GCIRCBUL6*05

Brief Report on the Breeding of Low Erucic Strain of B. juncea Coss in Xinjiang

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Xinjiang is one of the main productive regions of Brassica juncea in China. The production acreage is kept at 100 thousands ha every year. It is not only one of the most productive regions in China, but also it is one of the original centres of B. juncea Coss. in China. Xinjiang has a long cultural history and abundant resources of rapeseed varieties and local cultivars. Owing to the long-term evolution under a continental climate, the growth features of B. juncea are as follows : well-developed root-system, high resistance to drought and cold, high resistance to lodging and shattering of pods, strong tolerance to spring sowing, short growth period and ability to mature before high summer temperature comes. Although it has a low or stable yield average, it has raised to a highest level of production due to irrigation in China. Its oil content ranges from 21,87 to 39,36%, and its erucic content from 11,52% to 45,15%, on average 27,14%, and the glucosinolate content varies from 1,05% to 2,49%, so the improvement of the quality is an urgent object in the breeding of B. juncea. Under the support of the International Development Research Centre, we started breeding low erucic varieties of B. juncea.

1. Breeding procedure for low erucic acid strains of B. juncea.

In 1981, Australian low erucic variety Zeme-2 was introduced via the Oil Crops Institute of Chinese Academy of Agricultural Science. Tests showed by gas-chromatograph that the erucic content of population samples was 8,9 %. Adopting paper chromatograph, erucic free seeeds were picked out. In 1982, a diallel cross experiment (6 x 5) was carried out.

After plant selections in five successive generations, laboratory tests and propagations by adding generations in th e South and the North, the first strains with low erucic content and high yield were bred. For example, the strain 85-1312, its female parent was high yielding and a high erucic variety 556 (25,95% erucic acid), and the male parent was erucic-free variety Zeme-2. The erucic content of crossing seeds (Fo) was 12,85 % just intermediate as expected. The seeds borne by the first generation plants were tested for erucic content in single seeds. 60 to 120 seeds per plant were analysed. As a result, three to six seeds with non-erucic content were acquired. Next, plant selections in five successive generations were carried out. Because of the

adopting of transplantation cultivation, summer growing in Hami and winter growing in Hainan Island, three generations every year were produced. Thus, the breeding procedure was speeded up. Compared with local and improved cultivars, yield characters were superior to Xin-you No.1. The plant yield was 1,76-2,03 grammes higher and the composition of fatty acids was also improved.

2. Morphological characters.

The leaf colour of low erucic acid strains is lighter green, for example, new strain 85-1312, and younger plants grow fast and erectly, which is profitable to control weeds. There are 3 to 4 couples of basal leaves, green, having several deep incisions and a small terminal lobe. On the petiols and blades, there exists a small amount of bristle. The main stem and branches have purple spots at the bases which is the most obvious character discriminating it from other cultivars. Plants are 165 to 192 cm high, branching from 35 to 85 cm. The number of primary branches ranges from 5,2 to 7,8 on average. Its compact plant type is suitable for dense population. Every plant has 295 to 384 siliques, which bear a relatively large number of seeds per silique (17,5-19,6). But seeds are small, therefore the weight per 1000 seeds is low (2,95 - 3,12 g). This strain belongs to vernal B. juncea with medium-short growth period (75-125 days ; on average 96 days). It matures 4 days earlier than the control (Xin-you No.1).

3. Yield Capacity of new strains 85-1312

From 1986 to 1988, comparative experiments of six cultivars were carried out for determining the adaptation, resistance to stress and yields of low erucic acid strains. The experiments were carried out in 9 sites located in the South and the North of Tion-shan mountains, in random blocks and with four replications. Five new strains were 85-1312, 85-991, 85-1026, 85-875, and Xin-you No.1 was used as control. The plot area was 22,2 square meters.

The yield of strain 85-1312 were at the average of 2849,1 kg/ha in three years. In 6 out of the 9 sites, the yields of 85-1312 were all the highest, the extent to contrast variety was 1,85-43,5%. The highest yield was 9.345 kg/ha. Strain 85-991 yielded the most at Qitai, 9,60% higher than the check.

4. Quality Characters of New Strains 85-1312 and 85-991.

Experiments reveal that the healthy fatty acid content (oleic and linoleic) in low erucic strains increases significantly. The contents in 85-1312 and 86-991 are 77,28 and 74,4. 9% respectively almost is twice as high as Baichenhuang Youcai (41,40%) and Xin-you No.1. (48,37%). Other characters for quality are as follows :

Fatty acid composition of high and low erucic cultivars :

cultivars and strains	palmitic (16:0)	oleic (18:1)	linoleic (18:2)	linolenic (18:3)	eico- (20:1)	eruric (22:1)
Baichenhuang Yoy Cai	3,62	18,40	23,00	11,27	13,61	30,12
Xin-you No.1	3,89	24,12	24,25	11,41	13,49	30,12
85-991	4,95	42,62	36,87	15,44	0,12	0
85-1312	4,33	44,63	32,65	17,78	0,61	0

Based on the three years' experiments, the results are as follows:

1) 85-1312 is a promising strain. It contains 0 to 0,5 % of erucic acid, 77,28% of oleic and linoleic acids. But Xin-you No.1 and Baichenhang only contain 48,37% and 41,40% of linoleic and oleic acids, respectively.

The yield and oil content of the strain are both higher than Xin-you No.1. In addition, it matures 3-5 days earlier and tolerate downy mildew (Peronospora parasitica (pers.Derbary) and white rust disease (Albugo candida (pers.) O. Kze) relatively well.

2) 85-991 is also a promising strain. Although the strain decreases yield by 5,87% compared with the check, it matures earlier. Its total growth period is 70-120 days, 7-15 days shorter than the control. It may be used to replace B. campestris and may be grown under multiple cropping. Furthermore, it is suitable for growing in upland fields above 1,500 meters altitude. Its quality is satisfactory, erucic acid content being 0-0,48%, linoleic acid being 36, 81%.

Both strains are expected to pass provincial assessment and be registered in the near future. Thus, they will become the first low erucic varieties of B. juncea in China. They may be adapted in Xinjiang and China.