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# ASSOCIATION BETWEEN YIELD AND ITS ATTRIBUTES IN SEED CLUSTER BEAN

**Sayed Sefatullah, A. V. D. Dorajeerao, D. R. Salomi Suneeta and K. Umakrishna**

College of Horticulture, Venkataramannagudem, West Godavari District (Andhra Pradesh), India.

## Abstract

Pod yield per plot exhibited significant and positive correlation with seed yield per plot ($r_g$: 0.58, $r_p$: 0.52), gum content ($r_g$: 0.79), number of cluster per plant ($r_g$: 0.67, $r_p$: 0.33) and days taken from flowering pod drying ($r_g$: 0.80, $r_p$: 0.25) at genotypic as well as phenotypic levels. Seed yield per plot showed a significant and positive correlation with gum content ($r_g$: 0.53, $r_p$: 0.61), number of clusters per plant ($r_g$: 0.65, $r_p$: 0.46) and days to flowering pod maturity ($r_g$: 0.75, $r_p$: 0.32) at genotypic as well as phenotypic levels. Significant positive association was observed for number of seeds per pod with seed yield per plot ($r_g$: 0.79, $r_p$: 0.15), number of cluster per plant ($r_g$: 0.54, $r_p$: 0.00) and days taken from flowering to pod drying ($r_g$: 0.83, $r_p$: 0.51) at both genotypic and phenotypic levels.

***Key words :*** Seed guar, pod yield, seed yield.

## Introduction

Cluster bean is botanically called as *Cyamopsis tetragonoloba* (L.). It belongs to the family Leguminaceae. The crop is popularly known as guar referring to its seed. India is considered as native place for guar or cluster bean. Very limited scientific information is available on local germplasm evaluation in this crop under Godavari Zone of Andhra Pradesh, India. Cluster bean has good germplasm collection in our country. Evaluation of the cultivars is required across different locales or agro-climatic regions to know their performance in terms of yield and its attributing characters.

Evaluation of different cluster bean cultivars and identification of high yielding cultivars for a particular agro-climatic region would be very useful to growers so as to derive benefit of maximising the profitability by taking up the cultivation of suitable cultivarsonly. There is a great potential for the commercial production of cluster bean under Godavari zone. Considering the importance of this crop, it is felt that there is a prime need to evaluate some of the local cultivars to study their performance and to find out the fittest one for Godavari region. Very little work has been done in the improvement of seed cultivars and there is a great paucity of research data in *C. tetragonoloba* regarding seed yield in Godavari zone of Andhra Pradesh, India.

## Materials and Methods

The present investigation was carried out during the year 2015-16 at College of Horticulture, Dr. Y.S.R Horticultural University, Venkataramannagudem, West Godavari District, A.P., India. A total of 14 cultivars were taken for evaluation study which were sourced from Rajasthan Agriculture Institute and Hisaragriculture Institute whereas, the rest of the accession were sourced from Andhra Pradesh. Observations was recorded on various yield attributing characters in order to find out the degree of association among them.

## Results and Discussion

### Character association

Crop yield is the end product of the interaction between a number of interrelated attributes. A thorough understanding of the interaction between the characters and among themselves is of great use in plant breeding. The efficiency of selection for yield mainly depends on the direction and magnitude of association between yield and its component characters and also among themselves. Character association provides information on the nature and extent of association between pairs of traits and helps

in selection for crop improvement. The aim of correlation studies is primarily to know the suitability of various characters for indirect selection because selection of any particular trait may bring about undesirable changes in other associated characters.

Phenotypic correlation is the association between two variables, which can be directly observed. It includes both genotypic and environmental effects and therefore, it differs under different environmental conditions. Genotypic correlation is the inherent or heritable association between two variables. This type of correlation may be either due to pleiotropic action of genes or due to linkage or more likely both. This type of correlation is more stable and is of paramount importance for a plant breeder to bring about genetic improvement in one character by selecting the other character of a pair that is genetically correlated.

Phenotypic and genotypic correlation coefficients were worked out on yield and its component characters among 14 cultivars of cluster bean. In general, genotypic correlations were higher than phenotypic correlations, which indicate that though there is strong inherent association between characters studied, its expression is lessened due to influence of environment. The genotypic and phenotypic correlation coefficients among yield and its component characters are presented in Table nos. 4.14 and 4.15.

The values of genotypic correlation coefficients were greater than the values of phenotypic correlation coefficients for most of the characters, which indicated thereby a strong inherent association between various traits that were quite influenced by the environment.

**Plant height (cm)**

Plant height recorded significant positive association with number of primary branches ($r_g$: 0.63, $r_p$: 0.56), 100-seed weight ($r_g$: 0.67, $r_p$: 0.43), number of clusters per plant ($r_g$: 0.55, $r_p$: 0.09) at genotypic as well as phenotypic levels. Joshi (1971) and Dahiya *et al.* (2007) also worked out similar correlations in Dolichos bean.

**Number of primary branches per plant**

The character exhibited significant and positive correlation with number of pods per cluster ($r_g$: 0.60, $r_p$: 0.38), pod yield per plot ($r_g$: 0.57, $r_p$: 0.31), number of seeds per pod ($r_g$:0.76, $r_p$:0.47), seed yield per plot ($r_g$: 0.92, $r_p$: 0.41), gum content($r_g$: 0.54, $r_p$: 0.04), number of clusters per plant ($r_g$: 0.65, $r_p$: 0.09) and days taken from flowering to pod drying ($r_g$: 0.78, $r_p$: 0.62) at genotypic as well as phenotypic levels. The character showed significant negative correlation with days to flowering initiation ($r_g$: -0.60, $r_p$: -0.42) at genotypic as well as phenotypic levels. The findings as reported by Kalaiyarasi and Palanisamy (2000) confirmed the same in cow pea.

**Leaf area ($cm^2$)**

The character exhibited significant and positive correlation with days to 50% flowering ($r_g$: 0.54, $r_p$: 0.38), seed yield per plot ($r_g$: 0.56, $r_p$: 0.50), gum content ($r_g$: 0.65, $r_p$: 0.11) and number of clusters per plant ($r_g$: 0.76, $r_p$: 0.61) at genotypic as well as phenotypic levels. Similar result were reported by Singh *et al.* (1979) in Dolichos bean.

**Days to flowering initiation**

It had significantly negative correlation with number of pods per cluster ($r_g$: -0.77, $r_p$: -0.47), pod yield per plot ($r_g$: -0.59 $r_p$: -0.45), number of seeds per pods ($r_g$: -0.54, $r_p$: -0.42), seed yield per plot ($r_g$: -0.57, $r_p$: -0.55), gum content ($r_g$: -0.78, $r_p$: -0.11), number of clusters per plant ($r_g$: -0.59, $r_p$: -0.34) and at genotypic and phenotypic levels. Similar result were reported by Belhekar *et al*. (2003) in cow pea.

**Days to 50% flowering**

The chracter exhibited significant and positive correlation with weight of dry pod ($r_g$: 0.53, $r_p$: 0.34) at genotypic as well as phenotypic levels. Similar results were reported by Singh *et al*. (1979) and Ali *et al*. (2005) in Dolichos bean.

**Number of pods per cluster**

Significant positive association was observed with seed yield per plot ($r_g$: 0.57, $r_p$: 0.25), gum content ($r_g$: 0.57, $r_p$: 0.14) and number of cluster per plant ($r_g$: 0.54, $r_p$: 0.37) at both genotypic and phenotypic level. Kalaiyarasi and Palanisamy (2000) also recorded similar findings in cow pea.

**Number of clusters per plant**

This trait had significant positive association with number of pods per plant ($r_g$: 0.70 $r_p$: 0.24) and days taken from flowering to pod drying ($r_g$: 0.80, $r_p$: 0.09) at both genotypic and phenotypic levels. Similar values were obtained by Kalaiyarasi and Palanisamy (2000) in cow pea.

**Pod length (cm)**

The character exhibited significant and positive correlation with pod yield per plot ($r_g$: 0.53, $r_p$: 0.35), number of seeds per pod ($r_g$: 0.57, $r_p$: 0.31), seed yield per plot ($r_g$: 0.53, $r_p$: 0.25), number of clusters per plant ($r_g$: 0.66, $r_p$: 0.35), days taken from flowering to pod drying ($r_g$: 0.72, $r_p$: 0.41) at genotypic as well as phenotypic levels. Similar results were reported by Biju *et al.* (2001)

**Table 1 :** Genotypic correlation coefficients between yield and its attributes in cluster bean.

| S. no. | Character | PH | NB | NL | LA | DFI | D50%F | NPC | PL | WDP | PY | NS | 100-SW | SY | GC | PC | NC | NPP | FPD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | PH | **1.000** | | | | | | | | | | | | | | | | | |
| 2 | NB | 0.635* | **1.000** | | | | | | | | | | | | | | | | |
| 3 | NL | -0.205 | -0.379 | **1.000** | | | | | | | | | | | | | | | |
| 4 | LA | 0.387 | 0.501 | -0.174 | **1.000** | | | | | | | | | | | | | | |
| 5 | DFI | -0.271 | -0.607* | 0.418 | -0.427 | **1.000** | | | | | | | | | | | | | |
| 6 | D50%F | 0.157 | 0.313 | -0.216 | 0.544* | 0.089 | **1.000** | | | | | | | | | | | | |
| 7 | NPC | 0.458 | 0.600* | -0.389 | 0.493 | -0.772** | 0.126 | **1.000** | | | | | | | | | | | |
| 8 | PL | 0.485 | 0.530 | -0.217 | 0.390 | -0.167 | 0.400 | 0.334 | **1.000** | | | | | | | | | | |
| 9 | WDP | 0.281 | 0.352 | -0.117 | 0.522 | -0.319 | 0.538* | 0.098 | 0.354 | **1.000** | | | | | | | | | |
| 10 | PY | 0.246 | 0.575* | -0.403 | 0.521 | -0.598* | 0.230 | 0.345 | 0.535* | 0.581* | **1.000** | | | | | | | | |
| 11 | NS | 0.463 | 0.767* | -0.217 | 0.256 | -0.540* | 0,083 | 0.357 | 0.570* | 0.389 | 0.498 | **1.000** | | | | | | | |
| 12 | 100-SW | 0.671** | 0.466 | -0.435 | 0.414 | -0.146 | 0.432 | 0.206 | 0.503 | 0.600* | 0.267 | 0.349 | **1.000** | | | | | | |
| 13 | SY | 0.448 | 0.926** | -0.299 | 0.562* | -0.576* | 0.373 | 0.570* | 0.537* | 0.317 | 0.587* | 0.797** | 0.318 | **1.000** | | | | | |
| 14 | GC | 0.289 | 0.542* | -0.296 | 0.651* | -0.785** | 0.204 | 0.578* | 0.364 | 0.561* | 0.796** | 0.353 | 0.321 | 0.534* | **1.000** | | | | |
| 15 | PC | 0.035 | -0.129 | 0.396 | 0.168 | 0.137 | 0.196 | -0.148 | 0.092 | 0.238 | -0.128 | 0.242 | -0.030 | 0.064 | -0.015 | **1.000** | | | |
| 16 | NC | 0.556* | 0.653* | -0.438 | 0.764** | -0.595* | 0.313 | 0.548* | 0.669** | 0.443 | 0.679** | 0.546* | 0.572* | 0.655* | 0.784** | 0.143 | **1.000** | | |
| 17 | NPP | 0.128 | 0.121 | -0.119 | 0.663** | -0.415 | 0.131 | 0.454 | 0.456 | 0.178 | 0.421 | 0.023 | 0.123 | 0.149 | 0.626* | 0.058 | 0.704** | **1.000** | |
| 18 | FPD | 0.431 | 0.784** | -0.257 | 0.524 | -0.649 | 0.216 | 0.435 | 0.724** | 0.592* | 0.806** | 0.832** | 0.404 | 0.754** | 0.730** | 0.181 | 0.806** | 0.448 | **1.000** |

*Significant at 5%; ** Significant at 1% level of significance

**PH** Plant height
**NB** Number of primary branches
**NL** Number of leaves per plant
**LA** Leaf area
**DFI** Days to flower initiation
**D50%F** Days to 50% flowering
**NPC** Number of pods per cluster
**PL** Pod length
**WDP** Weight of dry pod
**PY** Pod yield per plot
**NS** Number of seeds per pods
**100-SW** 100-seed weight
**SY** Seed yield per plot
**GC** Gum content
**PC** Protein content
**NC** Number of clusters per plant
**NPP** Number of pods per plant
**FPD** Days taken from Flowering to pod drying

**Table 2 :** Phenotypic correlation coefficients between yield and its attributes in cluster bean.

| S. no. | Character | PH | NB | NL | LA | DFI | D50%F | NPC | PL | WDP | PY | NS | 100-SW | SY | GC | PC | NC | NPP | FPD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | PH | **1.0000** | | | | | | | | | | | | | | | | | |
| 2 | NB | 0.5625 | **1.0000** | | | | | | | | | | | | | | | | |
| 3 | NL | -0.2285 | -0.3110 | **1.0000** | | | | | | | | | | | | | | | |
| 4 | LA | 0.3248 | 0.4242 | -0.1942 | **1.0000** | | | | | | | | | | | | | | |
| 5 | DFI | -0.1737 | -0.4267 | 0.3367 | -0.3827 | **1.0000** | | | | | | | | | | | | | |
| 6 | D50%F | 0.0394 | 0.2835 | -0.1904 | 0.3860 | 0.1641 | **1.0000** | | | | | | | | | | | | |
| 7 | NPC | 0.5124 | 0.3877 | -0.3153 | 0.3907 | -0.4798 | 0.0200 | **1.0000** | | | | | | | | | | | |
| 8 | PL | 0.2681 | 0.2538 | -0.1796 | 0.3125 | -0.0392 | 0.2629 | 0.2432 | **1.0000** | | | | | | | | | | |
| 9 | WDP | 0.1692 | 0.2811 | -0.0290 | 0.3644 | -0.2493 | 0.3412 | 0.0700 | 0.2941 | **1.0000** | | | | | | | | | |
| 10 | PY | 0.0809 | 0.3197 | -0.2134 | 0.3330 | -0.4527 | 0.1872 | 0.1630 | 0.3574 | 0.5184 | **1.0000** | | | | | | | | |
| 11 | NS | 0.1766 | 0.4746 | -0.1198 | 0.2274 | -0.4290 | -0.1190 | 0.1183 | 0.3118 | 0.2023 | 0.2799 | **1.0000** | | | | | | | |
| 12 | 100-SW | 0.4357 | 0.2918 | -0.3576 | 0.3379 | -0.1854 | 0.2217 | 0.1369 | 0.2162 | 0.3006 | 0.0699 | 0.2858 | **1.0000** | | | | | | |
| 13 | SY | 0.1325 | 0.4156 | -0.1918 | 0.5090 | -0.5502 | 0.1193 | 0.2568 | 0.2563 | 0.3978 | 0.5225 | 0.1586 | 0.0699 | **1.0000** | | | | | |
| 14 | GC | 0.0171 | -0.0474 | 0.2936 | 0.1150 | 0.1124 | 0.1297 | -0.1403 | 0.0620 | 0.1102 | -0.0747 | 0.0953 | 0.1024 | -0.0791 | **1.0000** | | | | |
| 15 | PC | 0.4032 | 0.5034 | -0.3982 | 0.7081 | -0.5309 | 0.2361 | 0.3766 | 0.6047 | 0.3587 | 0.5177 | 0.4011 | 0.4100 | 0.6114 | 0.1053 | **1.0000** | | | |
| 16 | NC | 0.0937 | 0.0907 | -0.1109 | 0.6182 | -0.3405 | 0.1572 | 0.3705 | 0.3583 | 0.1101 | 0.3333 | 0.0010 | 0.0935 | 0.4682 | 0.0242 | 0.6604 | **1.0000** | | |
| 17 | NPP | 0.1326 | 0.4043 | -0.0646 | 0.3234 | -0.5154 | -0.0391 | 0.1213 | 0.4166 | 0.4883 | 0.5023 | 0.5961 | 0.1593 | 0.4392 | 0.2073 | 0.5627 | 0.2442 | **1.0000** | |
| 18 | FPD | 0.3020 | 0.6278 | -0.0925 | 0.4588 | -0.4374 | 0.1092 | 0.3718 | 0.3657 | 0.2380 | 0.2532 | 0.5181 | 0.2053 | 0.3287 | 0.1248 | 0.4675 | 0.0974 | 0.5209 | **1.0000** |

*Significant at 5%; **Significant at 1% level of significance.

**PH** Plant height
**NB** Number of primary branches
**NL** Number of leaves per plant
**LA** Leaf area
**DFI** Days to flower initiation
**D50%F** Days to 50% flowering
**NPC** Number of pods per cluster
**PL** Pod length
**WDP** Weight of dry pod
**PY** Pod yield per plot
**NS** Number of seeds per pods
**100-SW** 100-seed weight
**SY** Seed yield per plot
**GC** Gum content
**PC** Protein content
**NC** Number of clusters per plant
**NPP** Number of pods per plant
**FPD** Days taken from Flowering to pod drying.

and Savitha *et al*. (2012) inDolichos bean.

**Weight of dry pod**

Significant positive association was observed with pod yield per plot ($r_g$: 0.58, $r_p$: 0.51), 100-seed weight ($r_g$: 0.60, $r_p$: 0.30), gum content ($r_g$: 0.56, $r_p$: 0.11) and days taken from flowering to drying ($r_g$: 0.59, $r_p$: 0.48) at both genotypic and phenotypic levels. Similar result were reported by Belhekar *et al.* (2003) in cow pea.

**100- seed weight**

This trait had significant positive association with number of cluster per plant ($r_g$: 0.57, $r_p$: 0.09), at both genotypic and phenotypic levels. Similar results were reported by Joshi (1971) and Dahiya *et al*. (1991) in Dolichos bean.

**Number of seeds per pod**

Significant positive association was observed with seed yield per plot ($r_g$: 0.79, $r_p$: 0.15), number of cluster per plant ($r_g$: 0.54, $r_p$: 0.00) and days taken from flowering to pod drying ($r_g$: 0.83, $r_p$: 0.51) at both genotypic and phenotypic levels. Similar results were reported by Kalaiyarasi and Palanismy (2000) in cow pea.

**Gum content (%)**

This trait had significant positive association with number of clusters per plant ($r_g$: 0.78, $r_p$: 0.02), number of pods per plant ($r_g$: 0.62, $r_p$: 0.20) and days taken from flowering to pod drying ($r_g$: 0.73, $r_p$: 0.12) at both genotypic and phenotypic levels. Similar results reported by Biju *et al.* (2001) and Savitha *et al*. (2012).inDolichos bean.

**Pod yield per plot**

The character exhibited significant and positive correlation with seed yield per plot ($r_g$: 0.58, $r_p$: 0.52), gum content ($r_g$: 0.79), number of cluster per plant ($r_g$: 0.67, $r_p$: 0.33) and days taken from flowering pod drying ($r_g$: 0.80, $r_p$: 0.25) at genotypic as well as phenotypic levels. Similar results reported by Biju *et al.* (2001), Singh *et al*. (1979),Dahiya*et al.* (1991) and Upadhyay and Mehta (2010) in Dolichos bean.

**Seed yield per plot**

The character exhibited significant and positive correlation with gum content ($r_g$: 0.53, $r_p$: 0.61), number of clusters per plant ($r_g$: 0.65, $r_p$: 0.46) and days to flowering pod maturity ($r_g$: 0.75, $r_p$: 0.32) at genotypic as well as phenotypic levels. Similar result were reported by Belhekar *et al.* (2003) in cow pea.

The top five positive values of correlation coefficients were estimated between the pair of characters *viz.,* number of branches, number of seed per pod pod yield per plot, number of cluster per plant and seed yield per plot. Similarly the highest negative associations were recorded between the pairs of characters *viz.,* gum content, number of pods per cluster, pod yield per plot, number of cluster per plant and days to flower initiation.

## References


Ali, F., B. Sikadar, A. K. Roy and O. I. Joarder (2005). Correlation and genetic variation of twenty different genotypes of Lablab bean, *Lablab purpureus* (L.) Sweet. *Bangladesh Journal of Botany*, **34(2)**: 125-12.

Biju, M. G., K. P. Prasanna and S. Rajan (2001). Genetic divergence in Hyacinth bean *Vegetable Science*, **28** : 163- 64.

Belhekar, P. S., V. W. Bendale, B. M. Jamadagni and S. P. Birari (2003). Correlation and path-coefficient analysis of cowpea and Asparagus bean crosses in F2 generation. *Journal of Maharashtra Agriculture University,* **2(2)**: 145-47.

Dahiya, O. P., S. K. Mishra and D. Singh (2007).Genetic variability in cowpea *[Vigna unguiculata* (L.)Walp]. *Journal Arid Legumes*, **4(2)** : 127-29.

Joshi, S. N. (1971). Status on genetic variability for yield and its components in Indian bean (*Dolichus lablab* Var. *lignosus*). *Madras Agricultural Journal*, **58(5)** : 367-71.

Kalaiyarasi, R. and G. A. Palanisamy (2000). Estimation of genetic parameters in five F4 populations of cowpea. *Annual of Agriculture Research*, **21(1)** : 100- 03.

Savitha, B. N., R. L. Ravikumar and D. K. Kumar (2012). Characterization andgenetic diversity analysis in Field bean [*Lablab purpureus* (L.) Sweet] collections of Karnataka. *Journal of Food Legumes*, **25(1)** : 18-24.

Singh, S. P., H. N. Singh, N. P. Singh and J. P. Srivastava (1979). Genetic studies on yield components in Field bean. *Indian Journal of Agricultural Sciences*, **49(8)** : 579-82.

Upadhyay, D. and N. Mehta (2010). Biometrical Studies in Dolichos bean (*Dolichos lablab* L.) for Chhattisgarh Plains. *Research Journal of Agricultural Sciences*, **1(4)** : 441- 47.