Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(2): 2593-2595
Received: 03-01-2018
Accepted: 07-02-2018

Satyendra Kumar
Department of Genetics and Plant Breeding, Narendra Deva University of Agriculture and Technology, Faizabad, Uttar Pradesh, India

Aarti Sharma
Department of Genetics and Plant Breeding, Narendra Deva University of Agriculture and Technology, Faizabad, Uttar Pradesh, India

Anand Mohan Choudhary
Department of Genetics and Plant Breeding, Narendra Deva University of Agriculture and Technology, Faizabad, Uttar Pradesh, India

Purushottam
Department of Genetics and Plant Breeding, Narendra Deva University of Agriculture and Technology, Faizabad, Uttar Pradesh, India

MP Chauhan
Department of Genetics and Plant Breeding, Narendra Deva University of Agriculture and Technology, Faizabad, Uttar Pradesh, India

Correspondence
Aarti Sharma
Department of Genetics and Plant Breeding, Narendra Deva University of Agriculture and Technology, Faizabad, Uttar Pradesh, India

Applying correlation and path coefficient to study genetic variability in linseed (*Linum usitatissimum* L.)

Satyendra Kumar, Aarti Sharma, Anand Mohan Choudhary, Purushottam and MP Chauhan

Abstract
The comparison of mean performance of 66 linseed entries for 10 quantitative traits using least significant differences revealed existence of very high level of variability in germplasm collections. The genotype Gewargi 1-2 produced highest seed yield per plant (10.09 g) and also showed highest mean performance for number of capsules per plant, harvest index and number of primary branches per plant. Seed yield per plant exhibited highly significant and positive correlation with harvest index (0.834), biological yield per plant (0.702). Number of capsules per plant exhibited highly significant and positive correlation with secondary branches per plant (0.754), primary branches per plant (0.424), days to 50% flowering (0.354) while number of capsules per plant showed non-significant positive correlation with plant height (0.219). The highest positive direct effect on seed yield per plant was exerted by harvest index (0.7118) followed by biological yield per plant (0.5348). Correlation coefficient studies indicated days to 50% flowering, number of primary branches, number of secondary branches and test weight have non-significant and positive correlation with seed yield per plant but it was significantly and negatively correlated with days to maturity. Path analysis identified biological yield per plant followed by harvest index, as major direct contributors towards seed yield per plant, while number of capsules per plant, test weight and plant height emerged as most important indirect yield components.

Keywords: brinjal, variability, GCV, PCV, heritability, genetic advance

Introduction
Linseed is an oilseed crop and it possesses excellent medicinal uses as well (M.P. Chauhan *et. al* 2009) [6]. Linseed-cake is a very good manure and animal feed. Linseed is used in making paper and plastics. Out of total linseed oil, 20 percent is used for edible and domestic purpose and rest of 80 percent goes for industrial utilization. It's seed contains about 33-45 percent oil which is generally unsuitable for domestic purpose due to high linolenic acid content (47-58 percent), whereas it is an excellent source for industrial use in manufacture of paints, surface coating varnish, printing inks, soap, antibiotics and similar other products.
The correlation and path coefficient help us in understanding the relative importance of various yield influencing characters so that the most important yield component is necessary for planning and execution of a successful selection strategy because it is almost impossible and in practical to practice selection for large number of characters along with seed yield.
The result of the earlier studies on germplasm evaluation, variability, correlation, path analysis and genetic divergence in linseed are relevant only for materials and environments of the particular study due to their non-consistent nature and cannot be generalized. Linseed genotypes showed a wide fluctuation in their performance, when grown under varied agro-climatic conditions (Yadav; 2001, Adugna and Labuschange; 2003, Copur *et al.*; 2006, Sohan *et al.*; 2007, Jadhav *et al.*; 2011, Savita *et al.*; 2011**,** Reddy *et al.;* 2013) [14, 1, 3, 13, 5, 9, 11].

Material and Methods
The experimental material comprising 63 linseed germplasm lines including three checks (T-397, Mukta and Hira) were planted in augmented block design. The experimental field was divided into three blocks of twenty four plots. The checks were distributed randomly in each block. Each plot consisted of double row of 5 meter length spaced 30 cm apart with plant to plant distance of 10 cm. All the recommended cultural practices were followed to raise a good crop. The correlation coefficients were worked out using the formula given by Searle (1961) [12]. Path coefficient analysis was done according to the formula given by Dewey and Lu (1959) [4]. The seed yield was assumed to be dependent variable (effect), which is influenced by all the nine other characters, the independent variable (cause) directly as well as indirectly through other characters. The unexplained variation in seed yield by the nine characters was presumed to be contributed by a residual factor (x), which is uncorrelated with other factors.

Experimental results

In the Table-1 simple correlation coefficients between different ten characters of linseed has been mentioned, which explains, seed yield per plant exhibited highly significant and positive correlation with harvest index (0.834), biological yield per plant (0.702) and number of capsules per plant (0.313). The non-significant but positive correlation of seed yield was with number of seeds per capsules (0.067) and plant height (0.060). Biological yield per plant showed significant and positive correlation with number of capsules per plant (0.278) while biological yield per plant had non-significant positive correlation with primary branches per plant (0.187), secondary branches per plant (0.184), number of seed per capsules (0.138), test weight (0.057) and days of 50% flowering (0.004) whereas, plant height (-0.078) was negatively correlated with biological yield per plant. Harvest index exhibited non-significant and positive correlation with biological yield per plant (0.220), number of capsules per plant (0.204), days to 50% flowering (0.151), plant height (0.114), test weight (0.078) and primary branches per plant (0.053) and non-significant and negative correlation with number of seed per capsule (-0.056). Test weight exhibited highly significant and positive correlation with secondary branches per plant (0.305) while test weight showed non-significant positive correlation with number of capsules per plant (0.202), primary branches per plant (0.102), days to 50% flowering (0.012) and number of seeds per capsule (0.001) and non-significant and negative correlation with plant height (-0.096). Number of seeds per capsule exhibited highly significant and positive correlation with plant height (0.470) days to 50% flowering (0.323), and significant positive correlation with primary branches per plant (0.286), while number of seeds per capsule showed non-significant positive correlation with number of capsules per plant (0.098), and secondary branches per plant (0.012). Number of capsules per plant exhibited highly significant and positive correlation with secondary branches per plant (0.754), primary branches per plant (0.424), days to 50% flowering (0.354) while number of capsules per plant showed non-significant positive correlation with plant height (0.219). The results on path coefficient has been tabulated in the Table-2, which specify that the highest positive direct effect on seed yield per plant was exerted by harvest index (0.7118) followed by biological yield per plant (0.5348). The very low value of direct effect recorded in case of remaining seven characters indicated that their direct contribution to seed yield per plant was too low to be considered of any consequence**.** Biological yield per plant (0.1180), number of capsules per plant (0.0070), test weight (0.0013), plant height (0.0012) exerted substantial positive indirect effect on seed yield via harvest index. Harvest index (0.1571), number of capsules per plant (0.0096), number of seeds per capsule (0.0046), and test weight (0.0010) also exerted substantial positive indirect effect on seed yield via biological yield per plant. The remaining estimates of indirect effect in present analysis were too low to be considered important. The estimated of residual effects (0.1392) was negligible.

Table 1: Estimates of simple correlation coefficients between different characters in linseed germplasm

Character	Days to 50% flowering	Plant height (cm)	Primary branches/ plant	Secondary branches/ plant	Capsules/ plant	Seeds/ capsule	Test weight (g)	Biological yield/ plant (g)	Harvest index (%)	Seed yield/ Plant (g)
Days to 50% flowering	1.0000	0.4214**	0.3374	0.2713*	0.3544**	0.3230**	0.01291	0.0049	0.1516	0.1209
Plant height (cm)		1.0000	0.2238	0.02659*	0.2193	0.4709**	-0.0963	-0.0782	0.1140	0.0606
Primary branches/ plant			1.0000	0.4343**	0.4241**	0.2869*	0.1027	0.1871	0.0536	0.1422
Secondary branches/plant				1.0000	0.7541	0.0123	0.3056**	0.1841	0.0175	0.1157
Number of capsules/ plant					1.0000	0.0980	0.2028	0.2786*	0.2044	0.3136**
Number of seeds/ capsule						1.0000	0.0011	0.1381	-0.0563	0.0676
Test weight (g)							1.0000	0.0579	0.0782	0.0987
Biological yield/plant (g)								1.0000	0.2206	0.7020**
Harvest index (%)									1.0000	0.8349**
Seed yield/ Plant (g)										1.0000

* Significant at 5 % probability level

** Significant at 1 % probability level

Table 2: Direct and indirect effects of different characters on Seed yield per plant in linseed germplasm

Character	Days to 50% flowering	Plant height (cm)	Primary branches/ plant	Secondary branches /plant	Capsules / plant	Seeds/ capsule	Test weight (g)	Biological yield/plant(g)	Harvest Index (%)	Correlation with seed yield/plant (g)
Days to 50% flowering	-0.0123	-0.0052	-0.0041	-0.0033	-0.0044	-0.0040	-0.0016	-0.0001	-0.0019	0.1209
Plant height (cm)	0.0044	0.0105	0.0023	0.0028	0.0023	0.0049	-0.0010	-0.0008	0.0012	0.0606
Primary branches/ plant	-0.0040	-0.0027	-0.0119	-0.0052	-0.0050	-0.0034	0.0012	-0.0022	-0.0006	0.1422
Secondary branches/plant	-0.0029	-0.0028	-0.0046	-0.0106	-0.0080	0.0001	0.0032	-0.0020	-0.0002	0.1157

Capsules/ plant	0.0122	0.0075	0.0146	0.0260	0.0344	0.0034	-0.0070	0.0096	0.0070	0.3136
Seeds/Capsules	0.0107	0.0156	0.0095	0.0004	0.0032	0.0331	0.0000	0.0046	-0.0019	0.0676
Test weight (g)	0.0022	-0.0017	-0.0018	-0.0052	-0.0035	0.0000	0.0172	0.0010	0.0013	0.0987
Biological yield /plant (g)	0.0026	-0.0418	0.1001	0.0984	0.1490	0.0739	0.0310	0.5348	0.1180	0.7020
Harvest index (%)	0.1079	0.0811	0.0381	0.0125	0.1455	-0.0401	0.0557	0.1571	0.7118	0.8349

Residual = 0.9806, Residual effects =0.1392

Discussion

Biological yield per plant showed highly significant and positive correlation with number of capsules per plant, and negative and significant correlation with days to maturity. The positive and non-significant correlation of biological yield is recorded with plant height (0.053). More or less similar observations have been reported by Naik and Satapathy (2002) [7]; Mohammad *et al.* (2003); Al-Kordy *et al*. (2003) [2]. Number of capsules per plant was highly significant and positively correlated with plant height while significant and positively correlated with number of primary branches per plant. Days to 50% flowering were non-significant and negatively correlated with the number of capsules per plant. Number of seeds per capsule showed non- significant and positive correlation with days to maturity, plant height, number of primary branches, number of secondary branches per plant and number of capsule per plant.

The high positive direct contribution towards seed yield per plant was exhibited by biological yield per plant followed by harvest index. These characters have also identified as major direct contributors of yield by Naik and Satapathy (2002) [7]; Rama Kant *et al.* (2008) [10]. Plant height, Days to 50% flowering, Primary branches per plant and seed per capsule were the traits having substantial negative direct effects on seed yield per plant which is in agreement with previous report (Pal *et al.* 2002). In the present study, path analysis identified biological yield per plant, harvest index as important direct yield components. While number of capsules per plant, test weight and plant height emerged as most important indirect yield contributing characters because they showed substantial indirect effect on seed yield per plant via biological yield per plant which made high direct contribution on seed yield per plant. Number of secondary branches per plant, number of primary branches/plant, and days to 50% flowering exerted substantial positive indirect effect on seed yield via harvest index were important indirect contributors to seed yield. The characters mentioned above should be given due consideration at the time of selection for high yielding genotypes in linseed.

References

1. Adugna W, Labuschange MT. Association of linseed characters and its variability in different environments. J Agric. Sci. 2003; 140(3):285-296.
2. Al-Kordy MA, Ahmed MA, Hassanein MS. Correlation and path coefficient analysis of some quantitative traits in flax (*Linum usitatissimum* L.). Annals of Agricultural Science, Moshtohor. 2003; 41(2):579-597.
3. Copur O, Gur MA, Karakus M, Demirel U. Determination of correlation and path analysis among yield components and seed yield in oil flax varieties (*Linum usitatissimum* L.). J Bio. Sci. 2006; 6(4):738-743.
4. Dewey DR, Lu KH. Correlation and path coefficient analysis of crested wheat grass seed production. Agron. J 1959; 51:515-518.
5. Jadhav RR, Maheshwari JJ, Katre LA, Ghorpade PB. Genetic analysis of yield and yield contributing traits in linseed (*Linum usitatissimum* L.). J Soils and Crops, 2011; 21(1):133-138.
6. Chauhan MP, Singh S, Singh AK. Post-Harvest Uses of Linseed. J Hum Ecol. 2009; 28(3):217-219.
7. Naik BS, Satapathy PC. Selection strategy for improvement of seed yield in late sown linseed. Res. Crops. 2002; 3(3):599-605.
8. Pal SS, Gupta TR, Singh I. Genetic determination of yield in linseed (*Linum usitatissimum* L.). Crop Improv. 2000; 27(1):109-110.
9. Savita SG, Kenchanagoudar PV, Parameshwarappa KG, Rudranaik V. Correlation and path coefficient analysis for yield and yield components in linseed (*Linum usitatissimum* L.) germplasm. Karnataka J Agri. Sci. 2011; 24(3):382-386.
10. Rama Kant, Chauhan MP, Srivastava RK, Maurya KN. Correlation and path coefficient analysis of seed yield and yield components of linseed (*Linum usitatissimum* L.), Inter. J Plant Sci. (Muzaffarnagar). 2008; 3(2):323-325.
11. Reddy MP, Reddy BN, Arsul BT, Maheshwari JJ. Genetic variability, heritability and genetic advance of growth and yield components of linseed (*Linum usitatissimum* L.). Int. J Curr. Microbiol. App. Sci. 2013; 2(9):231-237.
12. Searle SR. Phenotypic, genotypic and environmental correlations. *Biometrics.* 1961; 17:474-480.
13. Sohan Ram, Singh SK, Kerketta V. Correlation studies of different crosses and parents in linseed (*Linum usitatissimum* L.). J Res., Birsa Agricultural University. 2007; 19(1):41-47.
14. Yadav RK. Association studies over locations in linseed. Progressive Agriculture, 2001; 1:11-15.