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RELATIONSHIP BETWEEN YIELD AND YIELD CONTRIBUTING CHARACTERS IN F₅ POPULATION OF CHICKPEA (*CICER ARIETINUM* L.)

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ABSTRACT

An experiment was conducted with four selection procedures of 20 progenies [PS(EF), PS(HY), SSD and RBP] of GJG 0719 x SAKI 9516 in F₅ generation in Desi chickpea (*Cicer arietinum* L.) to study the correlation and direct and indirect effects of different characters on seed yield. Correlation coefficients of seed yield per plant with various characters within F₅ generation revealed that seed yield per plant exhibited significant and positive association at genotypic and phenotypic levels with number of pods per plant in all the selection procedures of the cross. Likewise, significant and positive association of seed yield per plant was observed with number of branches per plant in PS(EF) and PS(HY) at genotypic level and in SSD at phenotypic level; 100-seed weight in PS(EF) at genotypic level; biological yield per plant in PS(EF) at genotypic level only as well as in PS(HY) and RBP at both levels; Harvest index in SSD and RBP at both levels. Phenotypic path coefficient analysis revealed that very high to high direct effects were exerted by biological yield per plant and harvest index towards seed yield per plant in all the selection procedures of the cross. Overall, Number of pods per plant, biological yield per plant and harvest index could be used as indirect selection criteria for improving seed yield in segregating generations of chickpea with irrespective of the breeding selection procedures based on the correlations and path coefficient analysis.

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INTRODUCTION

Chickpea is one of the most important grain legumes crop that plays a significant role in the nutrition of rural and urban poor in the developing world, grown as rainfed in cool and dry climate in semi-arid regions. Two types of chickpea i.e., Kabuli is grown in the temperate regions, while Desi type chickpea is grown in the semi-arid tropics (Muehlbauer and Singh, 1987). A number of selection procedures such as pedigree, mass pedigree, bulk, single seed descent (SSD) and early generation testing (EGT), have been proposed for the improvement of self-pollinated crops (Mehta and Zaveri, 1994 and Mehta, 2000). Correlation among traits may result from pleiotropy, linkage or physiological correlations among characters. The path coefficient analysis could provide the more realistic picture of the interrelationship as it considers direct as well as indirect effects of the variables by partitioning the correlation coefficient. Therefore, present study was

undertaken to estimate correlation coefficient and path coefficient for four selection procedures in chickpea.

MATERIALS AND METHODS

The present experiment was carried out at the Instructional Farm, College of Agriculture, Junagadh Agricultural University, Junagadh. A total of 80 progenies of F₅ generation GJG 0719 x SAKI 9516 were studied in the final evaluation trial in the field along with two parental lines. In randomizedblock design (RBD) as suggested by Panse and Sukhatme (1986) with three replications. The row length 3.0 m was used to accommodate 20 plants per row at 45 x 15 cm spacing. All the recommended agronomical practices along with necessary plant protection measure were followed timely for the successful raising of crop. During evaluation phase in F₅ generation, the observations were recorded on five randomly selected competitive plants in each of the parents as well as each progenies of the PS(EF), PS(HY), SSD and RBP

populations on 10 characters and their averages were used in the statistical analysis (Table 1).The phenotypic as well as genotypic correlation coefficients were calculated as suggested by Al-Jibouri *et al.* (1958), while path coefficient analysis was done as per the method suggested by Dewey and Lu (1959).

RESULTS AND DISCUSSION

Plant height had significant and strong positive correlation in PS(EF) ($r_g = 0.626$) and PS(HY) ($r_g = 0.938$) as well as days to maturity and reproductive phase duration had significant and strong positive correlation in SSD ($r_g = 1.190$, $r_g = 0.986$, respectively) at genotypic level only. Correlation study revealed that days to flowering and days to maturity recorded significant and positive association among themselves. Though, their associations with seed yield per plant were weak in certain genetic backgrounds, otherwise almost non-significant. The possibility of combining components of earliness with yield-promoting alleles was suggested by Monpara and Dhameliya (2013). Seed yield per plant had significant and positive association with number of branches per plant and biological yield per plant in PS(EF) ($r_g = 0.644$, $r_g = 0.645$) and PS(HY) ($r_g = 0.560$, $r_g = 0.982$) as well as number of pods per plant in RBP ($r_g = 0.541$) at genotypic level, respectively. In the present study, the seed yield per plant had significant and positive association at genotypic as well as phenotypic level with number of pods per plant in PS(EF) ($r_g = 1.025$; $r_p = 0.701$), PS(HY) ($r_g = 1.072$; $r_p = 0.725$) and SSD ($r_g = 0.683$; $r_p = 0.692$). Gupta *et al.* (1989), Yadav (1990) and Deshmukh and Patil (1995) resulted akin to earlier reports of the seed yield was positively correlated with number of pods per plant.Significant and strong positive relationship was observed between 100-seed weight with biological yield in PS(EF) ($r_g = 0.708$) at genotypic level only. Similar finding were reported by Salimath and Bahl (1985) and Shamsuzzaman *et al.* (1994). Seed yield per plant had significant and positive association at genotypic and phenotypic levels with biological yield per plant in PS(EF) ($r_g = 0.645$); PS(HY) ($r_g = 0.982$; $r_p = 0.484$) and RBP ($r_g = 0.746$; $r_p = 0.492$) and with harvest index in SSD ($r_g = 0.492$; $r_p = 0.651$) and RBP ($r_g = 0.570$; $r_p = 0.573$).These results are in agreement with those of Meena and Kumar (2012) in chickpea.

In case of PS(EF), pair of characters that showed significant and positive correlations(Table 1) were between days to first flowering and days to maturity($r_g = 0.705$); days to first flowering and plant height ($r_g = 0.560$); days to maturity with four traits viz., reproductive phase duration ($r_p = 0.628$), plant height ($r_g = 0.779$), 100-seed weight ($r_g = 0.490$) and biological yield per plant ($r_g = 0.710$); reproductive phase duration and 100-seed weight ($r_g = 0.719$); plant height with three traits viz., number of pods per plant ($r_g = 0.683$), 100-seed weight ($r_g = 0.514$) and biological yield per plant ($r_g = 0.839$); number of branches per plant and number of pods per plant ($r_g = 0.554$); number of pods per plant with two traits viz., 100-seed weight ($r_g = 0.562$) and biological yield per plant ($r_g = 0.648$); 100-seed weight and biological yield per plant ($r_g = 0.528$). Likewise, PS(HY) showed significant and positive association (Table 1) between reproductive phase duration and days to maturity ($r_g = 0.815$ and $r_p = 0.609$); number of branches per plant with two traits viz., days to maturity ($r_g = 0.814$) and reproductive phase duration ($r_g = 0.449$); number of pods per plant and plant height($r_g = 0.496$); biological yield per plant

with two traits viz., plant height ($r_g = 0.791$) and number of pods per plant ($r_g = 0.863$ and $r_p = 0.537$) as well as harvest index and days to first flowering ($r_g = 0.569$). In case of SSD, significant and positive correlations(Table 2) were observed between days to first flowering and plant height ($r_g = 0.885$); days to maturity with five trait namely reproductive phase duration ($r_g = 0.643$ and $r_p = 0.718$), number of branches per plant ($r_g = 0.638$), number of pods per plant ($r_g = 0.600$), 100-seed weight ($r_g = 0.636$) and harvest index ($r_g = 0.514$); reproductive phase duration with three traits viz., number of branches per plant ($r_g = 0.733$), 100-seed weight ($r_g = 0.631$) and harvest index ($r_g = 0.589$); plant height with two traits namely number of pods per plant ($r_g = 0.709$) and harvest index ($r_g = 0.872$); number of branches per plant and 100-seed weight ($r_g = 0.465$); number of pod and harvest index ($r_g = 0.693$ and $r_p = 0.511$). On the other hand, in case of RBP, significant and positive correlations (Table 2) were recorded between reproductive phase duration and days to maturity ($r_g = 0.922$ and $r_p = 0.792$); number of pods per plant and number of branches per plant ($r_g = 0.634$ and $r_p = 0.620$); biological yield per plant with two traits viz., number of branches per plant ($r_g = 0.556$) and number of pods per plant ($r_g = 0.599$).

Seed yield per plant was found to be highly significant and positively correlated with number of pods per plant, harvest index and biological yield per plant at phenotypic level indicating that these three attributes were more influencing the seed yield in chickpea and therefore, were important traits for bringing genetic improvement in seed yield. In the present investigation, high degree of correlation between two variables at genotypic level, its phenotypic expression was deflated by the influence of environments. It was also indicated that there was inherent relationship between the characters studied which is in agreement with the findings of Meena and Kumar (2012) and Raval (2016). In present study, all the nine characters were considered as causal variables of seed yield and phenotypic correlation coefficients of these characters with seed yield were partitioned into the direct and indirect effects through path coefficient analysis (Table 3 to Table 6).Very high to moderatepositive direct effect on seed yield was revealed by biological yield per plant and harvest index of all four selection procedures*viz.*, PS(EF) (1.1553, 1.2201); PS(HY) (1.3093, 1.1813); SSD (0.9353, 1.2307) and RBP (0.8836, 0.9484). The maximum and positive direct effects of biological yield per plant and harvest index were also recorded by Raval and Dobariya (2003), Thakur and Sirohi (2009), Vaghela *et al.*, (2009) and Meena (2011) in homogenous experimental materials.Low to moderate residual effects permit explanation about the interaction of seed yield components. Hence, it can be concluded that the characters considered under study are sufficient for effective selection for seed yield improvement in chickpea.

The significant and positive correlation between number of pods per plant and seed yield per plant might be due to considerable indirect effect of number of pods per plant via biological yield per plant and harvest index in all the four selection schemes except PS(HY). Likewise, number of branches per plant had considerable indirect effects via harvest index and biological yield per plant in SSD. In overall conclusion, seed yield per plant was found to be highly significant and positively correlated with for number of pods per plant in all the four selection schemes; for biological yield per plant in PS(HY) and RBP; for harvest index in SSD and RBP at both the levels.

Table 1. Genotypic (r$_g$) and phenotypic (r$_p$) correlation coefficients of pedigree selection for early flowering (above diagonal) and pedigree selection for high yield (below diagonal) among various characters in F$_5$ generation of GJG 0719 x SAKI 9516 of chickpea

Characters		Seed yield / plant	Days to first flowering	Days to maturity	Reproductive phase duration	Plant height (cm)	No. of branches / plant	No. of pods / plant	100 seed weight (g)	Biological yield / plant (g)	Harvest index (%)
Seed yield / plant	r$_g$	**1.000**	0.219	0.272	0.078	0.626 **	0.644 **	1.025 **	0.708 **	0.645 **	0.183
	r$_p$	**1.000**	0.144	0.227	0.098	0.134	0.299	0.701 **	0.385	0.332	0.421
Days to first flowering	r$_g$	0.410	**1.000**	0.705 **	-0.357	0.560 *	0.146	0.251	-0.058	0.419	-0.255
	r$_p$	0.119	**1.000**	0.408	-0.455 *	0.309	0.069	0.131	-0.053	0.280	-0.121
Days to maturity	r$_g$	0.232	-0.439	**1.000**	0.412	0.779 **	0.311	0.440	0.490 *	0.710 **	-0.610 **
	r$_p$	0.097	-0.037	**1.000**	0.628 **	0.088	0.142	0.156	0.322	0.184	0.027
Reproductive phase duration	r$_g$	-0.141	-0.879 **	0.815 **	**1.000**	0.306	0.223	0.257	0.719 **	0.396	-0.475 *
	r$_p$	-0.038	-0.816 **	0.609 **	**1.000**	-0.178	0.080	0.040	0.359	-0.060	0.129
Plant height (cm)	r$_g$	0.938 **	0.367	0.276	-0.090	**1.000**	0.194	0.683 **	0.514 *	0.839 **	-0.452 *
	r$_p$	0.271	-0.024	-0.183	-0.087	**1.000**	0.093	0.324	0.202	0.226	-0.088
No. of branches / plant	r$_g$	0.560 *	-0.025	0.814 **	0.449 *	0.341	**1.000**	0.554 *	0.271	0.265	0.280
	r$_p$	0.314	-0.037	0.303	0.204	0.143	**1.000**	0.385	0.212	0.201	0.052
No. of pods / plant	r$_g$	1.072 **	0.221	-0.015	-0.150	0.496 *	0.389	**1.000**	0.562 **	0.648 **	0.285
	r$_p$	0.725 **	0.020	-0.021	-0.028	0.249	0.283	**1.000**	0.391	0.384	0.190
100 seed weight (g)	r$_g$	0.010	0.088	-0.432	-0.286	-0.106	-0.469 *	0.093	**1.000**	0.528 *	-0.026
	r$_p$	-0.011	-0.032	-0.266	-0.129	-0.049	-0.374	0.072	**1.000**	0.294	-0.036
Biological yield / plant (g)	r$_g$	0.982 **	-0.027	-0.022	0.005	0.791 **	0.408	0.863 **	0.095	**1.000**	-0.635 **
	r$_p$	0.484 *	0.175	-0.044	-0.164	0.291	0.324	0.537 *	0.045	**1.000**	-0.689 **
Harvest index (%)	r$_g$	-0.697 **	0.569 **	0.245	-0.237	-0.451 *	-0.200	-0.408	-0.077	-0.865 **	**1.000**
	r$_p$	0.228	-0.077	0.093	0.115	-0.146	-0.114	-0.047	-0.013	-0.729 **	**1.000**

*, ** Significant at 5% and 1% levels, respectively

Table 2. Genotypic (r$_g$) and phenotypic (r$_p$) correlation coefficients of single seed descent (above diagonal) and random bulk population (below diagonal) among various characters in F$_5$ generation of GJG 0719 x SAKI 9516 of chickpea

Characters		Seed yield / plant	Days to first flowering	Days to maturity	Reproductive phase duration	Plant height (cm)	No. of branches / plant	No. of pods / plant	100 seed weight (g)	Biological yield / plant (g)	Harvest index (%)
Seed yield / plant	r$_g$	**1.000**	-0.056	1.190 **	0.986 **	0.276	0.181	0.683 **	0.364	0.153	0.492 *
	r$_p$	**1.000**	-0.047	0.267	0.221	0.043	0.466 *	0.692 **	0.150	0.253	0.651 **
Days to first flowering	r$_g$	-0.630 **	**1.000**	0.190	-0.630 **	0.885 **	-0.292	0.086	-0.164	0.258	-0.234
	r$_p$	-0.181	**1.000**	-0.019	-0.710 **	-0.059	-0.134	0.044	-0.107	0.099	-0.127
Days to maturity	r$_g$	-0.259	0.386	**1.000**	0.643 **	-0.954 **	0.638 **	0.600 **	0.636 **	0.255	0.514 *
	r$_p$	-0.048	0.122	**1.000**	0.718 **	-0.215	0.276	0.186	0.341	0.149	0.112
Reproductive phase duration	r$_g$	-0.016	-0.002	0.922 **	**1.000**	-1.446 **	0.733 **	0.408	0.631 **	0.001	0.589 **
	r$_p$	0.070	-0.509 *	0.792 **	**1.000**	-0.110	0.287	0.101	0.314	0.036	0.167
Plant height (cm)	r$_g$	-0.467 *	-0.384	-1.598 **	-1.571 **	**1.000**	-0.217	0.709 **	-0.558 *	-0.797 **	0.872 **
	r$_p$	0.189	-0.168	0.074	0.167	**1.000**	0.249	0.158	0.118	0.254	-0.161
No. of branches / plant	r$_g$	0.403	-0.152	-0.297	-0.259	0.295	**1.000**	-0.035	0.465 *	0.092	-0.027
	r$_p$	0.407	0.013	-0.220	-0.199	0.199	**1.000**	0.370	0.292	0.238	0.194

Character																				
No. of pods / plant	r_g	0.541	*	-0.651	**	0.110		0.393		-1.021	**	0.634	**	**1.000**		-0.097		-0.282		0.693	**
	r_p	0.435		-0.108		-0.105		-0.024		0.326		0.620	**	**1.000**		-0.095		0.172		0.511	*
100 seed weight (g)	r_g	0.184		0.431		0.209		0.045		-0.182		0.118		0.098		**1.000**		0.186		0.083	
	r_p	0.115		0.084		0.004		-0.048		0.105		0.110		0.097		**1.000**		0.084		0.061	
Biological yield / plant (g)	r_g	0.746	**	0.267		0.224		0.131		-0.528	*	0.556	*	0.599	**	0.342		**1.000**		-0.777	**
	r_p	0.492	*	0.031		0.151		0.113		0.314		0.373		0.322		0.222		**1.000**		-0.553	*
Harvest index (%)	r_g	0.570	**	-1.311	**	-0.736	**	-0.248		0.016		-0.120		0.013		-0.179		-0.122		**1.000**	
	r_p	0.573	**	-0.190		-0.208		-0.064		-0.110		0.076		0.152		-0.101		-0.424		**1.000**	

*, ** Significant at 5% and 1% levels, respectively

Table 3. Phenotypic path coefficient analysis showing direct (diagonal and bold) and indirect effects of pedigree selection for early flowering for different characters on seed yield per plant in F₅ generation of GJG 0719 X SAKI 9516 of chickpea

Characters	Days to first flowering	Days to maturity	Reproductive phase duration	Plant height (cm)	No. of branches / plant	No. of pods / plant	100 seed weight (g)	Biological yield / plant (g)	Harvest index (%)	Correlation coefficient with Seed yield / plant	
Days to first flowering	-0.1289	0.0419	0.0741	-0.0128	-0.0008	0.0006	-0.0062	0.3239	-0.1475	0.144	
Days to maturity	-0.0526	0.1027	-0.1022	-0.0037	-0.0017	0.0007	0.0379	0.2127	0.0328	0.227	
Reproductive phase duration	0.0587	0.0645	-0.1628	0.0074	-0.0009	0.0002	0.0423	-0.0687	0.1578	0.098	
Plant height (cm)	-0.0399	0.0091	0.0289	-0.0415	-0.0011	0.0014	0.0238	0.2610	-0.1078	0.134	
No. of branches / plant	-0.0088	0.0146	-0.0130	-0.0038	-0.0117	0.0017	0.0250	0.2318	0.0637	0.299	
No. of pods / plant	-0.0169	0.0160	-0.0065	-0.0134	-0.0045	0.0044	0.0461	0.4440	0.2317	0.701	**
100 seed weight(g)	0.0068	0.0331	-0.0585	-0.0084	-0.0025	0.0017	0.1178	0.3394	-0.0444	0.385	
Biological yield / plant (g)	-0.0361	0.0189	0.0097	-0.0094	-0.0024	0.0017	0.0346	1.1553	-0.8405	0.332	
Harvest index (%)	0.0156	0.0028	-0.0211	0.0037	-0.0006	0.0008	-0.0043	-0.7959	1.2201	0.421	

*, ** Significant at 5% and 1% level, respectively,   Residual effect, R = 1.0155

Table 4. Phenotypic path coefficient analysis showing direct (diagonal and bold) and indirect effects of pedigree selection for high yield for different characters on seed yield per plant in F₅ generation ofGJG 0719 X SAKI 9516 of chickpea

Characters	Days to first flowering	Days to maturity	Reproductive phase duration	Plant height (cm)	No. of branches / plant	No. of pods / plant	100 seed weight (g)	Biological yield / plant (g)	Harvest index (%)	Correlation coefficient with Seed yield / plant	
Days to first flowering	-0.0207	-0.0019	-0.0016	-0.0013	0.0017	0.0017	0.0020	0.2292	-0.0904	0.119	
Days to maturity	0.0008	0.0514	0.0012	-0.0101	-0.0142	-0.0017	0.0164	-0.0571	0.1103	0.097	
Reproductive phase duration	0.0168	0.0313	0.0019	-0.0048	-0.0096	-0.0023	0.0079	-0.2151	0.1356	-0.038	
Plant height (cm)	0.0005	-0.0094	-0.0002	0.0548	-0.0067	0.0206	0.0030	0.3808	-0.1730	0.271	
No. of branches / plant	0.0008	0.0156	0.0004	0.0078	-0.0469	0.0234	0.0230	0.4243	-0.1341	0.314	
No. of pods / plant	-0.0004	-0.0011	-0.0001	0.0136	-0.0133	0.0826	-0.0044	0.7028	-0.0551	0.725	**
100 seed weight(g)	0.0007	-0.0137	-0.0002	-0.0027	0.0175	0.0059	-0.0615	0.0589	-0.0154	-0.011	
Biological yield / plant (g)	-0.0036	-0.0022	-0.0003	0.0160	-0.0152	0.0443	-0.0028	1.3093	-0.8612	0.484	*
Harvest index (%)	0.0016	0.0048	0.0002	-0.0080	0.0053	-0.0039	0.0008	-0.9545	1.1813	0.228	

*, ** Significant at 5% and 1% level, respectively,   Residual effect, R = 0.1843

Table 5. Phenotypic path coefficient analysis showing direct (diagonal and bold) and indirect effects of single seed descent for different characters on seed yield per plant in F$_5$ generation of GJG 0719 X SAKI 9516 of chickpea

Characters	Days to first flowering	Days to maturity	Reproductive phase duration	Plant height (cm)	No. of branches / plant	No. of pods / plant	100 seed weight (g)	Biological yield / plant (g)	Harvest index (%)	Correlation coefficient with Seed yield / plant	
Days to first flowering	0.0651	0.0004	-0.0379	-0.0011	-0.0077	-0.0057	0.0039	0.0928	-0.1565	-0.047	
Days to maturity	-0.0013	-0.0226	0.0383	-0.0040	0.0158	-0.0242	-0.0123	0.1397	0.1375	0.267	
Reproductive phase duration	-0.0462	-0.0162	0.0534	-0.0021	0.0165	-0.0130	-0.0113	0.0338	0.2058	0.221	
Plant height (cm)	-0.0038	0.0049	-0.0059	0.0187	0.0143	-0.0205	-0.0042	0.2374	-0.1978	0.043	
No. of branches / plant	-0.0087	-0.0062	0.0153	0.0046	0.0573	-0.0479	-0.0105	0.2228	0.2388	0.466	*
No. of pods / plant	0.0029	-0.0042	0.0054	0.0030	0.0212	-0.1296	0.0034	0.1612	0.6291	0.692	**
100 seed weight(g)	-0.0070	-0.0077	0.0168	0.0022	0.0167	0.0124	-0.0361	0.0784	0.0746	0.150	
Biological yield / plant (g)	0.0065	-0.0034	0.0019	0.0047	0.0136	-0.0223	-0.0030	0.9353	-0.6808	0.253	
Harvest index (%)	-0.0083	-0.0025	0.0089	-0.0030	0.0111	-0.0662	-0.0022	-0.5174	1.2307	0.651	**

*, ** Significant at 5% and 1% level, respectively,   Residual effect, R = 0.1657

Table 6. Phenotypic path coefficient analysis showing direct (diagonal and bold) and indirect effects of random bulk population for different characters on seed yield per plant in F$_5$ generation of GJG 0719 X SAKI 9516 of chickpea

Characters	Days to first flowering	Days to maturity	Reproductive phase duration	Plant height (cm)	No. of branches / plant	No. of pods / plant	100 seed weight (g)	Biological yield / plant (g)	Harvest index (%)	Correlation coefficient with Seed yield / plant	
Days to first flowering	-0.0412	0.0042	0.0079	-0.0012	0.0001	0.0006	0.0013	0.0270	-0.1801	-0.181	
Days to maturity	-0.0050	0.0343	-0.0122	0.0005	-0.0023	0.0006	0.0001	0.1337	-0.1977	-0.048	
Reproductive phase duration	0.0210	0.0272	-0.0154	0.0012	-0.0021	0.0001	-0.0008	0.0994	-0.0608	0.070	
Plant height (cm)	0.0069	0.0025	-0.0026	0.0071	0.0021	-0.0019	0.0017	0.2778	-0.1047	0.189	
No. of branches / plant	-0.0005	-0.0076	0.0031	0.0014	0.0103	-0.0036	0.0018	0.3298	0.0723	0.407	
No. of pods / plant	0.0044	-0.0036	0.0004	0.0023	0.0064	-0.0058	0.0016	0.2849	0.1439	0.435	
100 seed weight(g)	-0.0034	0.0001	0.0007	0.0007	0.0011	-0.0006	0.0161	0.1958	-0.0957	0.115	
Biological yield / plant (g)	-0.0013	0.0052	-0.0017	0.0022	0.0039	-0.0019	0.0036	0.8836	-0.4017	0.492	*
Harvest index (%)	0.0078	-0.0072	0.0010	-0.0008	0.0008	-0.0009	-0.0016	-0.3743	0.9484	0.573	**

*, ** Significant at 5% and 1% level, respectively,   Residual effect, R = 0.1098

Very high to moderate positive direct effect of component traits on seed yield was revealed by biological yield per plant and harvest index of all four selection procedures. Number of pods per plant had considerable indirect effects *via* biological yield per plant as well as harvest index of all selection schemes except PS(HY). Therefore, number of pods per plant, biological yield per plant and harvest index may serve as effective selection criteria for genetic improvement of seed yield in chickpea.

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