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Patel CK
Main Oilseeds Research
Station, Junagadh
Agricultural University,
Junagadh, Gujarat, India

Vachhani JH
Main Oilseeds Research
Station, Junagadh
Agricultural University,
Junagadh, Gujarat, India

Kachadiya VH
Main Oilseeds Research
Station, Junagadh
Agricultural University,
Junagadh, Gujarat, India

Nayak JJ
Main Oilseeds Research
Station, Junagadh
Agricultural University,
Junagadh, Gujarat, India

Jalu RK
Main Oilseeds Research
Station, Junagadh
Agricultural University,
Junagadh, Gujarat, India

Correspondence
Patel CK
Main Oilseeds Research
Station, Junagadh
Agricultural University,
Junagadh, Gujarat, India

Studies on correlation and path analysis for important traits in F₂ generations of groundnut (*Arachis hypogaea* L.)

Patel CK, Vachhani JH, Kachadiya VH, Nayak JJ and Jalu RK

Abstract

The correlation coefficients among nine yield and yield contributing traits with their path effects towards pod yield were investigated in F₂ generation for six crosses of groundnut during *Summer*-2016. The correlation coefficients of pod yield per plant were found positive and highly significant with kernel yield per plant, number of mature pods per plant and shelling out-turn. Kernel yield per plant had the highest positive direct effect on pod yield per plant. While, shelling out-turn showed high negative direct effect towards pod yield per plant in Cross 6 but it expressed high indirect effect *via* kernel yield per plant. Thus, on the basis of correlations and direct and indirect effects, kernel yield per plant, number of mature pods per plant and shelling out-turn were proved to be the outstanding characters influencing pod yield in groundnut and need to be given importance in selection to achieve higher pod yield.

Keywords: Correlation coefficient, path coefficient

Introduction

Groundnut (*Arachis hypogaea* L.) is the important oilseed crop of the India. Though, it leads in area and production in the world, its productivity is low as compared to other countries. Yield is a complex and polygenically controlled highly environmental influenced trait governed by the interaction of many variables and selection if based merely on yield is not effective. Correlation analysis is a biometrical technique to find out the nature and degree of association between various physicochemical traits including yield, while path analysis splits the correlation coefficient into direct and indirect effect so as to measure the relative contribution of each variable towards yield. Hence, keeping the above aspects in mind, efforts were made to establish interrelationship among various yield contributing traits and also their contribution towards pod yield in the segregating population of groundnut. This will be facilitating the breeder to design appropriate selection strategies to increase pod yield in groundnut.

Materials and Methods

The experimental material for the present study involved F₂ generation of six crosses derived from crossing among eleven parents. The F₂ generation was sown with their parents in a Randomized Block Design with three replications at the Main Oilseeds Research Station, Junagadh Agricultural University, Junagadh, during *summer*, 2016. Each F₂ generation was planted in 3 rows of 5 m length and parent was planted in a single row of same length at the spacing of 60 cm between rows and 15 cm between the plants. Observations on nine characters (Table 1) were recorded on randomly selected five plants from each parent and fifty plants from each F₂ generation per replication. The correlation coefficients were calculated as per Al-Jibouri *et al.* (1958) ^[1]. The path analysis was done as per the method suggested by Dewey and Lu (1959) ^[2].

Results and Discussion

In F₂ segregating generation, the association of pod yield per plant was found positive and highly significant with number of mature pods per plant, kernel yield per plant and shelling out-turn at both genotypic and phenotypic levels (Table 1). These characters can be considered as criteria for selection for higher pod yield as they were mutually and directly associated with pod yield per plant. Narasimhulu *et al.* (2012) ^[6] and John *et al.* (2012) ^[4] observed positive and highly significant correlations of number of pods per plant and kernel

yield per plant towards pod yield per plant. Mane *et al.* (2008) [5] and Parameshwarappa *et al.* (2008) [7] reported similar results for shelling out-turn whereas and John *et al.* (2007) [3] for kernel yield per plant. Days to maturity had negative correlation with pod yield per plant in Cross 1 and Cross 2 at both genotypic and phenotypic levels. This is in conformation with the results of Sharma and Gupta (2008) [8]. Remaining characters exhibited their positive or negative and negligible association with pod yield per plant. Considering interrelationship between characters, number of primary branches per plant had positive and significant association with immature pods per plant in the Cross 3 indicating it was undesirable for plant breeder and should be breakdown for enhancing pod yield. In the present investigation, path coefficient analysis revealed that kernel yield per plant had the highest positive direct effect on pod yield (Table 2). These results are in

accordance with John *et al.* (2007) [3]. Shelling out-turn showed high indirect effect on pod yield per plant via kernel yield per plant. Path analysis had also revealed that among the pod yield attributes, the mutual relationship of number of mature pods per plant and kernel yield per plant had resulted in high and positive effect with pod yield per plant. The residual effects ranged from 0.31 to 0.73 among the crosses studied, which indicated that there may be some important characters that could not be utilized in present study. Hence, other remaining characters may also be incorporated before making any final selection. When correlation and direct as well as indirect positive contribution were considered, kernel yield per plant, number of mature pods per plant and shelling outturn were proved to be the outstanding characters and need to be given importance in selection to achieve higher pod yield in groundnut.

Table 1: Correlation coefficients between different characters for six crosses of F₂ generation of groundnut

Correlated traits		Cross 1	Cross 2	Cross 3	Cross 4	Cross 5	Cross 6
Days to appearance of first flower with							
Days to maturity	r _g	-0.3717**	-0.0002**	-0.0682	-0.0065	0.2304**	0.3433**
	r _p	-0.1304	0.0387	0.0093	-0.0148	0.0569	0.0945
Number of primary branches/plant	r _g	-0.2041**	0.4370**	-0.0313	-0.1718*	0.0636	0.1144
	r _p	-0.1333	0.2246**	0.0099	-0.1822*	-0.0801	0.1297
Plant height (cm)	r _g	-0.2336**	0.0214	0.2255**	0.3778**	-0.1887*	-0.4090**
	r _p	-0.0334	-0.0333	0.1028	0.2202**	-0.0352	-0.0436
Number of matured pods/plant	r _g	-0.4557**	-0.0575	-0.2742**	0.0685	0.0038	-0.3997**
	r _p	-0.1963*	-0.0280	-0.0343	0.0410	0.0453	-0.1873*
Number of immature pods/plant	r _g	-0.0785	-0.1200	0.4654**	0.0519	-0.1433	0.0996
	r _p	-0.0712	0.0145	0.1031	0.0654	-0.1032	0.1627*
Kernel yield/plant (g)	r _g	-0.1687*	-0.1621*	-0.7137**	0.1141	0.2101**	0.1788*
	r _p	-0.0636	-0.0736	-0.2752**	0.0323	0.0107	0.0514
Days to appearance of first flower with							
Days to maturity	r _g	-0.3717**	-0.0002**	-0.0682	-0.0065	0.2304**	0.3433**
	r _p	-0.1304	0.0387	0.0093	-0.0148	0.0569	0.0945
Number of primary branches/plant	r _g	-0.2041**	0.4370**	-0.0313	-0.1718*	0.0636	0.1144
	r _p	-0.1333	0.2246**	0.0099	-0.1822*	-0.0801	0.1297
Plant height (cm)	r _g	-0.2336**	0.0214	0.2255**	0.3778**	-0.1887*	-0.4090**
	r _p	-0.0334	-0.0333	0.1028	0.2202**	-0.0352	-0.0436
Number of matured pods/plant	r _g	-0.4557**	-0.0575	-0.2742**	0.0685	0.0038	-0.3997**
	r _p	-0.1963*	-0.0280	-0.0343	0.0410	0.0453	-0.1873*
Number of immature pods/plant	r _g	-0.0785	-0.1200	0.4654**	0.0519	-0.1433	0.0996
	r _p	-0.0712	0.0145	0.1031	0.0654	-0.1032	0.1627*
Kernel yield/plant (g)	r _g	-0.1687*	-0.1621*	-0.7137**	0.1141	0.2101**	0.1788*
	r _p	-0.0636	-0.0736	-0.2752**	0.0323	0.0107	0.0514
Shelling outturn (%)	r _g	0.0330	-0.1502	-0.3221**	-0.1487	0.3951**	-0.2072**
	r _p	0.1360	-0.1004	-0.1069	-0.0421	0.1297	-0.1562
Pod yield/plant (g)	r _g	-0.2288**	-0.1177	-0.5094**	0.1317	-0.0291	0.1202
	r _p	-0.1241	-0.0939	-0.2211**	0.0130	-0.0381	-0.0139
Days to maturity							
Days to appearance of first flower	r _g	-0.3717**	-0.0002	-0.0682	-0.0065	0.2304**	0.3433**
	r _p	-0.1304	0.0387	0.0093	-0.0148	0.0569	0.0945
Number of primary branches/plant	r _g	-0.0994	-0.2262**	-0.1004	-0.1107	-0.3902**	0.1619*
	r _p	-0.0557	-0.0729	-0.1332	0.0833	-0.1039	0.1375
Plant height (cm)	r _g	0.1236	0.0320	0.0996	0.3671**	-0.0862	-0.3307**
	r _p	0.0470	-0.0492	0.0567	0.1301	-0.0516	-0.1355
Number of matured pods/plant	r _g	-0.1212	-0.3006**	-0.1314	-0.1114	-0.1435	0.0381
	r _p	-0.0238	-0.0372	-0.0229	-0.0238	-0.0464	-0.0129
Number of immature pods/plant	r _g	-0.0620	0.1840*	-0.0642	0.1495	-0.2095*	-0.0365
	r _p	-0.0694	-0.0283	-0.0727	0.1103	-0.0419	0.0181
Kernel yield/plant (g)	r _g	-0.2600**	-0.0614	0.2239**	0.1004	0.2295**	0.0658
	r _p	-0.1431	0.0088	0.1675*	0.0970	0.1496	0.0308
Shelling outturn (%)	r _g	-0.4349**	-0.0149	0.1499	0.0308	0.2582**	-0.0857
	r _p	-0.2617**	-0.0349	0.0997	0.0528	0.0758	-0.0242
Pod yield/plant (g)	r _g	-0.1553	-0.0488	0.3495**	0.1220	0.0139	0.0321
	r _p	-0.0421	-0.0089	0.1933*	0.1037	0.0063	-0.0094

Table 1: (Contd.)

Correlated traits	Cross 1	Cross 2	Cross 3	Cross 4	Cross 5	Cross 6	
Number of primary branches/plant							
Days to appearance of first flower	r _g	-0.2041*	0.4370**	-0.0313	-0.1718*	0.0636	0.1144
	r _p	-0.1333	0.2246**	0.0099	-0.1822*	-0.0801	0.1297
Days to maturity	r _g	-0.0994	-0.2262**	-0.1004	-0.1107	-0.3902**	0.1619*
	r _p	-0.0557	-0.0729	-0.1332	0.0833	-0.1039	0.1375
Plant height (cm)	r _g	-0.1184	0.1033	-0.2802**	-0.3672**	-0.3811**	0.1687*
	r _p	0.0470	0.0454	-0.1603*	-0.3057**	-0.0928	0.0358
Number of matured pods/plant	r _g	0.1648*	-0.0634	0.1542	-0.4865**	-0.2952**	-0.0105
	r _p	-0.0238	0.0172	0.1026	-0.1508	-0.1125	0.0375
Number of immature pods/plant	r _g	-0.1782*	-0.0990	0.2623**	-0.4321**	0.1360	-0.0052
	r _p	-0.0694	-0.0142	0.1237	-0.1615*	0.0734	-0.0412
Kernel yield/plant (g)	r _g	0.1396	0.0557	-0.0508	-0.3808**	-0.1541	-0.2407**
	r _p	-0.1431	0.0246	0.0255	-0.1409	-0.0136	-0.1234
Shelling outturn (%)	r _g	0.0948	-0.0446	-0.0134	-0.4088**	-0.1307	-0.2536**
	r _p	-	0.0080	0.0895	-0.0971	-0.0196	-0.0381
Pod yield/plant (g)	r _g	0.1260	-0.3008**	0.1663*	-0.4634**	-0.1926*	-0.2417**
	r _p	-0.0421	-0.1262	0.1237	-0.1434	-0.0535	-0.1016
Plant height (cm) with							
Days to appearance of first flower	r _g	-	0.0214	0.2255**	0.3778**	-0.1887*	-0.4090**
	r _p	0.2336**	-0.0333	0.1028	0.2202**	-0.0352	-0.0436
Days to maturity	r _g	0.1236	0.0320	0.0996	0.3671**	-0.0862	-0.3307**
	r _p	0.0470	-0.0492	0.0567	0.1301	-0.0516	-0.1355
Number of primary branches/plant	r _g	-0.1184	0.1033	-0.2802**	-0.3672**	-0.3811**	0.1687*
	r _p	-0.0964	0.0454	-0.1603*	-0.3057**	-0.0928	0.0358
Number of matured pods/plant	r _g	-0.1745*	0.2753**	-0.0787	0.0848	0.2125**	0.1449
	r _p	-0.0446	0.0684	-0.0620	0.1485	0.1577	-0.0007
Number of immature pods/plant	r _g	0.2498**	-0.1528	-0.0524	0.1091	0.3170**	-0.0196
	r _p	0.0171	-0.0043	0.0123	0.1080	0.1136	0.1360
Kernel yield/plant (g)	r _g	0.0814	0.2826**	-0.2390**	-0.0851	0.1393	0.0228
	r _p	0.1270	0.1037	-0.1327	0.1232	0.1609*	0.0184
Shelling outturn (%)	r _g	0.1599	0.2196**	-0.1572	-0.1061	-0.3846**	0.4222**
	r _p	0.1534	0.0565	-0.1299	-0.0289	-0.1190	0.1330
Pod yield/plant (g)	r _g	-0.0141	0.1599	-0.1830*	-0.0545	0.2026**	0.0854
	r _p	0.0191	0.1245	-0.1567	0.1335	0.1821*	0.0238

Table 1: (Contd.)

Correlated traits	Cross 1	Cross 2	Cross 3	Cross 4	Cross 5	Cross 6	
Number of matured pods/plant with							
Days to appearance of first flower	r _g	-0.4557**	-0.0575	-0.2742**	0.0685	0.0038	-0.3997**
	r _p	-0.1963*	-0.0280	-0.0343	0.0410	0.0453	-0.1873*
Days to maturity	r _g	-0.1212	-0.3006**	-0.1314	-0.1114	-0.1435	0.0381
	r _p	-0.0238	-0.0372	-0.0229	-0.0238	-0.0464	-0.0129
Number of primary branches/plant	r _g	0.1648*	-0.0634	0.1542	-0.4865	-0.2952**	-0.0105
	r _p	0.0802	0.0172	0.1026	-0.1508	-0.1125	0.0375
Plant height (cm)	r _g	-0.1745*	0.2753**	-0.0787	0.0848	0.2125**	0.1449
	r _p	-0.0446	0.0684	-0.0620	0.1485	0.1577	-0.0007
Number of immature pods/plant	r _g	0.0833	0.0228	-0.3034**	0.2982**	-0.0077	-0.2694**
	r _p	0.0035	-0.0321	-0.1348	0.1867*	0.0214	-0.1609*
Kernel yield/plant (g)	r _g	0.2843**	0.3844**	0.2670**	0.5885**	0.0275	0.4694**
	r _p	0.3130**	0.3979**	0.2895**	0.6288**	0.2302**	0.4132**
Shelling outturn (%)	r _g	0.2013*	0.2465**	0.4392**	0.4274**	0.4821**	0.6871**
	r _p	0.2273**	0.2229**	0.3135**	0.3854**	0.2033**	0.4783**
Pod yield/plant (g)	r _g	0.1864*	0.3911**	0.3404**	0.5852**	0.2743**	0.5682**
	r _p	0.1836*	0.3919**	0.3163**	0.6512**	0.3622**	0.4412**
Number of immature pods/plant with							
Days to appearance of first flower	r _g	-0.0785	-0.1200	0.4654**	0.0519	-0.1433	0.0996
	r _p	-0.0712	0.0145	0.1031	0.0654	-0.1032	0.1627*
Days to maturity	r _g	-0.0620	0.1840	-0.0642	0.1495	-0.2095**	-0.0365
	r _p	-0.0694	-0.0283	-0.0727	0.1103	-0.0419	0.0181
Number of primary branches/plant	r _g	-0.1782*	-0.0990	0.2623**	-0.4321**	0.1360	-0.0052
	r _p	-0.0626	-0.0142	0.1237	-0.1615*	0.0734	-0.0412
Plant height (cm)	r _g	0.2498**	-0.1528	-0.0524	0.1091	0.3170**	-0.0196
	r _p	0.0171	-0.0043	0.0123	0.1080	0.1136	0.1360

Number of matured pods/plant	r _g	0.0833	0.0228	-0.3034**	0.2982**	-0.0077	-0.2694**
	r _p	0.0035	-0.0321	-0.1348	0.1867*	0.0214	-0.1609*
Kernel yield/plant (g)	r _g	0.1775*	-0.0334	-0.2141**	0.0011	-0.0988	-0.0064
	r _p	0.0512	-0.0290	-0.1090	0.0709	-0.0366	-0.0555
Shelling outturn (%)	r _g	-0.0683	-0.0824	-0.2100**	0.2305**	-0.3245**	-0.2144**
	r _p	-0.1624*	-0.0152	-0.1383	0.0824	-0.0976	-0.1718*
Pod yield/plant (g)	r _g	-0.2047*	0.0258	-0.1089	0.0118	-0.1934*	0.0292
	r _p	-0.1252	-0.0329	-0.0644	0.0716	-0.1903*	-0.0278

Table 1: (Contd.)

Correlated traits		Cross 1	Cross 2	Cross 3	Cross 4	Cross 5	Cross 6
Kernel yield/plant (g) with							
Days to appearance of first flower	r _g	-0.1687*	-0.1621*	-0.7137**	0.1141	0.2101	0.1788*
	r _p	-0.0636	-0.0736	-0.2752**	0.0323	0.0107	0.0514
Days to maturity	r _g	-0.2600**	-0.0614	0.2239**	0.1004	0.2295**	0.0658
	r _p	-0.1431	0.0088	0.1675*	0.0970	0.1496	0.0308
Number of primary branches/plant	r _g	0.1396	0.0557	-0.0508	-0.3808**	-0.1541	-0.2407**
	r _p	0.0744	0.0246	0.0255	-0.1409	-0.0136	-0.1234
Plant height (cm)	r _g	0.0814	0.2826**	-0.2390**	-0.0851	0.1393	0.0228
	r _p	0.1270	0.1037	-0.1327	0.1232	0.1609*	0.0184
Number of matured pods/plant	r _g	0.2843**	0.3844**	0.2670**	0.5885**	0.0275	0.4694**
	r _p	0.3130**	0.3979**	0.2895**	0.6288**	0.2302**	0.4132**
Number of immature pods/plant	r _g	0.1775*	-0.0334	-0.2141**	0.0011	-0.0988	-0.0064
	r _p	0.0512	-0.0290	-0.1090	0.0709	-0.0366	-0.0555
Shelling outturn (%)	r _g	0.6631**	0.7333**	0.6179**	0.7366**	0.5304**	0.5869**
	r _p	0.5487**	0.6222**	0.6016**	0.5760**	0.3156**	0.5780**
Pod yield/plant (g)	r _g	0.7477**	0.8148**	0.7588**	0.9763**	0.8403**	0.9964**
	r _p	0.6400**	0.7315**	0.7630**	0.9435**	0.7430**	0.9370**
Shelling outturn (%) with							
Days to appearance of first flower	r _g	0.0330	-0.1502	-0.3221**	-0.1487	0.3951**	-0.2072**
	r _p	0.1360	-0.1004	-0.1069	-0.0421	0.1297	-0.1562
Days to maturity	r _g	-0.4349**	-0.0149	0.1499	0.0308	0.2582**	-0.0857
	r _p	-0.2617**	-0.0349	0.0997	0.0528	0.0758	-0.0242
Number of primary branches/plant	r _g	0.0948	-0.0446	-0.0134	-0.4088**	-0.1307	-0.2536**
	r _p	0.0380	0.0080	0.0895	-0.0971	-0.0196	-0.0381
Plant height (cm)	r _g	0.1599	0.2196**	-0.1572	-0.1061	-0.3846**	0.4222**
	r _p	0.1534	0.0565	-0.1299	-0.0289	-0.1190	0.1330
Number of matured pods/plant	r _g	0.2013*	0.2465**	0.4392**	0.4274**	0.4821**	0.6871**
	r _p	0.2273**	0.2229**	0.3135**	0.3854**	0.2033**	0.4783**
Number of immature pods/plant	r _g	-0.0683	-0.0824	-0.2100**	0.2305**	-0.3245**	-0.2144**
	r _p	-0.1624*	-0.0152	-0.1383	0.0824	-0.0976	-0.1718*
Kernel yield/plant (g)	r _g	0.6631**	0.7333**	0.6179**	0.7366**	0.5304**	0.5869**
	r _p	0.5487**	0.6222**	0.6016**	0.5760**	0.3156**	0.5780**
Pod yield/plant (g)	r _g	0.5671**	0.6313**	0.7095**	0.8098**	0.3014**	0.6326**
	r _p	0.4447**	0.5096**	0.6329**	0.5929**	0.2738**	0.5678**

Table 2: Direct and indirect effect of different characters on pod yield for six crosses of F₂ generation of groundnut

Character	Cross 1	Cross 2	Cross 3	Cross 4	Cross 5	Cross 6
Days to appearance of first flower through						
Days to appearance of first flower	-0.2540	0.2364	-0.0949	0.1182	0.0469	0.1068
Days to maturity	0.0206	0.0000	-0.0149	-0.0006	0.0107	-0.0091
Number of primary branches/plant	0.0190	-0.2031	-0.0059	0.0219	-0.0043	-0.0094
Number of matured pods/plant	0.0637	-0.0009	-0.0173	0.0054	0.0046	-0.1097
Number of immature pods/plant	0.0267	-0.0062	0.0432	-0.0077	0.0356	0.0073
Kernel yield/plant (g)	-0.1285	0.1402	-0.3060	0.0720	0.3676	0.1610
Shelling outturn (%)	0.0025	-0.0028	-0.1231	-0.0444	-0.6533	0.0257
Correlated with pod yield/plant (g)	-0.2288	-0.1177	-0.5094	0.1317	-0.0291	0.1202
Days to maturity through						
Days to appearance of first flower	0.0944	0.0000	0.0065	-0.0008	0.0108	0.0366
Days to maturity	-0.0554	-0.1038	0.2189	0.0992	0.0465	-0.0266
Number of primary branches/plant	0.0093	0.1051	-0.0191	0.0141	0.0265	-0.0134
Plant height (cm)	-0.0112	-0.0013	0.0042	-0.0321	0.0745	-0.0423
Number of matured pods/plant	0.0169	-0.0049	-0.0083	-0.0088	-0.1710	0.0104
Number of immature pods/plant	0.0211	0.0094	-0.0060	-0.0221	0.0520	-0.0027
Kernel yield/plant (g)	-0.1979	-0.0531	0.0960	0.0633	0.4015	0.0592

Shelling outturn (%)	-0.0325	-0.0003	0.0573	0.0092	-0.4269	0.0106
Correlated with pod yield/plant (g)	-0.1553	-0.0488	0.3495**	0.1220	0.0139	0.0321
Number of primary branches/plant through						
Days to appearance of first flower	0.0518	0.1033	0.0030	-0.0203	0.0030	0.0122
Days to maturity	0.0055	0.0235	-0.0220	-0.0110	-0.0181	-0.0043
Number of primary branches/plant	-0.0931	-0.4647	0.1899	-0.1275	-0.0680	-0.0826
Plant height (cm)	0.0108	-0.0040	-0.0118	0.0321	0.3295	0.0216
Number of matured pods/plant	-0.0230	-0.0010	0.0097	-0.0384	-0.3518	-0.0029
Number of immatured pods/plant	0.0606	-0.0051	0.0244	0.0639	-0.0338	-0.0004
Kernel yield/plant (g)	0.1063	0.0482	-0.0218	-0.2401	-0.2696	-0.2168
Shelling outturn (%)	0.0071	-0.0008	-0.0051	-0.1222	0.2161	0.0315
Correlated with pod yield/plant (g)	0.1260	-0.3008	0.1663*	-0.4634	-0.1926	-0.2417
Plant height (cm) through						
Days to appearance of first flower	0.0593	0.0050	-0.0214	0.0447	-0.0089	-0.0437
Days to maturity	-0.0068	-0.0033	0.0218	0.0364	-0.0040	0.0088
Number of primary branches/plant	0.0110	-0.0480	-0.0532	0.0468	0.0259	-0.0139
Plant height (cm)	-0.0909	-0.0392	0.0421	-0.0875	-0.8646	0.1278
Number of matured pods/plant	0.0244	0.0045	-0.0050	0.0067	0.2532	0.0398
Number of immatured pods/plant	-0.0850	-0.0078	-0.0049	-0.0161	-0.0787	-0.0014
Kernel yield/plant (g)	0.0620	0.2446	-0.1025	-0.0537	0.2437	0.0205
Shelling outturn (%)	0.0120	0.0041	-0.0601	-0.0317	0.6358	-0.0524
Correlated with pod yield/plant (g)	-0.0141	0.1599	-0.1830	-0.0545	0.2026*	0.0854

Table 2: (Contd.)

Character	Cross 1	Cross 2	Cross 3	Cross 4	Cross 5	Cross 6
Number of matured pods/plant through						
Days to appearance of first flower	0.1157	-0.0136	0.0260	0.0081	0.0002	-0.0427
Days to maturity	0.0067	0.0312	-0.0288	-0.0110	-0.0067	-0.0010
Number of primary branches/plant	-0.0153	0.0295	0.0293	0.0620	0.0201	0.0009
Plant height (cm)	0.0159	-0.0108	-0.0033	-0.0074	-0.1837	0.0185
Number of matured pods/plant	-0.1397	0.0163	0.0631	0.0789	1.1916	0.2745
Number of immatured pods/plant	-0.0284	0.0012	-0.0282	-0.0441	0.0019	-0.0196
Kernel yield/plant (g)	0.2165	0.3326	0.1145	0.3710	0.0480	0.4228
Shelling outturn (%)	0.0151	0.0047	0.1678	0.1277	-0.7971	-0.0852
Correlated with pod yield/plant (g)	0.1864*	0.3911**	0.3404**	0.5852**	0.2743**	0.5682**
Number of immatured pods/plant through						
Days to appearance of first flower	0.0199	-0.0284	-0.0442	0.0061	-0.0067	0.0106
Days to maturity	0.0034	-0.0191	-0.0141	0.0148	-0.0097	0.0010
Number of primary branches/plant	0.0166	0.0460	0.0498	0.0551	-0.0092	0.0004
Plant height (cm)	-0.0227	0.0060	-0.0022	-0.0095	-0.2741	-0.0025
Number of matured pods/plant	-0.0116	0.0004	-0.0191	0.0235	-0.0091	-0.0740
Number of immatured pods/plant	-0.3403	0.0514	0.0929	-0.1479	-0.2482	0.0728
Kernel yield/plant (g)	0.1351	-0.0289	-0.0918	0.0007	-0.1728	-0.0058
Shelling outturn (%)	-0.0051	-0.0016	-0.0802	0.0689	0.5366	0.0266
Correlated with pod yield/plant (g)	-0.2047	0.0258	-0.1089	0.0118	-0.1934	0.0292
Kernel yield/plant (g) through						
Days to appearance of first flower	0.0429	-0.0383	0.0677	0.0135	0.0099	0.0191
Days to maturity	0.0144	0.0064	0.0490	0.0100	0.0107	-0.0017
Number of primary branches/plant	-0.0130	-0.0259	-0.0096	0.0485	0.0105	0.0199
Plant height (cm)	-0.0074	-0.0111	-0.0101	0.0075	-0.1205	0.0029
Number of matured pods/plant	-0.0397	0.0063	0.0168	0.0464	0.0327	0.1289
Number of immatured pods/plant	-0.0604	-0.0017	-0.0199	-0.0002	0.0245	-0.0005
Kernel yield/plant (g)	0.7613	0.8653	0.4288	0.6305	1.7495	0.9007
Shelling outturn (%)	0.0496	0.0138	0.2361	0.2201	-0.8770	-0.0728
Correlated with pod yield/plant (g)	0.7477**	0.8148**	0.7588**	0.9763**	0.8403**	0.9964**
Shelling outturn (%) through						
Days to appearance of first flower	-0.0084	-0.0355	0.0306	-0.0176	0.0185	-0.0221
Days to maturity	0.0241	0.0016	0.0328	0.0030	0.0120	0.0023
Number of primary branches/plant	-0.0088	0.0207	-0.0025	0.0521	0.0089	0.0209
Plant height (cm)	-0.0145	-0.0086	-0.0066	0.0093	0.3325	0.0539
Number of matured pods/plant	-0.0281	0.0040	0.0277	0.0337	0.5745	0.1886
Number of immatured pods/plant	0.0233	-0.0042	-0.0195	-0.0341	0.0806	-0.0156
Kernel yield/plant (g)	0.5048	0.6345	0.2649	0.4644	0.9279	0.5286
Shelling outturn (%)	0.0748	0.0189	0.3821	0.2989	-1.6534	-0.1241

Correlated with pod yield/plant (g)	0.5671**	0.6313**	0.7095**	8098**	0.3014**	0.6326**
Residual effect	0.7299	0.6507	0.5911	0.3157	0.6030	0.3355

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