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Priyanka Rajbhar
M.Sc., Department of Vegetable Science, Acharya Narendra Deva University of Agriculture and Technology, Ayodhya, Uttar Pradesh, India

DP Mishra
Assistant Professor, Department of Vegetable Science, Acharya Narendra Deva University of Agriculture and Technology, Ayodhya, Uttar Pradesh, India

Ramesh Rajbhar
Ph.D. Research Scholar, Department of Vegetable Science, Acharya Narendra Deva University of Agriculture and Technology, Ayodhya, Uttar Pradesh, India

Corresponding Author:
Priyanka Rajbhar
M.Sc., Department of Vegetable Science, Acharya Narendra Deva University of Agriculture and Technology, Ayodhya, Uttar Pradesh, India

Correlation coefficient and path coefficient among yield and yield contributing traits in vegetable pea (*Pisum sativum* L. Var. *Hortense*)

Priyanka Rajbhar, DP Mishra and Ramesh Rajbhar

Abstract
Forty genotypes of pea were undertaken to determine relationships among yield and some yield components using direct and indirect selection parameters (Correlation and path coefficient analysis). The present investigation was carried out at the Main Experiment Station, Department of Vegetable Science, A.N. D. University of Agriculture and Technology, Kumarganj, Ayodhya during the *Rabi*, season of 2014-2015. Correlation studies revealed that pod yield per plant was positively and significantly correlated with pods per plant, number of seeds per 100 g, number of pods per 100 g, days to 50% flowering, 100 seed weight, number of seeds per pod, node at first pod appears, primary branches per plant, plant height, number of pods per plant, shelling percentage and total soluble solids. The path coefficient analysis the higher magnitude of positive direct effect on pod yield was exerted by number of pods per plant, number of seeds per 100 g, node at first flower appears and 100 seeds weight.

Keywords: Pea, correlation, path analysis, pods per plant

1. Introduction
Vegetable pea [*Pisum sativum* L. var. hortense, 2n=2x=14], belongs to the family Fabaceae. Peas are harvested in an immature condition to be cooked as green peas to provide a delicious dish, or to be canned or frozen for subsequent uses. It is an important legume vegetable grown throughout the world.

The geographical region of pea comprising of Central Asia, Near East Abyssinia and Mediterranean region is considered as centre of origin (Blixt, 1970) [2]. The Mediterranean region is the primary centre of diversity with secondary Centres is Ethiopia and the Near Cost.

In Uttar Pradesh, area under this crop is 0.178 million hectare with the production of 1.953 million tonnes and productivity 10.97 tonne per hectare (Anonymous, 2014) [1].

Garden peas are one of the most nutricious leguminous vegetables rich in health benefiting phytonutrients, vitamins and antioxidents, low in calories and no cholesterol. They are good sources of protein vitamins and dietary fibre. It is excellent sources of nutritive value (per 100 g of edible portion) *viz.* protein 7.2 g, carbohydrates 15.8 g, folic acid 65 µg, ascorbic acid 14.0 mg, vitamin K 24.8 µg and vitamin A 765 IU, also good source of phosphorus, magnesium, copper, iron and zinc. Among the pulse, peas have the highest protein digestibility, being 93.3% as compared to 59.5% to 90% in other pulses. Tender seeds are also used for preparing soups. Canned, frozen and dehydrated peas are very common for use during off season. It also contains phytosterols, especially B-sitosterol which help lower cholesterol levels inside the human body. The inflorescence is raceme arising from the axil of a leaf. The lowest node at which flower initiation occurs is normally constant under a given set of conditions and is used in classifying the varieties into early and late types. Most early cultivars produce the first flower from nodes 5 to 11 and the late cultivars start flowering at about nodes 13 to 15.

The path coefficient analysis provides the portioning of correlation coefficients into direct and indirect effect giving the relative impotence of each causes factors. The understanding of association of characters is of prime impotence in developing an efficient breeding programme.

2. Materials and Methods

The details of materials used, experiment procedure followed and techniques adapted during the course of investigation have been described in this chapter. The experimental material consisting of forty pea genotypes was sown during *Rabi*, 2014-2015 to study the genetic variation, correlation and path coefficient between yield and other traits and genetic divergence among the pea genotypes.

The experimental material for the present investigation comprised forty genotypes of garden pea collected from different places in India and being maintained at Main Experiment Station, Department of Vegetable Science, A.N. D. University of Agriculture and Technology, Narendra Nagar (Kumarganj), Ayodhya (U.P.). The experimental was conducted in Randomly Block Design with three replications during *Rabi* season in 2014-2015 to assess correlation coefficient and path analysis performance of 40 genotypes. Seed of each genotype were sown in a plot measuring 3.0 x 0.90 meter at spacing of 30 cm and 10 cm were maintained between row to row and plant to plant, respectively. All the recommended agronomic package of practices and plant protection. Observations were recorded on five randomly selected plants from each treatment in each replication for Days to 50% flowering, Plant height (cm), Number of nodes per plant, Internodal length (cm), Node at first flowers appears, Node at first pod appears, Primary branches per plant, Primary branches per plant, Circumference of pod (cm), Width of pod (cm), Number of pods per plant, Length of pod (cm), Number of seeds per pod, 100 seed weight (g), Number of seeds per 100 g, Number of pods per 100 g, Shelling percentage (%),Total soluble solids (%), Pod yield per plant (g). In the present study, correlations between eighteen characters were worked out in all possible combinations at phenotypic and genotypic levels and had been presented in Table 4.4 and 4.5. In general, the magnitude of genotypic correlation coefficients was higher than the corresponding values of the phenotypic correlation coefficients. This indicated a strong genetic association between the traits and the phenotypic expression which was suppressed due to environmental influence. Singh *et al.* (2011) [7] and Sharma and Sharma (2013) [6] also reported higher estimates of genotypic correlations than the corresponding phenotypic correlations between yield and its yield component traits. The available literature has also indicated positive correlation between pod yield per plant and among themselves in vegetable pea. Similar association of traits in garden pea had also been reported by Ghobary (2010) [3] and Singh *et al.* (2011) [7]. This indicated that direct selection based on number of pods per plant, number of seeds per 100 g, node at first flower appears and 100 seed weight would result in an appreciable improvement of pod yield per plant in vegetable pea.

Therefore during selection these characters should also be taken into consideration. Similar results were also reported by Arya *et al.* (2004) [9], Singh *et al.* (2011) [7] and Kaur *et al.* (2007) [8], Sharma *et al.* (2009) [5] and Katoch *et al.* (2015) [4].

3. Results and Discussion

The phenotypic and genotypic correlation coefficient computed among the eighteen characters under study had been presented in Table 1 and 2.

In general, genotypic correlation coefficients were higher than the corresponding phenotypic correlation coefficients, suggesting therefore, a strong inherent relationship in different pairs of characters in vegetable pea genotypes.

The most important trait pod yield per plant had exhibited highly significant and positive phenotypic correlation with number of pods per plant (0.939), number of seeds per 100 g (0.924), number of pods per 100 g (0.887), days to 50% flowering (0.716), 100 seed weight (0.714) number of seeds per pod (0.686), node at first flower appears (0.650), length of pod (0.573), node at first pod appears (0.554), primary branches per plant (0.536), plant height (o.481), number of pods per plant (0.411), shelling percentage (0.436), and Total Soluble Solids (0.381). While, circumference of pod and width of pod showing significant negative association with pod yield per plant (-0.482) and (-0.046) respectively.

Days to 50% flowering had significant and positive correlation with node at first pod appears (0.751), node at first flower appears (0.718), number of seeds per 100 g (0.688), primary branches per plant (0.648), plant height (0.526), number of nodes per plant (0.517), length of pod (0.441), 100 seed weight (0.370), total soluble solids (0.248) and intermodal length (0.238). While, it was significant negatively associated with circumference of pod (-0.464) and width of pod (-0.417).

Plant height had significant and positive association with all the characters except circumference of pod, width of pod and shelling percentage. However, it was significant and negatively correlated with circumference of pod (-0.280) and width of pod (-0.253).

Number of nodes per plant showed significant and positive association with node at first flower appears (0.528), node at first pod appears (0.538), primary branches per plant (0.408), number of pod per plant (0.402), number of seeds per 100 g (0.459), number of seeds per pod (0.374), number of pods per 100 g (0.571), length of pod (0.209) and total soluble solids (0.193). However, circumference of pod (-0.343) and width of pod (-0.292) were significant and negatively correlated with number of nodes per plant.

Internodal length showed significant and positive correlation with 100 seed weight (0.270), node at first pod appears (0.259), node at first flower appears (0.231), number of pods per plant (0.229) and shelling percentage (0.185).

Node at first flower appears was significant and positively correlated with all characters accept circumference of pod width of pod. However, it was significant and negatively correlated with circumference of pod (-0.406 and width of pod (-0.277).

Node at first pod appears had significant and positive correlation with number of pods per plant (0.521), number of seeds per 100 g (0.513), number of pods per 100 g (0.479), primary branches per plant (0.417), number of seeds per pod (0.331), length of pod (0.318), 100 seeds weight (0.195). However, it was significant and negatively correlated with circumference of pod (-0.390) and width of pod (-0.310).

Primary branches per plant showed significant positive association with number of seeds per 100 g (0.540), number of pods per 100 g (0.529), number of pods per plant (0.466), number of seeds per pod (0.319), total soluble solids (0.285), length of pod (0.278) and 100 seed weight (0.190). While, it was significant and negatively correlated with circumference of pod (-0.606) and width of pod (-0.247).

Circumference of pod had significant and negatively correlation with number of pods per plant (0.447), number of seeds per 100 g (-0.456), number of pods per 100 g (-0.421), total soluble solids (-0.320), number of seeds per pod (-0.253) and length of pod (-0.236). While it was significant and positively associated with width of pod (0.240).

Table 1: Estimates of phenotypic correlation coefficients between eighteen characters in vegetable pea

Characters	Plant height (cm)	Number of nodes per plant	Internodal Length (cm)	Node at first flower appears	Node at first pod appears	Primary branches per plant	Circumference of pod (cm)	Width of pod (cm)	Number of pods per plant	Length of pods (cm)	Number of seeds Per pod	100 seed Weight (g)	Number of seeds per 100 g	Number of Pods per 100 g	Shelling percentage (%)	T. S. S. (%)	Pod yield per plant (g)
Days to 50% flowering	0.526**	0.517**	0.238**	0.751**	0.718**	0.648**	-0.464**	-0.417**	0.665**	0.441**	0.480**	0.370**	0.688**	0.622**	0.145**	0.248**	0.716*
Plant height (cm)		0.726**	0.477**	0.545**	0.595**	0.303**	-0.280**	-0.253**	0.468**	0.262**	0.358**	0.346**	0.473**	0.403**	0.115	0.214*	0.481**
Number of Nodes per plant			0.015	0.528**	0.538	0.408**	-0.343**	-0.292**	0.402**	0.209*	0.374**	0.182*	0.459**	0.371**	0.038	0.193*	0.411**
Internodal length (cm)				0.231*	0.259*	-0.041**	0.045	-0.007	0.229*	0.125	0.132	0.270**	0.166	0.149	0.185*	0.007	0.212
Node at first flower appears					0.923**	0.433**	0.406**	-0.277**	0.613**	0.367**	0.408**	0.263**	0.599**	0.557**	0.182*	0.164	0.650**
Node at first pod appears						0.417**	-0.390**	-0.310**	0.521**	0.318**	0.331**	0.195*	0.513**	0.479**	0.136	0.141	0.554**
Primary branches per plant							-0.606**	-0.247**	0.466**	0.278**	0.319**	0.190*	0.540**	0.529**	0.045	0.285**	0.536**
Circumference of pod (cm)								0.240**	-0.447**	-0.236**	-0.253**	-0.166	-0.457**	-0.421**	-0.090	-0.320**	-0.482**
Width of pod (cm)									-0.009	-0.099	-0.012	0.167	-0.071	-0.040	0.170	-0.054	-0.046
Number of pods per plant										0.525**	0.658**	0.694**	0.893**	0.868**	0.444**	0.328**	0.939**
Length of pod (cm)											0.486**	0.546**	0.540**	0.463**	0.375**	0.308**	0.573**
Number of seeds per pod												0.652**	0.697**	0.604**	0.469**	0.321**	0.686**
100 seed weight (g)													0.647**	0.633**	0.565**	0.361**	0.714**
Number of seeds per 100 g														0.891**	0.336**	0.312**	0.924**
Number of pods per 100 g															0.403**	0.346**	0.887**
Shelling percentage (%)																0.161	0.436**
T.S.S. (%)																	0.381**

*, ** - significant at 5% and 1% probability level, respectively.

Table 2: Estimates of genotypic correlation coefficients between eighteen characters in vegetable pea genotypes

Characters	Plant height (cm)	Number of nodes per plant	Internodal Length (cm)	Node at first flower appears	Node at first pod appears	Primary branches per plant	Circumference of pod (cm)	Width of pod (cm)	Number of pods per plant	Length of pods (cm)	Number of seeds Per pod	100 seed weight (g)	Number of seeds per 100 g	Number of pods per 100 g	Shelling percentage (%)	T. S. S.(%)	Pod yield per plant (g)
Days to 50% flowering	0.5462	0.5753	0.2611	0.8796	0.8522	0.7364	-0.6332	-0.4985	0.7273	0.8274	0.5976	0.4308	0.7171	0.7200	0.2189	0.2858	0.7713
Plant height (cm)		0.8013	0.5901	0.6135	0.6619	0.3590	-0.3834	-0.3209	0.5007	0.4382	0.4418	0.3961	0.4842	0.4880	0.1908	0.2399	0.5006
Nodes per plant			0.0064	0.6226	0.6700	0.5247	-0.4935	-0.3915	0.4461	0.4923	0.4515	0.2362	0.5055	0.4543	-0.0067	0.2365	0.4439
Internodal length (cm)				0.3323	0.3497	-0.0822	0.1197	0.0028	0.2881	0.1485	0.1013	0.3255	0.2060	0.2379	0.2342	-0.0655	0.2841
Node at first flower appears					0.9813	0.5385	-0.5918	-0.3897	0.7340	0.7298	0.5613	0.4366	0.6791	0.7032	0.2464	0.1671	0.7499

Node at first pod appears						0.4929	-0.5174	-0.4035	0.6189	0.6431	0.5085	0.3459	0.5788	0.5982	0.1615	0.1184	0.6384
Primary branches per plant							-0.8212	-0.2880	0.5417	0.5004	0.5002	0.2486	0.5954	0.6045	0.0661	0.3389	0.6002
Circumference of pod (cm)								0.4131	-0.5511	-0.4476	-0.4883	-0.2669	-0.5815	-0.6368	-0.0937	-0.4101	-0.6270
Width of pod (cm)									-0.0379	-0.1699	-0.0266	0.1762	-0.0834	0.0381	0.2309	-0.0940	-0.0785
Number of pods per plant										1.0200	0.9204	0.8595	0.9387	0.9936	0.6185	0.4027	1.0108
Length of pod (cm)											1.1990	0.9875	0.9583	1.0843	0.8840	0.5646	1.0117
Number of seeds per pod												0.9041	0.9053	0.9944	0.8953	0.4570	0.9246
100 seeds weight (g)													0.7468	0.8437	0.8329	0.4644	0.8442
Number of seeds per 100 g														0.9771	0.4614	0.3547	0.9463
Number of Pods per 100 g															0.5837	0.4400	0.9986
Shelling (%)																0.2445	0.6060
T.S.S. %																	0.4310

*, ** - significant at 5% and 1% probability level, respective

Table 3: Direct and indirect effect of eighteen characters on pod yield per plant (g) at phenotypic level in vegetable pea.

Characters	Days to 50% flowering	Plant height (cm)	Number of nodes per plant	Internodal Length (cm)	Node at first flower appearance	Node at first pod appears	Primary branches per plant	Circumference of pod (cm)	Width of pod(cm)	Number of pods per plant	Length of pod (cm)	Number of seeds per pod	100 seed weight (g)	Number of seeds per 100 g	Number of pods per 100 g	Shelling percentage (%)	T. S. S. (%)	Correlation with pod yield per plant (g)
Days to 50% flowering	0.0845	0.0304	-0.0413	-0.0069	0.1208	-0.0522	0.0222	0.0161	-0.0120	0.2367	0.0111	0.0012	0.0385	0.1968	0.0564	0.0044	0.0099	0.7166
Plant height (cm)	0.0444	0.0577	-0.0580	-0.0137	0.0877	-0.0433	0.0104	0.0097	-0.0073	0.1667	0.0066	0.0009	0.0360	0.1352	0.0366	0.0035	0.0085	.04816
Number of nodes per plant	0.0437	0.0420	-0.0798	-0.0005	0.0849	-0.0392	0.0140	0.0119	-0.0084	0.1432	0.0052	0.0010	0.0190	0.1314	0.0337	0.0012	0.0077	0.4110
Internodal length (cm)	0.0201	0.0276	-0.0012	-0.0288	0.0372	-0.0189	-0.0014	-0.0016	-0.0002	0.0815	0.0031	0.0003	0.0281	0.0474	0.0135	0.0056	0.0003	0.2127
Node at first flower appears	0.0635	0.0315	-0.0422	0.0067	0.1606	-0.0671	0.0148	0.0141	-0.0080	0.2182	0.0092	0.0011	0.0274	0.1714	0.0506	0.0055	0.0065	0.6506
Node at first pod appears	0.0607	0.0344	-0.0431	-0.0075	0.1484	-0.0726	0.0143	0.0136	-0.0089	0.1855	0.0080	0.0009	0.0203	0.1469	0.0435	0.0041	0.0056	0.5540
Primary branches per plant	0.0548	0.0175	-0.0326	0.0012	0.0696	-0.0303	0.0343	0.0211	-0.0071	0.1657	0.0070	0.0008	0.0198	0.1545	0.0480	0.0014	0.0113	0.5368
Circumference of pod (cm)	-0.0392	-0.0162	0.0274	-0.0013	-0.0653	0.0284	-0.0208	-0.0348	0.0069	-0.1590	-0.0059	-0.0007	-0.0173	-0.1308	-0.0383	-0.0027	-0.0127	-0.4822
Width of pod (cm)	-0.0353	-0.0147	0.0233	0.0002	-0.0446	0.0226	-0.0085	-0.0084	0.0287	-0.0032	-0.0025	0.0000	0.0174	-0.0205	0.0037	0.0051	-0.0021	-0.0461
Number of pods per plant	0.0562	0.0271	-0.0321	-0.0066	0.0986	-0.0379	0.0160	0.0155	-0.0003	0.3556	0.0132	0.0017	0.0722	0.2553	0.0788	0.0134	0.0130	0.9396
length of pod (cm)	0.0373	0.0151	-0.0167	-0.0036	0.0590	-0.0232	0.0095	0.0095	0.0082	-0.0029	0.0250	0.0013	0.0568	0.1550	0.0420	0.0113	0.0122	0.5735
Number of seeds per pod	0.0406	0.0207	-0.0299	-0.0028	0.0656	-0.0240	0.0110	0.0088	-0.0004	0.2341	0.0122	0.0026	0.0678	0.1994	0.0548	0.0141	0.0127	0.6864
100 seed weight (g)	0.0313	0.0200	-0.0146	-0.0078	0.0423	-0.0142	0.0065	0.0058	0.0048	0.2470	0.0137	0.0017	0.1039	0.1851	0.0658	0.0587	0.0376	0.7143
Number of seeds per 100 g	0.0582	0.0273	-0.0367	0.0048	0.0963	-0.0373	0.0185	0.0159	-0.0021	0.3176	0.0136	0.0018	0.0673	0.2858	0.0809	0.0101	0.0123	0.9248
Number of pods per 100 g	0.0526	0.0233	-0.0297	-0.0043	0.0896	-0.0349	0.0181	0.0147	-0.0012	0.3090	0.0116	0.0016	0.0658	0.2548	0.0907	0.0121	0.0137	0.8876
Shelling percentage (%)	0.0123	0.0066	-0.0031	-0.0053	0.0293	-0.0099	0.0016	0.0031	0.0049	0.1581	0.0094	0.0012	0.0587	0.0962	0.0366	0.0301	0.0064	0.4361
T.S.S. (%)	0.0210	0.0124	-0.0155	-0.0002	0.0264	-0.0103	0.0098	0.0111	-0.0015	0.1167	0.0077	0.0008	0.0376	0.0892	0.0314	0.0049	0.0396	0.3811

Residual effect- 0.9451 R2- 0.2344

Table 4: Direct and indirect effect of eighteen characters on pod yield per plant (g) at genotypic level in vegetable pea

Characters	Days to 50% flowering	Plant height (cm)	Number of nodes per plant	Internodal Length (cm)	Node at first flower appears	Node at first pod appears	Primary branches per Plant	Circumference of Pod (cm)	Width of pod (cm)	Number of pods per plant	Length of pod (cm)	Number of seeds per pod	100 seed weight (g)	Number of seeds per 100 g	Number of pods per 100 g	Shelling percentage (%)	T. S. S. (%)	Correlation with pod yield per plant(g)
Days to 50% flowering	-0.1008	-0.0606	0.0646	0.0429	0.5324	-0.5207	0.0672	-0.0077	0.0492	0.3728	0.1589	0.0314	0.0102	-0.3668	0.5530	-0.0379	-0.0163	0.7713
Plant height (cm)	-0.0551	-0.1109	0.0891	0.0969	0.3714	-0.4044	0.0328	-0.0047	0.0317	0.2566	0.0842	0.0232	0.0094	-0.2477	0.3748	-0.0330	-0.0137	0.5006
Number of nodes per plant	-0.0580	-0.0888	0.1112	0.0011	0.3768	-0.4094	0.0479	-0.0060	0.0387	0.2286	0.0945	0.0237	0.0056	-0.2586	0.3489	0.0012	-0.0135	0.4439
Internodal length (cm)	-0.0263	-0.0654	0.0007	0.1614	0.2011	0.2137	-0.0075	0.0015	-0.0003	0.1477	0.0285	0.0053	0.0077	-0.1054	0.1827	-0.0405	0.0038	0.2841
Node at first flower appears	-0.0887	-0.0680	0.0692	0.0546	0.6053	-0.5996	0.0491	-0.0072	0.0385	0.3762	0.1402	0.0295	0.0104	-0.3474	0.5401	-0.0426	-0.0095	0.7499
Node at first pod appears	-0.0859	-0.0734	0.0745	0.0574	0.5940	-0.6110	0.0450	-0.0063	0.0398	0.3172	0.1235	0.0267	0.0082	-0.2961	0.4594	-0.0279	-0.0067	0.6384
Primary branches per plant	0.0742	-0.0398	0.0583	-0.0135	0.3259	-0.3012	0.0913	0.0100	0.0284	0.2776	0.0961	0.0263	0.0059	-0.3046	0.4643	-0.0114	-0.0193	0.6002
Circumference of pod (cm)	0.0638	0.0425	-0.0549	0.0196	-0.3582	0.3161	-0.0749	0.0122	-0.0408	0.2825	-0.0860	-0.0257	-0.00630	0.2975	-0.4890	0.0162	0.0234	-0.6270
Width of pod (cm)	0.0503	0.0356	-0.0435	0.0005	-0.2359	0.2466	-0.0263	0.0050	-0.0987	-0.0194	-0.0326	0.0014	0.0042	0.0427	0.0293	-0.0399	0.0054	-0.0785
Number of pods per plant	-0.0733	-0.0555	0.0496	0.0473	0.4443	-0.3781	0.0494	-0.0067	0.0037	0.5125	0.1959	0.0484	0.0204	0.4802	0.7631	-0.1070	-0.0229	1.0.108
Length of pod (cm)	-0.0834	-0.0486	0.0547	0.0244	0.4418	-0.3929	0.0457	0.0054	0.0168	0.5228	0.1920	0.0630	0.0234	-0.4902	0.8327	-0.1529	-0.0322	1.0117
Number of seeds per pod	-0.0602	-0.0490	0.0502	0.0166	0.3397	-0.3107	0.0456	-0.0059	0.0026	0.4717	0.2303	0.0526	0.0215	-0.4631	0.7637	-0.1549	-0.-260	0.9246
100 seed weight (g)	-0.0434	-0.0439	0.0263	0.0534	0.2642	-0.2114	0.0227	-0.0032	-0.0178	0.4406	0.1896	0.0475	0.0237	-0.3820	0.6480	-0.1441	-0.0264	0.8442
Number of seeds per 100 g	-0.0723	-0.0537	0.0562	0.0338	0.4111	-0.3536	0.0543	-0.0071	0.0082	0.4811	0.1840	0.0476	0.0177	-0.5116	0.7504	-0.0798	-0.0202	0.9463
Number of pods per 100 g	-0.0726	-0.0541	0.0505	0.0390	0.4256	-0.3655	0.0552	-0.0077	-0.0038	0.5093	0.2082	0.0523	0.0200	-0.4998	0.7680	-0.1010	-0.0251	0.9986
Shelling percentage (%)	-0.0221	-0.0212	-0.0008	0.0384	0.1491	-0.0987	0.0060	-0.0011	-0.0228	0.3170	0.1698	0.0471	0.0198	-0.2360	0.4483	-0.1730	-0.0139	0.6060
T.S.S. (%)	-0.0288	-0.0266	0.0263	-0.0109	-0.1011	-0.0724	0.0309	-0.0050	0.0093	0.2064	0.1084	0.0240	0.0110	-0.1815	0.3379	-0.0423	-0.0570	0.4310

Residual effect-1.0160, R2 -1.0160

Number of pods per plant showed significant and positively association with number of seeds per 100 g (0.892), number of pods per 100 g (0.686) 100 seed weight (0.694), number of seeds per pod (0.658), length of pod (0.525), shelling percentage (0.444) and total soluble solids (0.328).

Length of pod showed significant and positive correlation with 100 seed weight (0.546), number of seeds per 100 g (0.540), number of seeds per pod (0.486), number of pods per 100 g (0.463), shelling percentage (0.357) and total soluble solids (0.308).

Number of seeds per 100 g showed significant and positive correlated with number of seeds per 100 g (0.652), number of pods per 100 g (0.602), shelling percentage (0.469) and total soluble solids (0.321). 100 seed weight had significant and positive association with number of seeds per 100 g (0.467), number of pods per 100 g (0.633), shelling percentage (0.565) and total soluble solids (0.361).

Number of seeds per 100 g showed significant and positively association with number of pod per 100 g (0.891), shelling percentage (0.336), total soluble solids (0.312). Number of pods per 100 g had significant and positive association with shelling percentage (0.403) and total soluble solids (0.346). Whereas shelling percentage showed none significant positive associated with total soluble solids.

The path coefficient analysis was carried out at phenotypic and genotypic level to resolve direct and indirect effect of eighteen characters on pod yield per plant.

The direct and indirect effects of different characters on pod yield at phenotypic and genotypic level had been presented in Table 3 and 4 The higher magnitude of positive direct effect at phenotype level on pod yield was exerted by number of pods per plant (0.3556) followed by number of seeds per 100 g (0.2858), nodes to first pod appears (0.1606) and 100 seed weight (0.1039). The higher magnitude of negative direct effect on pod yield per plant was exerted by number of nodes per plant (-0.0798) followed by node at first pod appears (-0.0726), circumference of pod (-0.0348) and internodal length (-0.0288).

At phenotypic level, days to 50 per cent flowering via number of pods per plant (0.2367), number of seeds per 100 g (0.1988) and nodes to first flower appears exhibited positive association with pod yield per plant (0.7166). Positive indirect effects via number of pods per plant (0.1667) and number of seeds per 100 g (0.1352) were major contribution towards the association by plant height.

Number of nodes per plant had positive association with pod yield per plant which is mainly due to indirect effects of number of pods per plant (0.1432) and number of seeds per 100 g (0.1314). Node at first pod appears via number of pods per plant (0.2182) and number of seeds per 100 g (0.1214) exhibited positive association with pod yield per plant. At phenotypic level, node at first pod appears via node at first flower appears (0.1484), number of pods per plant (0.1855) and number of seeds per 100 g (0.1469) showed significant and positive association.

Primary branches per plant via number of pods per plant (0.1657) and number of seeds per 100 g (0.1545) exhibited positive association with pod yield per plant. Number of seeds per pod via, number of pods per plant (0.2341) and number of seeds per 100 g (0.1994) exhibited positive association with pod yield per plant. 100 seeds weight had significant positive association with pod yield per plant which was mainly due to indirect effect of number of pods per plant (0.2470) and number of seeds per 100 g (0.1851). Number of seeds per 100 g via number of pods per plant (0.3176) showed positive association with pod yield per plant. Number of pod per 100 g via indirect effect of number of pods per plant (0.3090) and number of seeds per 100 g exhibited positive correlation with number of pods per plant, shelling percentage (%), total soluble solids had significant and positive correlated with pod yield per plant which was mainly due to the indirect effect via number of pods per plant (0.1581, 0.1167) respectively. Rest of the estimates of indirect effects was very low. The estimate of residual factor was high (0.9437) indicating the importance of some other component not included under the present investigation.

4. Conclusion

The present study revealed that most important trait pod yield per plant had exhibited highly significant and positive phenotypic correlation with number of pods per plant (0.939), number of seeds per 100 g (0.924), number of pods per 100 g (0.887), days to 50% flowering (0.716), 100 seed weight (0.714) number of seeds per pod (0.686), node at first flower appears (0.650), length of pod (0.573), node at first pod appears (0.554), primary branches per plant (0.536), plant height (o.481), number of pods per plant (0.411), shelling percentage (0.436), and Total Soluble Solids (0.381). While, circumference of pod and width of pod showing significant negative association with pod yield per plant (-0.482) and (-0.046) respectively. Days to 50% flowering had significant and positive correlation with node at first pod appears (0.751), node at first flower appears (0.718), number of seeds per 100 g (0.688), primary branches per plant (0.648), plant height (0.526), number of nodes per plant (0.517), length of pod (0.441), 100 seed weight (0.370), total soluble solids (0.248) and intermodal length (0.238). While, it was significant negatively associated with circumference of pod (-0.464) and width of pod (-0.417). Circumference of pod had significant and negatively correlation with number of pods per plant (0.447), number of seeds per 100 g (-0.456), number of pods per 100 g (-0.421), total soluble solids (-0.320), number of seeds per pod (-0.253) and length of pod (-0.236). While it was significant and positively associated with width of pod (0.240).

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