PERFORMANCE OF RAPESEED-MUSTARD CULTIVARS AT ISLAMABAD

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Introduction:

The most important rapeseed and mustard crops in Pakistan are Brassica campestris, B. napus and B. juncea. Local cultivars of these species are high in erucic acid and glucosinolates (Khan et al., 1987). The oil from these cultivars is mostly used for non-edible purposes such as in lubricants and hair oil. However, small quantities are used in cooking of local foods such as pakoras and fish.

Oils and fats consumed in the country are mostly in the form of ghee, a hydrogenated product in semi-solid form. This product is manufactured from locally produced cottonseed oils and from imported oils. Since local crushers do not have the capability of pre-treating rapeseed and mustard to deactivate the myrosinase leading to glucosinolate expression, the oil from local rapeseed-mustard cultivars contains sulphur products and is unsuited for the manufacture of ghee. Thus the use of these oils for edible purposes is limited. Recent introductions of rapeseed cultivars from Canada contain very low levels of sulphur in the oil and meal and are considered to be nutritionally superior to normal rapeseed because of the reduction of the fatty acid, erucic acid, in the oil. These introductions commonly referred to as "double low" or Canola cultivars also produce a high quality meal used in animal feed.

Thurling (1974) tested three cultivars each of B. napus and B. campestris at different sowing dates in Australia and reported non-significant differences between cultivars within species. Rawat and Anand (1978) grew 50 varieties of Indian mustard (B. juncea) at three locations and found significant differences between the varieties for almost all the characters recorded including seed yield per plant. Degenhardt and Kondra (1981) studied the effects of seeding date and seeding rate of five genotypes of B. napus including four cultivars and one experimental line for two years at two locations in Western Canada and found non-significant differences among genotypes. Munir and McNeilly (1986) reported non-significant seed yield per plant differences among six B. napus cultivars grown in a greenhouse at three fertility levels and two densities.

The objective of the present investigation was to test the performance of introduced "double low" cultivars of B. campestris and B. napus against the standard local and introduced cultivars grown in Pakistan. The tests were conducted in field plots at the National Agricultural Research Centre (NARC), Islamabad, during two years 1984-85 and 1985-86.

Materials and Methods:

The names of the cultivars and strains and their main characteristics are given in Table 1. Seed of these entries was sown during rabi (winter) season on the dates shown in Table 2. Each test consisted of four replications in a randomized complete block design and entries of each species were sown in separate blocks. Each plot consisted of six 5 m rows in 45 cm and 30 cm spacings during 1984-85 and 1985-86, respectively. The fertilizer dosages were at 80 kg N and 50 kg P in 1984-85 and at 90 kg N and 60 kg P in 1985-86. All fertilizer was broadcast and disced to a depth of approximatley 10 cm before seeding. Plots were seeded at 6 kg/ha and were thinned after two weeks to approximately 5 cm between plants giving a final population of 75 plants/m^2. At maturity, four central rows were harvested and threshed and data analysed statistically. During 1985-86, two sets of trials were planted, one in a rainfed area and the other in an area where irrigation facilities existed and plots could be watered if required. Because of an inordinate amount of rainfall during the season, there was no need to irrigate. During 1984-85, one flood irrigation of about 8 cm was applied at the pod filling stage.

Results and Discussion:

The means for maturity days, seed yield and 1000-seed weight are given in Table 2. It is evident that B. campestris cultivars were earlier maturing than those of B. juncea and B. napus. B. napus entries were the last to mature requiring approximatley 178 days. Introduced cultivars from Canada, Tobin and Torch, required 6 to 9 days longer to mature than the check variety, B.S.A.

The overall yield of B. juncea lines was higher than B. napus and B. campestris entries. B. juncea lines have also proven to be more hardy and tolerant to some insects such as aphids as compared to the other two species. Seed yields of all B. campestris entries were similar except Tobin which yielded less than other entries, although not significantly from the check. Seed yield of Ganyou-5 was the highest among B. napus entries. The other entries including the check and Westar, a "double low" cultivar, produced similar yields with Westar averaging approximately 10 percent higher yield than the check over the two year period. Similar seed yield

differences among B. napus entries have also been reported by several Brassica workers (Thurling, 1974; Degenhardt and Kondra, 1981; Munir and McNeilly, 1986).

Among the B. juncea entries, seed yield of BM-1 was the highest (averaging approximately 20 percent over the check) followed by Varuna, K-318, and S-9 (check). These results suggest there may be more opportunity for improvement of yield in this species in Pakistan than for the other Brassica species. A similar conclusion was reached by Rawat and Anand (1978) in a study conducted in India. In Pakistan, registration and licencing of BM-1 is already in process.

Table 1. The origin and main characteristics of local and introduced cultivars and strains of B. napus, B. campestris and B. juncea grown at NARC, Islamabad, during 1984-85 and 1985-86.

Cultivar	Main Characteristics
Brassica campestris	
B.S.A.	An old local cultivar released by Punjab Province in 1930s - normal erucic acid and glucosinolates.
K-953	A selection from local material - normal erucic acid and glucosinolates.
Tobin	An introduction from Canada - "double low".
Torch	An introduction from Canada - low in erucic acid and high in glucosinolates.
Brassica napus	
PR-7	A local cultivar released by North West Frontier Province in 1967 - normal erucic acid and glucosinolates.
NARC-82	A selection from local material - normal erucic acid and glucosinolates.
Ganyou-5	An introduction from China - normal erucic acid and glucosinolates.
Westar	An introduction from Canada - "double low".
Brassica juncea	
S-9	A local cultivar released by Sind Province in 1974 - normal erucic acid and glucosinolates.
K-318	A selection from local material - normal erucic acid and glucosinolates.
Varuna	An introduction from India - normal erucic acid and glucosinolates.
BM-1	A selection from introduced Indian material - normal erucic acid and glucosinolates.

Table 2. Mean days to maturity, seed yield and 1000-seed weight of Brassica cultivars grown in Islamabad, Pakistan, over two years.

Cultivars	Days to Maturity				Seed Yield (kg/ha)				1000-Seed Weight (g)			
	1984 -85a	1985(1) -86b	1985(2) -86	Ave.	1984 -85	1985(1) -86	1985(2) -86	Ave.	1984 -85	1985(1) -86	1985(2) -86	Ave.
B. campestris												
B.S.A.*	150	174	157	160	1391	1286	1453	1377	2.76	3.07	2.92	2.92
K-953	160	173	157	163	1482	1185	1364	1345	2.75	2.90	2.65	2.77
Tobin	160	178	169	169	1024	1193	1194	1137	2.33	2.67	2.50	2.50
Torch	159	176	162	166	1137	1768	1453	1453	2.13	2.95	3.02	2.70
LSD at 0.05	0.0	0.7	0.0		NS	182.4	NS		0.32	NS	NS	
C.V.	0.0	2.0	0.0		19.5	8.4	9.8		8.10	6.40	10.90	
B. napus												
PR-7*	171	186	178	178	1205	1954	1568	1576	3.72	4.15	4.05	3.97
NARC-82	170	187	177	178	1385	1767	1368	1507	4.39	4.20	4.25	4.28
Ganyou-5	171	186	180	179	1626	2472	1832	1977	3.64	3.70	3.92	3.75
Westar	168	185	178	177	1404	1997	1670	1590	3.53	3.92	3.57	3.67
LSD at 0.05	0.2	1.3	NS		NS	365	NS		0.37	NS	NS	
C.V.	0.1	0.4	1.7		23.8	11.1	19.2		5.50	8.90	8.80	
B. juncea												
S-9*	163	181	175	173	1560	1567	1210	1446	3.66	3.15	3.35	3.39
K-318	163	177	174	172	1453	1600	1797	1617	3.62	3.52	3.57	3.57
Varuna	164	170	172	169	1941	1635	1576	1717	4.50	3.97	4.02	4.16
BM-1	163	173	175	171	1615	1707	2303	1875	4.77	4.42	4.57	4.59
LSD at 0.05	0.0	6.1	2.2		NS	NS	556		0.41	0.67	0.67	
C.V.	0.0	2.2	0.7		18.5	29.0	20.2		6.20	9.70	11.10	

* = Check Variety
a = 1984-85 was sown on 7.11.84, 1985-86(1) on 17.10.85 and 1985-86(2) on 4.11.85.
b = ( ) indicates one of the two sets of trials.

Thousand seed weight differences were mostly non-significant in both B. campestris and B. napus groups. However in the B. juncea group, significant differences were observed between the introduced strains and the local check with the introduced strains showing higher 1000-seed weights. The higher seed yield of these strains can probably be attributed to their greater 1000-seed weight (Table 2).

To increase utilization of rapeseed and mustard in Pakistan, it is essential that the edible oil industry becomes familiar with the "double low" qualities and begin using the oil and meal derived from these cultivars in a major way. It is important, therefore, to determine the performance of "double low" strains in relation to locally adapted cultivars and strains. Since yields of these "double low" cultivars are not significantly different from the locally grown ones with normal erucic acid and glucosinolate contents, it may not be difficult to promote these good quality cultivars, especially the higher yielding ones like Westar.

The potential is good for developing higher yielding locally adapted "double low" strains. Accordingly, cultivars such as Ganyou-5 have been included in a breeding program at NARC, Islamabad, utilizing Westar and other introduced "double low" strains. In addition, a functional well equipped oilseed quality laboratory has recently been established in support of the breeding program. With these programs and facilities in place, it is anticipated that Pakistan will shortly begin the conversion process of "double low" cultivars.

References:

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