*International Journal of Plant & Soil Science*

***Volume 35, Issue 2, Page 120-129, 2023; Article no.IJPSS.102240***
***ISSN: 2320-7035***

# Estimation of Genetic Variability for Yield and Yield Attributing Traits in Dolichus Bean [*Lablab purpureus* (L.) Sweet var. Typicus] Genotypes

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***Authors' contributions***

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

***Article Information***

DOI: 10.9734/IJPSS/2023/v35i23197

**Open Peer Review History:**
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/102240

***Original Research Article***

***Received: 18/12/2022***
***Accepted: 22/02/2023***
***Published: 23/02/2023***

## ABSTRACT

Dolichos bean is an indigenous legume grown as vegetable (*Lablab purpureus* var. typicus) and pulse (*Lablab purpureus* var. lignosus) throughout India. A wide range of variation exists for the morphological and reproductive characters amongst the land races of Indian Bean grown all over the country. Therefore it is necessary to select variety having desired pod quality with high yield potential. Despite of these good attributing characters it is still regarded as underexploited vegetable because of low productivity, long duration and photosensitivity, flowering irregularity, growth habit and preference of consumers with respect to pod shape, pod size, pod colour, pod aroma. Keeping this in view the present investigation was conducted at All India Co-ordinated Research Project on Vegetable Crops, Odisha University Of Agriculture and Technology,

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Bhubaneswar during Rabi, 2020-21 for evaluating the yield and yield attributing characters, for estimating the variability, heritability, genetic advance and the association between yield and yield attributing characters for an effective selection to estimate the genetic variability in Dolichus bean [*Lablab purpureus* (L.) sweet var. typicus] genotypes for further crop improvement study. The genotypic variance ranged from 0.02 for pod weight per plant to 2435 for average leaf area. The phenotypic variance ranged from 0.023 for pod weight per plant to 2879.8 for average leaf area. Phenotypic coefficient of variation (PCV) was higher than genotypic coefficient of variation (PCV) for all the 14 characters taken. This happened because PCV estimates includes variations due to environment (E) and genotype and environment (GE) interaction. PCV was highest (60.31) for pod yield per plant followed by average leaf area (35.09) indicating the presence of wide range of genetic variability in the germplasm for these traits. Higher value of GCV was found for characters like pod yield per plant (59.80) followed by average leaf area (32.26) and number of pods per plant (31.94). Highest estimates of heritability in broad sense was observed in Pod weight per plant (98.30) followed by number of pods per plant (96.17), average leaf area (84.55), number of pods per inflorescence (83.91), pod length (82.22), plant height (78.82), pod yield per hectare (78.66) indicating that these characters are less influenced by environment.

*Keywords: Genetic variability; heritability; genetic advance; PCV; GCV.*

## 1. INTRODUCTION

"Dolichos bean [*Lablab purpureus* (L.) sweet var. typicus] is also called as Indian bean, Sem, Field bean, Hyacinth bean, Bonavist bean, Egyptian bean and Lablab bean. It belongs to the family Fabaceae, sub family Faboideae, tribe phaseoleae and sub tribe phaseolineae, having chromosome number 2n = 2x = 22" [1]. "Dolichos bean is an indigenous legume grown as vegetable (*Lablab purpureus* var. typicus) and pulse (*Lablab purpureus* var. lignosus) throughout India. A wide range of variation exists for the morphological and reproductive characters amongst the land races of Indian Bean grown all over the country" [2]. "India is considered as the centre of diversity of Dolichos bean and large number of indigenous strains are available in northern India" [3]. Vavilov (1931) has reported India as its centre of origin from where it spread throughout the world. The crop is mostly grown throughout tropical regions of Asia, Africa and America.

"Perennial climbing races with long pods and annual bushy races with small pods are the two groups of *Dolichos lablab* species available in India. Preponderance of indeterminate (pole) type over determinate (bush) type is usually noticed and grown on a commercial scale in the country. Much concerted efforts are needed to develop an ideotype having semi-determinate growth habit with early flowering and having desirable pod quality, suitable for vegetable purpose that do not require cost intensive trellising" (Das et al., 2015).

"A wide range of variability exists in pod shape, size and colour and other agronomic characters in Dolichos bean. Therefore, it is necessary to select variety having desired pod quality with high yield potential. It also possesses antimicrobial, anti-fungal, anti-inflammatory, aphrodisiac, hypocholesterolemic, galactagogue, appetite suppressants and antispasmodic properties that prevents from various types of ailments" [4]. Dolichos bean is grown throughout the country mainly for its green pods. As a dual purpose (food and feed) legume, it can be grown as a monocrop or in intercrop systems (Tapkeer et al., 2017). "Its foliages are also used as hay, silage and green manure. Its seeds contain water soluble polysaccharides comprised of rhamnose, xylose, arabinose, galactose, glucose, uronic acid, unidentified sugars and proteins" [5]. "Apart from the nutrients, the lablab beans, as is the case with other legume grains, may also contain varying amounts of anti- nutritional factors such as tannins, phytic acid and trypsin inhibitors" [6]. "Despite of these good attributing characters it is still regarded as underexploited vegetable because of low productivity, long duration and photosensitivity, flowering irregularity, growth habit and preference of consumers with respect to pod shape, pod size, pod colour, pod aroma. Limited area planted to this crop and efforts towards its genetic improvement truly qualities its tag as an underutilized crop" [7].

"Despite of being originated in India, very little work has been done in the field of yield and quality aspect of Dolichos bean. A great range of variation exists for the plant and pod characters

amongst the accessions grown all over the country" [8].

Study of genetic variability, heritability and genetic advance are pre-requisite for improvement of any crop for the selection of superior genotypes and improvement of any trait. It is very difficult to judge whether observed variability is heritable or due to environment alone. Knowledge of heritability is essential for selection based improvement as it indicates extent of transmissibility of character in future generations. Dolichos bean is very popularly grown in Odisha during rabi season as an offseason crop and there exists more genetic variability among the varieties available in Odisha. So, keeping in view the above facts, this study is done for further crop improvement to select superior bush type genotypes in Dolichos bean.

## 2. MATERIALS AND METHODS

The present investigation was conducted at All India Co-ordinated Research Project on Vegetable Crops, Odisha University Of Agriculture and Technology, Bhubaneswar during Rabi, 2020-21 to estimate the genetic variability in Dolichus bean [*Lablab purpureus* (L.) sweet var. typicus] genotypes for yield and yield attributing traits. "It is located at a latitude of 20º15'N and longitude of 85º52'E with an altitude of 25.5 m above mean sea level (MSL). The selected experimental site comes under the fourth agro-climatic zone of Odisha (East and South Eastern Coastal Plain) having hot and humid climate with mild winter. The average temperature varied from 15ºC in winter, 40ºC in summer and 30ºC in rainy season and R. H. varied from 60% - 80% during December and January. The experiment was laid out using statistical design Randomized Block Design (RBD) having 12 number of Genotypes as treatments with three replications. The 12 genotypes are V1:2017/DBB VAR-1 from AVT-2, AICRP on Vegetable crops, OUAT, V2: 2017/DBB VAR-2fromAVT-2, AICRP on Vegetable crops, OUAT, V3: 2017/DBB VAR-4 from AVT-2, AICRP on Vegetable crops, OUAT, V4: 2017/DBB VAR-5 from AVT-2, AICRP on Vegetable crops, OUAT, V5: 2017/DBB VAR-6 from AVT-2, AICRP on Vegetable crops, OUAT, V6: 2017/DBB VAR-7 from AVT-2, AICRP on Vegetable crops, OUAT, V7: 2017/DBB VAR-8 from AVT-2, AICRP on Vegetable crops, OUAT, V8: 2018/DOLBVAR-2 AVT-1, AICRP on Vegetable crops, OUAT, V9: 2018/DOLBVAR-4 from AVT-1, AICRP on Vegetable crops, OUAT, V10: 2018/DOLBVAR-6 from AVT-1, AICRP on Vegetable crops, OUAT, V11: ARKA AMOGH from IIHR, Bangalore and V12: ESWARA from B Bio Seeds". These twelve genotypes taken were randomly distributed in each replication. Sowing was done on 15$^{th}$ October, 2020. Healthy and Bold seeds were selected from all the twelve genotypes and were sown in different plots of each replication randomly. The data recorded for different characters were subjected to statistical analysis based on their sample means. The data was recorded for different characters and subjected to statistical analysis to measure heritability (broad sense), ($h^2_{bs}$), genetic advance, GCV and PCV for all the characters related to yield and yield attributing characters using TNAU Stat software.

### 2.1 Estimation of Genotypic and Phenotypic Variances

Genotypic and phenotypic variances were estimated according to the formula which is given by Johnson et al. [9].

Error variance = $\sigma^2 e$ = EMS/r
Genotypic variance = $\sigma^2 g$ = GMS-EMS/r
Phenotypic variance = $\sigma^2 p = \sigma^2 g + \sigma^2 e$

Where,

EMS= Error mean sum of squares
GMS= Genotypic mean sum of squares
r = number of replications

### 2.2 Estimation of Genotypic and Phenotypic Variances

The genotypic co-efficient of variation (GCV) and the phenotypic co-efficient of variation (PCV) were calculated by the formula given by Burton and Devane [10].

GCV (%) = Genotypic standard deviation/Grand mean ×100

PCV (%) = Phenotypic standard deviation/Grand mean ×100

### 2.3 Heritability

The heritability estimate was used to measure the degree of correspondence between phenotypic value and breeding value. Heritability in broad sense estimates for various parameters as per the formula suggested by Hanson et al., [11].

$h^2$ (bs) = Genotypic variance/ Phenotypic variance = $\sigma^2g/\sigma^2p$

$h^2$ (bs%) = Genotypic variance/ Phenotypic variance × 100 = $\sigma^2g/\sigma^2p \times 100$

Variation in quantitative traits occurs due to their degree of heritability.

Heritability values are categorized as follows: [12]. The percentage of heritability estimated on (0-30% having low), (31-60% Medium), and (>60% High).

If the heritability percentage is observed as high, it indicates that characters are least influenced by environment and selection for this type of characters are fruitful for improvement purpose.
If the heritability percentage is observed as low, it indicates that characters are highly influenced by environment and selection for this type of characters is difficult for improvement programmes.

## 2.4 Expected Genetic Advance

Genetic advance was computed as per the formula suggested by Johnson et al. [9].

$$GA = K. h^2.\sigma p$$

Where,

K= Selection differential in standard units (which is 2.06 per 5% selection intensity)
h2 = Heritability in broad sense
σp = Phenotypic standard deviation

Genetic Advance GA (expressed as percentage of mean) = GA / Mean × 100

The genetic advance as per cent over mean was categorized as mentioned below [9]. (Less than 10%= Low, 10-20%=Moderate, more than 20%=High)

## 3. RESULTS AND DISCUSSION

The present study was conducted for evaluating the yield and yield attributing characters, for estimating the variability, heritability, genetic advance and the association between yield and yield attributing characters for an effective selection.

The Table 1 presents the analysis of variance i.e., the mean sum of squares between twelve genotypes of bush type of Dolichos bean for 14 characters to study the genetic variability. The data revealed the existence of significant differences among the genotypes for all the characters studied. The mean sum of square for genotypes was maximum in case of average leaf area followed by number of pods per plant. The characters like pod yield per plant, pod width, number of flowering nodes per inflorescence, number of flowering nodes per inflorescence, number of compound leaves, Number of primary branches showed minimum values for genotypic mean sum of squares.

**Table 1. Analysis of variance (mean sum of squares) for 14 characters of 12 genotypes of bush type Dolichos bean**

| Sl. No. | Characters (df) | Mean sum of squares | | |
|---|---|---|---|---|
| | | Replications (2) | Genotypes (11) | Error (22) |
| 1 | Plant height (cm) | 2.3721 | 47.69** | 3.9201 |
| 2 | Number of compound leaves | 2.6678 | 3.10** | 0.7854 |
| 3 | Number of primary branches | 0.0478 | 3.87** | 0.4708 |
| 4 | Average leaf area ($cm^2$) | 276.6799 | 7749.55** | 444.8177 |
| 5 | Days to 1st flowering | 0.6286 | 12.51** | 3.1129 |
| 6 | Days to 50% flowering | 0.1733 | 13.72** | 4.1358 |
| 7 | Inflorescence length (cm) | 4.6150 | 18.78** | 1.7401 |
| 8 | Number of flowering nodes per inflorescence | 1.0978 | 2.29* | 0.7451 |
| 9 | Number of pods per inflorescence | 0.7678 | 4.67** | 0.2805 |
| 10 | Number of pods per plant | 22.6609 | 568.99** | 7.4621 |
| 11 | Pod length (cm) | 3.9994 | 19.01** | 1.2776 |
| 12 | Pod width (cm) | 0.4090 | 0.61** | 0.0913 |
| 13 | Pod yield per plant (kg) | 0.0011 | 0.07** | 0.0004 |
| 14 | Yield in t/ha | 0.9695 | 21.38** | 1.7725 |

**Significant at 5% level, **Significant at 1% level*

### 3.1 Genetic Variability

"Germplasm evaluation is a necessary and preliminary step for genetic improvement of any crop. The effectiveness of selection as well as hybridization programme depends on the amount of variation present in the material and the extent to which it is heritable. Variability refers to the presence of differences among the individuals of plant population. Variability results due to differences either in the genetic constitution of the individual of a population or in the environment in which they are grown. Hence the presence of genetic variability in the available germplasm of a crop is of immense value to design a selection procedure and to identify the superior genotypes. An assessment of the nature and extent of variability is, therefore, one of the basic approach towards successful breeding assignment" [13].

The estimation of genetic parameters such as mean, range, genotypic variance and phenotypic variance in the present study are presented in Table 2 and the respective genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), heritability in broad sense, genetic advance and genetic advance as percentage of mean of different characters are presented in Table 3.

The general mean results indicated wide variation ranging from pod yield per plant (0.25 kg) to average leaf area (152.94 $cm^2$). The range was highest in case of average leaf area (100.4 - 286.16 $cm^2$) and lowest range was observed in pod weight per plant (0.04-0.48 kg). Results from Table 2 indicated that the genotypic variance ranged from 0.6 for number of flowering nodes per inflorescence to 2435 for average leaf area. The phenotypic variance ranged from 0.023 for pod yield per plant to 2879.8 for average leaf area.

The study of data in Table 3 revealed that the phenotypic coefficient of variation (PCV) was higher than the genotypic coefficient of variation (GCV) for all the 14 characters taken. This happened because PCV estimates includes variations due to environment (E) and genotype and environment (GE) interaction. PCV was highest (60.31) for pod yield per plant followed by (35.09) for average leaf area. PCV was lowest (5.93) for days to 50% flowering, followed by (6.10) for days to 1st flowering, (6.37) plant height (cm), (6.83) number of compound leaves in ascending order. The characters like inflorescence length (11.89), number of flowering nodes per inflorescence (13.88), number of pods per inflorescence (19.69) exhibited moderate values of PCV (10-20%). Relatively higher PCV (>20%) was observed in rest of the characters. Relatively higher value of GCV was found for characters like pod yield per plant (59.80) followed by average leaf area (32.26) and number of pods per plant (31.94). Moderate values were obtained in 4 characters. Lowest values were observed in days to 50% flowering (3.91), days to 1st flowering (4.32) and number of compound leaves (4.81) in ascending order. The GCV and PCV for yield traits is given in the Fig. 1, From the Fig. 1 it is clear that among all the characters GCV and PCV was recorded highest for Pod yield per plant and lowest is recorded for Days to 1$^{st}$ flowering and Days to 50% flowering.

**Table 2. General mean, range, genotypic variance, phenotypic variance for 14 characters in bush type of Dolichos bean genotypes**

| Sl.No. | Characters | General mean | Range | GV | PV |
|---|---|---|---|---|---|
| 1 | Plant height (cm) | 67.51 | 60.04 - 75.66 | 14.6 | 18.6 |
| 2 | Number of compound leaves | 18.26 | 15.6 - 20.4 | 0.8 | 1.6 |
| 3 | Number of primary branches | 6.24 | 3.6 - 7.8 | 1.13 | 1.7 |
| 4 | Average leaf area ($cm^2$) | 152.94 | 100.4 - 286.16 | 2435 | 2879.8 |
| 5 | Days to 1st flowering | 40.95 | 36.2 - 45.6 | 3.13 | 6.24 |
| 6 | Days to 50% flowering | 45.68 | 40.8 - 50.4 | 3.19 | 7.33 |
| 7 | Inflorescence length (cm) | 22.91 | 19.6 - 29.22 | 5.7 | 7.41 |
| 8 | Number of flowering nodes per inflorescence | 8.09 | 5.2 - 10.6 | 0.6 | 1.26 |
| 9 | Number of pods per inflorescence | 6.71 | 4.4 - 10 | 1.46 | 1.8 |
| 10 | Number of pods per plant | 42.84 | 20 - 71.5 | 187.17 | 194.7 |
| 11 | Pod length (cm) | 9.06 | 3.1 - 13.8 | 6 | 7.18 |
| 12 | Pod width (cm) | 1.93 | 1.2 - 3.3 | 0.17 | 0.26 |
| 13 | Pod yield per plant (kg) | 0.25 | 0.040 - 0.484 | 0.02 | 0.023 |
| 14 | Yield in t/ha | 10.00 | 5.38 - 15.430 | 6.6 | 8.30 |

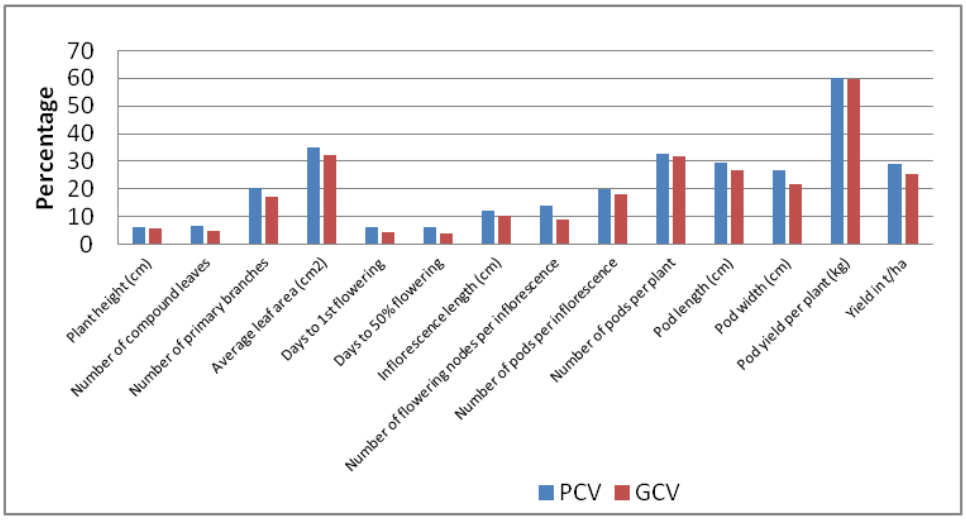


**Fig. 1. GCV and PCV for yield traits in Dolichos bean**

## 3.2 Heritability

Knowledge of heritability is essential for selection based improvement as it indicates the transmissibility of a character from parents to their offspring. The concept of heritability is useful in determining whether the phenotypic differences among individuals are genetical or as a result of environmental factors.

The heritability (broad sense) estimates for 14 characters as presented in Table 3 ranged from 40.90% in number of flowering nodes per inflorescence to 98.30% in pod yield per plant. Moderate heritability was observed in number of flowering nodes per inflorescence (40.90), days to 50% flowering (43.59), number of compound leaves (49.53) and days to 1st flowering (50.16). All the other characters recorded high heritability (> 60%).

## 3.3 Genetic advance

The range of genetic advance (GA) among different characters as presented in Table 3 varied from 0.31% in pod yield per plant to 93.47% in average leaf area. The GA as % of mean was found to be in a range of 5.32% in days to 50% flowering to 122.13% in pod yield per plant. Expected GA was found to be low (<10%) for traits like days to 50% flowering (5.32%), days to 1st flowering (6.31) and number of compound leaves (6.97). Similarly moderate value of GA (10-20%) was recorded for plant height (10.35%), number of flowering nodes per inflorescence (11.69%), inflorescence length (18.75%) whereas relatively higher value of GA as % of mean (>20%) was recorded for rest of the characters. Heritability (Broad sense) and Mean for Genetic advance is given in the Fig. 2, from the Fig. 2 it is clearly understood that. High genetic advance and heritability is for pod yield per plant similarly high heritability and low genetic advance is recorded for Number of pods per plant, lowest genetic advance is recorded in days to 1$^{st}$ flowering and days to 50 % flowering. Lowest heritability is seen in Number of flowering nodes per inflorescence.

## 3.4 Genetic Variability and Heritability

By examining the ANOVA Table 1 from the present conducted investigation it was found that the nature and magnitude of variability for different quantitative characters are clearly observed among different Dolichos bean as significant. The existence of large amount of variation from all the characters studied provides ample of scope for improvement in this crop. A wide range of variability was observed for average leaf area, number of pods per plant, plant height. As high to moderate range of variation was observed for majority of the characters and related statistics for different characters gives us a strong opportunity for selecting potential and promising genotypes as per our objectives in breeding programme. Similar to the present findings investigations carried out earlier also revealed wide variations for various characters by (Singh et al., [14] and Noorjahan et al., [15]). Further the coefficient of variation value is less than 20% for all the characters, which indicates high precision was maintained during conducting the experiment.

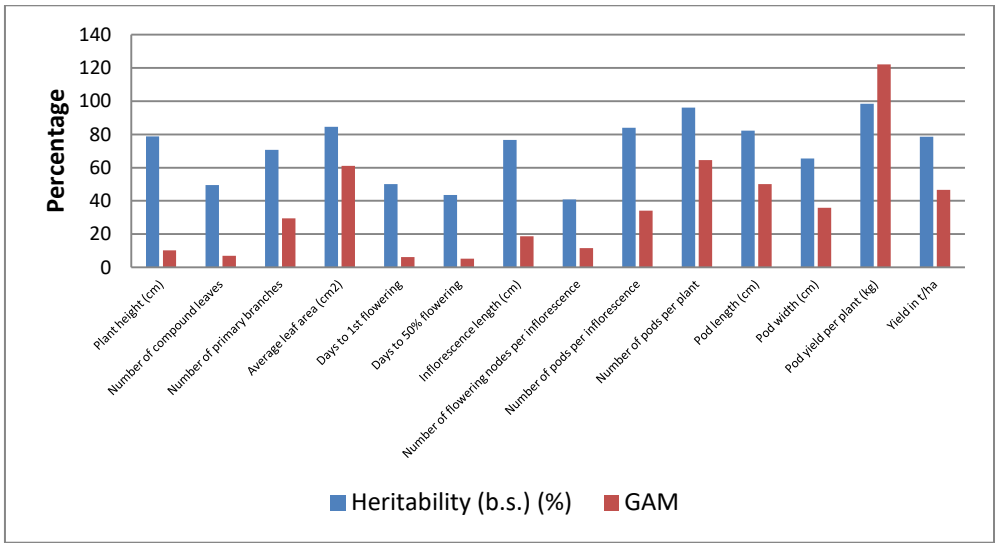


**Fig. 2. Heritability and genetic advance mean for yield traits in dolichos bean**

**Table 3. Genotypic coefficient of variation (GCV), Phenotypic coefficient of variation (PCV), Heritability (Broad sense), Genetic Advance (GA), Genetic Advance as % of Mean (GAM) for 14 characters studied in Dolichos bean**

| Sl. No. | Characters | PCV | GCV | Heritability (b.s.) (%) | GA (at 5% level) | GAM |
|---|---|---|---|---|---|---|
| 1 | Plant height (cm) | 6.37 | 5.66 | 78.82 | 6.99 | 10.35 |
| 2 | Number of compound leaves | 6.83 | 4.81 | 49.53 | 1.27 | 6.97 |
| 3 | Number of primary branches | 20.29 | 17.05 | 70.66 | 1.84 | 29.53 |
| 4 | Average leaf area ($cm^2$) | 35.09 | 32.26 | 84.55 | 93.47 | 61.12 |
| 5 | Days to 1st flowering | 6.10 | 4.32 | 50.16 | 2.58 | 6.31 |
| 6 | Days to 50% flowering | 5.93 | 3.91 | 43.59 | 2.43 | 5.32 |
| 7 | Inflorescence length (cm) | 11.89 | 10.40 | 76.55 | 4.30 | 18.75 |
| 8 | Number of flowering nodes per inflorescence | 13.88 | 8.88 | 40.90 | 0.95 | 11.69 |
| 9 | Number of pods per inflorescence | 19.69 | 18.04 | 83.91 | 2.28 | 34.04 |
| 10 | Number of pods per plant | 32.57 | 31.94 | 96.17 | 27.64 | 64.52 |
| 11 | Pod length (cm) | 29.58 | 26.82 | 82.22 | 4.54 | 50.11 |
| 12 | Pod width (cm) | 26.62 | 21.55 | 65.54 | 0.70 | 35.94 |
| 13 | Pod yield per plant (kg) | 60.31 | 59.80 | 98.30 | 0.31 | 122.13 |
| 14 | Yield in t/ha | 28.81 | 25.56 | 78.66 | 4.67 | 46.69 |

For understanding the principles of crop improvement programme, two aspects are important *i.e.* (1) Selection in any breeding programme depends upon the amount of already existing variability in the experimental material rather it cannot create new variability by itself. (2) Selection for any character can act effectively only on the basis of heritable differences [16]. Therefore, assessing whether the genetic variability for characters under study is significant or not is the most important factor for selection. Further, the phenotypic mean values which are basis of comparison can be misleading while interpreting the data as it may be influenced by environmental factor. To minimise this environmental effect and precise interpretation of recorded data, statistics like variance and coefficient of variations are calculated.

Burton and Devane [10] suggested “method for calculating the genetic parameters such as phenotypic and genotypic variance along with the coefficients of variations which provides a sound basis to determine the variability components as well as to know the relative amounts of heritable and non-heritable variation for each of these characters studied”.

While comparing the phenotypic coefficient of variation and genotypic coefficient of variation values it can be concluded that the PCV values were always higher than the GCV values for all the fifteen characters studied. However, there was close linkage and very minute difference between the values of PCV and GCV with respect to most of the traits except pod width and number of flowering nodes per inflorescence revealing the fact that there was very minor influence of environment on the expression of most of the characters and selection of these characters based on phenotype would be effective. Similar results were disseminated in the findings [3,17-22].

GCV represents the heritable components of total variation. Therefore it is an important parameter for comparing variability of different characters among the 12 genotypes of dolichos bean. The highest genotypic coefficient of variation was observed for Pod yield per plant (59.80) followed by average leaf area (32.26) and number of pods per plant (31.94) which indicated maximum variability existing in the genotypes that provides better scope for genetic improvement in the character through effective simple selection. These research findings found uniformity with results found by (Kyada et al., [23], Verma et al., [24] ; Singh et al., [25] ; Jyothireddy et al., [19] and Gamit et al., [22]. "Lowest GCV were observed for days to 50% flowering (3.91) followed by days to 1st flowering (4.32) and number of compound leaves (4.81) which reveals that the extent of response of these traits for selection would be less than that of other traits. High GCV alone is not sufficient for determination of heritable variation. So, GCV along with heritability would give the best view of advance to be expected by selection" [13].

Heritability is a measure of transmissibility of character from one generation to another and is of prime interest to plant breeder for selection of elite genotypes from diverse genetic population. Those characters which are less influenced by environment are regarded as highly heritable character [26]. In the present experiment, the highest estimates of heritability in broad sense were observed for 98.30% in pod yield per plant followed by number of pods per plant (96.17%), average leaf area (84.55%), number of pods per inflorescence (83.91%), pod length (82.22%). High heritability showed the possibility of effective selection based on phenotypic expression. Similar results have been reported by Dewangan et al., [27]; Jyothireddy et al., [19]; Sahu and Bahadur [3]; Noorjahan et al., [28], Gamit et al., [22] and Singh et al., [25].

Heritability estimates along with genetic advance are more valuable than heritability alone in predicting the response of selection. Genetic advance is the quantum of genetic gain expected during a selection process. High heritability coupled with high genetic advance as per cent of mean was recorded for most of the characters, highest in pod yield per plant followed by number of pods per plant, average leaf area, yield in t/ha, pod width, number of pods per inflorescence. These characters had also high GCV which indicated that these characters were least influenced by environmental effects and were governed by additive genes and selection on the phenotypic performance will be rewarding for improvement of such traits. Considering GCV, PCV, Heritability and GAM among fourteen characters pod yield per plant recorded highest for all the above said parameters, this character is considered as good parameter to inherit in next generation, if we use the genotypes in future breeding programme. The studies related to heritability and genetic advance is exactly coinciding with the findings [29-36].

## 4. CONCLUSION

The present investigation was done to estimate the extent of genetic variability, for yield and yield attributing traits in bush type Dolichos bean [*Lablab purpureus* (L.) sweet var. typicus] genotypes. The genotypic variance ranged from 0.02 for pod weight per plant to 2435 for average leaf area. The phenotypic variance ranged from 0.023 for pod weight per plant to 2879.8 for average leaf area. Phenotypic coefficient of variation (PCV) was higher than genotypic coefficient of variation (PCV) for all the 14 characters taken. This happened because PCV estimates includes variations due to environment (E) and genotype and environment (GE) interaction. PCV was highest (60.31) for pod yield per plant followed by average leaf area (35.09) indicating the presence of wide range of genetic variability in the germplasm for these traits. Higher value of GCV was found for characters like pod yield per plant (59.80) followed by average leaf area (32.26) and number of pods per plant (31.94). Highest estimates of heritability in broad sense was observed in Pod weight per plant (98.30) followed by number of pods per plant (96.17), average leaf area (84.55), number of pods per inflorescence (83.91), pod length (82.22), plant

height (78.82), pod yield per hectare (78.66) indicating that these characters are less influenced by environment. High heritability coupled with high genetic advance as per cent of mean was recorded for most of the characters, highest in pod yield per plant followed by number of pods per plant, average leaf area, yield in t/ha, pod width, number of pods per inflorescence. These characters had also high GCV which indicated that these characters were least influenced by environmental effects and were governed by additive genes and selection on the phenotypic performance will be rewarding for improvement of such traits. Therefore, characters with high heritability, GCV, PCV and genetic advance is considered as predominant characters in selecting dolicos bean genotypes for future breeding programmes. Categorically breeders should consider the effect of additive and non-additive gene actions in selecting the genotypes.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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