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SELECTION OF PROMISING LINES FROM F_4 GENERATION OF CHICK PEA GENOTYPES THROUGH CORRELATION AND PATH COEFFICIENT ANALYSIS

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ABSTRACT
The investigation was conducted with 45 genotypes of Chickpea out of 30 elite lines of F4 generation, 12 parental lines and 3 checks in randomized block design which were evaluated for correlation among agronomical yield components and their direct and indirect effects on seed yield. The correlation coefficient analysis revealed seed yield per plant exhibited positive and significant correlation with plant height (0.2736, 0.2957), number of branches per plant (0.4912, 0.5492), pods per plant (0.4726, 0.4837), number of seeds per plant (0.4736, 0.4899), 100 seed weight (0.5892, 0.6193) and harvest index (0.4453, 0.4806) at both genotypic and phenotypic level. The characters biological yield per plant and days to maturity depicted positive but no significant association and days to 50% flowering exhibited negative and non significant association with seed yield per plant at both genotypic and phenotypic level. The perusal of path analysis indicated that the high positive direct effect exhibited by branches per plant (0.2782) followed by 100-seed weight (0.2415), harvest index (0.2107) and number of pods per plant (0.1569) on grain yield at both genotypic and phenotypic level. Thus the study suggest that plant height, number of branches per plant, pods per plant, number of seeds per plant, 100 seed weight and harvest index are important traits for the selection criteria in crop improvement program of chickpea.

INTRODUCTION

The Chick pea (*Cicer arietinum* L.) is third most vital pulse in the world (Padmavathi *et al.*, 2013) which grown in over forty country which occupies upper position in the territory (Dhingani *et al.,* 2013). It is important crop of *rabi* season in India. It has manifold benefit for human and livestock as pod and seed coat can be utilized as fodder. It provides good source of protein, energy, fiber, vitamin and minerals and considered healthy food in many developed countries (Maiti, 2001; Nair and Mehta, 2014). It is also good source of amino acids like tryptophan and lysine (Awasthi *et al.,* 1991). Apart from providing dietary benefits to human beings chick pea is very useful in management of soil fertility due to nitrogen fixation ability (Gul *et al.*, 2011).

Seed yield is the most important economic character and very complex character in nature because it is governed by polygenes and greatly influenced by environmental factors (Singh *et al.*, 2014). Therefore direct selection for yield *per se* may not be effective since there may not be genes for yield *per se;* hence, it is necessary to consider the yield contributing traits during selection (Singh, 2006). The contribution of different characters towards yield is significantly different from each other. Thus, it is imperative to identify those characters, which would play an important role during selection. The correlation and path co-efficient analysis provide information about the importance of various yield components in formulation of appropriate selection strategy. Studies on above aspects on available germplasm under the environment where it is to be explained are essential for successful utilization of germplasm resources for the development of superior chickpea varieties.

Present study was under taken to find out the association of different characters, direct and indirect effect among yield and yield contributing characters and their contribution to define seed yield.

MATERIALS AND METHODS

The experiment was conducted at the Field Experimental Center of the Department of Genetics and Plant Breeding, Sam Higginbottom Institute of Agriculture Technology and Sciences, Allahabad in *rabi* 2007-08 to 2011-12.

The experiment was carried out in 45 genotypes of Chickpea (30 elite lines + 12 parents + 3 checks) which were grown in randomized block design with two replications. The six cross (ICC-12234 x IPC-9494, BG-396 x ICC-11316, ICC-5742 x ICC-12234, IPC-94-94 x ICC-12234, ICC-596 x ICC-12234 and IC-264091 x ICC-596) were carried out in 2007-08. Elite lines were selected from F_3 generation in 2009-10.

The observations like days to 50% flowering, plant height, number of branches per plant, number of pods per plant, number of seeds per plant, days to maturity, 100 seed weight, harvest index, seed yield per plant and seed yield per hectare were recorded from F_4 generation in 2011-12 which was utilized to estimate correlation and path analysis. The statistical

Table 1: Phenotypic correlation (above the diagonal) and genotypic correlation (below the diagonal) between different quantitative characters in Chickpea

No	Character	Plant Height	Days to 50% Flowering	Branches/ Plant	Pods/ Plant	Days to 50% maturity	Seeds/ Plant	Biological Yield/ Plant	Harvest Index 100	Seed Weight	Seed yield/ Plant
1	Plant Height	1.0000	-0.2782*	0.3627*	0.2784*	0.1403	0.2457*	0.1075	-0.0127	0.2133*	0.2736*
2	Days to 50% Flowering	-0.3291*	1.0000	0.0067	-0.0813	0.0761	0.0155	0.1785	0.0152	0.0196	-0.0095
3	Branches/ Plant	0.4074*	0.0038	1.0000	0.3287*	-0.1635	0.3394*	0.2069	0.2469*	0.5006*	0.4912*
4	Pods/ Plant	0.2911*	-0.0889	0.3678*	1.0000	-0.0644	0.9106*	0.1718	0.1787	0.3961*	0.4726*
5	Days to 50%maturity	0.1470	0.0484	-0.1698	-0.0773	1.0000	-0.1208	0.0629	0.0239	-0.0620	0.0478
6	Seeds/ Plant	0.2545*	0.0166	0.3725*	0.9159*	-0.1282	1.0000	0.1690	0.2676*	0.4138*	0.4736*
7	Biological Yield/ Plant	0.1014	0.2009	0.2327*	0.1762	0.0571	0.1743	1.0000	-0.2442*	0.0300	0.0855
8	Harvest Index	-0.0019	0.0072	0.2550*	0.1921	0.0453	0.2778*	-0.2553*	1.0000	0.5523*	0.4453*
9	100 Seed Weight	0.2198*	0.0206	0.5462*	0.4071*	-0.0641	0.4250*	0.0240	0.6050*	1.0000	0.5892*
	Seed Yield/ Plant	0.2957*	-0.0386	0.5492*	0.4837*	0.0590	0.4899*	0.0903	0.4806*	0.6193*	1.0000

Table 2: Genotypic direct and indirect effect of component traits attributing to grain yield in Chickpea

No	Character	Days to 50% Flowering	Plant Height	Branches/ Plant	Pods/ Plant	Days to 50% maturity	Seeds/ Plant	Biological Yield/ Plant	harvest Index	100 Seed Weight
1	Days to 50% Flowering	-0.0365	0.0120	-0.0001	0.0032	-0.0018	-0.0006	-0.0073	-0.0003	-0.0008
2	Plant Height	-0.0091	0.0277	0.0113	0.0081	0.0041	0.0071	0.0028	-0.0001	0.0061
3	Branches/ Plant	0.0011	0.1133	0.2782	0.1023	-0.0472	0.1036	0.0647	0.0709	0.1519
4	Pods/ Plant	-0.0140	0.0457	0.0577	0.1569	-0.0121	0.1437	0.0276	0.0301	0.0639
5	Days to 50%maturity	0.0064	0.0193	-0.0224	-0.0102	0.1316	-0.0169	0.0075	0.0060	-0.0084
6	Seeds/ Plant	0.0014	0.0222	0.0324	0.0797	-0.0112	0.0870	0.0152	0.0242	0.0370
7	Biological Yield/ Plant	0.0056	0.0028	0.0065	0.0049	0.0016	0.0048	0.0278	-0.0071	0.0007
8	harvest Index	0.0015	-0.0004	0.0537	0.0405	0.0095	0.0585	-0.0538	0.2107	0.1275
9	100 Seed Weight	0.0050	0.0531	0.1319	0.0983	-0.0155	0.1026	0.0058	0.1461	0.2415

analysis for genotypic and phenotypic correlation as per methods suggested by Singh and Chaudhari (1985) and path coefficient analysis were worked out according to the methods described by Dewey and Lu (1959).

RESULTS AND DISCUSSION

Correlation coefficient

Correlation coefficient is one of important statistical analysis for amelioration of any crop.It provides information about the degree and magnitude of association among the two variables which is due to pleiotropic gene action or linkage or both (Kumar, 2013).In the present investigation genotypic and phenotypic correlation between seed yield and its component characters were estimated to know the nature of relationship between them and presented in Table 1 which indicated that seed yield per plant exhibited significant positive correlation with plant height (rp = 0.2736, rg = 0.2957),number of branches per plant (rp = 0.4912, rg = 0.5492), pods per plant (rp = 0.4726, rg = 0.4837), number of seeds per plant (rp = 0.4736, rg = 0.4899), 100 seed weight (rp = 0.5892, rg = 0.6193) and harvest index (rp = 0.4453, rg = 0.4806) at both genotypic and phenotypic level.The similar finding was reported by Rao and Rao (2005) Yucel *et al.* (2006), Durga *et al.* (2007), Yucel and Anlarsal (2010)and Ali *et al.* (2011) in chick pea. While the characters biological yield per plant (rp = 0.0855, rg = 0.0903) and days to maturity (rp = 0.0478, rg = 0.0590) depicted positive but non significant association with seed yield per plant at both genotypic and phenotypic level. The character days to 50% flowering (rp = -0.0095, rg = -0.0386) exhibited negative and non significant association with seed yield per plant at both genotypic and phenotypic level.

The results indicate that the genotypic correlation is higher than phenotypic correlation which may due to masking effect of environment on the expression of genotype similar finding were reported by Rai and Dharmatti (2014) in clusterbean.

Correlation coefficient analysis revealed that seed yield exhibited significant and positive correlation both at genotypic and phenotypic level with 100 seed weight, branches per plant, seeds per plant, pods per plant and harvest index. Hence direct selection for these traits could be helpful in the improvement of Chickpea breeding.

Path coefficient analysis

The seed yield per plant is a complex character with many component characters each having positive or negative contribution to the final manifestation. Further, the contribution of any component character to seed yield may be direct and indirect through other component characters and its magnitude may also be different than what is revealed by simple correlations. As a result the direct and indirect effects of different casual characters on fruit yield per plant were estimated and are presented in Table 2 which indicated that the characters like plant height (0.0277), Branches per plant (0.2782), number of pods per plant (0.1569), days to maturity (0.1316), seeds per plant (0.0870), biological yield (0.0278), harvest index (0.2107) and 100-seed weight (0.2415) exhibited positive direct effect on yield, while days to 50 per cent flowering exhibited negative direct effect (-0.0365) on seed yield per plant. These findings are in accordance with Khoragade *et al.* (1995), Kumar *et al.* (1999), Bhaduoria *et al.* (2003), Rao and Rao (2005) and Yucel *et al.* (2006) in chick pea.

In plant breeding, it is very difficult to have complete knowledge of all components characters on yield. A residual effect measures the role of other possible independent variables. The residual effects observed in present study were 0.6884 for genotypic path coefficient analysis.

The perusal of path analysis indicated that branches per plant, 100 seed weight, harvest index and pods per plant had high positive direct effect on grain yield at both genotypic and phenotypic levels. Thus, these characters may serve as effective selection parameters in direct breeding programme for yield improvement in Chickpea.

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