LR-5397
[1-6]

RESEARCH ARTICLE
Legume Research- An International Journal

Variability and Correlation Studies in Dolichos bean (*Dolichos lablab* L.)

K. Venkatesan[1], V. Jegadeeswari[2], K.R. Vijayalatha[2], M. Prabhu[1],
K. Padmadevi[3], I. Geethalakshmi[2], T. Uma Maheswari[2]

10.18805/LR-5397

ABSTRACT

Background: Dolichos bean (*Dolichos lablab* L.), 2n = 22 is an important leguminous vegetable crop which provides protein, minerals and vitamins. The exploitation of variability is of great importance and is a prerequisite for the effective screening of superior genotypes. Keeping this in view, the present investigation was carried out to assess the variability and correlation for yield and other components which are useful to select the promising genotypes.

Methods: The study on variability and correlation in Dolichos Bean genotypes for yield and quality was conducted at the College Orchard, Tamil Nadu Agricultural University, Coimbatore. Twenty lablab genotypes, sourced from various locations, were planted in a randomized block design with three replications during the *kharif* and *rabi* seasons of 2021 and 2022. Observations on growth, yield and quality traits were recorded and analysed for variance, variability and correlations.

Result: In the *kharif* season, Ankur Gold yielded the highest green pods per plant (487.50 g), while Acc.7 yielded the lowest (89.59 g). In the pooled analysis, Ankur Gold (469.80 g) had the highest and Acc.6 (87.49 g) had the lowest green pod yield per plant. The study suggests using a selection index based on the number of racemes per plant, raceme length, number of pods per plant, green pod yield per plant and pod length to identify high yielding lablab genotypes.

Key words: Dolichos bean, Genetic analysis, Quality, Variability, Yield.

INTRODUCTION

Dolichos bean (*Dolichos lablab* L.), 2n = 22 is an important leguminous vegetable crop cultivated in the tropical regions of Asia, Africa and America. It is commonly called as hyacinth bean, bonavist bean, Indian bean, field bean, Egyptian bean, Australian pea or chink or Chicaros or pharao. It is a good source of amino acids, minerals and vitamins. Although this crop is native to India but minimum research work was carried out for the genetic improvement of yield and quality (Parmar *et al*., 2013). Therefore, a study of genetic variability has become the prime prerequisite for improvement of lablab (Rai *et al*., 2008).

An assessment of heritability and non-heritable components in the total variability observed is indispensable in adopting suitable breeding procedure. The heritable portion of the overall observed variation can be ascertained by studying the components of variation such as coefficients of genotypic and phenotypic variability, heritability and predicted genetic advance. Heritability estimates aid in determining the relative magnitude of heritable portion of variation. Ramanujam and Thirumalachari (1967) found that heritability estimates in broad sense accompanied with genetic advance would be more reliable. Such a study helps to locate the desirable types and further utilization of the selected types in improvement programme. Further, the character yield depends upon number of component characters consideration on yield determinants simultaneously will help improve the efficacy of selection. Keeping this in view, the objective of the study is to ascertain the extent of variability parameters and correlation coefficients in assembled genotypes and to identify the promising genotypes for further improvement.

[1]Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore-641 003, Tamil Nadu, India.
[2]Horticultural College and Research Institute for Women, Tamil Nadu Agricultural University, Tiruchirapalli-620 009, Tamil Nadu, India.
[3]Agricultural College and Research Institute, Tamil Nadu Agricultural University, Karur-639 001, Tamil Nadu, India.

Corresponding Author: V. Jegadeeswari, Horticultural College and Research Institute for Women, Tamil Nadu Agricultural University, Tiruchirapalli-620 009, Tamil Nadu, India.
Email: jegadeeswari.v@tnau.ac.in

How to cite this article: Venkatesan, K., Jegadeeswari, V., Vijayalatha, K.R., Prabhu, M., Padmadevi, K., Geethalakshmi, I. and Maheswari, T.U. (2024). Variability and Correlation Studies in Dolichos bean (*Dolichos lablab* L.). Legume Research. (): doi: 10.18805/LR-5397.

Submitted: 10-08-2024 **Accepted:** 09-09-2024 **Online**: 07-10-2024

MATERIALS AND METHODS

The present investigation was carried out at the College Orchard of Tamil Nadu Agricultural University, Coimbatore during 2021-2022. The experimental material consisted of 20 genotypes of crop which were collected from different sources (Table 1). These genotypes were sown in a randomized block design (RBD) with three replications in *kharif* and *rabi* seasons during 2021 and 2022. Each genotype was sown with inter row spacing of 60 cm and inter plant spacing of 60 cm under drip irrigation.

Data from five plants of each genotype were averaged replication wise and mean data was used for statistical analysis. Observations on growth parameters *viz*., plant height, number of primary branches per plant, days to first flowering, days to 50 per cent flowering, number of racemes per plant, raceme length, number of flower buds per raceme and number of nodes per raceme were recorded. The yield attributes *viz*., days to first harvesting, number of pods per plant, pod length, pod width and hundred green pods weight and green pod yield per plant were recorded. In addition, quality traits *viz*., crude protein (Lowry *et al*., 1951), crude fibre (Chopra and Kanwar, 1976), carbohydrate (Hedge and Hofreiter, 1962) and ascorbic acid (A.O.A.C, 1975) contents in the pods were also estimated.

Pooled analysis was carried out by combining both *kharif* and *rabi* data for all the 20 characters studied. Mean, range, genotypic coefficients of variation (GCV) and phenotypic coefficients of variation (PCV) were estimated according to Burton (1952); heritability in broad sense (h^2bs) was estimated according to Burton and Devane (1953); genetic advance (GA) and genetic advance as per cent of mean were calculated by Johnson *et al*. (1955); correlation coefficient analysis by Robinson *et al.* (1951). Pooled season data used for statistical analysis

RESULTS AND DISCUSSION

Per se performance of genotypes

In the study, all 20 dolichos bean genotypes exhibited significant differences in pod yield (Table 2). The highest green pod yield per plant in *kharif* was from Ankur Gold (487.50 g), while Acc.7 had the lowest (89.59 g). During *rabi*, yields ranged from 53.84 to 452.11 g. Pooled data revealed Ankur Gold had the highest yield (469.80 g) and Acc. 6 had the lowest (87.49 g). These results align with Chattopadhyay and Dutta (2010).

Variability parameters

A wide range of variability was observed among genotypes, with PCV exceeding GCV for all characters, indicating some environmental interaction (Table 3). The narrow gap between PCV and GCV suggests low environmental influence. Plant height showed a higher proportion of genotypic variance and minimal environmental impact, with high heritability and GA supporting its reliability for selection. In contrast, the studies by Basavarajappa and Byre Gowda (2004) and Golani *et al*. (2007) showed low GCV and PCV, moderate heritability with low genetic advance for plant height in dolichos bean. In contrast, the number of primary branches per plant had low genotypic variance and moderate GCV and PCV, indicating limited environmental impact, with high heritability and low GA aligning with Borah and Shadeque (1992). Minimal differences between phenotypic and genotypic variance for days to first flowering, indicated by a narrow gap between PCV and GCV, suggest low environmental influence, similar to Nath *et al*. (2009) in cowpea. High heritability coupled with high genetic advance as per cent of mean observed for 50% flowering character in *kharif*. During *rabi*, it showed low PCV and GCV with high heritability estimates coupled with moderate genetic advance. Days to 50% flowering showed high PCV and GCV, consistent with (Pandita *et al*., 1980; Kabir and Sen, 1987; Basavarajappa and Gowda, 2004 and Chattopadhyay and Dutta, 2010). Days to first harvesting were recorded high phenotypic and genotypic coefficients of variability with high heritability estimates coupled with high genetic advance in both *kharif* and *rabi* aligning with Rathi and Dhaka (2007) in pea. The higher PCV compared to GCV indicates that environmental factors influence the phenotypic expression of traits. However, a smaller difference between GCV and PCV suggests a minimal environmental impact, emphasizing the stronger role of genetic factors in trait expression. High heritability estimates indicate that phenotypic values are reliable and can be effectively used for trait selection.

High PCV and GCV values for the number of racemes per plant, along with high heritability and genetic gain, indicate additive gene effects, consistent with Uddin and Newaz (1997) and Ali *et al*. (2005). However, Basavarajappa and Byre Gowda (2004) reported moderate heritability coupled with low genetic advance for this trait in lablab. Raceme length showed moderate PCV and GCV with a narrow gap, suggesting suitability for selection, as noted by Pandita *et al*. (1980). This trait showed high heritability

Table 1: List of Dolichos bean genotypes collected for genetic analysis.

Genotype	Source
Short duration types	
CO 12	TNAU, Coimbatore
CO13	TNAU, Coimbatore
CO(Gb)14	TNAU, Coimbatore
Arka Jay	ICAR - IIHR, Bangalore
Arka Vijay	ICAR - IIHR, Bangalore
HA 3	GKVK, Bangalore
HA 4	GKVK, Bangalore
Arya	Private variety
Green lady	Private variety
Ankur gold	Private variety
Medium duration genotypes	
Acc. 1	Rasipuram, Namakkal
Acc. 2	Sengam, Thiruvannamalai
Acc. 3	Papparapatti, Dharmapuri
Acc. 4	Morappur, Dharmapuri
Acc. 5	Pennagaram, Dharmapuri
Acc. 6	Pappanur, Dharmapuri
Acc. 7	Krishnagiri
Acc. 8	Ellampillai, Salem
Acc. 9	Mecheri, Salem
Acc. 10	Mecheri, Salem

with moderately low genetic gain depicting suitability for the selection in breeding programme. The number of racemes per plant and flower buds per raceme exhibited high PCV, GCV, heritability and GA, supporting findings by Uddin and Newaz (1997). However, Basavarajappa and Byre Gowda (2004) reported moderate heritability coupled with low genetic advance for this trait in lablab.

Table 2: Mean performance of lablab genotypes for green pod yield per plant.

Genotype	Pod yield/plant (g)		
	Kharif	*Rabi*	Pooled
CO 12	332.56	312.40	322.48
CO 13	344.24	329.62	336.93
CO (Gb) 14	296.56	292.11	294.33
Arka Jay	287.90	308.59	298.25
Arka Vijay	276.63	264.47	270.55
HA 3	220.07	207.38	213.72
HA 4	257.91	249.06	253.49
Arya	432.04	424.33	428.19
Green lady	310.54	295.52	303.03
Ankur gold	487.50	452.11	469.80
Acc. 1	238.17	225.83	232.00
Acc. 2	396.33	385.36	390.84
Acc. 3	94.00	53.84	88.20
Acc.4	156.04	86.76	121.40
Acc.5	188.03	91.11	139.57
Acc.6	103.06	71.92	87.49
Acc.7	89.59	75.20	103.21
Acc.8	147.61	79.74	113.68
Acc.9	132.78	65.21	99.00
Acc.10	122.32	75.37	98.85
SE (d)	9.69	13.84	11.03
CD (0.05)	19.63	28.02	23.54

High phenotypic and genotypic variance, along with elevated PCV and GCV, were recorded for the number of pods per plant, indicating strong selection potential (Pandita *et al*., 1980; Borah and Shadeque, 1992). Very high heritability and genetic gain support effective selection (Joshi, 1971; Arunachala, 1979; Uddin and Newaz, 1997). High heritability with high genetic advance indicated these characters were controlled due to considerable additive gene effects (Panse, 1957). Pod length and width showed high PCV and GCV with high heritability but low GA (Borah and Shadeque, 1992; Ali *et al*., 2005). Hundred green pod weight also had high PCV, GCV and heritability, with moderate GA, suggesting some selection limitations (Basavarajappa and Gowda, 2004; Chattopadhyay and Dutta, 2010). Green pod yield per plant and per hectare exhibited high GCV, PCV, heritability and GA, indicating minimal environmental impact and effective selection due to additive gene action. Phenotypic Coefficient of Variation values were usually higher than the Genotypic Coefficient of Variation values indicating the influence of the environment over genotype and phenotypic selection for this trait would be less effective (Jyothireddy *et al*., 2018).

Protein content showed low non-genetic influence with moderate GCV and PCV, high heritability and low GA. Carbohydrate content followed similar patterns, while crude fibre content had high variance and heritability, suggesting effective selection with minimal environmental impact.

Table 3: Estimates of variability and genetic parameters of lablab genotypes (Pooled).

Characters	Mean	Range	PCV (%)	GCV (%)	Heritability (%) (BS)	GA as % of mean
Plant height (cm)	109.64	73.36-135.69	15.24	15.22	99.71	31.33
Primary branches/plant	5.47	4.29-6.19	18.24	12.75	48.45	18.39
Days to first flowering	60.00	37.17-85.00	44.86	44.63	99.03	91.52
Days to 50 per cent flowering	65.06	53.33-73.67	27.34	27.08	99.28	83.62
Number of racemes/plant	7.72	5.99-12.57	35.17	32.82	87.03	63.1
Raceme length (cm)	31.01	26 .45-38.45	16.83	15.34	3.98	6.306
Number of flower buds/raceme	23.75	15.50-35.17	35.82	28.52	63.36	46.80
Number of nodes/raceme	8.17	6.73-10.47	26.57	24.48	84.70	46.45
Days to first harvesting	77.65	50.83-106.67	41.41	39.26	89.88	76.70
Number of pods/plant	78.56	39.52-144.62	50.81	44.12	77.68	80.13
Pod length (cm)	7.66	4.42-13.98	52.59	44.78	72.46	78.56
Pod width (cm)	1.90	1.30-2.88	30.56	18.10	34.84	22.09
Hundred green pods weight (g)	390.50	304.17-755.00	43.91	28.09	40.92	37.03
Number of seeds per pod	3.68	3.17-5.50	28.53	19.61	47.24	27.93
Green pod yield/plant (g)	235.25	87.49-509.87	73.66	66.83	82.33	124.93
Total yield (t/ha)	6.34	2.02-13.22	74.51	68.22	83.80	128.75
Crude protein (%)	3.23	2.74-3.52	14.65	8.06	27.27	8.39
Carbohydrate (%)	5.93	4.99-6.93	19.59	15.15	58.54	24.13
Crude fibre (%)	2.65	1.28-3.87	53.91	50.05	85.85	100.00
Ascorbic acid (mg/100 g)	8.06	6.84-9.66	19.61	15.18	59.91	24.30

Moderate heritability was exhibited for carbohydrate content coupled with low genetic advance as per cent of mean. These findings supported by Sarma *et al.* (2010).

Correlation of green pod yield with quantitative traits

The correlation coefficients for 15 traits studied during the *kharif* and *rabi* seasons are shown in Table 4 and 5. The analysis revealed a positive and highly significant association between green pod yield per plant and traits such as raceme length, number of flowers per raceme, number of nodes per raceme, number of pods per plant, pod length, pod width, hundred green pod weight and number of seeds per pod in both seasons. The increased green pod yield observed in *kharif* season sowing could be attributed to the production of higher amounts of photosynthates. This is likely due to the optimal temperature and greater sunshine hours during the vegetative phase, which is favourable for Dolichos bean, a photosensitive crop (Venkatesan *et al*., 2024). These traits are key contributors to yield in lablab bean, aligning with the findings of (Pandey and Dubey, 1972 and Golani *et al*., 2007).

During *kharif*, days to first flowering and 50% flowering were positively correlated with raceme length and number of flowers per raceme, but negatively with number of pods per plant. Raceme length positively correlated with multiple traits, including green pod yield, but negatively with days to first harvesting. Number of flower buds per raceme showed positive correlations with raceme length and nodes but negative correlations with days to first harvesting. In *rabi,* days to first flowering positively correlated with raceme length and number of flowers per raceme but negatively with other traits. Raceme length correlated positively with nodes, number of pods per plant and green pod yield. Number of flower buds per raceme had mixed correlations, while number of pods per plant was positively associated with several traits but negatively with plant height and flowering days. Strong correlations between number of pods per plant and pod length were noted in both seasons.

The local genotypes with longer duration produced higher green pod yield. This may be due to more vegetative growth and larger duration of flowering and reproductive growth leading to more number of racemes, flowers and pods. In Dolichos bean, early-maturing types accumulate less biomass (Mass *et al*., 2003). Positive associations between days to 50% flowering, number of green pods per plant and number of inflorescences with yield have been noted (Joshi, 1971; Dahiya *et al*., 1991; Basavarajappa and Gowda, 2004; Ali *et al*., 2005). However, excessive primary branches negatively impact green pod yield due to increased vegetative growth. Thus, selecting genotypes with fewer primary branches but more racemes and pods is recommended. Days to 50% flowering positively correlates with racemes per plant and pods per plant, indicating that longer duration bush types yield better (Arunachala, 1979; Dahiya *et al*., 1991; Basavarajappa and

Table 4: Genotypic correlation among yield and yield influencing traits of lablab genotypes during *kharif*.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1.00	0.48*	0.74**	0.72**	-0.17	-0.56**	0.44*	-0.39	0.77**	-0.36	-0.45*	-0.58**	-0.53*	- 0.54*	0.59**
2		1.00	0.24	0.23	0.41	0.08	0.21	0.29	0.23	0.05	0.25	0.08	0.47*	0.12	0.12
3			1.00	0.99**	-0.26	-0.87**	0.71**	-0.76**	0.99**	-0.75**	-0.70**	-0.81**	-0.49*	-0.83**	0.87**
4				1.00	-0.23	-0.84 **	0.70**	-0.74**	0.99**	-0.74**	-0.68**	-0.80**	-0. 47*	-0.82**	0.86**
5					1.00	0.46 *	0.40*	0.45*	-0.25	0.25	0.69**	0.26	0.59 * *	0.44*	0.51*
6						1.00	0.82**	0.71**	-0.86**	0.75**	0.94**	0.81**	0.65 **	0.89**	0.76**
7							1.00	0.79**	-0.70**	0.97**	0.85**	0.87**	0.67**	0.98**	0.78**
8								1.00	-0.74 **	0.70**	0.93**	0.99**	0.62 **	0.82**	0.64**
9									1.00	-0.74**	-0.69**	-0.81**	-0.48*	-0.82**	0.82**
10										1.00	0.92**	0.95**	0.64**	0.97**	0.97**
11											1.00	0.84**	0.67**	0.88**	0.70**
12												1.00	0.68 **	0.98**	0.99**
13													1.00	0.62**	0.68**
14														1.00	0.84**
15															1.00

1- Plant height, 2- Branches/plant, 3- Days to first flowering, 4- Days to 50% flowering, 5- No. of racemes/plant, 6- Raceme length, 7- No. of flowers/raceme, 8- No. of nodes/raceme, 9- days to first harvesting, 10- No. of pods/ plant, 11- Pod length, 12- Pod width, 13- 100 green pod weight, 14- No. of seeds/pod, 15- Pod yield/plant, *Significant at 5% level **Significant at 1% level.

Table 5: Genotypic correlation among yield and yield influencing traits of lablab genotypes during *rabi*.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1.00	0.42*	0.82**	0.84**	-0.55**	-0.58**	0.58**	-0.57**	0.76**	-0.61**	-0.46*	-0.58**	-0.45*	0.49*	-0.59**
2		1.00	0.24	0.24	0.13	0.09	0.14	0.11	0.15	-0.02	0.27	0.22	0.15	0.19	0.11
3			1.00	0.99**	-0.69**	-0.66**	0.65**	-0.68**	0.90**	-0.70**	-0.60**	-0.75**	-0.48**	0.57**	-0.66**
4				1.000	-0.67**	-0.64**	0.65**	-0.64**	0.91**	-0.70**	-0.59*	-0.75**	-0.47*	0.54*	-0.65**
5					1.00	0.89**	0.92**	0.80**	-0.73**	0.93**	0.91**	0.89**	0.87**	0.94**	0.99**
6						1.00	0.97**	0.87**	-0.71**	0.93**	0.99**	0.89**	0.82**	0.62**	0.99**
7							1.00	0.79**	-0.76**	0.95**	0.93**	0.97**	0.78**	0.96**	0.98**
8								1.00	-0.76**	0.79**	0.79**	0.83**	0.84**	0.61**	0.91**
9									1.00	-0.84**	-0.67**	-0.80**	-0.43	0.56**	-0.78**
10										1.00	0.86**	0.91**	0.62**	0.87**	0.97**
11											1.00	0.98**	0.83**	0.97**	0.95**
12												1.00	0.80**	0.94**	0.97**
13													1.00	0.79**	0.77**
14														1.00	0.95**
15															1.00

1- Plant height, 2- Branches/plant, 3- Days to first flowering, 4- Days to 50% flowering, 5- No. of racemes/plant, 6- Raceme length, 7- No. of flowers/raceme, 8- No. of nodes/raceme, 9- Days to first harvesting, 10- No. of pods/ plant, 11- Pod length, 12- Pod width, 13- 100 green pod weight, 14- No. of seeds/pod, 15- Pod yield/ plant, *Significant at 5 % level; **Significant at 1% level.

Gowda, 2004; Ali *et al*., 2005; Chattopadhyay and Dutta, 2010). Primary branches, however, have no significant positive associations with yield traits and negatively affect green pod yield.

The significant positive association of the number of racemes per plant with green pod yield, number of pods per plant and days to 50% flowering (Uddin and Newaz, 1997; Basavarajappa and Gowda, 2004; Ali *et al*., 2005; Upadhyay and Mehta, 2010) suggests that selecting plants with more racemes can boost yield. It is evident from the results that the selection for longer duration accessions among bush types results in higher yields. It is mainly because, days to 50 per cent flowering is positively associated with several yield components which are in turn positively associated with yield. The primary branches did not show significant positive association with any of the traits studied. However, it has significant negative association with important yield components. Therefore, it has significant negative association with green pod yield. Raceme length was significantly associated only with the number of flower buds and nodes per raceme, not pod yield (Baswana *et al*., 1980; Pandita *et al*., 1980). Number of nodes per raceme positively correlated with flower buds and raceme length. The number of flower buds per raceme was strongly correlated with green pod yield, number of racemes per plant, number of pods per plant, raceme length and number of nodes (Uddin and Newaz, 1997). Therefore, selecting genotypes with more racemes and flower buds is recommended. Additionally, the number of pods per plant had a significant positive correlation with days to 50% flowering and number of flower buds (Joshi, 1971; Baswana *et al*., 1980; Uddin and Newaz, 1997; Basavarajappa and Gowda, 2004; Chattopadhyay and Dutta, 2010). Hundred green pod weight was positively correlated with both pod width and length.

CONCLUSION

During *kharif*, Ankur Gold had the highest green pod yield per plant (487.50 g), while Acc.7 had the lowest (89.59 g). In *rabi*, yields ranged from 53.84 to 452.11 g. The pooled analysis showed Ankur Gold with the highest yield (469.80 g) and Acc.6 with the lowest (87.49 g). Protein content varied from 2.74% to 3.55%, with CO (Gb) 14 being the highest. For optimizing yield and quality, a selection index based on raceme number, raceme length, number of pods, green pod yield and pod length, along with low crude fibre and high protein content, is recommended.

Data availability statement

All pertinent data are presented within this manuscript.

Ethical approval

No falsification, deformation, or modification of data was used in the presentation of the results and the article was not submitted anywhere else. There is no risk to national security or public health from research.

Declarations

Conflict of interest

The authors declare no conflict of interest.

REFERENCES

A.O.A.C. (1975). Officials and Tentative Methods of Analysis. Association of Official Analytical Chemists. Washington. USA.

Ali, F., Sikdar, B., Roy, A.K. and Joarder, O.I. (2005). Correlation and genetic variation of different genotypes of Lablab bean, *Lablab purpureus* (L.) Sweet. Bangladesh Journal of Botany. 34(2): 125-128.

Arunachala, A.S. (1979). Genetic variability and correlation studies in field bean (*Dolichos lablab* L.). Mysore Journal of Agricultural Sciences. 8(3): 369.

Basavarajappa, P.S. and Gowda, M.B. (2004). Assessment of field bean germplasm of southern Karnataka and isolation of elite genotypes. Mysore Journal of Agricultural Sciences. 38(4): 474-479.

Baswana, K.S., Pandita, M.L., Partap, P.S. and Dhankhar, B.S. (1980). Correlation and path coefficient analysis in Indian bean (*Dolichos lablab* var. *lignosus* L.). Haryana Agricultural University Journal of Research. 10: 485-489.

Borah, P. and Shadeque, A. (1992). Studies on genetic variability of common Dolichos bean. Indian Journal of Horticulture. 49: 270-273.

Burton, G.W. (1952). Quantitative inheritance in grasses. Proceedings of Sixth International Grassland Congress. 1: 277-283.

Burton, G.W. and Dewane, E.H. (1953). Estimating heritability in tall Fescues (*Festuca allamidiaceae*) from replicated clonal material. Agronomy Journal. 45: 1476-1481.

Chattopadhyay, A. and Dutta, S. (2010). Characterization and identification of selection indices of Pole Type Dolichos Bean. Vegetable Crops Research Bulletin. 73: 33-45.

Chopra, R. and Kanwar, S.L. (1976). Analytical Agricultural Chemistry, Kalyani Publishers, New Delhi. pp.38.

Dahiya, M.S., Pandita, M.L. and Vashistha, R.N. (1991). Correlation and path analysis studies in sem (*Dolichos lablab* var. *lignosus* L.). Haryana Journal of Horticultural Science. 20(1-2): 134-138.

Golani, I.J., Mehta, D.R., Naliyadhara, M.V., Patel, R.K. and Kanzariya, M.V. (2007). Genetic variability, correlation and path analysis for green pod yield and its characters in hyacinth bean. Orissa Journal of Horticulture. 35: 71-75.

Hedge, J.E. and Hofreiter, B.T. (1962) Carbohydrate Chemistry 17. [Whistler, R.L. and Be Miller, J. N. (Eds.)], Academic Press, New York.

Johnson, W.W., Robinson, H.F. and Comstock, R.E. (1955). Genotypic and phenotypic correlation in soybeans and their implications in selection. Agronomy Journal. 47: 477-482.

Joshi, S.N. (1971). Studies on genetic variability for yield and its components in Indian bean. Madras Agricultural Journal. 58: 367-371.

Jyothireddy, K., Prabhakar, B.N., Saidaiah, P. and Pandravada, S.R. (2018). Genetic divergence, variability, heritability and genetic advance for growth, pod quality and yield characters in dolichos bean (*Dolichos lablab* L. *var. typicus* Prain) germplasm. Legume Research-An International Journal. 41(6): 804-809. doi: 10.18805/LR-3952.

Kabir, J. and Sen, S. (1987). Studies on genetic variability and heritability in dolichos bean. Annals of Agricultural Research. 8: 141-144.

Lowry, C.H., Rose brough, N.J., Farr, L.A. and Randall, R.J. (1951). Protein measurement with folin phenol reagent. Journal of Biological Chemistry. 193: 265-273.

Mass, B.L., Ayisi, K.K., Bopape, P.M., Usongo, M. and Pengelly, B.C. (2003). Appropriate Germplasm Facilitates New Interest in Neglected Crops-the Case of *Lablab purpureus* in the Limpopo Province, South Africa. In: Proceedings of International Workshop on Underutilized Plant Species, 6-8 May, Lepizig, Germany.

Nath, V., Lal, H., Rai, M., Rai, N. and Ram, D. (2009). Hierarchical clustering and character association studies in cowpea [*Vigna unguiculata* (L.) Walp.]. Indian Journal of Plant Genetic Resources. 22(1): 22-25.

Pandey, R.P. and Dubey, K.G. (1972). Studies on variability in *Dolichos lablab*. JNKVV Research Journal. 6(2): 145-148.

Pandita, M.L., Pandey, S.C., Pindhu, A.S. and Arora, S.K. (1980). Studies on genetic variability and Indian Bean (*Dolichos lablab*). Haryana Journal of Horticultural Science. 9: 154-159.

Parmar, A.M., Singh, A.P., Dhillon, N.P.S. and Jamwal, M. (2013). Genetic variability of morphological and yield traits in Dolichos bean (*Lablab purpureus* L.). African Journal of Agricultural Research. 8(12): 1022-1027.

Panse, V.G. (1957). Genetics of quantitative characters in relation to plant breeding. Indian J. Genet. 17: 318-28.

Rai, N., Singh, P.K., Verma, A., Lal, H., Yadav, D.S. and Rai, M. (2008). Multivariate characterization of Indian bean [*Lablab purpureus* (L.)] Sweet genotypes. Indian Journal of Plant Genetic Resources. 21(1): 42-45.

Ramanujam, S. and Thirumalachari, D.K. (1967). Genetic variability of certain characters in red pepper *Capsicum annuum* L. Mysore Journal of Agricultural Sciences. 1: 30-36.

Rathi, R. and Dhaka, R. (2007). Genetic variability, correlation and path analysis in pea. Indian Journal of Plant Genetic Resources. 20: 126-129.

Robinson, H.F., Comstock, R.E. and Harvey, P.H. (1951). Genotypic and phenotypic correlation's in wheat and their implications in selection. Agronomy Journal. 43: 282-287.

Sarma, B., Sarma, A., Handique, G.K. and Handique, A.K. (2010). Evaluation of country bean (*Dolichos lablab*) landraces of north east India for nutritive values and characterization through seed protein profiling. Legume Research. 33(3): 184-185.

Uddin, M.S. and Newaz, M.A. (1997). Genetic parameters and the association among flower and pod characteristics of hyacinth bean. Legume Research. 20: 82-86.

Upadhyay. D and Mehta, N. (2010). Biometrical studies in dolichos bean (*Dolichos lablab* L.) for chhattisgarh plains. Research Journal for Agricultural Sciences. 1(4): 441-447.

Venkatesan, K., Jegadeeswari, V., Vijayalatha, K.R. and Prabhu, M., Sonthamizhsei, B., Mohanalakshhni, M. and Padmadeni, K. (2024). Studies on seasonal influence on yield and quality of dolichos bean genotypes. Legume Research-An International Journal. 47(7): 1099-1103. doi: 10.18805/LR-5315.