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

KEYWORDS
Chickpea
Correlation
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ABSTRACT
Theinvestigationwasconductedwith45genotypesofChickpea, comprisingoutof30elitelinesofF4generation,12parental linesand3checksinrandomizedblockdesign.These genotypes whichwereevaluatedforcorrelationamongagronomicalyield components and their direct and indirect effects on seed yield. The correlation coefficient analysis revealed that seed yield per plant exhibited a positive and significant correlation with plant height (0.2736, 0.2957), number of branchesperplant(0.4912,0.5492),podsperplant(0.4726,0.4837),numberofseedsperplant(0.4736, 0.4899),100seedweight(0.5892,0.6193)andharvestindex(0.4453,0.4806)atbothgenotypicandphenotypic level.Thecharacterstraitsbiologicalyieldperplantanddaystomaturitydepictedshowed apositivebutnosignificantassociation anddaysto50%floweringexhibitedshowed a negativeandnonsignificantassociationwithseedyieldperplantatboth genotypicandphenotypiclevel.TheperusalofPpathanalysisindicatedrevealedthatthehighpositivedirecteffectexhibited by branches per plant (0.2782) followed by 100-seed weight (0.2415), harvest index (0.2107) and number of podsperplant(0.1569)ongrainyieldatbothgenotypicandphenotypiclevel.Thusthestudysuggestthatplant height,numberofbranchesperplant,podsperplant,numberofseedsperplant,100seedweightandharvest index are important traits for the selection criteria in crop improvement program of chickpea.

## INTRODUCTION

TheChickpea(*Cicer arietinum* L.)isthirdmostvitalimportantpulsein theworld(Padmavathi*etal.*,2013)whichgrowninoverforty country which occupies upper position in the territorya prominent position in cultivated areas (Dhingani*et al.*, 2013).Itis animportantcropof*rabi* seasonin India.Ithasmanifoldmultiplebenefitforhumanandlivestockasp od and seed coat can be utilized used as fodder. It provides good source of protein, energy, fiber, vitamin and minerals and considereda healthyfoodinmanydevelopedcountries(Maiti, 2001;NairandMehta,2014).Itisalsogoodsourceofamino acidsliketryptophanandlysine(Awasthi*et al.*, 1991).Apart fromprovidingitsdietarybenefitstohumanbeings,chickpeais very useful in management of soil fertility due to its nitrogen fixation ability (Gul *et al.*, 2011).

Seedyieldisthemostimportanteconomiccharactertraitandvery complex character in nature because it is governed by polygenes and greatly influenced by environmental factors (Singh*etal.*,2014).Therefore,directselectionforyield*perse* maynotbeeffectivesincetheremaynotbegenesforyield*per se*.;Hhence, it is necessary to consider the yield contributing traits during selection (Singh, 2006). The contribution of differentcharacterstowardsyieldisvariessignificantlydifferentfro m eachother.Thus,itisimperativetoidentifythosecharacters, which would play an important role during selection. The correlation and path co-efficient analysis provide valuable information about the importance of various yield components in formulationofappropriateselectionstrategy.Studiesonabovethese

aspects~~on~~of the available germplasm under the specific environment where it is to be ~~explained~~ exploited are essential for successful utilization of germplasm resources ~~for the development~~ in developing ~~of~~ superior chickpea varieties.

The ~~P~~present study was undertaken to ~~find out~~ determine the association ~~of~~ among different ~~characters~~ traits, their direct and indirect effect ~~among~~ on 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* from 2007-08 to 2011-12.

The experiment ~~was carried out in~~ involved 45 genotypes of Chickpea (30 elite lines + 12 parents + 3 checks) which were grown in randomized block design with two replications. ~~S~~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~~ made in 2007-08. Elite lines were selected from $F_3$ generation in 2009-10.

~~The o~~Observations ~~like~~ such as 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 the $F_4$ generation in 2011-12 which were ~~as~~ utilized to estimate correlation and path analysis. The statistical

Table1:Phenotypiccorrelation(abovethediagonal)andgenotypiccorrelation(belowthediagonal)betweendifferentquantitativecharacters inChickpea

| No | Character | Plant Height | Daysto 50% Flowering | Branches/ Plant | Pods/ Plant | Daysto 50% maturity | Seeds/ Plant | Biological Yield/ Plant | Harvest Index 100 | Seed Weight | Seedyield/ Plant |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | PlantHeight | 1.0000 | -0.2782* | 0.3627* | 0.2784* | 0.1403 | 0.2457* | 0.1075 | -0.0127 | 0.2133* | 0.2736* |
| 2 | Daysto50%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 | Daysto50%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 | BiologicalYield/Plant | 0.1014 | 0.2009 | 0.2327* | 0.1762 | 0.0571 | 0.1743 | 1.0000 | -0.2442* | 0.0300 | 0.0855 |
| 8 | HarvestIndex | -0.0019 | 0.0072 | 0.2550* | 0.1921 | 0.0453 | 0.2778* | -0.2553* | 1.0000 | 0.5523* | 0.4453* |
| 9 | 100SeedWeight | 0.2198* | 0.0206 | 0.5462* | 0.4071* | -0.0641 | 0.4250* | 0.0240 | 0.6050* | 1.0000 | 0.5892* |
| | SeedYield/Plant | 0.2957* | -0.0386 | 0.5492* | 0.4837* | 0.0590 | 0.4899* | 0.0903 | 0.4806* | 0.6193* | 1.0000 |

Table2:Genotypicdirectandindirecteffectofcomponenttraitsattributingtograinyieldin Chickpea

| No | Character | Daysto 50% Flowering | Plant Height | Branches/ Plant | Pods/ Plant | Daysto 50% maturity | Seeds/ Plant | Biological Yield/Plant | harvest Index | 100Seed Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Daysto50%Flowering | -0.0365 | 0.0120 | -0.0001 | 0.0032 | -0.0018 | -0.0006 | -0.0073 | -0.0003 | -0.0008 |
| 2 | PlantHeight | -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 | Daysto50%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 | BiologicalYield/Plant | 0.0056 | 0.0028 | 0.0065 | 0.0049 | 0.0016 | 0.0048 | 0.0278 | -0.0071 | 0.0007 |
| 8 | harvestIndex | 0.0015 | -0.0004 | 0.0537 | 0.0405 | 0.0095 | 0.0585 | -0.0538 | 0.2107 | 0.1275 |
| 9 | 100SeedWeight | 0.0050 | 0.0531 | 0.1319 | 0.0983 | -0.0155 | 0.1026 | 0.0058 | 0.1461 | 0.2415 |

analysis for genotypic and phenotypic correlation was performed as per the methodssuggestedbySinghandChaudhariChaudhary(1985)a ndpath coefficientanalysiswereworkedwas carriedoutaccordingtofollowingthemethods described by Dewey and Lu (1959).

## RESULTSANDDISCUSSION

### Correlationcoefficient

Correlationcoefficientisoneofthe most importantstatisticalanalysis tools foramelioration the improvementofanycrop.Itprovidesinformationaboutthe degree and magnitude of association among between the two variables which is may be due to pleiotropic gene action, or linkage or both (Kumar, 2013).In the present investigation, genotypic and phenotypiccorrelationbetweenseedyieldanditscomponent characterstraitswereestimatedtoknowunderstandthenatureo ftheir relationshipsbetweenthemandaspresentedinTable1.whichThe results indicatedthat seedyieldperplantexhibitedsignificantpositivecorrelation withplantheight(rp=0.2736,rg=0.2957),numberofbranches 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 bothgenotypicandphenotypiclevel.ThesimilarSimilarfindingw as were reportedbyRaoandRao(2005)Yucel*et al.* (2006),Durga*et al.* (2007), Yucel and Anlarsal (2010)and Ali *et al*. (2011) in chickpea. While Tthe characters traits biological yield per plant (rp=0.0855, rg=0.0903) and days to maturity (rp=0.0478, rg=0.0590)depictedshowed a positivebutnonsignificantassociation with seed yield per plant at both genotypic and phenotypic level.Thecharactertraits daysto50%flowering(rp=-0.0095,rg= -0.0386) exhibited a negative and non-significant association withseedyieldperplantatbothgenotypicandphenotypic

level.

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

Correlation coefficient analysis revealed that seed yield exhibited significant and positive correlation at 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~~ improving ~~of Chickpea~~ chickpea breeding.

Path coefficient analysis

The seed yield per plant is a complex ~~character~~ trait ~~with~~ influenced by many component characters, each having positive or negative contribution to the final ~~manifestation~~ expression. Further, the contribution of any component character to seed yield may be direct ~~and~~ or indirect through other component characters ~~and~~ with its magnitude ~~may also be different than~~ differing from what is ~~revealed~~ indicated by simple correlations. As a result, the direct and indirect effects of different casual characters on ~~fruit~~ seed yield per plant were estimated and are represented in Table 2. ~~which~~ The analysis indicated that the characters ~~like~~ plant height (0.0277), ~~b~~ 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 seed yield, ~~while~~ in contrast, days to 50 per cent flowering exhibited negative direct effect (-0.0365) on seed yield per plant. These findings ~~are in accordance with~~ align with those of Khorgade *et al.* (1995), Kumar *et al.* (1999), Bhaduoria *et al.* (2003), Rao and Rao (2005) and Yucel *et al.* (2006) in chickpea.

Inplantbreeding,itis~~verydifficulttohave~~challenging to gaincompleteknowledge of the effects of all components characters on yield. A residual effect measures the role of other ~~possible~~ potentialindependent variables. In the present study t~~T~~heresidualeffect~~s~~was observed~~inpresentstudywere~~to be0.6884 for genotypic path coefficient analysis.

The~~perusalof~~pathanalysisindicatedthatbranchesperplant, 100-seedweight,harvestindexandpodsperplanthadhigh positive direct effect on grain yield at both genotypic and phenotypiclevels.Therefore~~us~~,these~~characters~~traitsmayserveasef fective selectionparametersindirectbreedingprogrammes~~s~~foryield improvement in Chickpea.

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