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CORRELATION AND PATH ANALYSIS STUDY IN COWPEA (*VIGNA UNGUICULATA* (L.) WALP.)

[1]Patel, U.V., [2]Parmar, V.K.*, [3]Patel, P.B. and [4]Malviya, A.V.

[1,3,4]Department of Vegetable Science, Aspee College of Horticulture and Forestry, Navsari Agricultural University, Navsari 396 450

[2]Associate Professor (Horti.), Department of Horticulture
N.M. College of Agriculture, Navsari Agricultural University
Navsari-386450
E-mail: vinaymin2002@yahoo.com

Abstract: The present investigation was carried out on 32 diverse genotypes of cowpea to study the correlations and path coefficient for different traits *viz.,* Days to 50 per cent flowering, Number of branches per plant, Number of clusters per plant, Pod length (cm), Number of seeds per pod, Number of pods per plant, Plant height at final harvest (cm), Sugar content (%), Shelling (%), Crop duration, Green pod yield per plant (g), Green pod yield per hectare (kg/ha). Association analysis between green pod yield per plant and other eleven quantitative characters revealed that green pod yield per plant was highly significant and positively correlated with pod length (r_g=0.456), (r_p=0.312) and sugar content (r_g=0.269), (r_p =0.217) at both genotypic and phenotypic level. Path coefficient analysis indicate the highest positive direct effect on green pod yield per plant by pod length (0.716) followed by days to 50 per cent flowering (0.645), shelling % (0.398), number of pods per plant (0.289), sugar content (0.219) and plant height at final harvest (0.204).

Keyword: Cowpea, Genotype, Correlation, Path coefficient, Phenotypic, Genotypic.

Introduction

Vegetables are considered potential crops for improving nutrition, food security and also to generate employments in the country. Among all the legume vegetable crops, cowpea (*Vigna unguiculata* (L.) Walp.) is grown as one of the most important vegetable crop in almost all parts of our country during rainy and summer season and has got potential to solve the protein problem. India and Ethiopia are recognized as primary and China as a secondary centre of origin (Vavilov, 1951). Cowpea adjusts well in a variety of cropping system and also grown as catch crop and green manure crop as it fix atmospheric nitrogen in the soil by symbiotic bacteria to a range of 64 to 131 kg/ha (Ayanaba and Dart, 1977). In India, cowpea is grown in almost all states. The largest cultivating states are Gujarat, West Bengal, Tamil Nadu, Andhra Pradesh, Kerala and Orissa. In Gujarat, vegetable cowpea occupies an area of

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0.26 lakh hectares with an annual production of 2.83 lakh metric tons green tender pods (Annon., 2014).

Average yield of cowpea is very low in India and year to year variation in yield is also remarkably high. There is an urgent need to make efforts for increasing the vegetable cowpea production to meet the minimum requirements as well as for ensuring the national security of fast growing population. The vegetable improvement work was initiated few decades ago in India and has resulted in the development of a large numbers of improved varieties. There are still some vegetables, which are left unexploited though they have great potential in the Indian vegetable scenario. Cowpea is the one of them. This is possible only when diverse parents are available for breeding programme. The basic rational in crop improvement programme is the selection of parents. It is well known that there is a likelihood of getting better segregants, when the parents used in crossing are genetically diversed (Jain, 1975).

The correlation study and quantitative characters are atmost importance in selecting the desired genotypes for future breeding. For systematic breeding programme to develop high yielding types, information on inter relationship among different characters is prerequisite.

Information on nature and degree of genetic divergence would help the plant breeder in choosing the right type parents for effective hybridization (Arunachalam, 1981).

Correlation and path coefficient analysis are the important biometrical techniques to determine the yield components. The characters that are positively correlated with yield are considerably important to plant breeder for selection purpose. Although, the correlation coefficients indicates the nature of association among the different traits. Path analysis splits the correlation coefficients into measure of direct and indirect effects, thus providing understanding of the direct and indirect contribution of each character towards yield.

Materials and methods

The experiment was carried out in Randomized Block Design with three replications. The present study comprised of 32 genotypes of cowpea at Regional Horticultural Research Station (RHRS), Navsari during *Kharif* 2015. Each genotype consists of two row of spaced at 45cm between the lines. Plant to plant distance was 30cm. Data was recorded on five randomly selected competitive plants per replication for 12 parameters *viz.,* Days to 50 per cent flowering, Number of branches per plant, Number of clusters per plant, Pod length (cm), Number of seeds per pod, Number of pods per plant, Plant height at final harvest (cm), Sugar content (%), Shelling (%), Crop duration, Green pod yield per plant (g), Green pod yield per hectare (kg/ha). The sugar content was estimated according to the method described by

Ranganna (1986). Correlation coefficient and path analysis was worked out as per the method suggested by Dewey and Lu (1959).

Results and discussion

The phenotypic and genotypic correlation coefficients (**Table 1**) were estimated for 11 characters using 32 cowpea genotypes to find out the association of green pod yield per plant with other yield contributing characters. The result of present investigation revealed that the green pod yield per plant showed positively associated with pod length and sugar content at both the genotypic and phenotypic levels, whereas, green pod yield per plant was negatively correlated with days to 50 per cent flowering at genotypic level only. The results are in consonance with those of Narayanankutty *et al.* (2003), Ullah *et al*. (2011), Mahmudul *et al.* (2012) Selvakumar and Ushakumari (2013), Chattopadhyay *et al.* (2014) and Hitiksha *et al.* (2014). Other characters *viz*., pod length and sugar content showed positive and highly significant association with green pod yield per plant. The same results were also represented by Vidya and Oommen (2002), Narayanankutty *et al.* (2003), Pal *et al*. (2004), Mishra and Dash (2009), Ullah *et al.* (2011), Mahmudul *et al*. (2012), Selvakumar and Ushakumari (2013), Chattopadhyay *et al.* (2014) and Hitiksha *et al.* (2014) in favour of pod length.

The genotypic correlation coefficients were worked out between green pod yield per plant and each of the eleven causal variables and among themselves to study the direct and indirect effects on green pod yield per plant. The data on the direct and indirect effects of these variables on green pod yield per plant are presented in **Table 2.** In the present study, highest positive direct effect on green pod yield per plant was recorded for pod length followed by days to 50 per cent flowering, shelling %, number of pods per plant, sugar content and plant height at final harvest. Similar results were reported by Bastin *et al.* (2001), Kharde *et al.* (2014) and Sapara and Javiya (2014) for pod length. Vidya and Oommen (2002), Kalaiyarasi and Palanisamy (2002), Pal *et al.* (2004), Nigude *et al.* (2004), Mishra and Dash (2009), Bhardu and Navale (2011), Mahmudul *et al.* (2012), Chattopadhyay *et al.* (2014), Hitiksha *et al.* (2014) and Lal *et al.* (2014) for days to 50 per cent flowering and number of pods per plant.

Green pod yield per plant showed highly significant and positive correlation with pod length and sugar content. Negative correlation was observed between green pod yield per plant and the characters *viz.,* days to 50 per cent flowering, number of branches per plant, number of clusters per plant, number of pods per plant, shelling % and crop duration.

Considering above discussion ideal plant type would be early flowering, more number of branches per plant and having more clusters per plant, number of seeds per pod and increased plant height.

Path coefficient analysis revealed the highest positive direct effect of pod length followed by days to 50 per cent flowering, shelling %, number of pods per plant, sugar content and plant height at final harvest. The crop duration had the highest negative direct effect followed by number of clusters per plant and number of seeds per pod.

From the results of path coefficient analysis it could be concluded that the characters like pod length, day to 50 per cent flowering, shelling %, number of pod per plant, sugar content and plant height at final harvest should be considered essential while selecting high yielding genotypes because besides having high genotypic values, they also had high positive direct effect on green pod yield per plant.

References

[1] Anonymous (2014). Directorate of Horticulture, Gujarat State, Gandhinagar.http://gujecostat.gujarat.gov.in

[2] Arunachalam, V. (1981). Genetic distance in plant. *Indian J. of Genetics and Plant Breeding,* **41**: 226-236.

[3] Ayanaba, A. and Dart, D.J. (1977). *Biochemical nitrogen fixation in farming system of tropics.* John Wiley and Sons, New York. pp.205.

[4] Bastian, D.; Vijendra Das, L.D.; Kandasamy, G. and Sakila, M. (2001). Path analysis in cowpea [*Vigna unguiculata* (L.) Walp.]. *Madras Agric. J.,* **88**(7-9): 526-527.

[5] Bhardu, D. and Navale, P.A. (2011). Correlation and path analysis studieds in F_3 population of cowpea [*Vigna unguiculata* (L.) walp.]. *Legume Res.,* **34**(1): 41-44.

[6] Chattopadhyay, A.; Rana, N.P.; Tania, Seth; Das, S.; Soumitra, Chatterjee and Subrata, Dutta. (2014). Identification of selection indices and choosing of parents for vegetable cowpea (*Vigna unguiculata* cv-gr. sesquipedalis) breeding programme. *Legume Res.,* **37**(1): 19-25.

[7] Dewey, D.R. and Lu, K.H. (1959). A correlation and path analysis of components of crested wheat grass seed production. *Agron. J.,* **51**: 513-516.

[8] Hitiksha, K. Parmar,; Acharya, R.R. and Sheetal R. Patel. (2014). Interrelationship among green pod yield and its yield contributing characters and biochemical characters vegetable cowpea [*Vigna unguiculata* (L.) Walp.]. *Trends in Biosciences,* **7**(23): 3972-3976.

[9] Jain, H.K. (1975). Development of high yielding varieties of pulses; perspective, possibility and experimental workshop on grain legumes held at ICRISAT, Hydrabad, India, pp. 177-185.

[10] Kalaiyarasi, R. and Palanisamy, G.A. (2002). Path analysis of F_3 populations in cowpea [*Vigna unguiculata* (L.) Walp.]. *Legume Res.,* **25**(1): 47-49.

[11] Kharde, R.P.; Kale, V.S. and Bhogave, A.F. (2014). Genetic variability studies in cowpea. *Bioinfolet,* **11**(1A): 113-118.

[12] Lal, H.; Bhardwaj, D.R.; Nath, V. and Singh, R. (2014). Hierarchical clustering and path analysis in cowpea [*Vigna unguiculata* (L.) Wlap.]. *Annals of Plant and Soil Research,* **16**(2): 159-163.

[13] Mahmudul, H.A.M.K.; Hossain, K.M.; Alam, N.; Hasanuzzaman, M. and Biswas, B.K. (2012). Genetic divergence in yardlong bean (*Vigna unguiculata* (L.) Walp. ssp. *sesquipedalis* Verdc.). *Bangladesh J. Bot.,* **41**(1): 61-69.

[14] Mishra, H.N. and Dash, S.R. (2009). A study on variability, characters association and path analysis for green pod yield in yard long bean [*Vigna unguiculata sub sp. sesquipedalis* (L.) Verdcourt]. *Veg. Sci.,* **36**(3 suppl.): 319-322.

[15] Narayanankutty, C.; Mili, R. and Jaikumaran, U. (2003). Correlation and path coefficient analysis in vegetable cowpea [*Vigna unguiculata* (L.) Walp.]. *Indian. J. Hort.,* **60**(3): 257-261.

[16] Nigude, A.D.; Dumbre, A.D. and Lad, D.B. (2004). Path coefficient analysis in cowpea. *J. Maharashtra agric. Univ.,* **29**(3): 363-364.

[17] Pal, A.K.; Singh, B.; Maurya, A.N. and Sanjay, K. (2004). Correlation and path analysis in cowpea [*Vigna unguiculata* (L.) Walp.]. *South Indian Hort.,* **52**(1-6): 82-88.

[18] Ranganna, S. (1986). "Handbook of Analysis and Quality control for Fruit and Vegetable Products", *Tata McGraw-Hill Education,* pp. 182-201.

[19] Sapara, G.K. and Javiya, R.M. (2014). Correlation and path analysis in vegetable cowpea (*Vigna unguiculata* L.). *International J. Pl. Sciences,* **9**(1): 138-141.

[20] Selvakumar, G. and Ushakumari, R. (2013). Association analysis in the inter subspecific crosses of cowpea [*Vigna unguiculata* (L.) Walp.] and yard long bean [*Vigna unguiculata* (L.) Walp. *ssp. sesquipedalis*]. *Electronic J. Pl. Breeding,* **4**(4): 1336-1339.

[21] Ullah, M.Z.; Hasan, M.J.; Rahman, A.H.M.A. and Saki, A.I. (2011). Genetic variability, characters association and path analysis in yard long bean. *SAARC J. Agri.,* **9**(2): 9-16.

[22] Vavilov, N.I. (1951). The origin, variation, immunity and breeding of cultivated plants. Translated from the Russion by K.S. Chester. *Chronica Botanica,* Vr. 1/6.

[23] Vidya, C. and Oommen, K.S. (2002). Correlation and path analysis in yard long bean. *J. Tropical Agri.,* **40**: 48-50.

Table 1: Genotypic (r_g) and Phenotypic (r_p) correlation coefficient for different characters in cowpea

Character		Days to 50 per cent flowering	Number of branches per plant	Number of clusters per plant	Pod length (cm)	Number of seeds per pod	Number of pods per plant	Plant height at final harvest (cm)	Sugar content (%)	Shelling (%)	Crop duration
Green pod yield per plant (g)	r_g	-0.205*	-0.159	-0.153	0.456**	0.055	-0.056	0.092	0.269**	-0.027	-0.069
	r_p	-0.139	-0.132	-0.156	0.312**	-0.027	-0.091	0.067	0.217*	-0.015	0.029
Days to 50 per cent flowering	r_g		0.207*	0.277**	-0.067	0.092	-0.069	-0.062	0.128	-0.354**	1.071**
	r_p		0.119	0.120	-0.031	0.043	-0.033	-0.041	0.087	-0.229*	0.360**
Number of branches per plant	r_g			0.340**	0.202*	-0.094	-0.300**	-0.132	-0.273**	-0.109	0.233*
	r_p			0.238*	0.182	-0.098	-0.236*	-0.111	-0.240*	-0.137	0.172
Number of clusters per plant	r_g				-0.179	-0.018	-0.135	-0.021	-0.129	0.067	-0.189
	r_p				0.059	-0.041	0.061	0.071	-0.018	0.162	0.099
Pod length (cm)	r_g					0.297**	-0.533**	-0.299**	0.103	-0.416**	-0.295**
	r_p					0.214*	-0.281**	-0.166	0.089	-0.278**	-0.103
Number of seeds per pod	r_g						-0.070	-0.104	0.048	-0.140	-0.080
	r_p						-0.059	-0.098	0.041	-0.092	-0.035
Number of pods per plant	r_g							0.118	-0.103	0. 133	0.055
	r_p							0.191	-0.083	0.129	0.041
Plant height at final harvest (cm)	r_g								0.103	0.118	-0.020
	r_p								0.088	0.115	0.001
Sugar content (%)	r_g									-0.365**	-0.032
	r_p									-0.207*	-0.027
Shelling (%)	r_g										-0.204*
	r_p										-0.001

*, ** significant at 0.05% and 0.01% level of significance, respectively.

Table 2: Genotypic path coefficient analysis showing direct (diagonal and bold) and indirect effects of different characters on green pod yield per plant in cowpea

Character	Days to 50 per cent flowering	Number of branches per plant	Number of clusters per plant	Pod length (cm)	Number of seeds per pod	Number of pods per plant	Plant height at final harvest (cm)	Sugar content (%)	Shelling (%)	Crop duration	Genotypic correlation with yield
Days to 50 per cent flowering	**0.645**	0.134	0.179	-0.043	0.059	-0.044	-0.040	0.082	-0.228	0.691	-0.205*
Number of branches per plant	-0.006	**-0.030**	-0.010	-0.006	0.003	0.009	0.004	0.008	0.003	-0.007	-0.159
Number of clusters per plant	-0.070	-0.085	**-0.251**	0.045	0.005	0.034	0.005	0.033	-0.017	0.048	-0.153
Pod length (cm)	-0.048	0.145	-0.128	**0.716**	0.213	-0.382	-0.214	0.074	-0.298	-0.212	0.456**
Number of seeds per pod	-0.017	0.017	0.003	-0.054	**-0.180**	0.013	0.019	-0.009	0.025	0.014	0.055
Number of pods per plant	-0.020	-0.087	-0.039	-0.154	-0.020	**0.289**	0.034	-0.030	0.038	0.016	-0.056
Plant height at final harvest (cm)	-0.013	-0.027	-0.004	-0.061	-0.021	0.024	**0.204**	0.021	0.024	-0.004	0.092
Sugar content (%)	0.028	-0.060	-0.028	0.023	0.011	0.023	0.022	**0.219**	-0.080	-0.007	0.269**
Shelling (%)	-0.141	-0.043	0.027	-0.166	-0.056	0.053	0.047	-0.145	**0.398**	-0.081	-0.027
Crop duration	-0.564	-0.123	0.100	0.156	0.042	-0.029	0.011	0.017	0.108	**-0.527**	-0.069

(Residual effect = 0.828)