



E-ISSN: 2278-4136  
P-ISSN: 2349-8234  
[www.phytojournal.com](http://www.phytojournal.com)  
JPP 2020; 9(5): 2846-2850  
Received: 22-06-2020  
Accepted: 02-08-2020

**Neeta Tripathi**  
Department of Genetics and  
Plant Breeding, Acharya  
Narendra Deva University of  
Agriculture and Technology  
Kumarganj, Ayodhya, Uttar  
Pradesh, India

**K Kumar**  
Department of Genetics and  
Plant Breeding, Acharya  
Narendra Deva University of  
Agriculture and Technology  
Kumarganj, Ayodhya, Uttar  
Pradesh, India

**Rita Tiwari**  
Department of Botany, M.L.K.  
(P.G.) College Balrampur, Uttar  
Pradesh, India

**OP Verma**  
Department of Genetics and  
Plant Breeding, Acharya  
Narendra Deva University of  
Agriculture and Technology  
Kumarganj, Ayodhya, Uttar  
Pradesh, India

**Corresponding Author:**  
**Neeta Tripathi**  
Department of Genetics and  
Plant Breeding, Acharya  
Narendra Deva University of  
Agriculture and Technology  
Kumarganj, Ayodhya, Uttar  
Pradesh, India

## Correlation and path coefficient analysis for seed yield, its component and oil content in Indian mustard (*Brassica juncea* L. Czern and Coss.) under normal and saline/alkaline condition

Neeta Tripathi, K Kumar, Rita Tiwari and OP Verma

### Abstract

The nature of association for different characters among 20 genotypes along with four checks in Indian mustard (*Brassica juncea* L. Czern & Coss.) under normal condition (NS) and saline/alkaline condition (SS) was studied by using genotypic and phenotypic correlations (Aljibouri *et al.* 1958) and Path-coefficient analysis (Dewey and Lu, 1959). The analysis of variance revealed significant differences among treatments for all the characters under NS (normal condition) and SS (saline/alkaline condition). The genotypic correlation coefficients between most of the characters were higher in magnitude than phenotypic correlation coefficients in both the conditions indicating strong association between various characters studied and that the genotypic expression of the association was comparatively less influenced by the environmental deviation. The economic trait i.e. seed yield per plant showed strong positive and significant association with biological yield per plant at genotypic and phenotypic levels in both the conditions. Hence, by exercising selection for this character, it may be possible to isolate superior, higher yielding genotypes. Path coefficient analysis revealed that biological yield per plant and harvest index directly influenced seed yield in NS and SS at genotypic and phenotypic levels. Hence, selection based on biological yield per plant and harvest index would be more effective to meet higher seed yield. The residual effect under path analysis was very low and negligible.

**Keywords:** *Brassica juncea* L. Czern and Coss. genotypic and phenotypic correlations, path-coefficient analysis

### Introduction

Indian mustard [*Brassica juncea* (L.) Czern & Coss], which is cultivated under the genus *Brassica* is cultivated all over India and it is throughout the world belongs to family Cruciferae (Brassicaceae). It has 38 to 42 % oil and 24% protein. Among rapeseed and mustard, rai (*B. juncea*) is very popular among the farmers due to higher yield and greater tolerance against lodging, shattering, drought condition, heat and relative diseases as well as the saline sodic conditions. *Brassica* also performs well on neglected sites where problems like soil acidity, low available nutrient content, poor drainage, drought, and soils with topographical limitations exist. India is endowed with a great diversity of Indian mustard germplasm in its vast territorial land area. In recent years the interest of plant breeders has been directed towards better adaptation of crop varieties through collection of varieties from different environment. Path analysis may be of limited utility to a plant breeder but it definitely gives an insight into a complex relationship among different characters in a biological system, and provides information whether the observed correlation is due to the direct influence through other variables. Thus, path analysis specifies the causes and also gives the relative importance of the characters.

### Materials and methods

The materials for present study comprised 20 genotypes along with four checks viz., CS-52, CS-54, Narendra rai (NDR-8501) and Maya in Indian mustard (*Brassica juncea* L. Czern & Coss.) under normal condition (NS) and saline/alkaline condition (SS). The experiment was conducted at the Research Farm of Department of Genetics and Plant Breeding, Narendra Deva University of Agriculture & Technology, Narendra Nagar (Kumarganj), Faizabad, during *Rabi* season of 2013-14 in two conditions (Normal and saline/alkaline condition). The material was sown in Randomized Block Design with three replications. Each block consisted of single row of five meter length, following spacing (row to row and plant to plant) of 45 cm and 15 cm, respectively. In each entry, five plants were randomly tagged and utilized to collect data on yield and its component characters viz., days to 50% flowering, days to maturity, plant

height (cm), primary branches per plant, secondary branches per plant, length of main raceme, siliquae on main raceme, seeds per siliqua, 1000-seed weight (g), biological yield per plant (g), seed yield per plant (g), harvest index (%) and oil content (%). The data were subjected to statistical analysis using genotypic and phenotypic correlations (Aljibouri *et al.* 1958) and Path-coefficient analysis (Dewey and Lu, 1959) [3] was applied for determining the association between various characters studied and to carry out selection based on characters which would be more effective to meet higher seed yield.

### Results and discussion

The analysis of variance revealed significant differences among treatments for all the characters under NS (normal condition) and SS (saline/alkaline condition) Table 1. In normal condition (NS): days to 50% flowering showed positive and significant correlation at phenotypic level with days to maturity (0.4689), plant height exhibited positive and significant correlation with seeds per siliqua (0.4771) and also with 1000-seed weight (0.5768), secondary branches per plant showed positive and significant correlation with length of main raceme (0.4858), siliquae on main raceme showed positive and significant correlation with biological yield per plant (0.5207). Biological yield per plant showed negative and highly significant correlation with harvest index (-0.5999) and positive and highly significant correlation with seed yield (0.9023), primary branches per plant and oil content exhibited non significant correlation with all characters. In saline/alkaline condition (SS): days to 50% flowering showed positive and significant correlation at phenotypic level with

plant height (0.4950), days to maturity showed negative and significant correlation with biological yield per plant (-0.4498), secondary branches per plant showed positive and significant correlation with length of main raceme (0.5248) and seeds per siliqua (0.5089), biological yield per plant showed positive and significant correlation with seed yield per plant (0.7933), primary branches per plant, siliquae on main raceme, 1000 seed weight, harvest index and oil content exhibited non significant correlation with all characters (Table 2, 3, 4 & 5).

Path coefficient analysis revealed that biological yield per plant and harvest index directly influenced seed yield in both the condition (NS and SS) at genotypic and phenotypic levels (Table 6, 7, 8 & 9). Biological yield per plant had positive association with seed yield. This indicated that direct selection based on biological yield per plant and harvest index and indirectly via siliquae on main raceme and secondary branches per plant would result in an appreciable improvement of seed yield. In the present study, days to maturity, plant height, secondary branches per plant, length of main raceme, siliquae on main raceme and 1000-seed weight via biological yield per plant exerted substantial indirect effect on seed yield at genotypic and phenotypic levels in NS while in SS, primary branches per plant, length of main raceme, siliquae on main raceme, seeds/siliqua and 1000-seed weight via biological yield per plant exerted substantial indirect effect on seed yield at genotypic and phenotypic levels. Sirohi *et al.* (2004) [7] found that biological yield and harvest index had high, positive and direct effects on seed yield at genotypic and phenotypic levels.

**Table 1:** Analysis of variance for 13 characters in Indian mustard under normal (E1) and saline/alkaline (E2) condition

S. No.	Character	Replications		Treatments		Error	
		E1	E2	E1	E2	E1	E2
	d.f.	2	2	19	19	38	38
1	Days to 50 % flowering	5.07	0.20	16.938**	18.49**	5.51	0.73
2	Days to maturity	1.52	1.62	33.69**	14.87**	2.10	0.95
3	Plant height (cm)	3.90*	2.85	1020.14**	172.83**	1.07	5.92
4	Primary branches/plant	0.08	0.11	1.24**	1.96**	0.24	0.12
5	Secondary branches/plant	0.20	0.05	21.12**	19.11**	0.13	0.04
6	Length of main raceme (cm)	1.91*	0.62	190.55**	242.50**	0.56	0.42
7	Siliquae on main raceme	0.42	0.80	183.26**	176.73**	0.39	0.34
8	Seeds/siliqua	0.21	0.01	5.49**	6.32**	0.25	0.25
9	1000 seed weight (g)	0.0005	0.02	2.01**	2.01**	0.007	0.01
10	Biological yield/plant (g)	0.24	23.84*	198.39**	95.86**	10.05	6.39
11	Seed yield/plant (g)	0.07	0.86*	16.74**	4.55**	0.49	0.24
12	Harvest index (%)	1.05	0.22*	28.69**	33.24**	0.36	0.06
13	Oil content (%)	0.05	0.02	1.35**	1.48**	0.04	0.03

\*, \*\* Significant at 5% and 1% probability levels, respectively.

E1= Normal condition (NS)

E2= Saline/alkaline condition (SS)

**Table 2:** Estimate of genotypic correlation coefficients among 13 characters in Indian mustard (*Brassica juncea* L. Czern and Coss.) under normal condition

Character	Days to 50% Flowering	Days to 50% Maturity	Plant Height (cm)	Primary Branches/Plant	Secondary Branches/Plant	Length of Main Raceme	Siliquae On Main Raceme	Seeds/Siliqua	1000 Seed Weight (g)	Biological Yield/Plant (g)	harvest Index (%)	Oil Content (%)	Seed yield/plant (g)
Days to 50% Flowering	1.000	0.947	0.013	0.206	0.247	0.174	-0.053	-0.251	0.021	0.207	-0.102	0.256	0.211
Days to 50% Maturity		1.000	0.124	0.169	0.305	-0.164	0.305	-0.158	0.045	0.291	-0.012	0.307	0.355
Plant Height (cm)			1.000	0.532	0.221	-0.206	0.270	0.514	0.580	0.195	0.082	-0.100	0.245
Primary Branches/Plant				1.000	0.228	-0.202	0.337	0.497	0.128	0.178	-0.047	0.114	0.225
Secondary Branches/Plant					1.000	0.490	0.397	0.246	0.093	0.393	-0.398	0.007	0.241
Length of Main Raceme						1.000	0.060	0.208	-0.250	0.182	-0.226	-0.231	0.087
Siliquae On Main Raceme							1.000	0.228	0.284	0.566	-0.376	-0.047	0.456
Seeds/ Siliqua								1.000	0.043	0.029	0.018	-0.286	0.049
1000 Seed Weight (g)									1.000	0.287	-0.347	-0.117	0.121

Biological Yield/ Plant (g)										1.000	-0.633	-0.232	0.894
harvest Index (%)											1.000	0.184	-0.237
Oil Content (%)												1.000	-0.205
Seed Yield/ Plant (g)													1.000

\*,\*\* Significant at 5% and 1% probability levels, respectively.

**Table 3:** Estimate of phenotypic correlation coefficients among 13 characters in Indian mustard (*Brassica juncea* L. Czern and Coss.) under normal condition

Character	Days to 50% Flowering	Days to 50% Maturity	Plant Height (cm)	Primary Branches/ Plant	Secondary Branches/ Plant	Length of Main Raceme	Siliqae On Main Raceme	Seeds/ Siliqua	1000 Seed Weight (g)	Biological Yield/ Plant (g)	harvest Index (%)	Oil Content (%)	Seed yield/plant (g)
Days to 50% Flowering	1.000	0.469*	0.000	0.149	0.145	0.119	-0.008	-0.033	0.010	0.085	-0.068	0.179	0.067
Days to 50% Maturity		1.000	0.111	0.122	0.278	-0.154	0.278	-0.116	0.045	0.263	0.010	0.295	0.321
Plant Height (cm)			1.000	0.407	0.220	-0.204	0.268	0.477*	0.577**	0.186	0.081	-0.096	0.227
Primary Branches/ Plant				1.000	0.161	-0.157	0.253	0.360	0.100	0.069	-0.031	0.057	0.092
Secondary Branches/ Plant					1.000	0.486	0.391	0.221	0.090	0.366	-0.391	0.006	0.215
Length of Main Raceme						1.000	0.060	0.185	-0.248	0.169	-0.218	-0.219	0.081
Siliqae On Main Raceme							1.000	0.219	0.282	0.521*	-0.365	-0.047	0.407
Seeds/ Siliqua								1.000	0.046	0.028	0.024	-0.248	0.050
1000 Seed Weight (g)									1.000	0.275	-0.335	-0.115	0.124
Biological Yield/ Plant (g)										1.000	-0.600**	-0.205	0.902**
harvest Index (%)											1.000	0.173	-0.215
Oil Content (%)												1.000	-0.176
Seed Yield/ Plant (g)													1.000

\*,\*\* Significant at 5% and 1% probability levels, respectively.

**Table 4:** Estimate of genotypic correlation coefficients among 13 characters in Indian mustard (*Brassica juncea* L. Czern and Coss.) under saline/alkaline condition

Character	Days to 50% Flowering	Days to 50% Maturity	Plant Height (cm)	Primary Branches/ Plant	Secondary Branches/ Plant	Length of Main Raceme	Siliqae On Main Raceme	Seeds Siliqua	1000 Seed Weight (g)	Biological Yield/ Plant (g)	harvest Index (%)	Oil Content (%)	Seed yield/plant (g)
Days to 50% Flowering	1.000	0.254	0.543	-0.284	0.070	-0.201	0.023	0.025	0.140	-0.061	0.349	-0.079	0.194
Days to 50% Maturity		1.000	0.351	-0.257	-0.015	-0.200	-0.173	0.123	-0.049	-0.593	0.396	0.010	-0.357
Plant Height (cm)			1.000	0.194	0.207	-0.317	0.107	0.415	-0.025	-0.091	0.421	0.258	0.208
Primary Branches/ Plant				1.000	0.217	0.218	-0.208	0.321	-0.280	0.335	0.010	0.207	0.334
Secondary Branches/ Plant					1.000	0.528	0.428	0.535	0.120	0.369	-0.390	0.140	0.076
Length of Main Raceme						1.000	0.087	0.272	-0.217	0.126	-0.373	-0.334	-0.185
Siliqae On Main Raceme							1.000	0.206	0.333	0.339	-0.293	0.056	0.159
Seeds Siliqua								1.000	-0.142	0.310	0.077	-0.215	0.339
1000 Seed Weight (g)									1.000	0.298	-0.245	-0.111	0.141
Biological Yield/ Plant (g)										1.000	-0.425	-0.294	0.790
harvest Index (%)											1.000	0.029	0.215
Oil Content (%)												1.000	-0.266
Seed Yield/ Plant (g)													1.000

\*,\*\* Significant at 5% and 1% probability levels, respectively.

**Table 5:** Estimate of phenotypic correlation coefficients among 13 characters in Indian mustard (*Brassica juncea* L. Czern and Coss.) under saline/alkaline condition

Character	Days to 50% Flowering	Days to 50% Maturity	Plant Height (cm)	Primary Branches/ Plant	Secondary Branches/ Plant	Length of Main Raceme	Siliqae On Main Raceme	Seeds Siliqua	1000 Seed Weight (g)	Biological Yield/ Plant (g)	harvest Index (%)	Oil Content (%)	Seed yield/plant (g)
Days to 50% Flowering	1.000	0.229	0.495*	-0.252	0.065	-0.184	0.027	0.032	0.127	-0.038	0.330	-0.072	0.184
Days to 50% Maturity		1.000	0.272	-0.166	-0.015	-0.167	-0.143	0.048	-0.057	-0.450*	0.330	0.015	-0.293
Plant Height (cm)			1.000	0.202	0.196	-0.302	0.104	0.361	-0.035	-0.067	0.403	0.257	0.200
Primary Branches/ Plant				1.000	0.200	0.192	-0.190	0.272	-0.253	0.279	0.009	0.193	0.290
Secondary Branches/ Plant					1.000	0.525	0.425	0.509*	0.119	0.329	-0.389	0.137	0.065
Length of Main Raceme						1.000	0.089	0.253	-0.212	0.114	-0.369	-0.317	-0.171
Siliqae On Main Raceme							1.000	0.190	0.327	0.314	-0.291	0.057	0.157
Seeds Siliqua								1.000	-0.127	0.286	0.072	-0.204	0.312
1000 Seed Weight (g)									1.000	0.255	-0.243	-0.100	0.118
Biological Yield/ Plant (g)										1.000	-0.395	-0.264	0.793**
harvest Index (%)											1.000	0.027	0.198
Oil Content (%)												1.000	-0.255
Seed Yield/ Plant (g)													1.000

\*,\*\* Significant at 5% and 1% probability levels, respectively.

**Table 6:** Estimate of genotypic direct and indirect effect of 12 characters on seed yield per plant in mustard (*Brassica juncea* L. Czern and Coss.) under normal condition

Character	Days to 50% Flowering	Days to 50% Maturity	Plant Height (cm)	Primary Branches/ Plant	Secondary Branches/ Plant	Length of Main Raceme	Siliqae On Main Raceme	Seeds/ Siliqua	1000 Seed Weight (g)	Biological Yield/ Plant (g)	harvest Index (%)	Oil Content (%)	Seed yield/plant (g)
Days to 50% Flowering	0.030	-0.016	-0.001	0.013	0.001	-0.009	0.003	-0.011	0.000	0.269	-0.059	-0.008	0.211
Days to 50% Maturity	0.029	-0.017	-0.014	0.011	0.001	0.009	-0.018	-0.007	0.000	0.378	-0.007	-0.010	0.355
Plant Height (cm)	0.000	-0.002	-0.110	0.034	0.001	0.011	-0.016	0.023	0.000	0.253	0.047	0.003	0.245
Primary Branches/ Plant	0.006	-0.003	-0.058	0.065	0.001	0.011	-0.020	0.023	0.000	0.231	-0.027	-0.004	0.225
Secondary Branches/ Plant	0.007	-0.005	-0.024	0.015	0.004	-0.026	-0.023	0.011	0.000	0.511	-0.227	0.000	0.241
Length of Main Raceme	0.005	0.003	0.023	-0.013	0.002	-0.053	-0.004	0.009	0.000	0.236	-0.129	0.007	0.087
Siliqae On Main Raceme	-0.002	-0.005	-0.030	0.022	0.002	-0.003	-0.059	0.010	0.000	0.734	-0.215	0.002	0.456
Seeds/ Siliqua	-0.008	0.003	-0.056	0.032	0.001	-0.011	-0.013	0.045	0.000	0.037	0.010	0.009	0.049
1000 Seed Weight (g)	0.001	-0.001	-0.064	0.008	0.000	0.013	-0.017	0.002	0.000	0.372	-0.199	0.004	0.121
Biological Yield/ Plant (g)	0.006	-0.005	-0.021	0.012	0.002	-0.010	-0.033	0.001	0.000	1.298	-0.362	0.007	0.894
harvest Index (%)	-0.003	0.000	-0.009	-0.003	-0.002	0.012	0.022	0.001	0.000	-0.822	0.572	-0.006	-0.237
Oil Content (%)	0.008	-0.005	0.011	0.007	0.000	0.012	0.003	-0.013	0.000	-0.301	0.105	-0.032	-0.205

Residual effect = 0.095, Bold figures indicate direct effects.

**Table 7:** Estimate of phenotypic direct and indirect effect of 12 characters on seed yield per plant in mustard (*Brassica juncea* L. Czern and Coss.) under normal condition

Character	Days to 50% Flowering	Days to 50% Maturity	Plant Height (cm)	Primary Branches/ Plant	Secondary Branches/ Plant	Length of Main Raceme	Siliqae On Main Raceme	Seeds/ Siliqua	1000 Seed Weight (g)	Biological Yield/ Plant (g)	harvest Index (%)	Oil Content (%)	Seed yield/plant (g)
Days to 50% Flowering	-0.012	0.009	0.000	0.008	-0.001	-0.003	0.000	-0.001	0.000	0.106	-0.035	-0.004	0.067
Days to 50% Maturity	-0.005	0.020	-0.008	0.006	-0.003	0.004	-0.016	-0.004	0.000	0.329	0.005	-0.007	0.321
Plant Height (cm)	0.000	0.002	-0.072	0.021	-0.002	0.005	-0.015	0.017	-0.004	0.232	0.041	0.002	0.227
Primary Branches/ Plant	-0.002	0.002	-0.029	0.051	-0.002	0.004	-0.015	0.013	-0.001	0.087	-0.016	-0.001	0.092
Secondary Branches/ Plant	-0.002	0.005	-0.016	0.008	-0.010	-0.013	-0.023	0.008	-0.001	0.456	-0.199	0.000	0.215
Length of Main Raceme	-0.001	-0.003	0.015	-0.008	-0.005	-0.026	-0.003	0.006	0.002	0.211	-0.111	0.005	0.081
Siliqae On Main Raceme	0.000	0.005	-0.019	0.013	-0.004	-0.002	-0.058	0.008	-0.002	0.650	-0.186	0.001	0.407
Seeds/ Siliqua	0.000	-0.002	-0.034	0.018	-0.002	-0.005	-0.013	0.035	0.000	0.035	0.012	0.006	0.050
1000 Seed Weight (g)	0.000	0.001	-0.041	0.005	-0.001	0.007	-0.016	0.002	-0.006	0.343	-0.171	0.003	0.124
Biological Yield/ Plant (g)	-0.001	0.005	-0.013	0.004	-0.004	-0.004	-0.030	0.001	-0.002	1.248	-0.306	0.005	0.902**
harvest Index (%)	0.001	0.000	-0.006	-0.002	0.004	0.006	0.021	0.001	0.002	-0.749	0.510	-0.004	-0.215
Oil Content (%)	-0.002	0.006	0.007	0.003	0.000	0.006	0.003	-0.009	0.001	-0.256	0.088	-0.022	-0.176

Residual effect = 0.112, Bold figures indicate direct effects.

**Table 8:** Estimate of genotypic direct and indirect effect of 12 characters on seed yield per plant in mustard (*Brassica juncea* L. Czern and Coss.) under saline/alkaline condition

Character	Days to 50% Flowering	Days to 50% Maturity	Plant Height (cm)	Primary Branches/ Plant	Secondary Branches/ Plant	Length of Main Raceme	Siliqae On Main Raceme	Seeds/ Siliqua	1000 Seed Weight (g)	Biological Yield/ Plant (g)	harvest Index (%)	Oil Content (%)	Seed yield/plant (g)
Days to 50% Flowering	-0.029	0.058	0.092	0.072	-0.029	-0.071	-0.002	0.000	-0.003	-0.094	0.227	-0.028	0.194
Days to 50% Maturity	-0.007	0.227	0.059	0.065	0.006	-0.070	0.012	0.001	0.001	-0.912	0.258	0.004	-0.357
Plant Height (cm)	-0.016	0.080	0.169	-0.049	-0.087	-0.111	-0.007	0.005	0.000	-0.140	0.274	0.091	0.208
Primary Branches/ Plant	0.008	-0.058	0.033	-0.252	-0.092	0.077	0.014	0.004	0.005	0.515	0.007	0.073	0.334
Secondary Branches/ Plant	-0.002	-0.003	0.035	-0.055	-0.422	0.185	-0.029	0.006	-0.002	0.567	-0.254	0.049	0.076
Length of Main Raceme	0.006	-0.045	-0.054	-0.055	-0.223	0.351	-0.006	0.003	0.004	0.194	-0.242	-0.117	-0.185
Siliqae On Main Raceme	-0.001	-0.039	0.018	0.052	-0.181	0.031	-0.068	0.002	-0.007	0.522	-0.191	0.020	0.159
Seeds/ Siliqua	-0.001	0.028	0.070	-0.081	-0.226	0.095	-0.014	0.012	0.003	0.478	0.050	-0.076	0.339
1000 Seed Weight (g)	-0.004	-0.011	-0.004	0.071	-0.050	-0.076	-0.023	-0.002	-0.020	0.458	-0.159	-0.039	0.141
Biological Yield/ Plant (g)	0.002	-0.135	-0.015	-0.084	-0.156	0.044	-0.023	0.004	-0.006	1.539	-0.276	-0.103	0.790
harvest Index (%)	-0.010	0.090	0.071	-0.003	0.165	-0.131	0.020	0.001	0.005	-0.654	0.651	0.010	0.215
Oil Content (%)	0.002	0.002	0.044	-0.052	-0.059	-0.117	-0.004	-0.003	0.002	-0.452	0.019	0.352	-0.266

Residual effect = 0.221, Bold figures indicate direct effects.

**Table 9:** Estimate of phenotypic direct and indirect effect of 12 characters on seed yield per plant in mustard (*Brassica juncea* L. Czern and Coss.) under saline/alkaline condition

Character	Days to 50% Flowering	Days to 50% Maturity	Plant Height (cm)	Primary Branches/ Plant	Secondary Branches/ Plant	Length of Main Raceme	Siliqae On Main Raceme	Seeds/ Siliqua	1000 Seed Weight (g)	Biological Yield/ Plant (g)	harvest Index (%)	Oil Content (%)	Seed yield/plant (g)
Days to 50% Flowering	0.032	-0.015	0.005	-0.015	0.003	0.028	0.001	-0.001	-0.006	-0.037	0.181	0.007	0.184
Days to 50% Maturity	0.007	-0.065	0.003	-0.010	-0.001	0.025	-0.006	-0.002	0.003	-0.429	0.181	-0.001	-0.293
Plant Height (cm)	0.016	-0.018	0.010	0.012	0.010	0.046	0.004	-0.014	0.002	-0.064	0.221	-0.025	0.200
Primary Branches/ Plant	-0.008	0.011	0.002	0.058	0.010	-0.029	-0.007	-0.010	0.013	0.266	0.005	-0.019	0.290
Secondary Branches/ Plant	0.002	0.001	0.002	0.012	0.050	-0.080	0.016	-0.019	-0.006	0.314	-0.213	-0.014	0.065
Length of Main Raceme	-0.006	0.011	-0.003	0.011	0.026	-0.153	0.003	-0.010	0.011	0.109	-0.202	0.031	-0.171
Siliqae On Main Raceme	0.001	0.009	0.001	-0.011	0.021	-0.014	0.039	-0.007	-0.017	0.299	-0.160	-0.006	0.157
Seeds/ Siliqua	0.001	-0.003	0.004	0.016	0.026	-0.039	0.007	-0.038	0.006	0.272	0.039	0.020	0.312

1000 Seed Weight (g)	0.004	0.004	0.000	-0.015	0.006	0.032	0.013	0.005	-0.051	0.243	-0.133	0.010	0.118
Biological Yield/ Plant (g)	-0.001	0.029	-0.001	0.016	0.017	-0.017	0.012	-0.011	-0.013	0.953	-0.217	0.026	0.793**
harvest Index (%)	0.011	-0.021	0.004	0.001	-0.020	0.056	-0.011	-0.003	0.012	-0.377	0.548	-0.003	0.198
Oil Content (%)	-0.002	-0.001	0.003	0.011	0.007	0.048	0.002	0.008	0.005	-0.252	0.015	-0.099	-0.255

Residual effect = 0.221, Bold figures indicate direct effects

## References

1. Al-Jibouri HA, Miller PA, Robinson HF. Genotypic and environmental variance and covariance in an upland cotton cross of inter-specific origin. *Agron J.* 1958; 50:633-637.
2. Amit Singh, Ram Avtar, Dhiraj Singh, Sangwan O, Balyan P. Genetic variability, character association and path analysis for seed yield and component traits under two environments in Indian mustard. *Journal of Oilseeds Brassica.* 2013; 4(1):43-48.
3. Dewey DR, Lu KH. A correlation and path coefficient analysis of components of crested wheat grass seed production. *Agron. J.* 1959; 51:515-518.
4. Mahla HR, Jambhulkar SJ, Yadav DK, Sharma R. Genetic variability, correlation and path analysis in Indian mustard [*Brassica juncea* (L.) Czern and Coss.]. *Indian Journal of Genetics and Plant Breeding.* 2003; 63(2):171-172.
5. Mahak Singh, Srivastava RL, Lalta Prasad, Dixit RK. Correlation and path analysis in Indian mustard [*Brassica juncea* (L.) Czern and Coss.]. *Advances in Plant Sciences.* 2003; 16(1):311-315.
6. Priyamedha, Singh VV, Chauhan JS, Meena ML, Mishra DC. Correlation and path coefficient analysis for yield and yield components in early generation lines of Indian mustard (*Brassica juncea* L.). *Current Advances in Agri. Sci.* 2013; 5(1):37-40.
7. Sirohi SPS, Sanjai Malik, Ashok Kumar. Correlation and path analysis of Indian mustard [*Brassica juncea* (L.) Czern and Coss.]. *Annals of Agric. Research.* 2004; 25(4):491-494.