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RESEARCH ARTICLE

Study on selection parameters for yield components in yellow sarson (*Brassica rapa* var. yellow sarson)

■ **KUMARI SHANTI, KAMLESH KUMAR, POORAN CHAND AND KRISHNA KUMARI**

SUMMARY

An experiment was conducted to assess the genetic variability, heritability and genetic advance during*Rabi*-2012-13 at N.D.U.A. and T., Faizabad with forty four germplasm of yellow sarson. The data were recorded on 13 characters days to 50% flowering, days to maturity, plant height (cm), primary branches per plant, length of main raceme (cm), number of siliquae on main raceme, number of seeds per siliqua, length of siliqua (cm), biological yield (g), seed yield per plant (g), harvest index (%), 1000-seed weight (g) and oil content (%). The highest estimates phenotypic (PCV) and genotypic (GCV) co-efficient variation were found in plant height (cm) PCV=52.81 per cent, GCV=41.73 per cent. The lowest value of PCV and GCV was recorded for siliqua length (PCV=0.14%, GCV=0.06%), the value of heritability (h^2 b) ranged from 15.56 (oil content) to 92.32 per cent (days to 50 % flowering). Higher estimates of heritability were observed for days to 50 per cent flowering, primary branches (87%), seed yield/plant (88.11%) and plant height (79.03%) genetic advance in per cent of mean was exhibited highest for primary branches per plant (49.07%) and lowest for oil content (0.55%).

Key Words : Yellow sarson, Genotypes and phenotypes co-efficient of variation, Heritability and genetic advance in percentage of mean

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Among oilseed crops, especially *Brassica* species play a pivotal role in the agricultural economy of India. The important oilseed crops grown in the country in order of importance are groundnut, rapeseed-mustard, sesame, linseed, safflower, castor, sunflower and *niger*. Among these, *Brassica rapa* var. yellow *sarson* is *Rabi* crop of eastern India comprising Uttar Pradesh, Bihar, West Bengal and Assam. India is one of the leading oil seed producing country in the world and it is a rich center of diversity for rapeseed-mustard. *Brassica* (Rapeseed-mustard) is the second most

important edible oilseed crop in the India after groundnut and accounts for nearly 30 per cent of the total oil seeds produced in the country. When compared to other edible oils, the rapeseed-mustard oil has the lowest amount of harmful saturated fatty acids. It also contains adequate amount of two essential fatty acids, linoleic and linolenic, which are not present in many of the other edible oils. Indian cultivars have high erucic acid 40-50 per cent in oil and high glucosinolate (18-120 µ moles (g) in seed meal).

So there is an urgent need to make concerted efforts for breeding varieties with improved quality of oil (<2 % erucic acid) and meal (<22 µ moles /g fat free meal glucosinolate) at par with inter-national quality norms. Botanically, the genus *Brassica* has six species *B.campestris*, *B. oleracea*, *B. nigra*, *B. juncea*, *B. napu* and *B. carinata*). Among them first three species are elementary and diploid with 2n=20,18 and 16 chromosomes and other three are tetraploids with chromosome number 2n=36, 38 and 34. Yellow *sarson* (*B. rapa* L. var. *yellow sarson*), which is cultivated under the genus*Brassica*, all over India and throughout the world, belongs to family Cruciferae (*Brassica* ceae). Yellow *sarson* is the major *Rabi* oilseed crop, which is sown during October-November and the harvesting begins from February onwards. Oil content of different forms ranges from 30-48 per cent. It is self compatible and self pollinated crop. India is one of the major producer in the global oilseeds/vegetable oil economy. There is a severe shortage of edible oil in the country. Thus, the availability of energy through oil is word limited. The largest mustard seed producing states in India are Rajasthan (45%), Haryana (13%), Madhya Pradesh (13%) and Uttar Pradesh (11%). Genetic variability of yellow sarson is generally very important. The role of genetic variability is well documented in crop improvement, Genotypic and phenotypic co-efficient of variability helps to assess the magnitude of variability in population. Selection would be more effective for the traits which exhibit high variability and heritability along with moderate to high genetic advance. Keeping the above facts in view, the present investigation was carried out on genetic variability (PCV, GCV), heritability and genetic advance in per cent of mean.

MATERIAL AND METHODS

The present field experiment was conducted at the Research Farm of Genetics and Plant Breeding, N.D.U.A. and T., Kumarganj, Faizabad, (U.P.) during *Rabi* 2012-13. The experiment consisted of 44 germplasm accessions along with 5 checks was laid out in Augmented Block Design. These lines were grown in single row plot of 5 meter length. Each block consisted of 11 entries plus 5 checks. The spacing between row to row and plant to plant was 30cm and 15cm, respectively maintained by thinning. The recommended package of practices was followed to raise the normal crop. The data were recorded to analysis of variance to test significance of difference among 49 genotypes of yellow sarson for 13 characters *i.e.* days to 50 per cent flowering, days to maturity, plant height (cm), primary branches per plant, length of main raceme (cm), number of siliquae on main raceme, number of seeds per siliqua, length of siliqua (cm), biological yield (g), seed yield per plant (g), harvest index (%), 1000-seed weight (g) and oil content (%).

RESULTS AND DISCUSSION

The analysis of variance is presented in Table 1, reveals that differences due to the genotypes of yellow *Sarson* were highly significant for all the characters except length of main raceme, siliquae on main raceme, biological yield oil, content and harvest index. The difference due to blocks were significant for the seven characters *i.e.* days to 50 per cent flowering, plant height (cm), primary branches /plant, length of main raceme, siliquae on main raceme, seeds per siliqua and 1000-seed weight (g). The checks differed significantly for plant height (cm), primary branches per plant, siliqua length, siliquae on main raceme, seeds per siliqua and seed yield per plant (g).

The mean performance and range for different characters in yellow *Sarson* are presented in Table 2. Days to flowering ranged between 36 (YSWB-2012/9) to 69 days (NRCYS-05-02) with a general mean value of 47.67. Days to maturity ranged between 109.05 (YSWB-2011-10-1) to 140.45 days (PYS-9-3) with a general mean value of 115.94. Plant height (cm) ranged between 95.91 (NDYS-07-2) to140.91 cm (NDYS-424) with a general mean value of 111.48. Primary branches per plant ranged between 0.842 (PYS-10-7) to 8.64 (PYS-11-16) with a general mean value of 5.25. Length of main raceme (cm) ranged between 30.19 (PYS-09-11) to 63.79 cm (NDYS-116-1) with a general mean value of 45.46. Siliquae on main raceme ranged between 17.19 (PYS-09-11) to 37.42 (NDYS-126) with a general

Table 1: Analysis of variance of Augmented block design for 13 characters in yellow *Sarson*

	df	Days to 50% flowering	Days to maturity	Plant height (cm)	Primary branches/ plant	Length of main raceme (cm)	Siliqua length (cm)	Siliquae on main raceme	Seeds/ siliqua	Seed yield/ plant(g)	Biological yield (g)	1000-seed weight (g)	Oil content (%)	Harvest index (%)
Blocks (ignoring treatments)	3	76.94**	8.43	64.01*	1.323*	98.74*	0.182	53.44*	47.45**	0.572	41.94	0.965**	0.172	24.03
Treatments (eliminating Blocks)	48	41.64**	23.35*	73.49**	2.88**	37.34	0.256*	23.06	63.92**	2.680***	37.35	0.578**	0.661	18.13
Checks	4	2.325	19.45	109.06**	4.963**	28.18	0.536**	64.83**	184.197**	2.164**	64.06	0.342	1.098	9.88
Checks+ Var vs. Var.	44	45.21**	23.71*	70.26**	2.69**	38.18	0.231*	19.26	52.989**	2.727**	34.91	0.599**	0.621	18.88
Error	12	2.158	7.6	11.07	0.272	17.73	0.077	11.77	3.200	0.233	20.880	0.127	0.482	12.48
Blocks (eliminating check+Var.)	8	102.53**	4.050	12.62	0.116	4.600	0.284*	20.62	2.595	0.206	13.83	0.103	0.599	3.52
Entries (ignoring blocks)	48	40.04**	23.625*	76.70**	2.951**	43.22*	0.250*	25.11	66.727**	2.703**	39.10	0.632**	0.634	19.41
Checks	4	2.325	19.450	109.06**	4.963**	28.18	0.536*	64.83**	184.197**	2.164**	64.06	0.342	1.098	9.88
Varieties	43	38.37**	23.99*	69.31**	2.809**	45.55*	0.165	21.90	56.639	2.642**	37.11	0.645**	0.605	20.26
Checks vs. Varieties	1	262.91**	28.55	265.16**	1.010	3.43	2.733**	4.14	30.646**	7.465**	24.97	1.205**	0.007	20.88
Error	12	2.16	7.550	11.07	0.272	17.74	0.077	11.77	3.200	0.233	20.88	0.127	0.482	12.4

*, ** and *** indicate significance of values at P=0.05, 0.01 and 0.10, respectively.

mean value of 27.39. Siliqua length ranged between 2.69 (PYS-10-3) to 4.79 cm (NDYS-11-3) with a general mean value of 3.71. Seeds per siliqua ranged between 12.10 (YSWB-2012/3) to 39.32 (PYS-2007-10) with a general mean value of 28.56. 1000-seed weight (g) ranged between 2.34 (PYS-10-7) to 6.84 g (PYS-09-9) with a general mean value of 4.65. Oil content (%) ranged between 41.47% (YSWB-2014/3-12) to 45.01 % (PYS-1-9-5) with a general mean value of 43.44. Seed yield per plant (g) ranged between 2.63 g (PYS-10-3) to 9.99g (PYS-09-9) with a general mean value of 6.15. Biological yield per plant (g) ranged between 14.91g (PYS-9-1) to 47.46 g (PYS-11-13) with a general mean value of 23.20. Harvest index (%) ranged between 11.04 (PYS-10-3)to 34.43 (YSKM-12-11) with a general mean value of 26.72.

The phenotypic (PCV) and genotypic (GCV) co-efficients of variability for all the characters are presented in Table 2, highest estimates of phenotypic (PCV) and genotypic (GCV) co-efficient of variation were observed in case of plant height (cm) (PCV = 52.81%, GCV =41.73 %), followed by seeds per siliqua (PCV =41.49 %, GCV =38.29 %), main raceme length (PCV =37.67 %, GCV =19.93 %), biological yield (PCV=32.51 %, GCV = 11.63%), days to 50% flowering (PCV =28.10 %, GCV=25.94 %), days to maturity (PCV =19.26 % , GCV = 11.71%), siliquae per plant (PCV =19.03 %, GCV = 7.26%), harvest index (PCV =18.03 %,GCV =5.64 %), primary branches (PCV =2.09 %, GCV = 1.81%), oil content (PCV = 0.57%, GCV = 0.08%) and 1000-seed weight (PCV=0.49%, GCV= 0.37%). The lowest value of PCV and GCV was recorded for siliqua length (PCV = 0.14%, GCV = 0.06%). Similar results were observed by Das *et al.* (1998); Sikarwar *et al.* (2000); Singh and Mishra (2001); Chaudhary *et al.* (2003); Khan*et al*. (2006); Kumar and Mishra (2006); Gautam (2008) and Yadava *et al*. (2011).

The data presented in Table 3, reveals that heritability gives an idea of transmissibility of a character from parent to off spring. The estimates of heritability in broad sense (h^2b) showed considerable variation for different characters. The value of h^2b ranged from 15.56 (oil content) to 92.32 per cent (days to 50% flowering). Higher estimates of heritability were observed for days to 50% flowering, primary branches (87%), seed yield/ plant (88.11%) and plant height (79.03%) while moderate heritability was observed for length of main raceme (52.91%), 1000 seed weight (74.56%) and days to maturity (60.81%) and low estimates for oil content

Table 2 : Estimates of range, mean, phenotypic and genotypic co-efficients of variation and range of parameter for 13 characters in yellow *Sarson* genotypes

Sr. No.	Characters	Range		Mean	Co-efficient of variation (%)		Range of parameter			
		Lowest	Highest		PCV (%)	GCV (%)	LSD_1	LSD_2	LSD_3	LSD_4
1.	Days to 50% flowering	36	69	47.67	28.10	25.94	2.26	4.52	4.95	3.92
2.	Days to maturity	109.05	140.45	115.94	19.26	11.71	4.23	8.46	9.27	7.33
3.	Plant height (cm)	95.91	140.91	111.48	52.81	41.73	5.12	10.25	11.23	8.87
4.	Primary branches/ plant	0.842	8.64	5.25	2.09	1.81	0.80	1.60	1.75	1.39
5.	Length of main raceme (cm)	30.19	63.79	45.46	37.67	19.93	6.48	12.97	14.21	11.23
6.	Siliquae on main raceme	17.19	37.42	27.39	19.03	7.26	5.28	10.57	11.57	9.15
7.	Siliquae length (cm)	2.69	4.79	3.71	0.14	0.06	0.42	0.85	0.93	0.74
8.	Seeds/ silique	12.10	39.32	28.56	41.49	38.29	2.75	5.51	6.03	4.77
9.	1000-seed weight (g)	2.34	6.84	4.65	0.49	0.37	0.54	1.09	1.20	0.95
10.	Biological yield(g)	14.91	47.46	23.20	32.51	11.63	7.03	14.07	15.42	12.19
11.	Seed yield/ plant(g)	2.635	9.995	6.157	1.95	1.72	0.74	1.48	1.62	1.28
12.	Harvest index (%)	11.041	34.433	26.728	18.03	5.64	5.42	10.84	11.88	9.39
13.	Oil content (%)	41.479	45.019	43.440	0.57	0.08	1.06	2.13	2.34	1.85

Table 3 : Estimates of broad sense heritability and genetic advance for 13 characters in yellow *Sarson* genotypes

Sr. No.	Characters	Heritability (broad sense) (%)	Genetic advance	Genetic advance in% of mean
1.	Days to 50% flowering	92.32	10.08	21.34
2.	Days to maturity	60.81	5.49	4.736
3.	Plant height (cm)	79.03	11.83	10.65
4.	Primary branches/ plant	87.00	2.59	49.07
5.	Length of main raceme (cm)	52.91	6.69	14.73
6.	Siliquae on main raceme	38.16	3.42	12.54
7.	Siliqua length (cm)	44.87	0.34	9.43
8.	Seeds/ siliqua	92.29	12.24	43.10
9.	1000-seed weight (g)	74.56	1.08	23.46
10.	Biological yield (g)	35.78	4.20	18.00
11.	Seed yield/ plant (g)	88.11	2.54	40.77
12.	Harvest index (%)	31.30	2.73	10.19
13.	Oil content (%)	15.56	0.241	0.55

(15.56%), harvest index (31.30%) and biological yield (35.78%).

Genetic advance gives an idea of expected improvement through selection in the next generation. The highest estimates of genetic advance along with high heritability clearly indicates the possibility of improvement through selection. Genetic advance in per cent of mean ranged from 0.55 per cent for oil content to 49.07 per cent for primary branches per plant. Seed yield per plant and seeds/siliqua showed higher genetic advance in per cent of mean. Rest of the characters showed low genetic advance in per cent of mean.Similar results were observed by Khulbe*et al.* (2000); Sikarwar *et al.* (2003); Gautam (2008); Upadhyay and Kumar (2009); Ram and Verma (2010) and Prajapati *et al.* (2013) .

Conclusion :

On the basis of findings it may be concluded that differences due to the genotypes of yellow *Sarson* were highly significant for all the characters except length of main raceme, siliquae on main raceme, biological yield, oil content and harvest index. The highest estimates of phenotypic (PCV) and genotypic (GCV) co-efficient of variation were observed in case of plant height. Higher estimates of heritability were observed for days to 50 per cent flowering, primary branches/plant and plant height, seed yield/per plant for oil content, seed yield per plant and seeds/siliqua showed higher genetic advance in per cent of mean.

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