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Research Note

Development of yellow seeded brown sarson (*Brassica rapa* L.) genotypes for temperate conditions of Kashmir

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Abstract
The inheritance of yellow seed coat-colour in brown sarson (*Brassica rapa* L.) was investigated in two crosses involving two brown sarson cultivars viz Gulchin and KOS-1 and a yellow seeded genotype Yellow Sarson-1.The segregating pattern of seed coat colour in F2, BC1 and BC2 revealed the monogenic control of seed coat colour with black colour dominant over yellow colour. Five yellow seeded brown sarson populations(YBS) were constituted from BC2F3. All the populations had higher seed weight and seed oil content than Gulchin (check).YBS-2 was found promising over check variety in oil yield per ha by a margin of 22%. Developing yellow seeded varieties is an appropriate approach to enhance oilseed productivity and meal quality in brown sarson.

Key words
Brassica rapa, seed coat colour, inheritance, oil content

Brown sarson (*Brassica rapa* L.) is a predominantly grown oilseed crop in Kashmir. Winter hardiness and particularly short duration makes it the crop of choice in the prevailing rice-oilseed cropping sequence. Gobhi sarson (*B.napus* L.) and Indian mustard *(B.juncea* L. Czern & Coss) varieties do not fit in the cropping sequence due to their late vacation of field, thereby hampering the transplanting of rice crop in time. The brown sarson varieties grown in the valley are black/ dark brown seeded and thus inferior in oil yield and meal quality. Current emphasis has been to breed new brown sarson varieties with high oil yield. The yellow seed coat colour of oilseed brassicas is of particular interest because of its positive association not only with seed oil concentration but also with high protein and reduced fibre content in the meal (Stringam *et al.*,1974). In the present study, an attempt was made to develop yellow - seeded high yielding brown sarson varieties and to investigate the inheritance of seed coat colour.

The genetic material for the study comprised two F_1 hybrids viz. Gulchin x Yellow Sarson-1 and KOS-1 x Yellow Sarson-1 (Gulchin and KOS-1 are released black seeded brown sarson varieties and Yellow Sarson-1 is a yellow sarson genotype maintained at the centre), their backcrosses (BC_1 and BC_2) and F_2 generations. Two rows of F_1, six rows of BC_1 and BC_2 and 15 rows of F_2 of each cross were grown under cages at Mountain Research Centre for Field Crops, SKUAST-Kashmir, Khudwani in 2008. The rows were 5m long spaced 30cm apart. Excess plants were thinned out at rosette stage to maintain a distance of 5cm between plants within the rows. Twenty F_1, 100 BC_1 and BC_2, and 500 F_2 plants were randomly sampled from each cross to record the seed coat colour. The segregation ratios were tested for goodness of fit using X^2 test.

F_1 plants of Gulchin x Yellow Sarson-1 and KOS-1 x Yellow Sarson-1 crosses showed black seed coat colour indicating the recessive nature of gene governing the yellow seed coat colour. The segregation in F_2 population of Gulchin x Yellow Sarson-1 and KOS-1 x Yellow Sarson-1 crosses gave a good fit of 3 black : 1 yellow seed coat colour ratio (Table 1). All the plants in BC_1 of both the crosses showed black seed coat colour, whereas BC_2 of Gulchin x Yellow Sarson-1 exhibited a segregation pattern of 1 black : 1yellow . BC_2 of KOS-1 x Yellow Sarson-1 segregated in the ratio of 53 black: 47 yellow seeded plants (Table 1).The segregation pattern of F_2 and BC_1 and BC_2 generations suggested that yellow seed coat colour was under the genetic control of a single recessive gene. These results are in consonance with earlier findings (Hawk, 1982; Chen and Heneen, 1982; Choudhary,2008; Xiao *et al*. 2011). Some workers reported more than one genes controlling seed coat colour in oilseed brassicas (Stringan 1980, Choudhary and Solanki,2007; Rehman *et al*.,2008) which may be due to differences in the genetic material used in the study.

Five population of yellow seeded brown sarson were constituted (three from Gulchin x Yellow Sarson-1 and two from KOS-1 x Yellow Sarson -1) from BC_2F_3. All the population had significantly higher 1000-seed weight and oil content than the check variety (Table 2). One population,YBS-2 out performed standard check in seed yield by a

margin of more than 12% and gave an oil yield of 477kg/ha against 391kg/ha of standard check thereby showing a oil yield superiority of 22% over the check (Table 2).

Under the present study, genetic control of yellow seed coat in brown sarson has been found to be governed by a single recessive gene. Yellow seed coat had a positive effect on the seed oil content. Compared with seed yield, oil content is determined mainly by the genetic makeup and influenced to a lesser extent by the environment (Olsson,1960), therefore, breeding for higher oil content would be an effective strategy to improve the edible vegetable oil scenario in the state.

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Table 1. Segregation pattern of seed coat colour in brown sarson

Cross	Generation	No. of plants		Total	X^2 (3:1 or 1:1)	P value
		Black	Yellow			
Gulchin x Yellow Sarson-1	F2	370	130	500	0.24	2.82
	BC1	59	41	100	3.25	
KOS-1x Yellow Sarson-1	F2	391	109	500	2.82	
	BC2	53	47	100	0.37	

Table 2. Performance of yellow seeded brown sarson populations vis-a-vis check

Population	Cross	Seed yield (kg/ha)	1000-seed weight (g)	Oil content (%)	Oil yield (kg/ha)
YBS-1	Gulchin x Yellow	790	4.0	43.7	345
YBS-2	Sarson-1	1100	3.5	43.4	477
YBS-3		750	3.5	42.2	317
YBS-4	KOS-1x Yellow	886	3.4	42.9	380
YBS-5	Sarson-1	775	3.7	41.5	322
Gulchin (Check)	-	979	2.5	39.9	391
CD(P<0.05)	-	80	0.3	0.76	-
CV(%)	-	5.45	4.9	6.3	-