CHARACTER ASSOCIATION OF YIELD COMPONENTS AND SEED QUALITY PARAMETERS IN CHICKPEA (*CICER ARIETINUM* L.)

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Abstract

An experiment was conducted to study the character association of yield components and seed quality parameters in chickpea *i.e.* days to 50% flowering, Days to maturity, Plant height (cm) 30 and 60 DAS, No. of branches per plant 30 and 60 DAS, number of pod per plant, number of seed per pod, biological Yield (g), harvest index, 100-seed weight (g), seed yield kg/ha, germination (%), seedling length (cm), vigour index, seed yield per plant (g). The experiments were conducted in factorial RBD design with three levels of biofertlizer (*Rhizobium* 7.5g, 10g, 12.5g, *Trichoderma* 5g, 7.5g, 10g and PSB 7.5g, 10g, 12.5g) and seed priming (13, 16, 18 hrs) in chickpea variety (Pant G-186). Association studies revealed that During 2014-15 seed yield per plant showed highly significant and positive correlation with number of branches per plant on 30 days (0.801), number of branches per plant on 60 days (0.645) number of pods per plant (0.508) while significant and positive correlation with the number of seeds/pod (0.479), seed yield kg/ha (0.416), plant height on 30 days (0.402). During 2015-16 seed yield per plant showed highly significant and positive correlation with harvest index (0.866), biological yield (g) (0.717), plant height on 30 days (0.652), number of branches per plant on 60 days (0.641), vigour index (0.629), seedling length (0.595) plant height on 60 days (0.552) while significant positive correlation with seed yield kg/ha (0.587).

Key words : *Cicer arietinum* L., Yield components, Seedling length, Plant height

Introduction

Chickpea (*Cicer arietinum* L.) is the most important pulse crop in India with an average yield of 1500-2000 kg/ha. The gram is mentioned in Sanskrit which indicates that it is cultivated in India since a longer period than in any other country in the World. Chickpea (C*icer arietnium* L.) gram is an important *Rabi* season self pollinated legume crop having extensive geographical distribution. Chickpea is known by different names in various countries such as Gram, Chana, Bengal gram etc. Chickpea is a diploid species with a chromosome number $2n = 16$. It belongs to sub family Papilionaceae of the family Leguminaceae

Investigations on characters association between various agronomical and seed quality traits are important to crop production, not only from theoretical consideration of quantitative inheritance of the characters but also from practical view of point. Selection is usually conceded with change in two or more characters simultaneously. This information may be used in the prediction of correlated response to directional selection in the construction of selection indices and in the detection of some characters which may have no value by themselves but are useful as indicators of the more important ones under consideration.

The correlation coefficients help us in understanding the relative importance of various yield influencing characters. So that the most important yield component can be identified. The identification of the few most important components is necessary for planning and execution of a successful crop production strategy because it is almost impossible and impractical to practice selection for large number of characters along with grain yield. Correlation coefficient analyses were carried out to determine the relative importance of consumer quality and seedling vigour traits related to seed yield in chickpea. Seed index was positively and significantly correlated with seed volume, seed density and volume expansion. Association of volume expansion was also positive and significant with seed volume, seed density and water absorption capacity. Germination relative index showed significant positive association with water absorption

capacity and seed yield.

Materials and Method:

The field experiments under present investigation were conducted during *Rabi* 2014-15 and 2015-16 at Student Instructional Farm and lab experiments were carried out in Seed Testing Laboratory of Seed Technology Section, N. D. University of Agriculture and Technology, Kumarganj, Faizabad (U. P.). Geographically, Narendra Nagar situated between 26.47^0 N latitude, 82.12^0 longitude and at an altitude of 113 meters above the mean sea level. The chickpea crop was sown in the field using randomized block design (Factorial) with eight treatments and three replications. The treatment details are presented in Table 1.

Table 1: Treatments used in this study.

Treatment No.	Description
P_1	Hydro priming with distilled water 13 hrs
P_2	Hydro priming with distilled water 16 hrs
P_3	Hydro priming with distilled water 18 hrs
T_1	*Trichoderma* 5 gm
T_2	*Trichoderma* 7 gm
T_3	*Trichoderma* 10 gm
T_4	PSB 7 gm
T_5	PSB 10 gm
T_6	PSB 12 gm
T_7	*Rhizobium* 7 gm
T_8	*Rhizobium* 10 gm
T_9	*Rhizobium* 12 gm

The inoculums of *Rhizobium* and phosphate solubilizing bacterium were obtained from the Biotechnology Park Lucknow, Chickpea (Pant G-186) seeds inoculated by soaking in liquid culture for one hour and then were sown immediately.

For hydro-priming priming treatments seeds of chickpea were washed with water, dipped in 0.1 % mercuric chloride for 5 min and then washed thoroughly with sterilized water. The seeds were soaked in aerated solutions (Kaur *et al.,* 2005). The seeds were then put in the refrigerator at a temperature of 5°C until it was later used.

Plant to plant distance and row to row distance was kept 10 and 30 cm, respectively. Fertilizer was applied @ 20:40:40 (kg ha $^{-1}$) N:P:K at the time of sowing. The chickpea crop was cultivated using standard agronomic practices. The observations were recorded on days to 50% flowering, days to maturity, plant height (cm) on 30 and 60 days, number of branches per plant on 30 and 60 days, number of pods per plant, number of seeds per pod, biological yield per plant (g), seed index (g), harvest index (%), seed yield per plant (g) and seed yield (Kg/ha), germination (%), Seedling length, vigour index

Result and discussion

Correlation coefficient

The estimates of simple correlation coefficient computed among different characters of chickpea under study during *Rabi* 2014-15 and during *Rabi* 2015-16 are presented in the table 2 and 3.

The seed yield in almost all the crops is a complex character, which manifests from multiplicative interaction of several other characters that are termed as yield components. The genetic architecture of grain yield in chickpea as well as other crops is based on the balance or overall net effect produced by various yield components directly or indirectly by interacting with one another. Therefore, selection for yield *per se* alone would not matter much as such unless accompanied by the selection for various component characters responsible for conditioning it.

Thus, identification of important component characters and information about their association with yield and also with each other are very useful for selection of best bio-fertilizer for maximum production. The correlation coefficient is the measure of degree of linear association between two variables or characters and helps us in understanding the nature and magnitude of association among yield and yield components.

During 2014-15 seed yield per plant showed highly significant and positive correlation with number of branches per plant on 30 days (0.801), number of branches per plant on 60 days (0.645) number of pods per plant (0.508) while significant and positive correlation with the number of seeds/pod (0.479), seed yield kg/ha (0.416), plant height on 30 days (0.402). Whereas, it's positive but non-significant correlation coefficients were noted with rest of the traits.

During 2015-16 seed yield per plant showed highly significant and positive correlation with harvest index (0.866), biological yield (g) (0.717), plant height on 30 days (0.652), number of branches per plant on 60 days (0.641), vigour index (0.629), seedling length (0.595) plant height on 60 days (0.552). While significant positive correlation with seed yield kg/ha (0.587), number of branches per plant 30 days (0.538), number of pods per plant (0.479), number of seeds per pod (0.476) and positive correlation coefficient of this characters with rest attributes were noted non significant. The strong positive association of seed yield with one or more of the above

Table 2: Estimates of correlation coefficients among 16 characters in chickpea during 2014-15

Characters	Days to maturity	Plant height on 30 days (cm)	Plant height on 60 days (cm)	No. of branches/plant on 30 days	No. of branches/plant on 60 days	Number of pods/plant	N. of seeds/pod	Biological yield (g)	Harvest index	100-seed weight (g)	Seed yield (Kg/ha)	Germination (%)	Seedling length (cm)	Vigour index	Seed yield /plant (g)
Days to 50% flowering	0.249	-0.148	0.060	0.022	-0.104	-0.013	-0.206	0.004	0.047	-0.044	-0.305	-0.106	-0.173	-0.174	0.032
Days to maturity		-0.208	0.131	-0.191	-0.154	-0.156	0.106	0.164	-0.252	0.066	-0.349	-0.082	-0.116	-0.120	-0.067
Plant height on 30 days (cm)			0.467*	0.664**	0.705**	0.610**	0.354	0.441*	0.108	0.114	0.553*	-0.008	-0.128	-0.124	0.402*
Plant height on 60 days (cm)				0.470*	0.496**	0.405*	0.164	0.476*	0.230	0.170	0.252	0.055	0.087	0.088	0.516
N. of branches/ plant on 30 days					0.695**	0.647**	0.353	0.662**	0.487**	0.150	0.475*	0.146	0.119	0.133	0.801**
Number of branches/plant on 60 days						0.550**	0.335	0.439*	0.446*	0.226	0.543**	0.087	0.111	0.117	0.645**
Number of pods/plant							0.402*	0.455*	0.245	-0.145	0.398*	0.097	0.281	0.285	0.508**
No. of seeds/pod								0.336	0.332	0.201	0.559**	0.197	0.008	0.030	0.479*
Biological yield (g)									0.037	0.308	0.324	0.115	0.096	0.108	0.656
Harvest index										0.284	0.265	0.369	0.154	0.191	0.770
100- seed weight(g)											0.230	0.181	-0.053	-0.032	0.393
Seed yield (Kg/ha)												0.1670	0.254	0.259	0.416*
Germination (%)													0.284	0.392*	0.348
Seedling length (cm)														0.993*	0.184
Vigour index															0.219

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

Table3: Estimates of correlation coefficients of different characters with seed yield per plant in chickpea (2015-16)

Characters	Days to maturity	Plant height on 30 days (cm)	Plant height on 60 days (cm)	No. of branches/plant on 30 days	No. of branches/plant on 60 days	Number of pods/plant	N. of seeds/pod	Biological yield (g)	Harvest index	100-seed weight (g)	Seed yield (Kg/ha)	Germination (%)	Seedling length (cm)	Vigour index	Seed yield/plant (g)
Days to 50% flowering	-0.073	-0.003	0.009	-0.191	0.022	0.064	0.024	-0.048	0.229	0.103	-0.091	0.079	0.219	0.240	0.127
Days to maturity		-0.147	0.052	-0.182	-0.241	-0.296	-0.180	-0.387	-0.324	0.026	0.029	0.137	-0.223	-0.208	-0.397
Plant height on 30 days (cm)			0.507**	0.677**	0.476*	0.372	0.493**	0.433*	0.553**	0.075	0.705**	0.191	0.445*	0.503**	0.652**
Plant height on 60 days (cm)				0.330	0.621**	0.303	0.234	0.423*	0.384*	0.026	0.641**	0.078	0.370	0.399*	0.552**
N. of branches/plant on 30 days					0.479*	0.534**	0.476*	0.481**	0.359	0.068	0.576	0.030	0.415*	0.445*	0.538*
Number of branches/plant on 60 days						0.386*	0.242	0.368	0.580**	0.173	0.462*	0.249	0.416*	0.483**	0.641**
Number of pods/plant							0.402*	0.622**	0.198	-0.125	0.585**	0.097	0.404*	0.441*	0.479*
No. of seeds/pod								0.308	0.452*	0.103	0.503	-0.009	0.225	0.237	0.476*
Biological yield (g)									0.289	0.002	0.488**	-0.011	0.541**	0.559**	0.717**
Harvest index										0.212	0.428*	0.017	0.423	0.450*	0.866**
100- seed weight(g)											-0.058	0.520**	0.015	0.117	0.150
Seed yield (Kg/ha)												0.029	0.332	0.354	0.587*
Germination (%)													-0.256	-0.069	0.028
Seedling length (cm)														0.981**	0.595**
Vigour index															0.629**

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

traits has also been observed by previous workers Singh *et al.,* (2000), Thakur *et al.* (2007), Bhavani *et al.* (2008).

Plant height, number of branches per plant, number of pods per plant, number of seeds per pod had strong positive association with one another, besides having strong positives association with seed yield per plant. The strong positive association of seed yield with above mentioned four yield components, which were also highly correlated with each other, indicated highly favorable situation for obtaining high response through hydro priming and bio-fortification. Thus bio-fortification and hydro priming for improving these traits individually or simultaneously is likely to bring improvement in other due to correlated response. This suggested that bio-fortification would be quite efficient in improving yield and these four yield components in chickpea.

The above discussion revealed that all the highly significant estimates of correlation coefficient observed among the important yield components such as plant height, number of branches per plant, number of seeds per pod and number of pod per plant. Remaining estimates were, non-significant, and mostly positive in nature. Thus, bio-fortification practiced for improving these traits individually or simultaneously is likely to bring improvement in others due to correlated response. This suggests that bio-fortification would be quite efficient in improving yield and yield components in chickpea.

Vigour index showed significant and positive correlation with seedling length (0.993), germination (0.392). Whereas, it's positive but non-significant correlation coefficients were noted with rest of the traits.

Vigour index showed highly significant and positive correlation with biological yield (g) (0.559), plant height on 30 days (0.503), number of branches per plant on 60 days (0.483), while significant positive correlation with harvest index (0.450), number of branches per plant on 30 days (0.445), number of pods per plant (0.441) plant height on 60 days (0.399). Whereas, positive correlation coefficient of this characters with rest attributes were noted non significant. The strong positive association of vigour index with one or more of the above traits has also been observed by Khare *et al.* (1999).

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