 81792 in Table 1.

Table 1. Seed yield (t ha^{-1}) of Brassica cultivars

	Canberra			Wagga			
Species/Line/Maturity	1984	1985	1986	1984	1985	1986	Mean
B. juncea 85054 Early	1.87	1.72	-	1.80	1.41	-	-
81792 Mid	1.53	2.15	1.64	1.80	1.55	1.26	1.65
C-14 Early	-	-	2.17	-	-	1.61	-
Domo Late	1.55	2.41	2.17	1.60	1.83	1.65	1.87
B. napus Westbrook Mid	1.37	1.40	1.24	1.48	0.93	0.79	1.20
B. campestris Jumbuck Early	1.81	-	2.11	1.81	0.60	1.12	(1.49)
L.S.D. (5%)	0.30	0.63	0.35	0.20	0.29	0.30	

Wet springs in 1984-6 suited the Canadian cultivar Domo, but in 1986 revealed the greater susceptibility of the rapeseed species to Sclerotinia.

Recombinant B. juncea lines, such as C-14, combining earliness, short stature, high yield, zero erucic acid oil, and resistance to Pseudomonas and Sclerotinia, are becoming available. With low glucosinolate genes added, these lines should provide a new crop for southern Australia.

31. Kirk, J.T.O. and Oram, R.N. 1981. J. Aust. Inst. Agric. Sci. 47 51-2.

32. McGregor, D.J. and Downey, R.K. 1975. Can. J. Plant Sci. 55 191-6.