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EXPRESSION OF YIELD HETEROSIS IN SOME INTERVARIETAL CROSSES OF INDIAN RAPESEED (*BRASSICA CAMPESTRIS* L. PRAIN)

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ABSTRACT

Heterosis over the better parent and the commercial check variety PT 303 was estimated for seed yield, oil content and various yield components in 28 intervarietal crosses of *Brassica campestris*. The cross DTS x YST151 was the best for seed yield. The average heterosis over better parent for seed yield and oil content was 21.3 and 3.2%, respectively. Heterosis for these two traits was 35.1 and – 0.7%, respectively when compared to commercial check variety.

Key words: Heterosis, Indian rapeseed.

One of the basic requirement for developing hybrid varieties in oilseed Brassica is the availability of proven heterosis (preferably with more than 20 percent standard heterosis). It is often being viewed that in Indian rapeseed, better heterosis could be expressed if one involves parents of indigenous and exotic germplasm or if the *toria* parents are intercrossed with that of the *sarson* types which are easily intercrossable and belong to the same botanical species *Brassica campestris*. In the present paper an effort has been made to estimate the extent of better and standard heterosis in intervarietal crosses of 5 indegenous and 3 exotic varieties of *B. campestris*.

MATERIALS AND METHODS

The material utilized for the present investigation comprised eight (5 indegenous and 3 exotic) varieties of *B. campestris*. The indegenous varieties were PT 303, PT 30, DTS, YST 151 and Binoy and the exotic varieties were Candle, Torch and Tobin. Both *toria* and *sarson* types of *B. campestris* were included in this study. The 28 F_1 hybrids were grown along with their parents in randomized block design with three replications with a row length was 5 m, and row to row spacing of 45 cm and plant to plant distance of 10 cm. At full plant growth,

10 plants were randomly taken from each replication to record data for number of branches per plant, number of siliquae/plant number of seeds/siliqua, 1000-seed weight, seed yield per plant and oil content. PT 303 was kept as check parent. All the statistical analyses were conducted by following standard procedures for estimating the extent of better and standard heterosis [1, 2].

RESULTS AND DISCUSSION

The data on heterosis over better parent (BP) and over the check variety (CH) are presented in Table 1 and 2. As can be seen, a number of hybrids expressed heterosis for seed yield and its components. Considerably high CH was observed for seed yield (35.1%) and 1000 seed weight (25.0%). The cross DTS x YST 151 produced the highest yielding (78.8%) hybrid. It was followed by YST 151 x Candle (73.7%) and Candle x Torch (72.0%). The major attributes responsible for high heterosis for seed yield were the number of branches and siliquae/plant. Heterosis was also observed for oil content in some of the hybrids. However, the crosses expressing marked, significant and high value of heterosis for seed yield also showed high negative heterosis for oil content. Therefore, a compromise has to be reached between high seed yield and high oil content while selecting the crosses for developing commercial hybrids.

It was observed that in general in this study, the crosses involving *sarson* x *sarson* type parents expressed relatively higher heterosis for seed yield, although, the most heterotic cross DTS x YST 151 was a *toria* x *sarson* cross combination. It appears that optimum degree of favourable heterozygosity for high seed yield was accomplished in the *toria* x *sarson* cross DTS x YST 151 from these two phenotypically as also the genetically diverse sources. *Toria* and *sarson* types fortunately belong to the same botanical species *B. campestris* and the major difference between these two forms of Indian rapeseed is their relative time of crop maturity. They are easily crossable with each other and for the genetic improvement of seed yield in *toria*, the introgression of desirable gene complexes for high seed from *sarson* types is now considered essential. Higher values of heterosis for seed yield in *toria* x *sarson* crosses has also been reported [3, 4]. Considerable heterosis for grain yield in oilseed Brassicas has also been known [5–8]. In this study, the best hybrids with more than 20 percent check parent heterosis which could be of some value in hybrid breeding have been spotted utilizing the elite experimental materials of Indian rapeseed (including the national checks) for their further utilization in purposeful heterosis breeding work in this crop in years to come.

Table 1. Heterosis over better parent in intervarietal crosses of Indian rapeseed

Cross	Heterosis for different characters (%)					
	branches per plant	siliquae per plant	seeds per siliqua	1000-seed weight	yield per plant	oil content
PT 303 x PT 30	-16.2	10.1	18.0	1.9	25.6	3.1
PT 303 x DTS	-19.4	-4.7	7.2	9.7	11.8	-0.1
PT 303 x Binoy	-5.6	-17.0	12.4	-3.3	-9.4	3.4
PT 303 x YST 151	24.1	4.9	-10.7	-1.4	34.9	4.8
PT 303 x Candle	13.0	27.0	17.8	-2.2	38.1	4.9
PT 303 x Torch	30.3	10.6	0.7	7.0	12.0	5.2
PT 303 x Tobin	16.7	4.4	-0.2	1.6	14.9	-0.4
PT 30 x DTS	-10.8	12.0	15.8	9.7	2.6	1.3
PT 30 x Binoy	24.2	23.5	0.0	-3.9	60.6	0.8
PT 30 x YST 151	12.7	12.4	-22.0	-1.7	11.5	7.6
PT 30 x Candle	7.0	4.5	9.6	-11.2	-1.9	0.1
PT 30 x Torch	12.4	5.8	2.2	7.5	13.7	10.8
PT 30 x Tobin	14.9	20.1	-0.7	-10.7	63.0	4.6
DTS x Binoy	20.4	28.0	0.0	2.1	-14.8	3.7
DTS x YST 151	11.0	15.7	-0.0	-1.4	43.6	-14.2
DTS x Candle	-12.4	-32.8	17.8	9.3	12.1	6.7
DTS x Torch	-5.0	-34.2	0.0	9.0	14.0	-4.0
DTS x Tobin	2.4	-3.8	-0.2	5.9	18.6	9.3
Binoy x YST 151	-6.4	-24.0	-14.6	2.0	35.8	9.0
Binoy x Candle	0.0	-12.6	-0.0	-3.6	2.6	9.6
Binoy x Torch	11.9	-5.7	-0.8	-3.0	13.0	7.9
Binoy x Tobin	22.0	17.0	-0.1	5.4	4.3	11.4
YST 151 x Candle	11.4	24.1	-15.1	-3.4	39.5	-4.5
YST 151 x Torch	36.2	-18.9	-9.8	-22.1	23.4	3.7
YST 151 x Tobin	-0.6	15.3	-15.1	-0.9	6.0	2.7
Candle x Torch	25.7	14.2	-18.5	-7.6	50.6	3.3
Candle x Tobin	19.9	12.4	-2.7	8.5	21.0	-2.6
Torch x Tobin	2.8	27.2	10.8	-4.9	51.4	2.6
Overall Mean	8.6	4.8	0.5	-0.1	21.3	3.2
*CD 5%	2.8	16.3	1.1	0.3	0.5	0.8
1%	3.0	21.6	1.5	0.4	0.7	1.1

*Based on mean values tested in 3 replications.

Table 2. Heterosis over commercial check variety in intervarietal crosses of Indian rapeseed

Cross	Heterosis for different characters (%)					
	branches per plant	siliqua per plant	seeds per siliqua	1000-seed weight	yield per plant	oil content
PT 30 x DTS	-38.9	-9.2	28.5	20.9	0.2	-0.09
PT 30 x Binoy	-14.8	0.2	1.5	27.3	56.7	-1.4
PT 30 x YST 151	-9.7	17.3	16.8	35.2	38.9	4.9
PT 30 x Candle	-0.5	12.7	16.8	22.1	12.0	-2.1
PT 30 x Torch	13.4	26.1	3.6	12.6	20.6	8.4
PT 30 x Tobin	-10.6	10.5	0.7	8.3	59.1	2.3
DTS x Binoy	-23.6	-3.1	10.9	35.2	-24.7	-2.3
DTS x YST 151	28.7	21.5	46.7	35.6	78.8	-16.4
DTS x Candle	-18.6	-27.5	30.7	20.6	28.0	-2.4
DTS x Torch	4.2	-21.6	13.1	20.2	22.1	-8.7
DTS x Tobin	-20.4	-11.5	-13.1	28.5	11.4	2.2
Binoy x YST 151	-25.0	-20.6	27.7	40.3	69.1	6.2
Binoy x Candle	-6.4	-5.7	4.4	27.7	17.1	3.3
Binoy x Torch	13.0	12.3	-7.3	27.7	19.9	2.6
Binoy x Tobin	-5.1	7.7	0.7	39.5	-2.0	5.0
YST 151 x Candle	12.8	33.9	27.0	32.8	73.7	-7.0
YST 151 x Torch	37.5	-3.4	35.0	7.1	53.6	4.0
YST 151 x Tobin	-20.4	20.4	27.0	36.4	32.0	0.2
Candle x Torch	26.9	24.2	-13.1	0.4	72.0	-1.8
Candle x Tobin	11.6	21.2	3.6	31.6	38.1	-8.9
Torch x Tobin	3.7	37.2	-2.9	15.4	60.6	-2.5
Overall Mean	-2.0	6.8	12.3	25.0	35.1	-0.7
*CD at 5%	2.8	16.3	1.1	0.3	0.5	0.8
1%	3.0	21.6	1.5	0.4	0.7	1.1

*Based on mean values tested in 3 replications.

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