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STUDY ON VARIABILITY AND CORRELATIONS IN INDIAN RAPE (*Brassica campestris* L.) GERMPLASM

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Comparative pattern of variability and correlations was investigated in the two ecotypes of Indian rape, *Brassica campestris* L., viz., brown *sarson* (90 accessions) and yellow *sarson* (60 accessions). In both the ecotypes, viz., brown *sarson* (Group I) and yellow *sarson* (Group II), the oil content and the days to maturity exhibited the lowest variation whereas the primary branches/plant and the secondary branches per plant had the highest. Except for the siliqua on main shoot in brown *sarson* and the seeds per siliqua in yellow *sarson*, the pattern of variation was similar in both the Groups. The correlations were, however, variable in both the Groups. A consistent trend of relationship was observed in both the Groups for the plant height with the main shoot length ($r=0.565^{***}$ – 0.568^{**}) and the siliqua on main shoot ($r=0.344^{**}$–0.679^{**}) and similarly, the siliquae on the main shoot with main shoot length ($r=0.464^{**}$–0.471^{**}) and the primary branches per plant ($r=0.386^{**}$–0.497^{**}). The rest of the 1000-seed weight in Group II, the other traits seemed to be independent of the days to maturity, hence early types with good agronomic base could be developed.

Key words : Indian rape, *Brassica campestris* L., correlations, variability, agro-morphological traits

The major oleiferous *Brassica* grown in India are Indian mustard (*Brassica juncea* [L.] Czern & Coss.) and then three ecotypes of *B.campestris* L. viz., brown *sarson*, yellow *sarson* and *toria*. Among the three ecotypes of *B.campestris*, brown *sarson* appears to be the oldest. *Toria* and yellow *sarson* are reported have arisen from selection of a mutant of brown *sarson* for any early maturity type and for the yellowish seed colour, respectively (Singh, 1958; Hinata and Prakash, 1984).

The cultivation of brown *sarson* in the north-western region overlapped to a large extent with Indian mustard. Brown *sarson* is cultivated under rainfed condition and its yield potential is low. Brown *sarson* is rated as susceptible to soil sodicity (Kumar *et al.* 1984). Due to high susceptibility to frost, brown *sarson* once a predominant crop in India, has shrunk in hectarage and now cultivated only in Himachal Pradesh and Kashmir valley. Nevertheless due to its early maturity and high oil content as compared to *B. juncea*, brown *sarson* fits well in the sugarcane growing areas (Brown sarson - Sugarcane cropping system). Yellow *sarson*, has been again making in roads in eastern India especially in West Bengal, Sikkim, Bihar, easter Uttar Pradesh. Varieties like NDYS 1, Jhumka YS-193-3 and Rajendra sarson 1 are very popular. The medium - maturing yellow *sarson* has been reported to replace early duration *toria* owing to high yield and feasibility for sunflower sowing in February/March in the *tarai* region of Uttar Pradesh. However yellow *sarson* is highly susceptible to aphid (Lipaphis erysimi Kalt.) It is, therefore, imperative to develop early maturing and high yielding varieties of both brown *sarson* and yellow *sarson* that they escape

from the diseases and pests and fit in multiple cropping system. It could be desirable to systematically evaluate the available genetic resources of these two crops. In the present investigation, comparative variability and pattern of correlations in brown *sarson* and yellow *sarson* were studied.

MATERIALS AND METHODS

One hundred and fifty accessions of two ecotypes of *Brassica campestris* L. namely, brown sarson (90) and yellow sarson (60), were grown in 2-row plot in augmented design during rabi 1995-96 crop season. The plot length was 5m with a spacing of 30 cm × 15 cm between rows and between plants in a row, respectively. Forty kg N and 40 kg P_2O_5 per ha were applied at the time of sowing while 40 kg N per ha was top- dressed just after first irrigation (40 days after sowing). Standard agronomic practices were followed and plant protection measures were adopted as and when required. Observations were recorded on five competitive randomly chosen plants. The characters studied were days to maturity, plant height (cm), primary and secondary branches per plant(no.), main shoot length (cm), siliqua on main shoot(no), siliqua length (cm), seeds per siliqua(no.), 1000-seed weight (g) and oil content (%).

Mean values were used to compute coefficients of variability to assess variation in agro-morphological traits in brown *sarson* (Group I); yellow *sarson* (Group II) and pooled (Group III). Simple correlation coefficients among the different agro-morphological traits were estimated following standard statistical methods (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

1. Variability

The coefficients of variation (CV) indicated in both the groups, primary and secondary branches per plant varied the most (Table 1). In the yellow *sarson* (Group II), primary branches per plant showed higher variation while in brown *sarson* (Group I) secondary branches per plant showed higher variability. The magnitude of CV for seeds per siliqua was higher in Group II while in Group I, it was for siliquae on main shoot (Table 1).

The variability was the lowest for oil content and days to maturity in both the Groups. There was no appreciable difference in the extent of variation for days to maturity, plant height, main shoot length, siliqua length and 100-seed weight in Group I and Group II. Except for seeds per siliqua (Group II) and siliquae on main shoot (Group I), the pattern of variation was, by and large similar in both the Groups. Pooled analysis of variability (Group III) revealed that secondary and primary branches per plant, siliquae on main shoot, seeds/siliqua, 1000- seed weight and main shoot length exhibited substantial variation.

2. Correlation

As is evident from Table 2, the interrelationships among various agro-morphological traits showed that plant height was positively and significantly correlated with main shoot length and siliquae on main shoot in both the Groups. Similar results were also reported by Kumar and Yadava (1978a) and Yadava *et al.* (1988). Siliqua on the main shoot also had positive and significant association with primary branches per plant and main shoot length. The pattern of relationship for these traits in Group I and Group II was also reflected in the pooled analysis. Kumar and Yadava (1978a) also observed a high positive genotypic association between siliquae on main shoot with primary branches per plant in Indian rape.

In brown *sarson* (Group I) and yellow (Group II), seeds per siliqua was negatively and significantly associated with secondary branches per plant. In

Table 1. Comparative variability in agro-morphological traits among three groups of *Brassica campestris* L

Character	Coefficient of variability (%)		
	Group I (Brown *sarson*)	Group II (Yellow *sarson*)	Group III (Pooled)
Days to maturity	3.7	4.1	5.1
Plant height	8.5	8.4	8.7
Primary branches/plants	27.0	35.9	30.1
Secondary branches/plant	49.1	38.4	48.1
Main shoot length	12.5	12.0	12.6
Siliquae on main shoot	18.9	11.7	16.4
Siliqua length	10.6	9.2	10.0
Seeds/siliqua	10.2	25.0	22.6
1000-seed weight	11.5	13.2	13.7
Oil content	2.7	2.9	2.9

Group I, the relationship of secondary branches per plant with plant height was negatively significant (r=–0.302**) whereas primary branches per plant was positively associated with secondary branches per plant (r=0.300**). Seeds per siliqua was positively and significantly associated with siliqua length (r=0.485**) only in Group I. When the brown *sarson* and yellow *sarosn* accessions were combined (Group III), the interrelationship of days to maturity was significantly positive with plant height (r=0.245**), secondary branches per plant (r=0.285**), main shoot length (r=0.218**), seeds per siliqua (r=0.201*) and 1000-seed weight (r=0.3444**). However, secondary branches per plant had negative association with siliquae on main shoot, and its relationship with 1000-seed weight was positive (Table 2).

The relationship between oil content and main shoot length was positive (r=0.210*), whereas, it had negative relationship with siliqua length (r=–0.167*) in the pooled analysis.

Days to maturity and plant height showed negative and significant association with seeds per siliqua but relationship of days to maturity with 1000-seed weight was positive (r=0.293) only in yellow sarson. Plant height exhibited positively significant association with primary branches per plant (r=0.352**).

The relationship of seeds per siliqua was positive (r=0.283*) with primary branches per plant. However Kumar and Yadava (1978b) reported high negative genotypic correlation between these two traits. The associations of seeds per siliqua with main shoot length and 1000-seed weight were negatively significant in Group II only (Table 2). In this Group (yellow *sarson*), oil content was positively and significantly related with main shoot length and siliquae on main shoot. However, interrelationship of oil content with siliqua length was negative and significant (r=–0.385**).

The results suggest variable association in the two ecotypes : brown *sarson* and yellow *sarson*; hence group- specific characters need attention in the selection programme. Except for 1000-seed weight in Group II (yellow *sarson*), the other traits appeared to be independent of days to maturity, hence early types with good agronomic base could be developed.

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Table 2. Correlations coefficients between agro-morphological traits in three groups of *Brassica campestris*

Character	Group	Days to maturity	Plant height	Primary branches/ plant	Secondary branches/ plant	Main shoot length	Siliquae on main shoot	Siliqua length	Seeds/ siliqua	1000-seed weight
Plant height	I	–0.026								
	II	–0.123								
	III	0.245**								
Primary branches/plant	I	–0.038	0.052							
	II	–0.210	0.352**							
	III	–0.117	0.054							
Secondary branches/plant	I	0.171	–0.302**	0.300**						
	II	0.220	–0.048	–0.204						
	III	0.285**	0.061	0.025						
Main shoot length	I	0.156	0.568**	–0.135	–0.098					
	II	–0.095	0.565**	0.097	0.071					
	III	0.218**	0.615**	0.005	0.101					
Siliquae on main shoot	I	0.054	0.679**	0.386**	–0.195	0.471**				
	II	–0.165	0.344**	0.497**	–0.190	0.464**				
	III	–0.005	0.533**	0.416**	–0.212**	0.438**				
Siliqua length	I	–0.067	–0.115	–0.048	–0.058	0.003	–0.182			
	II	0.109	–0.049	0.018	0.240	–0.137	0.095			
	III	0.076	–0.072	0.023	0.080	0.035	–0.105			
Seeds/siliqua	I	0.033	0.090	–0.085	–0.288**	0.070	0.128	0.485**		
	II	–0.329**	–0.381**	0.283*	–0.461**	–0.423**	0.041	–0.026		
	III	0.201*	0.006	0.130	–0.116	0.031	0.064	0.154		
1000-seed weight	I	–0.162	–0.180	0.026	0.044	–0.038	0.074	0.108	–0.162	
	II	0.293*	0.028	–0.144	0.152	–0.072	–0.218	–0.002	–0.331**	
	III	0.344**	0.096	–0.074	0.236**	0.118	–0.068	0.093	0.035	
Oil content	I	0.033	0.010	–0.076	–0.111	0.003	–0.079	–0.071	–0.013	0.007
	II	–0.217	–0.112	–0.007	0.092	0.267*	0.267*	–0.385**	–0.139	–0.158
	III	0.114	0.103	–0.047	0.041	0.210*	0.027	–0.167*	0.079	0.074

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