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INHERITANCE OF PLANT HEIGHT AND SEED COAT COLOUR IN YELLOW SARSON (*BRASSICA CAMPESTRIS* L.)

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ABSTRACT

Crosses were made between sarson variety 66-197-3 and a dwarf toria to study inheritance of plant height and seed coat colour. The results obtained indicated that the characters plant height and seed coat colour are governed by two genes with tall and brown seed coat colour as dominant characters.

Key words: Yellow sarson, toria, plant height, seed coat colour.

Among rapeseed, yellow sarson contains higher oil content and gives better physical quality of oil, therefore, there is a natural preference for yellow sarson oil by consumers. However, its area is reducing fast because of its susceptibility to diseases and pests, less seed yield and late maturity as compared to toria. Development of the genotypes in yellow sarson having dwarf stature and early maturity are desirable characters so that escape from the diseases and pests and fitting in multiple cropping system. The present study was undertaken to transfer the dwarfing gene of toria into yellow sarson and to study its genetics. The results obtained from this study are discussed.

MATERIALS AND METHODS

A yellow sarson (self-pollinated) variety 66-197-3 (*Brassica campestris* L. var. yellow *sarson*) was crossed with the dwarf toria (cross pollinated: *Brassica campestris* var. *toria*) genotype in rabi 1981-82. The F_1 generation of the cross was raised in rabi 1982-83. Fifty-one F_1 plants obtained were harvested individually and raised in individual plant progeny rows in RBD with two replications in rabi 1983-84 at Tirhut College of Agriculture, Dholi, Bihar. The χ^2 values were calculated to fit the ratio for plant height and seed coat colour, also observations were recorded for days to maturity, plant height, number of primary branches,

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secondary branches, siliquae, and seed yield per plant and number of seeds/siliqua only on the dwarf and yellow seeded plants.

RESULTS AND DISCUSSION

The F_1 seeds obtained by crossing the self-pollinated yellow sarson variety 66-197-3 and cross pollinated dwarf toria genotype showed brown seed coat colour, which suggested dominance of brown seed coat colour over yellow. In F_1 segregation was observed for plant height. This was due to the fact that this F_1 generation was not the true F_1 generation in the sense that one of the parent (dwarf toria) was heterozygous in nature. In the F_1, 51 plants were studied for their plant height and seed coat colour. Out of 51 plants, 41 were tall (more than 100 cm) and 10 dwarf (less than 100 cm). The χ^2 value for this character was calculated 0.2136 and this fit well in the ratio 13:3 (probability 0.70-0.50). The seeds obtained from F_1 plants were the F_2 seeds and showed the segregation for seed coat colour. Twenty nine plants gave the seed with brown seed coat colour and 22 with yellow seed coat colour. This fits well in the dihybrid ratio of 9:7 with χ^2 value 0.0076 (probability 0.95–0.90). In F_1, plants were allowed open pollination and no selfing was followed. The plants were harvested and threshed individually. Individual plant progenies were raised in F_2 generation. The segregation pattern observed for plant height in F_2 (which is not a true F_2 generation) were presented in Table 1.

Table 1. Segregation for plant height in F_2 generation in yellow sarson x dwarf toria cross

No. of progenies	F_1	F_2 segregation		χ^2	Ratio tested	Probability
		tall	dwarf			
41	Tall	2621	170	0.1205	15:1	0.80–0.70
10	Dwarf	660	145	0.2934	13:3	0.70–0.50

In F_2 generation, a total of 2791 plants were studied in total 41 tall families. Out of these 2621 plants were tall and 170 plants were dwarf. The percentage of dwarf plants were 6.09. The χ^2 value was calculated for total plants observed in 41 tall families. The value of pooled χ^2 was 0.1205 which fits in a ratio of 15:1 with a high probability (0.80-0.70). Similarly, 805 plants were studied in 10 dwarf families which segregates into 660 tall plants and 145 dwarf plants. The pooled χ^2 value fits in a dihybrid ratio of 13:3 (probability 0.70-0.50). The seeds obtained from F_2 plants were F_3 seeds and segregation was observed for brown and yellow seed coat colour presented in Table 2. The 29 progenies of brown seeded plants segregated into brown and yellow seed coat colour. The segregation pattern fits with a dihybrid ratio of 14:2 (Table 2) with a high probability (0.90-0.80).

Table 2. Segregation for seed coat colour in yellow sarson x dwarf toria cross

No. of progenies	Seed coat colour F_1	Seed coat colour in F_2		χ^2	Ratio tested	Probability
		brown	yellow			
29	Brown	1854	262	0.0269	14:2	0.90–0.80
22	Yellow	1010	470	0.1769	11:5	0.70–0.50

Similarly in the progenies of 22 yellow seed coat colour plants a total of 1480 plants were studied which segregated into brown and yellow seed coat colour with 11:5 dihybrid ratio. The results of seed coat colour indicated that this is governed by two genes. However, the inheritance of seed coat colour is not mendelian but epistatic interaction played an important role for the expression of seed coat colour. Ahmad and Juberi [1] and Bhuiyan [2] reported that seed coat colour is governed by single gene with brown seed coat colour as completely dominant over yellow seed coat colour. Discrepancy observed in the results may be due to the difference of material in this study and one of the parent was heterozygous and no selfing was done in F_1 generation. Out of the total 3596 plants studied in F_2 generation 184 plants were dwarf and with yellow seed colour. This clearly revealed that it is possible to develop the dwarf and yellow seeded varieties through the hybridization of yellow sarson x dwarf toria. A plant breeder need not to wait for 2-3 years to develop the homozygous genotypes in toria.

The range and mean values (based on 184 plants) for various other quantitative characters observed only on the dwarf and yellow seeded plants are presented in Table 3. The days to maturity ranged from 87 to 110 days with a mean value of 99 days which is very close to dwarf toria. The plant height ranged from 35 to 92 cm with a mean value of 64.6 cm. The plant height was very close to that of dwarf toria plants. The range for primary and secondary branches per plant was 2.9 to 9.0 and 0 to 24 with a mean value of 5.8 and 3.9, respectively. The number of secondary branches were more than the yellow sarson parent 66-197-3, while primary branches were comparable to it. Siliquae/main shoot were reduced (36.2) as compared to 66-197-3 (42.1) but there is.a wide variability available with a range of 18.0 – 64.2 siliquae/main shoot for this important attribute. However, siliquae per plant were more (130.9).in yellow seeded dwarf plants as compared to 66-197-3 (82.1). The range for this character was 44.0 – 526.0 siliquae/plant and there is a good scope for selection of better genotype. The seeds/siliqua ranged from 6.8 to 26.0 with a mean value of 9.0. The mean value was less than both 66-197-3 (27.7) and dwarf toria (12.0), however, there exists a large variability for seeds/siliqua in the dwarf yellow seeded plants. The yield per plant was reduced and have a mean value of 5.42 as compared to 9.3 g yield per plant of 66- 197-3 variety. But the range observed for this economically important attribute was 0.9–23.7

Table 3. The range and mean for various quantitative characters of dwarf and yellow seeded plants and variety 66-197-3 and dwarf toria

Character	Range	Mean (dwarf yellow seeded plants	Mean based on 10 plants	
			66-197-3	dwarf toria
Days to maturity	87.0–110.9	99.0	119.0	97.0
Plant height (cm)	35.0–92.0	54.6	135.0	64.6
Primary branches/plant	2.9–9.0	5.8	5.5	4.7
Secondary branches/plant	0.0–24.0	3.9	0.4	6.6
Siliquae/main shoot	18.0–64.2	36.2	42.1	37.0
Siliquae/plant	44.0–526.0	130.9	82.1	173.4
Seeds/siliqua	6.8–26.0	9.0	27.7	12.0
Yield/plant (g)	0.9–23.7	5.4	9.3	3.6

g/plant. This clearly revealed that there is wide scope for selection of high yielding genotype with dwarf plant stature and yellow seed coat colour. In general it is observed that dwarf yellow plant mature about 15–20 days earlier than the yellow sarson variety 66-197-3. The material developed from the cross yellow sarson variety 66-197-3 x drawf toria will be further tested in yield trials for its yield and maturity to develop a high yielding, dwarf and early maturing yellow sarson strains.

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