**Characterization and Evaluation of Genotypes for Identification of Promising Lines of Dolichos Bean in Tripura Conditions**

**Abstract**

**Background:** To characterize Dolichos bean germplasm collected from different sources based on agro-morphological characteristics and identify suitable Bean lines used as Vegetable purpose in the hilly region of Tripura, field experiment was carried out at the Experimental Farm of College of Agriculture, Tripura at Lembucherra, West Tripura [91.31791˚East longitude, 23.910427˚ North latitude and 12.80 m altitude] during the Period of August 2023 to February2024.

**Methods:** The experiment was laid out in RBD (Randomized Complete Block Design) with 25 Treatments and 3 Replications. Germplasms was collected from different parts of Tripura and IIVR (Indian Institute of Vegetable Research). In the present study 6 qualitative characters and 13 quantitative characters were recorded from 25 genotypes.

**Results:** All the 25 Dolichos bean genotypes under study showed wide range of variations in the qualitative and quantitative characters including Pods per plant revealed significant variation ranging from 88.17 to 702.80, the range of yield per Plant was 0.68 Kg to 4.01 Kg, six distinct pod colors, four flower bud colors, four standard petal colors, three wing petal colors, four keel petal colors and three seed colors have been observed.

**Conclusion:** The identification of superior genotypes such as Khowai Local-2, VRSEM-1, and Brahmanpuskarini Local-4 is particularly noteworthy. These genotypes demonstrated exceptional performance in terms of yield and other agronomically important traits, making them strong candidates for inclusion in future breeding programs. Their potential to serve as parental lines in hybridization efforts could lead to the development of high-performing, location specific cultivars tailored to meet the needs of both farmers and consumers.

**Keywords:** Dolichos bean, genetic variability, pod yield, heritability, Tripura

**Introduction:**

Dolichos bean (*Lablab purpureus* L.), with a chromosome number of 2n = 22, is a significant vegetable crop of Indian origin belonging to the family Fabaceae. This bushy, semi-erect, and pole-type herbaceous self-pollinated crop is cultivated for its multifaceted uses, including seeds, pods, and foliage. Its adaptability to diverse agro-climatic conditions and ability to enhance soil fertility through nitrogen fixation make it an essential component of food security and sustainable agricultural practices. The state of Tripura, characterized by rich variability in Dolichos bean, presents untapped potential for agricultural exploitation. However, the crop’s genetic diversity and uniformity remain understudied, underscoring the need for a systematic evaluation program to identify promising genotypes and justify proper nomenclature. Dolichos bean, commonly referred to as Hyacinth bean, Bonavist bean, Field bean, Country bean, Egyptian bean, Indian bean, or Sem, is also known as the "Poor Man's Bean" due to its high protein content, which provides essential nutrition, particularly in hilly and underprivileged regions. This versatile legume is an annual or short-lived perennial forage crop characterized by its diverse growth habits, including climbing, erect, or creeping forms. It can reach lengths of 3–6 meters and is anchored by a deep taproot. The trifoliolate leaves, with smooth upper surfaces and short hairs beneath, measure 8 to 14 cm in width and 7.5 to 15 cm in length. The plant produces white, blue, or purple papilionaceous flowers on elongated racemes. The pods, measuring 4 to 15 cm in length and 1 to 4 cm in width, contain 2 to 8 seeds that vary in color from white to black, often displaying mottled patterns. *Lablab purpureus* has undergone taxonomic changes and is now placed in its unique genus, Lablab.

Two main varieties exist based on pod shape and seed orientation: **1. *Lablab purpureus* var. *typicus***: Produces long, flat, tapering pods with seeds aligned parallel to the pod suture; it is a climbing type requiring support. **2. *Lablab purpureus* var. *lignosus***: Features shorter, tougher pods with seeds oriented perpendicular to the suture. The species comprises three subspecies: (**a) *Lablab purpureus* subsp. *bengalensis***: Found in tropical regions of America, Asia, and Africa, characterized by tender fruits up to 15 cm × 2.5 cm. **b. *Lablab purpureus* subsp. *purpureus***: A semi-erect, bushy perennial with purple-tinged fruits up to 10 cm × 4 cm, grown in Asia for seeds and fodder. **c. *Lablab purpureus* subsp. *uncinatus***: Originates from East Africa, with small fruits measuring 4 cm × 1.5 cm believed to have originated in India or Africa, *Lablab purpureus* thrives in varied regions, including southern U.S. states and tropical to subtropical areas, at elevations up to 6,500 feet. India, particularly its northern regions, holds a vast reservoir of genetic diversity for Dolichos bean, making it a critical area for germplasm evaluation. Dolichos bean cultivation is concentrated in peninsular India, with significant areas in Karnataka, Andhra Pradesh, Tamil Nadu, Maharashtra, Odisha, and the northeastern states. India’s cultivation spans 227.78 hectares, producing 2,276.95 metric tonnes with a productivity of 10 metric tonnes per hectare (Anonymous, 2020-21). *Lablab purpureus* is a rich source of carbohydrates, protein, and fiber, with 100 g of green pods containing 6.7 g of carbohydrates, 3.8 g of protein, 1.8 g of fiber, 210 mg of calcium, 68 mg of phosphorus, and 1.7 mg of iron (Gopalan *et al*., 2004). It also contains vital amino acids like lysine, enhancing its role in improving dietary quality, particularly in rural communities. Additionally, Dolichos bean seeds possess therapeutic properties, including aphrodisiac, diuretic, and anti-spasmodic effects (Chopra *et al*., 1986). Bioactive compounds such as flavonoids (kievitone and genistein) have been linked to cancer prevention, while tyrosinase indicates potential antihypertensive applications (Morris, 2009).

The Dolichos bean holds immense potential as a sustainable crop for Tripura’s agricultural landscape. Agronomically, Dolichos bean improves soil fertility, controls erosion, and suppresses weeds. Its drought tolerance makes it suitable for dryland farming and intercropping systems. Despite its potential, Dolichos bean cultivation is constrained by low productivity, photosensitivity, and irregular flowering patterns. Consumer preferences for specific pod traits and limited genetic improvement efforts further hinder its adoption. The genetic variability in existing germplasm offers opportunities for developing high-yielding, desirable varieties.

This study aims to characterize and evaluate Dolichos bean genotypes under Tripura conditions to identify promising lines for enhanced yield and adaptability. By leveraging the rich genetic diversity present in the region, this research will contribute to developing improved varieties tailored to local preferences and agronomic needs.

**Materials and Methods:**

Field experiments were conducted during 2023–24 at the Experimental Farm of the College of Agriculture, Tripura, Lembucherra, West Tripura, located at 23.910427° N latitude, 91.31791° E longitude, and an altitude of 12.80 m. The soil of the experimental site was classified as Inceptisol with a sandy clay loam texture. Physical properties were determined as 62% sand, 10% silt, and 28% clay using the hydrometer method (Bouyoucos, 1936). Chemical properties included pH 5.10 (Blackman’s pH meter, Jackson, 1973), organic carbon 0.55% (Walkley and Blackman, 1934), available nitrogen 274.36 kg/ha (modified Kjeldahl method, Jackson, 1973), available phosphorus (P₂O₅) 12.28 kg/ha (Olsen’s method, Jackson, 1973), and available potassium (K₂O) 143.57 kg/ha (flame photometric method, Jackson, 1973).

The experiment was laid out in RBD design with 25 Treatments and 3 Replications. The following treatments include T1: Brahmanpuskarini Local -1, T2: Brahman puskarini Local -3, T3: Brahman puskarini Local -4, T4: Kailashahar Local-1, T5: Kailashahar Local-2, T6: Sabroom Local-3, T7: Khowai Local -1, T8: Khowai Local-2, T9: Lembucherra Local-1, T10: Lembucherra Local-2, T11: Lembucherra Local-3, T12: VRSEM-702, T13: VRSEM-938, T14: VRSEM-186, T15: VRSEM-736, T16: VRSEM-950, T17: VRSEM-937, T18: VRSEM-913, T19: VRSEM-808, T20: VRSEM-896, T21: VRSEM-45, T22: VRSEM-943, T23: VRSEM-201, T24: VRSEM-839, T25: VRSEM-1. The field was prepared by plowing with a tractor-drawn cultivator and laddering to achieve a fine tilth. Well-rotted farmyard manure (15 tons/ha) was incorporated during the final land preparation. Seeds were treated with Trichoderma at a rate of 5 g per 100 g of seed before sowing. Sowing was carried out on August 26, 2023, in plots measuring 3m x 4m, with spacing of 90 x 90 cm between plants.

A basal dose of 30 kg N, 60 kg P₂O₅, and 50 kg K₂O per hectare was applied at the time of sowing. The remaining 30 kg N was top-dressed 60 days after sowing. Irrigation was provided immediately after sowing, with subsequent watering at 14-day intervals or based on soil moisture levels. Manual weeding was performed four times, at 15, 30, 60, and 90 days after sowing, to maintain weed free conditions. All genotypes were supported with bamboo poles and wires for vertical growth and better pod development.

Neem oil (5 ml/L) was sprayed to manage aphids and pod borers. Wilt incidence was observed during the initial growth period. Green pods were harvested manually at intervals of 8–10 days once they reached edible maturity. Harvesting was continued throughout the cropping period to record yield per plant. Observations were recorded from 6 randomly selected plants of each plot in each replication. The characters studied were as follows:

Qualitative parameters: 1. Flower bud color, 2. Standard petal color, 3. Wing petal color, 4. Kell petal color, 5. Pod color, 6. Seed color

Quantitative parameters: 1.Vine length (cm), 2.Days to First Flowering, 3.Days to 50% Flowering, 4.Flower bud length (cm), 5.Flower bud width (cm), 6.Days to First harvest, 7.Pod length (cm), 8.Pod width (cm), 9.Number of Pods per plant, 10. Number of locules per pod, 11.Number of seeds per pod, 12. Individual Pod weight (gm), 13. Pod Yield per plant (kg).

## Results:

Morphological characterization plays a pivotal role in identifying and differentiating genotypes based on their phenotypic traits. The study of 25 pole-type Dolichos bean genotypes revealed a substantial range of variability across floral, pod, and seed traits, demonstrating the rich genetic diversity within the species. Six distinct pod color variations were observed: purple with green suture, green, purple, light green, green with pink suture, and deep purple. These colors are not merely aesthetic traits but also serve as potential indicators of genetic differences and environmental adaptability. Floral traits further reflected significant variability. Flower bud color was categorized into four types: pale purple, light green, white, and purple. Similarly, the standard petal color exhibited four variations: purple, lavender, white, and light green, while wing petal color was observed in three shades: purple, white, and lavender. The keel petal color displayed a broader spectrum, encompassing white, light purple, whitish purple, and purple. Seed color also displayed considerable diversity, categorized into three groups: brown, black, and white. The vine length among the genotypes ranged from 224.98 cm in Lembucherra Local-1 to 685.60 cm in Brahmanpuskarini Local-4. The time to first flowering varied significantly among the genotypes, ranging from 43 days in Lembucherra Local-2 to 136 days in VRSEM-937. Days to 50% flowering ranged from 46.66 days in Lembucherra Local-2 to 149.66 days in VRSEM-937. Flower bud traits showed significant variability, with flower bud length ranging from 1.16 cm in VRSEM-913 to 1.83 cm in Khowai Local-2. Flower bud width exhibited a similar trend, ranging from 1.03 cm in VRSEM-937 to 1.60 cm in Khowai Local-2. Days to first harvest, a critical indicator of maturity, varied from 56.66 days in Lembucherra Local-2 to 170.66 days in VRSEM-937. Pod length exhibited significant variability, ranging from 6.18 cm in VRSEM-913 to 12.06 cm in Khowai Local-2, with the longest pods observed in Khowai Local-2. Pod width ranged from 1.30 cm in VRSEM-937 to 3.82 cm in VRSEM-808. The number of pods per plant, a critical yield determinant, varied widely among the genotypes, ranging from 88.17 in VRSEM-702 to 702.80 in VRSEM-1. The number of locules per pod ranged from 3 in VRSEM-736 to 6 in VRSEM-1 and Kailashahar Local-1, while the number of seeds per pod varied from 3.66 in Lembucherra Local-1 to 6.00 in Kailashahar Local-1. These results emphasize the potential of genotypes with higher locule and seed counts for enhancing productivity. Individual pod weight exhibited wide variation, ranging from 2.68 g in Brahmanpuskarini Local-3 to 14.20 g in Brahmanpuskarini Local-4. Genotypes such as VRSEM-950 and VRSEM-808 also recorded higher pod weights, indicating their potential for high-yield breeding programs. The range of Yield per Plant was 0.68Kg to 4.01Kg. Maximum Yield/Plant was recorded in Khowai Local-2 (4.01 Kg) followed by Brahmanpuskarini Local-4 (3.84 kg), and the minimum was obtained in VRSEM-913 (0.68 Kg) followed by VRSEM-201 (0.72 kg).

**Figure 1: Variation in Pods of different Dolichos bean genotypes**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. NO.** | **Variety** | **Flower bud**  **color** | **Standard petal color** | **Wing petal**  **color** | **Kell petal**  **color** | **Pod**  **color** | **Seed**  **color** |
| **1.** | Brahman puskarini Local -1 | Pale purple | Purple | Purple | white | Purple & Green | Brown |
| **2** | Brahman puskarini Local -3 | Pale Purple | Purple | Purple | Light Purple | Purple & Green | Brown |
| **3** | Brahman puskarini Local -4 | Pale Purple | Purple | Purple | Whitish Purple | Purple & Green | Black |
| **4** | Kailashahar Local-1 | Pale Purple | Lavender | Purple | Whitish Purple | Purple & Green | Black |
| **5** | Kailashahar Local-2 | Pale purple | Purple | Purple | Light Purple | Green | Black |
| **6** | Sabroom Local-3 | Light Green | White | White | White | Green | Brown |
| **7** | Khowai Local -1 | Light Green | White | White | White | Green | Brown |
| **8** | Khowai Local-2 | Pale purple | Purple | Purple | Whitish Purple | Purple | Black |
| **9** | Lembucherra Local-1 | white | White | White | White | Light Green | Black |
| **10** | Lembucherra Local-2 | Pale purple | Purple | Purple | White | Purple& Green | Black |
| **11** | Lembucherra Local-3 | Pale purple | Purple | Purple | Light Purple | Green | Black |
| **12** | VRSEM-702 | Pale purple | Lavender | Lavender | White | Purple& Green | Black |
| **13** | VRSEM-938 | Pale purple | Purple | Purple | Purple | Green | Black |
| **14** | VRSEM-186 | Pale purple | Purple | Purple | white | Green & Pink | Black |
| **15** | VRSEM-736 | Light Purple | Lavender | Purple | White | Green | Deep Brown |
| **16** | VRSEM-950 | Pale purple | Purple | Purple | White | Green | Black |
| **17** | VRSEM-937 | White | White | White | White | Green | Brown |
| **18** | VRSEM-913 | Light Green | White | White | White | Green | White |
| **19** | VRSEM-808 | Purple | Purple | Purple | White | Light Green | Black |
| **20** | VRSEM-896 | Light Green | White | White | White | Green | Brown |
| **21** | VRSEM-45 | Pale purple | Purple | Purple | Purple | Purple & Green | Brown |
| **22** | VRSEM-943 | Light Green | Light Green | White | White | Light Green | Brown |
| **23** | VRSEM-201 | Purple | Purple | Purple | Purple | Deep Purple | Brown |
| **24** | VRSEM-839 | Purple | Lavender | Lavender | White | Green | Black |
| **25** | VRSEM-1 | White | White | White | White | Light Green | Brown |

**Table- 1: Characterization of 25 Dolichos bean genotypes based on qualitative traits**

**Table- 2a: Characterization of 25 Dolichos bean genotypes based on quantitative traits**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Genotypes** | **Vine length (cm)** | **Days to first flowering** | **Days to 50% flowering** | **Flower bud**  **Length (cm)** | **Flower bud width (cm)** | **Days to first harvest** |
| **1** | 439.90d | 81.66efg | 89.66de | 1.59def | 1.52b | 106efg |
| **2** | 354.91e | 72.66hij | 79.66fg | 1.33i | 1.29gh | 102.33fgh |
| **3** | 685.60a | 70.33hij | 75.00ghi | 1.66c | 1.46bcd | 84.66ijkl |
| **4** | 643.78a | 65.33jk | 71.00hij | 1.53g | 1.36efg | 83.33jkl |
| **5** | 344.14ef | 73.33hi | 78.33fgh | 1.74b | 1.34fgh | 93.66hij |
| **6** | 475.25cd | 83.00ef | 91.33de | 1.55fg | 1.33gh | 111.00ef |
| **7** | 452.87d | 87.33e | 96.33d | 1.64cd | 1.43cde | 116.00e |
| **8** | 658.60a | 67.00ij | 71.33hij | 1.83a | 1.60a | 80.00kl |
| **9** | 224.98g | 113.66cd | 124.00c | 1.34i | 1.30gh | 141.00cd |
| **10** | 679.12a | 43.00m | 46.66m | 1.52g | 1.34fgh | 56.66n |
| **11** | 350.84e | 74.00ghi | 79.66fg | 1.63cde | 1.45bcd | 95.33ghi |
| **12** | 441.27d | 112.33cd | 123.33c | 1.54fg | 1.36efg | 143.00cd |
| **13** | 549.17b | 69.00ij | 73.00ghi | 1.42h | 1.3gh | 90.00ijk |
| **14** | 648.51a | 87.00e | 92.00de | 1.58efg | 1.33gh | 107.66ef |
| **15** | 538.04bc | 58.66kl | 63.00kl | 1.64cd | 1.48bc | 74.66lm |
| **16** | 448.11d | 66.33ijk | 70.33ijk | 1.59def | 1.28h | 91.33hij |
| **17** | 346.25ef | 136.00a | 149.66a | 1.24j | 1.03j | 170.66a |
| **18** | 241.28g | 111.33d | 122.33c | 1.16k | 1.18i | 141.00cd |
| **19** | 545.73b | 107.33d | 117.33c | 1.21jk | 1.13i | 137.00d |
| **20** | 239.94g | 120.00bc | 132.00b | 1.46h | 1.18i | 148.66bc |
| **21** | 444.21d | 86.00e | 92.33de | 1.45h | 1.30gh | 110.00ef |
| **22** | 246.13g | 58.66kl | 64.33jkl | 1.33i | 1.43cde | 85.00ijkl |
| **23** | 281.59fg | 77.33fgh | 85.00ef | 1.67c | 1.51b | 109.66ef |
| **24** | 446.22d | 125.33b | 136.66b | 1.54fg | 1.40def | 156.66b |
| **25** | 649.30a | 57.00l | 62.33l | 1.75b | 1.48bc | 65.67mn |
| **SEm (±)** | 23.70 | 2.79 | 2.72 | 0.02 | 0.03 | 3.97 |
| **CD** | 67.42 | 7.93 | 7.73 | 0.05 | 0.07 | 11.30 |
| **CV (%)** | 9.02 | 5.74 | 5.15 | 2.19 | 3.32 | 6.37 |

**Figure 2: Mean Performance of 25 genotypes based on Days to first flowering,**

**Days to 50% flowering, Days to first harvest**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Genotypes**  **Table- 2b: Characterization of 25 Dolichos bean genotypes based on quantitative traits** | **Pod length (cm)** | **Pod width (cm)** | **Number of Pods per plant** | **Number of locules per pod** | **Number of seeds per pod** | **Individual pod weight (gm)** | **Pod Yield per plant (kg)** |
| **1** | 7.73hijkl | 1.84lm | 301.69de | 4.86bcde | 5.00bcd | 6.06kl | 1.97fgh |
| **2** | 6.51kl | 1.81mn | 332.68cde | 4.33ef | 4.33def | 2.68p | 0.93lm |
| **3** | 9.04efgh | 2.54efgh | 270.44efg | 5.33bc | 5.00bcd | 14.20a | 3.83ab |
| **4** | 10.69abcdef | 2.76de | 363.31cd | 6.00a | 6.00a | 9.67e | 3.43bc |
| **5** | 11.55abc | 2.65efg | 134.34ijk | 5.33bc | 5.00bcd | 8.50gh | 1.13jklm |
| **6** | 12.01a | 2.16ijk | 394.04c | 4.66de | 4.33def | 6.64jk | 2.64d |
| **7** | 11.07abcd | 2.75def | 207.12gh | 4.99bcd | 5.00bcd | 11.84c | 2.49de |
| **8** | 12.06a | 2.08ijkl | 530.13b | 5.33bc | 5.66ab | 8.17ghi | 4.01a |
| **9** | 6.51kl | 2.51efgh | 135.27ijk | 3.50gh | 3.66f | 5.56lm | 0.79m |
| **10** | 6.90jkl | 2.49fgh | 528.33b | 3.83fg | 3.66f | 4.68mn | 2.06efg |
| **11** | 7.10ijkl | 2.6efg | 192.85hij | 4.66de | 4.66cde | 4.64n | 0.91lm |
| **12** | 8.83fghi | 2.48gh | 88.17k | 4.83cde | 5.00bcd | 9.61ef | 0.84lm |
| **13** | 8.40ghij | 3.33b | 300.36de | 4.77cde | 4.66cde | 5.60l | 1.7ghi |
| **14** | 11.84ab | 2.02jklm | 369.07c | 5.50ab | 4.66cde | 8.73fg | 3.22c |
| **15** | 8.82ghi | 2.29hi | 233.7fgh | 3.00h | 4.00ef | 10.69d | 2.34def |
| **16** | 10.88abcde | 2.97cd | 125.01k | 4.66de | 4.33def | 13.27b | 1.65ghi |
| **17** | 9.12efgh | 1.30o | 233.09fgh | 5.00bcd | 5.00bcd | 3.80no | 1.00klm |
| **18** | 6.18l | 2.21ij | 193.35hi | 4.66de | 4.33def | 3.71o | 0.68m |
| **19** | 9.99bcdefg | 3.82a | 100.93k | 5.16bcd | 5.33abc | 12.96b | 1.3ijkl |
| **20** | 12.04a | 2.52efgh | 114.6k | 5.00bcd | 4.66cde | 7.61i | 0.87lm |
| **21** | 9.85cdefg | 2.56efg | 294.18ef | 5.33bc | 5.33abc | 5.72l | 1.54hij |
| **22** | 8.33ghijk | 1.56n | 140.75ijk | 4.83cde | 4.66cde | 7.80hi | 1.09jklm |
| **23** | 8.54ghij | 3.12bc | 127.65jk | 5.00bcd | 5.00bcd | 5.63l | 0.72m |
| **24** | 6.83jkl | 2.51fgh | 191.60hij | 3.83fg | 4.00ef | 7.48ij | 1.42ijk |
| **25** | 9.66defg | 1.95klm | 702.8a | 6.00a | 5.67ab | 5.66l | 3.54bc |
| **SEm (±)** | 0.66 | 0.09 | 22.97 | 0.23 | 0.29 | 0.31 | 0.16 |
| **CD** | 1.87 | 0.25 | 65.31 | 0.66 | 0.82 | 0.88 | 0.46 |
| **CV (%)** | 12.37 | 6.38 | 15.06 | 8.31 | 10.47 | 7.05 | 15.26 |

**Figure 3: Mean Performance of 25 genotypes based on pod yield per plant**

### Discussion:

### Qualitative parameter:

### This morphological variability not only highlights the extensive genetic base of Dolichos bean genotypes but also provides valuable information for breeding programs. The diversity in floral traits, particularly petal colors and bud morphology, can have implications for pollination efficiency and attractiveness to pollinators, which in turn affects seed production. These findings align with previous research (Kalauni *et al*., 2019; Bansod *et al*., 2021; Preetham *et al*., 2020), which also emphasized the genetic variability of Dolichos beans across different ecological and geographical regions. The mean performance analysis provided insights into the variability and performance of the genotypes across the studied traits, emphasizing the genetic potential of the Dolichos bean.

### Quantitative parameter:

### The substantial difference in vine length suggests variability in vegetative growth potential, which is an important trait for pole-type Dolichos beans, as longer vines can potentially support more pods and higher yields. Brahmanpuskarini Local-4, with the longest vines, demonstrated its potential as a genotype with robust vegetative growth. Previous studies have reported similar maximum vine lengths in Dolichos bean, including Ravinaik *et al*. (2015) at 350 to 510 cm, and Jyothireddy *et al*. (2018) at 57.98 to 462.17 cm. Days to first flowering and 50% flowering results indicate that certain genotypes, such as Lembucherra Local-2, exhibit early flowering, making them suitable for regions with shorter growing seasons or where early harvests are desirable. In contrast, late flowering genotypes like VRSEM-937 may be better suited for extended growing seasons, where prolonged flowering and pod production are advantageous. Jyothireddy *et al*. (2018) had also recorded days to first flowering ranged from 54.00 to 105.50 days in Dolichos bean. days for 50% flowering results are consistent with the findings of Chattopadhyay and Dutta (2010) reported a range of 57 to 115 days, Parmar *et al*. (2013) observed 39.33 to 147.30 days, and Jyothireddy *et al*. (2018) documented a range of 67.50 to 122.50 days. The larger flower buds observed in Khowai Local-2 may contribute to higher pollination success and seed set, further emphasizing its potential as a high-yielding genotype. The results of flower bud length and width are consistent with those reported by Preetham *et al*. (2020). The wide range in days to harvesting among the genotypes provides opportunities for breeding programs to develop early, medium, and late-maturing varieties tailored to specific agro-climatic conditions. Similar findings for days to pod harvest have been documented by Parmar *et al*. (2013) in PD-1 (91.66 days), while Kumar *et al*. (2014) observed 94 days in DWDFB-53. Pod length and width findings highlight the potential of certain genotypes, such as Khowai Local-2 and VRSEM-808, for producing larger pods, which are often preferred in commercial markets. Chattopadhyay and Dutta *et al*. (2010) had also recorded pod width ranged from1.44 to 3.11 cm and pod lengths ranging from 7.15 to 15.05 cm. Genotypes such as Khowai Local-2 and Lembucherra Local-1 also exhibited high pod counts, making them promising candidates for yield improvement programs. Similar findings have been observed in previous studies by Islam *et al*. (2011). The variability in pod yield per plant underscores the influence of both genetic and environmental factors on this trait, which is critical for marketability and consumer preference. The findings are consistent with those observed by Preetham *et al*. (2020) and Gupta *et al*. (2017).

### Conclusion:

The results of this study underscore the significant genetic variability observed among 25 pole type Dolichos bean genotypes, offering valuable insights into their diverse morphological, phenological, and yield related traits. This genetic diversity is a crucial resource for the development of robust breeding programs aimed at enhancing yield potential, adaptability to various environmental conditions, and marketability of Dolichos beans. By leveraging this variability, breeders can select and combine traits that address specific agricultural challenges, including biotic and abiotic stress tolerance, to promote sustainable crop production.

The identification of superior genotypes such as Khowai Local-2, VRSEM-1, and Brahmanpuskarini Local-4 is particularly noteworthy. These genotypes demonstrated exceptional performance in terms of yield and other agronomically important traits, making them strong candidates for inclusion in future breeding programs. Their potential to serve as parental lines in hybridization efforts could lead to the development of high-performing, location specific cultivars tailored to meet the needs of both farmers and consumers.

Moreover, the findings of this study contribute significantly to the understanding of the genetic diversity inherent in Dolichos beans, a vital component of legume crop systems. This knowledge is instrumental in addressing global food security challenges by promoting crop diversification and resilience. The ability of Dolichos beans to fix atmospheric nitrogen, coupled with their adaptability to marginal lands, further underscores their importance in sustainable agricultural development.

In conclusion, the study not only highlights the genetic potential of pole-type Dolichos beans but also paves the way for advanced research and breeding efforts. By utilizing the superior genotypes identified and the rich genetic variability observed, breeders and researchers can work towards enhancing the productivity, nutritional value, and ecological benefits of Dolichos beans, ultimately contributing to the goals of sustainable agriculture and global food security.

**Conflict of Interest**

The author declares no conflict of interest. The manuscript has not been submitted anywhere for the purpose of publication in any other journal.

**Disclaimer (Artificial Intelligence):**

The authors hereby declare that No generative AI technologies such as Large Language Models (COPILOT, Chat GPT etc.) and text to image generators have been used during the writing or editing of this manuscript.

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