



## **Morphology and Yield Potentials of Lablab Bean Genotypes Grown in Early Kharif Season**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. Authors DDN and MSI designed the study and performed the statistical analysis. Authors DDN and JF wrote the protocol and first draft of the manuscript. Authors JF and TA managed the literature searches and analyses of the study. All authors read and approved the final manuscript.*

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### **ABSTRACT**

An experiment was conducted during March 2014 to August 2014 at the experimental field of Sylhet Agricultural University (SAU), Sylhet to study the morphological variability, yield and yield contributing characteristics among the four lablab bean genotypes viz., SB003, SB010-1, SB011 and BP003. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. The genotypes SB003 and SB010-1 had reddish brown seed coat color while it was black in SB011 and reddish color in the genotype BP003. Among the genotypes 100 dry seed weight was ranged from 34.00 g (SB010-1) to 42.00 g (SB011). Variation in yield and yield contributing characteristics were found among four lablab bean genotypes. The genotype SB003 produced the maximum number of pods plant<sup>-1</sup> (206.3) followed by SB010-1 (134.3) while it was minimum for the genotype SB011 (92.67). Similar trend was also noticed in case of pod yield plant<sup>-1</sup> among the genotypes. The highest pod yield was recorded in the genotype SB010 (7.73 ton ha<sup>-1</sup>) while it was the lowest in SB011 (2.87 ton ha<sup>-1</sup>). However, pod yield ha<sup>-1</sup> indicating bright scope to popularize lablab bean production during early kharif in Sylhet region.

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## 1. INTRODUCTION

Lablab bean (*Lablab purpureus* L.) commonly known as country bean or sheem in Bangladesh is a highly proteineous legume and a major winter vegetable. Its cultivation and use are so widespread that in the winter, it would be almost impossible to find a homestead in rural Bangladesh without a vine of country bean. This bean is considered as one of the oldest cultivated crops of the world [1]. It is believed to have originated in Indian Subcontinent [2,3] and then spread to the other parts of the world. In Bangladesh, it is commercially cultivated in Comilla, Noakhali, Sylhet, Dhaka, Kishoregonj, Tangail, Jessore, Pabna and Dinajpur [4]. Availability of lablab bean is restricted in winter months due to its photo-sensitive behaviour. It is a short day plant and critical day length for those winter varieties is 12-13 hours. To mitigate this problem Horticulture Research Center (HRC) of BARI has developed some photo-insensitive line through genetic manipulation [5]. But their morphological variations and yield performances are not properly assessed under Sylhet condition. Islam *et al.*, [6] found significant physico-morphological variations among different genotypes grown in Bangladesh. Yield and yield attributes are also different among the genotypes [7]. These variations are useful material to plant breeder for crop improvement. Therefore, present experiment was undertaken to assess the morphological variability and yield performances among the collected genotypes.

## 2. MATERIALS AND METHODS

The experimental plot was located at the Horticulture research field of Sylhet Agricultural University, Sylhet and the experimental period was March 2014 to August 2014. Four lablab bean genotypes were used in the experiment. The seeds of these genotypes were collected from the Department of Horticulture, Sylhet Agricultural University, Sylhet. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. The unit plot size was 1.5 m × 6.0 m accommodating single row per bed. Pits were spaced 1.0 m in a bed and 2.0 m between two adjacent beds. The experimental plots were prepared by digging pits about two weeks before sowing. The land was fertilized with cowdung, urea, TSP and MoP @ 10 ton, 50 kg, 150 kg and 150 kg ha<sup>-1</sup>, respectively. Full dose of cowdung, TSP and half of the MoP

were applied during pit preparation two week before transplanting. The remaining MoP and urea were applied in three equal installments as top dressing at 15, 30 and 45 days after transplanting. Hence the land was acidic in nature, lime (Dolomite) was applied in the field @ 4 kg decimal<sup>-1</sup>. The soil of the pits and basal dose of fertilizers mixed well and prepared in such a way that the pit tops remained at least 10 cm above the ground level to facilitate drainage. For planting two seeds of the five genotypes were sown in polybags containing well prepared soil mixture on 5 March 2014. Then 10 day old seedlings were transplanted in the pit and out of two seedlings; one was thinned out two weeks after transplanting the young growing plant was supported by a single bamboo stake in each pit. Weeding and irrigation was done whenever necessary. The experiment was protected from herbivorous animals (e.g. cows, sheep, goats, etc.). Fencing was made around the experimental plots for this purpose. The pods were also protected from aphids, jute hairy caterpillar (*Spilosoma obliqua*) and pod borer (*Maruca vitrata*) attack by applying Maladan @ 2 ml L<sup>-1</sup> of water. Data were recorded from all experimental plants on different morphological parameters, yield and yield attributes and were analyzed using MSTAT software for interpretation of results.

## 3. RESULTS AND DISCUSSION

### 3.1 Qualitative Characteristics of Seed and Seedlings

Qualitative characteristics of seed and seedlings of lablab bean genotypes are presented in Table 1. Out of five groups of seed shape (round, flat, oval, drum and elongate) only two were found in this experiment viz. oval in SB003 and round in SB010-1, SB011 and BP003. Black, reddish and reddish brown seed color was recorded among the four genotypes. Similar variations in case of seed shape and seed color also reported by Islam *et al.* [6]. Only light green was observed among the four genotypes by visual observation in case of cotyledon and hypocotyl color. Islam [8] observed two types of cotyledon color (green and white) and two types of hypocotyl color (purple and white) studied with 44 genotypes. There was no variation noticed among the genotypes in terms of vein color of primary leaves and leaf color. Sultana [9] found green and purple vein color among 107 hyacinth bean

Table 1. Qualitative characteristics of seed and seedlings of lablab bean genotypes

Genotype	Seed shape	Seed colour	Cotyledon colour	Hypocotyl colour	Vein color of primary leaves	Leaf color	Flower colour	Pod colour	Pod curvature	Pod beak shape
SB003	Oval	Reddish brown	Light green	Light green	Green	Green	White	Deep green	Slightly curved	Short beak
SB010-1	Round	Reddish Brown	Light green	Light green	Green	Green	White	Deep green	Slightly curved	Short beak
SB011`	Round	Black	Light green	Light green	Green	Green	Purple	Purplish green	Slightly curved	Thick beak
BP003	Round	Reddish	Light green	Light green	Green	Green	White	Light green	Slightly curved	Thick beak

Table 2. Quantitative characteristics of lablab bean genotypes

Genotype	100 dry Seed weight (g)	Seedling height (cm)	Primary leaf length (cm)	Primary leaf breadth (cm)	No of leaves seedling <sup>-1</sup>	Terminal leaflet length (cm)	Terminal leaflet breadth (cm)	Petiole length (cm)	Inflorescence length (cm)
SB003	41.30a	76.03a	7.40a	7.93a	6.67	10.33ab	9.10c	7.47a	44.83ab
SB010-1	34.00b	65.00b	6.90a	7.20ab	6.60	10.83a	10.40a	8.38a	35.42c
SB011`	42.00a	57.45c	7.00a	7.50a	6.20	9.76b	9.53b	6.61b	47.58a
BP003	36.50b	47.87d	5.18b	6.05b	6.67	9.63b	9.50b	7.87a	41.50b
F-test	**	**	*	*	ns	*	**	**	**
CV%	4.47	3.43	10.79	9.73	11.60	4.67	1.04	5.79	6.01

ns = not significant; \*, \*\* = significant at 5% and 1% level respectively; Means followed by the same letters in a column do not differ significantly at 5% level of probability

Table 3. Pod yield and yield attributes of lablab bean genotypes

Genotype	Days to first flower	Days to first harvest	Harvesting duration (days)	Pod length (cm)	Pod breadth (cm)	No. of seeds pod <sup>-1</sup>	No. of pods plant <sup>-1</sup>	Individual pod weight (g)	Pod yield plant <sup>-1</sup> (kg)	Pod yield (ton ha <sup>-1</sup> )
SB003	50.67	76.67b	46a	10.23a	2.32b	4.46	206.3a	5.67a	1.16a	7.73
SB010-1	50.33	80.33ab	38b	9.56ab	2.42ab	4.18	134.3b	5.76a	0.78b	5.20
SB011`	49.67	75.67b	46a	8.33c	2.32b	4.67	92.67c	4.58b	0.43c	2.87
BP003	54.33	85.00a	28c	8.99bc	2.65a	3.93	127.3b	4.63a	0.71b	4.73
F-test	ns	*	*	**	*	ns	**	*	**	**
CV%	4.27	3.94	11.3	2.89	4.93	7.30	7.54	7.55	10.63	10.63

ns = not significant; \*, \*\* = significant at 5% and 1% level respectively; Means followed by the same letters in a column do not differ significantly at 5% level of probability

genotypes. Two types of flower color were observed among the genotypes where it was purple in SB011 and white in all other genotypes. In case of pod characteristics three types of pod color (light green, deep green and purplish green) were found among the genotypes and the pod curvature was recorded slightly curved for all genotypes while pod beak shape were thick for SB011 and BP003 and short for SB003 and SB010-1. This result about qualitative characteristics of pod is agreed with the findings of Islam et al. [10]. These kinds of variations regarding qualitative characteristics are useful materials for plant breeders to study the inheritance of characteristics.

### 3.2 Quantitative Characteristics of Lablab Bean Genotypes

Quantitative characteristics of the lablab bean genotypes are presented in Table 2. Before sowing it was found that 100 dry seed weight was significantly differed among the genotypes ranged from 34.0 g to 42.00 g while it was the highest in SB011 and lowest in BP003. Among the genotypes the tallest seedling (76.03 cm) at transplanting was recorded from the genotypes SB003 while it was the shortest in BP003 (36.50 cm). Primary leaf size was significantly differed among the genotypes. The maximum length and breadth (7.40 cm and 7.93 cm) were recorded from SB003 while both of these were the minimum in BP003 (5.18 cm and 6.05 cm). Almost all the genotypes had the similar number of leaves seedling<sup>-1</sup> ranged from 6.20 to 6.67. Islam [8] also reported the similar result in case of number of leaves seedling<sup>-1</sup> at transplanting studied with 44 genotypes. Significant variations were also observed in case of terminal leaflet length, leaflet breadth, petiole and inflorescence length. Terminal leaflet length was the maximum in SB010-1 (10.83 cm) and minimum in BP003 (9.63 cm) while breadth was the maximum in SB010-1 (10.40 cm) and minimum in SB003 (9.10 cm). The highest petiole length was measured from SB010-1 (8.38 cm) while it was the lowest in SB011 (6.61 cm). Inflorescence length among the four genotypes was the maximum in SB011 (47.58 cm) and minimum in SB010-1 (35.42 cm). Gupta et al. [11] observed that, the inflorescence length was negatively correlated with green pod yield plant<sup>-1</sup> studied with 38 genotypes.

### 4. POD YIELD AND YIELD ATTRIBUTES

Significant variations were observed on pod yield and yield attributes of four lablab bean genotypes

except days to first flower and number of seeds pod<sup>-1</sup> are presented in Table 3. Days to first flowering among the different genotypes were varied from 49.67 (SB011) to 54.33 (BP003) which was about a week later from the findings of Purseglove [2], who reported that some of the hyacinth bean varieties can produce flower at about 6 weeks after sowing. Sultana (2001) also reported similar results. Significant variation was recorded for days to first harvest which was the minimum in SB011 (75.67) and maximum in BP003 (85.00). Harvesting duration of the four genotypes were recorded was the maximum in SB003 (48 days) and minimum in BP003 (28 days). The genotype SB003 produced the longest (10.23 cm) pod while it was the shortest in SB011 (8.33 cm). Pod breadth of the genotypes ranged from 2.32 to 2.65 cm while it was the maximum for BP003 and minimum for SB003 and SB011. Pengelly and Maass [12] reported pod length ranged from 2.5 to 14.0 cm and breadth 1.6 to 3.2 cm among 249 genotypes studied in Australia. Similar variation in respect of pod length was also reported by Sultana [9]. The number of seeds pod<sup>-1</sup> was ranged from 3.9 to 4.67. Barua et al. [13] recorded the number of green seeds pod<sup>-1</sup> ranged from 4.33-5.33. The highest pod yield plant<sup>-1</sup> was recorded from the genotype SB003 (1.16 kg) since the number of pods plant<sup>-1</sup> (206.3) was almost double compared to other genotypes. The pod yield was lowest (0.43 kg plant<sup>-1</sup>) for SB011 due to lowest number of pods plant<sup>-1</sup> (92.67) and lowest individual pod weight (4.58 g). Similar result was obtained by Abdullah [14], who found that yield depends mainly on the number of pods plant<sup>-1</sup>. Similar trend also found in case of pod yield ha<sup>-1</sup> which was the highest for SB003 (7.73 ton ha<sup>-1</sup>) and lowest for SB011 (2.87 ton ha<sup>-1</sup>).

### CONCLUSION

Among the genotypes, the genotypes SB003 and SB010-1 showed better performance especially in respect of pod yield. Therefore, these genotypes can be taken under consideration for commercial cultivation in early kharif season in Sylhet region.

### COMPETING INTERESTS

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these

products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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