Journal BiNET
Scientific Publication

Published with Open Access at Journal BiNET
Vol. 30, Issue 02: 2570-2580
Journal of Bioscience and Agriculture Research

Journal Home: www.journalbinet.com/jbar-journal.html

Effects of growing mediums on the growth and yield of pot-grown Yard long bean (*Vigna unguiculata*)

Prantika Datta, Zahidul Hasan Zahid and Mehede Hassan Rubel

Department of Agriculture, Noakhali Science and Technology University, Sonapur, 3814-Bangladesh.

✉ For any information: mehede@nstu.edu.bd (Rubel MH)
Article received: 18.07.2023; Revised: 18.08.2023; First published online: 15 October, 2023

ABSTRACT

Yard long bean (Vigna unguiculata) is an important leguminous crop of tropical countries due to its good taste and nutritive value and it is very common vegetable cultivated by the farmers of South Asian countries, including Bangladesh. A pot experiment was conducted to evaluate the effect of different growing media on growth and yield of two varieties of yard long beans based on Randomized Complete Block Design (RCBD) with three replications at Cumilla from 4 August to 15 October 2020. Different morphological parameters for the varieties showed significant variation for different growing media. The highest leaf length (8.2) was recorded in soil and cocopeat medium (M_2), while the lowest (5.3) was observed in cocopeat and control (soil) media. The highest number of fruits per plant (20.5) was recorded in V_1M_2 (kagornatki variety × soil and cocopeat media). Maximum fruit length (43cm) was recorded in the kagornatki variety, followed by xinxiang-1820 (42cm) variety. In principle component analysis, first three components (76.53%, 12.59% and 10.88%) were recorded, which is statistically significant for variations, while in coefficient correlation, the positive highly significant genotypic associations (r≥0.72) were found in plant height with number of fruits per plant (r=0.92), fresh and dry weight of fruits per plant (r=0.90 and 0.87) and yield/pot (r=0.91). A maximum number of seeds per fruit (16.6) was found in kagornatki followed by Xinxiang-1820 (14.5) in soil and cocopeat medium. The maximum fresh weight (20.3g), dry weight (12.50g) and yield/pot (420.25g) were recorded by V_1M_2 (kagornatki variety × soil and cocopeat media), whereas V_1M_1 (Kagornatki × cocopeat) and V_1M_0 (Kagornatki × soil) showed the lowest performance. So, the variety kagornatki with soil and cocopeat media was found effective based on the overall performance for cultivation under the agro-climatic condition of Cumilla.

Key Words: *Growing media, Pot cultivation, Cocopeat and Yield performance.*

Cite Article: Datta, P., Zahid, Z. H. and Rubel, M. H. (2023). Effects of growing mediums on the growth and yield of pot-grown Yard long bean (*Vigna unguiculata*). Journal of Bioscience and Agriculture Research, 30(02), 2570-2580.
Crossref: https://doi.org/10.18801/jbar.300223.310

Article distributed under terms of a Creative Common Attribution 4.0 International License.

I. Introduction

Yard long bean, also known as Vegetable cowpea, is a popular leguminous vegetable grown extensively in Asia, particularly in South Asian and Southeast Asian countries. It belongs to the

Published with open access at journalbinet.com
EISSN: 2312-7945, © 2023 The Authors, Research paper

Fabaceae family and has the chromosome number 2n = 2x = 22 (Fana et al., 2004). This climbing annual vine produces indeterminate vines reaching 9 to 12 feet. The pods, which hang in pairs, should be harvested before they mature (Coker et al., 2021). Yard long beans are grown for their crisp, soft green pods, which are good either raw or cooked. It is thought that the yard long bean was domesticated from cultivated cowpea in Asia (Kongjaimun et al., 2012).

The cultivation of yard long beans is increasing every year due to their commercial value and high yield. It requires a sunny area for optimal growth, although excessive shade can reduce flowering and bean production. Yard long bean is not very particular about soil pH but thrives in a pH range of 6.0 to 7.5 It can withstand heat and relatively dry conditions better than pole beans because it is a day-neutral plant. However, it requires higher rainfall than the more drought-tolerant black-eyed pea (Purseglove et al., 1968). As one of the most significant leguminous vegetables, it is abundantly grown in Bangladesh during the summer. Currently, yard long beans are grown extensively across Asia, particularly in South Asian and Southeast Asian nations (Huque et al., 2012). Bangladesh produces 33281.75 metric tons of yard long bean from 17680.08 acres of land, the average yield being 1882.44kg/acre (BBS, 2020). Yard long beans have a relatively short shelf life due to their high respiration rate and susceptibility to wilting. They are chilling-sensitive and can be injured when stored at temperatures below 10°C. The yard long bean is grown largely for its pods, unlike other vigna crops that are farmed for their seeds (Rubatzky, 1997). However, specific nutrient guidelines for organically grown yard long beans in pots are lacking. Excessive application of organic manures can lead to excessive vegetative growth. Therefore, it is essential to determine suitable growing media and organic nutrient regimes for pot-grown yard long beans.

Using pots to produce yard long bean vegetables is significant because they enhance plant growth and productivity. Hence, selecting an adequate growing medium is one of the greatly significant appreciations when raising containerized vegetable crops. The word "growing medium," among others, describes the material used in a container to care for a plant. The terms "rooting media" (Verhagen and Blok, 2009) and "substrate" (Schroeder, 2007; Vaughn et al., 2011) are also used interchangeably. Growing media are materials used to grow plants that aren't actual soil. These can be inorganic materials like clay, perlite, vermiculite, or mineral wool or organic materials including peat, compost, tree bark, coconut (*Cocos nucifera* L.) coir, and chicken feathers (Grunert et al., 2008; Vaughn et al., 2011). Peat and compost, coir and clay, and other combinations are examples of other combinations (Nair et al., 2011). Vegetable growth media have been created using a variety of substances. According to local availability, different raw materials are used around the world (Schmilewski, 2009). Growing media are frequently made from a combination of several raw materials to obtain the ideal balance of air and water holding capacity for the plants to be grown as well as for the medium's long-term stability (Bilderback et al., 2005; Nair et al., 2011). Thus, it is crucial to identify adequate growing media that improve identical emergence, growth and yield of yard long bean.

There is a scarcity of distinct nutrient directions for yard long bean risen organically in pots. Field research indicated that applying abundant organic manures may lead to excess vegetative development. However, the effect of an increased dose of organic nutrients on pot risen yard long bean has not been experimented. Although yard long bean is a leguminous crop, preliminary development and installation require a starter amount of split requisition of fermented manures, which may enhance the feedback of applied nutrients. Against this backdrop, the current examination was attempted to observe a suitable development medium and to regularize an organic nutrient record for pot (growbag) risen yard long bean variety Kagornatki and Xinxiang-1820.

II. Materials and Methods

The experiment was carried out on the roof of Datta villa in Rasecourse, Adarsha sadar Cumilla, from 4 August to October 15. Geographically, the experimental field was located at 23.27°" N latitude and 91.12°" E longitude. The experiment was undertaken to know the effects of growing mediums on the growth and yield of pot-grown yard long bean. The experiment had three replications and was set up using the Randomized Complete Block Design (RCBD). The treatments comprised three growing media (M_0: Normal soil (control); M_1: Cocopeat; M_2: Soil and cocopeat) and two varieties (V_1: Kagornatki; V_2: Xinxiang-1820).

Published with open access at journalbinet.com
EISSN: 2312-7945, ©2023 The Authors, Research paper

So, the treatment combination are:

$V_1 \times M_0$: Kagornatki × Soil
$V_1 \times M_1$: Kagornatki × Cocopeat
$V_1 \times M_2$: Kagornatki × (Soil and Cocopeat)
$V_2 \times M_0$: Xinxiang × Soil
$V_2 \times M_1$: Xinxiang × Cocopeat
$V_2 \times M_2$: Xinxiang × (Soil and Cocopeat)

Eighteen empty plastic pots with 30cm depth and 35cm diameter were used for the experiment and are clean, with plenty of room for roots, lightweight for easy handling and drainage holes in the bottom. Seeds were sown in every pot and after sowing of seeds, pots were kept in a protected environment that provided their basic needs of warm temperatures, water and oxygen. Three plants were kept in each pot and the rest were removed after recording the germination data. Regular weeding was carried out on the pot to prevent crop weed competition and the plant was irrigated after sowing and later, irrigation was given at 2-3 days intervals to maintain uniform soil moisture. Data were recorded on the following parameters such as number of leaves per plant, length of leaves per plant, width of leaves (cm), number of branches per plant, plant height (cm), no. of fruits per plant, length of fruits (cm), number of seeds per fruit, fresh weight of fruits per plant (g), dry weight of fruits per plant (g), fresh weight of seeds per fruit (g), dry weight of seeds per fruit (g) and yield per pot (g). Data from three different analyses were shown as means and standard deviation. Principal Component Analysis (PCA) and Correlation coefficient were carried out using the Minitab 17 statistical software package. A two-way analysis of variance (ANOVA) was carried out in accordance with a factorial design on the basis of Randomized Complete Block Design (RCBD), and the significant differences between the pairs of means were separated by Tukey's pairwise comparison.

III. Results

Effects of growing mediums on vegetative traits

Number of leaves per plant: Genetics determine the number of leaves on a plant, and in this study, different varieties did not cause significant changes in leaf count (V_1) had the most leaves (30.33), while Xinxiang had the fewest (27.33) when grown in (M_1). Variety and media did not interact significantly regarding leaf quantity. V_1M_2 had the highest leaf count (37.33), followed by V_2M_2. The lowest leaf count (30.33) was found in V_1M_1 (Table 01).

Length of leaves per plant: Leaves are essential appendages on plant stems and play a crucial role in photosynthesis, generating food for the plant. In the study, the combination of soil and cocopeat mixture produced the longest leaves (8.57 cm), while the cocopeat media (M_1) yielded the shortest leaves (5.23cm). The interaction between the growing media and plant variety had a significant impact on leaf length. The treatment V_1M_2 (Kagonatki with soil and cocopeat media) consistently produced the longest leaves, which differed significantly from other treatments. V_2M_2 (Xinxiang-1820 with soil and cocopeat media) had the second-highest leaf length (7.57 cm) throughout most growth stages (Table 01).

Width of leaves: Leaf breadth showed a highly significant difference due to the medium used. M_2 resulted in the widest leaves while M_1 had the narrowest leaves. Varieties also exhibited significant variation in leaf width, with V1 having the widest leaves and V_2 having the narrowest leaves. There was no significant difference in leaf breadth due to the interaction between the medium and variety. Among the treatments, V_1M_2 produced the widest leaves (5.8cm), while V_2M_1 had the narrowest leaves (3.07cm). V_2M_2 and V_1M_1 fell in between these extremes (Table 01).

Number of branches per plant: Vegetative growth of yard long beans involves branch formation. The number of branches was recorded for plants grown in different plant growing media. M_2 resulted in the highest number of branches, followed by M_0 and M_1. Significant variations were observed in the number of branches among different varieties. V_1 had the maximum number of branches (6.7), while V_2 had the minimum number of branches (5.7). The interaction between the growing media and variety did not yield significant variations in the number of branches per plant. V_1M_2 had the highest number of branches per plant (8.27), while V_2M_1 had the lowest number of branches per plant (4.57) (Table 01).

Plant height: Plant height increased progressively until reaching 100% flowering. The tallest plant was observed in M_2 media with the Kagornatki variety, while the shortest plant height was recorded in

Published with open access at journalbinet.com
EISSN: 2312-7945, © 2023 The Authors, Research paper

M_1 medium. Both the media and variety significantly influenced plant height. V_1M_2 exhibited the tallest plants (143.30 cm), followed by V_2M_2, which differed from V_1M_0 (137.73 cm). The lowest plant height (124.77 cm) was observed in V_2M_1 (Table 01).

Table 01. Effect of variety and treatment on vegetative stage

Treatment	Plant height (cm)	Number of leaves/plant	Leaf length (cm)	Leaf width (cm)	Number of branch/plant
V_1M_0	137.73 c	33.33 c	7.07 b	4.93 c	6.23 c
V_2M_0	134.97 d	31.33 d	5.93 c	4.13 d	5.53 d
V_1M_1	127.10 e	30.33 d	6.60 d	3.87 e	5.57 d
V_2M_1	124.77 f	27.33 e	5.23 e	3.07 f	4.57 e
V_1M_2	143.30 a	37.33 a	8.57 a	5.80 a	8.27 a
V_2M_2	139.87 b	34.67 b	7.57 b	5.03 b	7.17 b
LSD (5% level of significance)	*	NS	*	*	NS
Standard Error (±)	0.31	0.51	0.16	0.04	0.11
CV %	0.28	1.93	2.81	1.13	2.25

Here, V_1= Kagornatki, V_2= Xinxiang-1820, M_0= Control (Soil), M_1= Cocopeat, M_2= Soil + Cocopeat, NS= Non significant, *= Significant.

Effects of growing mediums on reproductive traits

Number of fruits per plant: M_2 yielded the highest number of fruits (19.43) compared to the other media, followed by the control group M_o. M_1 resulted in the lowest number of fruits (13). Variety significantly influenced the number of fruits per plant, with V_1 producing the maximum number (16.78) and V_2 producing the minimum number (15.42). The interaction between growing media and variety did not lead to significant variations in the number of fruits per plant. The number of fruits increased with plant age in all treatments. V_1M_2 had the highest number of fruits (20.27) throughout the experiment, followed by V_2M_2 (18.60). The lowest number of fruits (12.37) was observed in V_2M_1, and V_1M_1 had slightly more fruits (13.63) (Table 02).

Fruit length: Variety significantly affected the length of fruits, with V_1 producing the longest (40.88 cm) and V_2 producing the shortest (39.44 cm). The plant growing medium also had a significant impact on fruit length. The control group M_0 and M_2 had the largest fruit length (41.33 cm), while the second medium M_1 resulted in the shortest fruit length (38.33 cm). The interaction between variety and plant growing medium did not significantly affect fruit length. The maximum fruit length (46.33 cm) was observed in V_1M_2, and the minimum fruit length (35.67 cm) was found in V_2M_1 (Table 02).

Number of seeds per fruit: The plant growing medium significantly affected the number of seeds per fruit. M_2 produced the highest number of seeds per fruit (15.50), followed by the control group M_0, while M_1 resulted in the lowest number of seeds per fruit (9.9). Variety also significantly influenced the number of seeds per fruit. V_1 had the highest number of seeds per fruit (13.46), while V_2 had the lowest number of seeds per fruit (12). The interaction between plant growing medium and variety had a significant impact on the number of seeds per fruit. The highest number of seeds per fruit (16.60) was observed in V_1M_2, followed by V_2M_2 (14.40), while the lowest number of seeds (9.37) was found in V_2M_1 (Table 02).

Fresh weight of fruits per plant: The growing medium significantly affected the fresh weight of fruits per plant. M_2 resulted in the highest fresh weight of fruits (19.33g), while M_1 yielded the lowest fresh weight (12.71g). Variety also significantly influenced the fresh weight of fruits per plant. V_1 had a higher fresh weight of fruits per plant (17.10g) compared to V_2, which produced 15.14g. The interaction between plant growing medium and variety did not significantly affect the fresh weight of fruits per plant. V_1M_2 had the highest fresh weight (20.37g), followed by V_2M_2 (18.30g), while V_2M_1 had the lowest fresh weight (11.80g) (Table 02).

Dry weight of fruit per plant: The plant growing medium had a remarkable impact on the dry weight of fruits per plant. M_0 resulted in a dry weight of 8.88g, M_1 yielded 7.88g, and M_2 produced the highest dry weight of 11. 48g. Variety also significantly affected the dry weight of fruits per plant. V_1 had a

Published with open access at journalbinet.com
EISSN: 2312-7945, ©2023 The Authors, Research paper

higher dry weight of fruits per plant (10.15g) compared to V_2, with 8.67g. There was a significant interaction between the plant growing medium and variety on the dry weight of fruits per plant. V_1M_2 had the highest dry weight (12.47g), while V_2M_1 had the lowest dry weight (7.30g) (Table 02).

Fresh weight of seeds per fruit: The plant growing medium had a significant influence on the fresh weight of seeds per fruit. M_2 resulted in a higher fresh weight compared to the control M_0. In V_2, the maximum fresh weight of seeds per fruit (7.65g) was observed in M_2, followed by M_0 (6.56g) as the control, and the minimum fresh weight of seeds per fruit (6.4g) was recorded in M_1 in V_1. There was a significant interaction between the plant growing medium and variety on the fresh weight of seeds per fruit. V_1M_2 had the highest fresh weight of seeds per fruit (8.40g), followed by V_2M_1 had the lowest fresh weight of seeds per fruit (5.03g) (Table 02).

Dry weight of seeds per fruit: Growing medium had a significant impact on the dry weight of seeds in yard long bean. M_2 resulted in the highest dry weight of seeds (6.35g), followed by M_0 (5.58g) as the control and the lowest dry weight of seeds (5g) was recorded in M_1. Variety also had a significant effect on the dry weight of seeds. V_2 produced the maximum dry weight of seeds (5.94g), while V_1 had the minimum dry weight of seeds per fruit (5.40g). The interaction between the plant growing medium and variety showed significant variations in the dry weight of seeds. V_1M_2 had the highest dry weight of seeds (6.40g), while V_2M_1 had the lowest dry weight of seeds (3.93g), which was similar to V_1M_1 (Table 02).

Yield per pot: In V_1 variety, M_2 resulted in the highest fruit weight (376.70g), significantly different from other media treatments. M_1 had the lowest yield (165.84g) due to its poor air-water relationship, resulting in low aeration and affecting oxygen diffusion. The interaction of medium and variety significantly impacted yield per pot. V_1M_2 had the highest yield (413.02g), significantly surpassing $_1M_0$ (284.88g) and V_2M_0 (234.59g). V_2M_1 had the lowest yield per pot (145.85g) (Table 02).

Table 02. Effect of Variety and Treatment on Reproductive stage

Treatment	Number of fruit/plants	Fruit length (cm)	Number of seeds/fruit	Fresh weight of fruit/plant (g)	Dry weight of fruit/plant (g)	Fresh weight of seeds/fruit (g)	Dry weight of seeds/fruit (g)	Yield/ pot (g)
V_1M_0	16.47 c	42.33 b	13.33 c	17.30 c	9.53 c	6.67 c	5.13 c	284.88 c
V_2M_0	15.30 d	39.67 c	12.33 d	15.33 d	8.23 d	5.40 d	4.60 d	234.59 d
V_1M_1	13.63 e	37.33 d	10.47 e	13 e	8.47 d	5.70 e	4.37 e	185.85 e
V_2M_1	12.37 f	35.67 e	9.37 f	11.80 f	7.30 e	5.03 f	3.93 f	145.85 f
V_1M_2	20.27 a	46.33 a	16.60 a	20.37 a	12.47 a	8.40 a	6.40 a	413.02 a
V_2M_2	18.60 b	43.33 b	14.40 b	18.30 b	10.50 b	7.07 b	5.30 b	340.38 b
LSD 5% level of significance	*	NS	*	*	NS	*	*	*
Standard Error (±)	0.1884	0.5092	0.1680	0.2858	0.1325	0.1051	0.0694	4.9991

Here, V_1= Kagornatki, V_2= Xinxiang-1820, M_0= Control (Soil), M_1= Cocopeat, M_2= Soil + Cocopeat, NS= Non significant, *= Significant.

Traits associations

Principal component analysis (PCA): Principle component analysis (PCA) is a technique for reducing the dimensionality of databases. Here, principal component was analyzed for genetic diversity among all yard long bean genotypes. In PCA, the eigenvalue variances among the components were estimated in Table 03. Among the total variances in PCA, 76.53% were recorded in 1st component, 12.59% in 2nd and 10.88% in 3rd component (Table 03)). In the first component, the maximum traits are positively identified: leaf length, leaf width, number of branches, plant height, number of fruit/plants, fruit length, number of seed/fruits, fresh and dry weight of fruit/plant, and yield. Only one trait (number of leaves/plant) contributed negatively. In the second component, number of leaves/plants, leaf length, plant height, fresh and dry weight of seed/fruit are positively

Published with open access at journalbinet.com
EISSN: 2312-7945, © 2023 The Authors, Research paper

contributed. The rest of the 8 traits are negatively correlated. The third component accounts for 10.88% of the total variance. This component is positively defined by plant height, fruit length, fresh and dry weight of seed/fruit and yield/pot and rest of 9 traits was negatively contributed. There is 2-yard long bean variety with three growing media that were categorized into four groups in the score plot of PCA (Figure 01A). These were grouped based on their similarities with one another and their positions in different quadrants distant from the central point. Almost all traits have large positive loading on component 1 except FWS (Fresh weight of seed) and DWS (Dry weight of seed). It means all other traits played a significant role in growth and yield of yard long bean (Figure 01B).

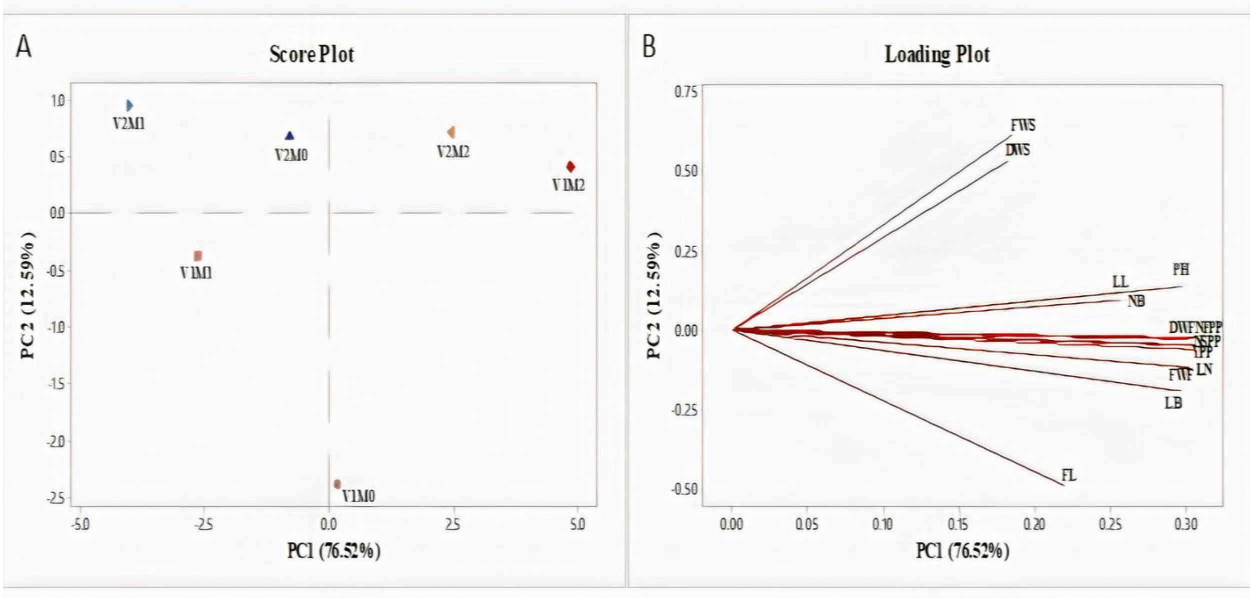

Figure 01. A schematic illustration of score plot (A) and loading plot (B) from PC

PC1: First principal component; PC2: Second principal component; PC3: Third principal component. LN - leaf number, LL - leaf length, LW - leaf width, NB - number of branches, PH - plant height, NFPP - number of fruits per plant, FL - fruit length, NSPF - number of seeds per fruit, FWF - fresh weight of fruits per plant, DWF - dry weight of fruits per plant, FWS - fresh weight of seeds per fruit, DWS - dry weight of seeds per fruit, YPP - yield per pot.

Table 03. Component loadings based on eigenvalue, factor scores and contribution of the first three principal component axes by Principal Component Analysis (PCA) for 13 quantitative traits

Variables	Eigenvectors		
	PC1	PC2	PC3
LN	-0.109	0.293	-0.722
LL	0.260	0.236	-0.400
LW	0.310	-0.185	-0.070
NB	0.314	-0.004	-0.093
PH	0.312	0.088	0.161
NFPP	0.319	-0.012	-0.051
FL	0.231	-0.520	0.008
NSPF	0.319	-0.068	-0.001
FWF	0.315	-0.109	-0.052
DWF	0.310	-0.013	-0.132
FWS	0.193	0.604	0.127
DWS	0.196	0.404	0.485
YPP	0.319	-0.032	-0.067
Eigenvalue	9.739	1.603	1.385
% Variation explained	76.52	12.59	10.88

PC1: First principal component; PC2: Second principal component; PC3: Third principal component. LN - leaf number, LL - leaf length, LW - leaf width, NB - number of branches, PH - plant height, NFPP - number of fruits per plant, FL - fruit length, NSPF - number of seeds per fruit, FWF - fresh weight of fruits per plant, DWF - dry weight of fruits per plant, FWS - fresh weight of seeds per fruit, DWS - dry weight of seeds per fruit, YPP - yield per pot.

Published with open access at journalbinet.com
EISSN: 2312-7945, ©2023 The Authors, Research paper

Correlation analysis

The association level among the distinct properties of the 2 varieties with 3 mediums was analyzed. 91 associations with their correlation coefficients were generated from the 13 vegetative and reproductive traits. At a 5% significance level, 34 associations originated to be not correlated, 57 were positively correlated and only 1 was negatively correlated (Table 04). The correlation analysis indicated that the positive highly significant genotypic associations (r≥0.72) were found in plant height with number of fruit/plant (r=0.92), number of seed/fruit (r=0.93), fresh and dry weight of fruit/plant (r=0.90 and 0.87) and yield/pot (r=0.91) and significant association (r=0.72 to 0.59) with dry weight of seed/fruit. Number of seed/fruits exhibited highly significant relation (r≥0.72) with fresh and dry weight of fruit/plant and yield/pot. Fruit length exhibited negative correlation with fresh weight of seed/fruit (r= -0.079) and significant relations with number of seed/fruit, fresh weight of fruit/plant and yield/pot. Significant correlations (r= 0.72 to 0.45) were documented for leaf length and plant height (r=0.67). A highly significant positive association (r≥0.72) was reported for number of branches with plant height, number of fruit/plant, number of seed/fruit, and yield/pot. Leaf number indicated no significant relations (r= 0.44 to 0.15) with fruit length (r= 0.37), fresh and dry weight of seed/fruit. Number of seed/fruits indicated highly significant positive correlation (r=≥0.72) with fresh and dry weight of fruit/plant and yield/pot.

Table 04. Correlation coefficient of 13 morphological traits of Yard long bean genotypes

Traits	LN	LL	LW	NB	PH	NFPP	FL	NSPF	FWF	DWF	FWS	DWS	YPP
LN	1												
LL	0.517	1											
LW	0.502	0.730	1										
NB	0.549	0.811	0.959	1									
PH	0.505	0.677	0.879	0.904	1								
NFPP	0.551	0.786	0.965	0.971	0.928	1							
FL	0.375	0.294	0.753	0.589	0.584	0.639	1						
NSPF	0.495	0.749	0.975	0.958	0.922	0.989	0.692	1					
FWF	0.556	0.741	0.987	0.959	0.900	0.981	0.715	0.984	1				
DWF	0.504	0.832	0.952	0.986	0.876	0.956	0.564	0.953	0.946	1			
FWS	0.440	0.559	0.371	0.551	0.685	0.569	-0.079	0.502	0.459	0.508	1		
DWS	0.300	0.390	0.401	0.488	0.731	0.545	0.164	0.547	0.462	0.457	0.762	1	
YPP	0.557	0.800	0.974	0.978	0.919	0.996	0.649	0.991	0.989	0.969	0.540	0.523	1

Black, Purple and Blue colors, respectively represent 1% and 5% level of significance and non-significance. LN - leaf number, LL - leaf length, LW - leaf width, NB - number of branches, PH - plant height, NFPP - number of fruits per plant, FL - fruit length, NSPF - number of seeds per fruit, FWF - fresh weight of fruits per plant, DWF -dry weight of fruits per plant, FWS - fresh weight of seeds per fruit, DWS - dry weight of seeds per fruit, YPP - yield per pot.

IV. Discussion

Effects of various growth media on vegetative traits

The degree of vegetative traits such as number of leaves per plant, leaf length, leaf breadth, number of branches, and plant height were used for this study to detect the effect of different growth media on the growth and yield of yard long bean. Regarding vegetative traits, most plants were grown in a soil and cocopeat medium, the least in cocopeat, while the control was soil media. Soil and cocopeat media is best because cocopeat may be directly absorbed into the soil to promote water retention aeration and reduce the danger of soil fungal and root diseases. Mixing the soil with cocopeat, it can be used as mulch around plants to help the soil retain moisture and inhibit weed growth. Similar result recorded by Thekkayam et al, (2021) comparing the maximum plant height and number of leaves per plant in soil and cocopeat media to soil as a control. It was also noted that by Hatibarua et al. (2003) similarly soil and cocopeat media had the highest leaf length and number of branches compared to the control. According to Khalaj et al. (2015), an experiment was carried out to determine the impact of various growing conditions on the growth and yield of gerbera (*Gerbera jamesonii* L.). In this trial, results indicated that flower number, flower diameter, shoot diameter, stem neck diameter, flower height and vase life in cocopeat and soil media showed significant differences among growing media associated with our findings.

Published with open access at journalbinet.com
EISSN: 2312-7945, © 2023 The Authors, Research paper

Seedlings grow very well on cocopeat. Plants require sufficient nutrients as they mature, however, cocopeat cannot provide these nutrients. As a result, good outcomes in cocopeat media are not found. This experiment recorded minimum results in $M_{1,}$ which was used as cocopeat media. Rani et al. (2005) also found same results in vegetative traits. According to their trial the longest bud (7.65cm), bigger flower (18.30cm) and higher number of bulblets (1.83/bulb) were produced by mixture of soil and cocopeat. Minimum leaf length and leaf width were recorded from cocopeat media. Same results were recorded by Umar et al. (2003). The minimum number of branches and highest plant height recorded in cocopeat media compared to soil (Mahadeen et al., 2009). It also mentions that using cocopeat media identified the minimum number of leaves per plant (Mahadeen et al., 2009).

Effects of various growth media on reproductive traits

Flowering and fruit formation are favored by reproductive growth in establishing a marketable crop. In this experiment, the number of fruits per plant, fruit length, no. of seeds per fruit, fresh and dry weight of fruits per plant, fresh and dry weight of seeds per fruit, and yield per pot were used to evaluate the effect of different growing media on the growth and yield of yard long bean. M_2, which was utilized as a soil and cocopeat media in this study, significantly impacted the growth and yield of yard long bean. Highest water use efficiency, amount of porosity, cation exchange capacity (CEC) in date-palm peat was higher in soil and cocopeat mixtures in yard long bean compared to other media which is effective for reproductive phase (Mohammadi et al., 2013). Coco peat and soil are good moisture-retentive materials; however, aeration is required in most circumstances, especially for bulbous plants. When comparing these two media - coco peat alone against coco peat/soil (1:1) - the latter is more likely to be suggested because 1) Coco peat provides moisture availability and nutrient status of the medium, and 2) aeration is provided by soil. So, the soil and cocopeat media are far superior in yield production (Khayyat et al., 2007). Our findings matched those of researchers who discovered that Treatment G5 (soil and cocopeat) had significantly larger numbers of fruits per plant, average fruit weight, and yield than the other treatments (Lata et al., 2020). Roses planted on coco peat with soil medium were also observed to yield the best.

Cocopeat may contain pollutants from the soil. According to statistical data on fresh weight of plants (FWP), cocopeat media had strawberry plants with a minimum fresh weight of 22.21 g (Tariq et al., 2013). This investigation recorded the lowest fruit length in M_1, which was used as cocopeat media. An experiment was conducted to optimize plant growth and yield through innovation of the viticultural materials and media (Sitawati et al., 2016). In this trial result found that fresh weight per plant was low in cocopeat. But, the maximum length of fruit and fresh weight of cowpeas in cocopeat media compared to control has been reported by Sarwar et al. (2008). Growbags filled with pure coco-peat media had the lowest yield, water, land, and fertilizer productivity (Naem et al., 2015). The lowest results were obtained when coco-peat was used as a soilless media. This is due to cocopeat's weak air-water connection, which resulted in insufficient aeration within the media, affecting oxygen transfer to the roots (Abad et al., 2002).

Principal component analysis and correlation among the traits

The first five principal components axis explained 89.45% of the overall variation, according to the results of the principal component of yield and its components in 20 mung bean accessions. With Eigenvalues greater than 1.0, the first three components explained 70.48% of the total variation. The first five principal components had eigenvalues of 2.72, 2.09, 1.53, 0.96, and 0.74, corresponding to the total variations of 30.25%, 23.23%, 17.01%, 10.71%, and 8.25%. Others who studied mungbean observed similar outcomes (Pandiyan et al., 2012; Divyaramakrishnan et al., 2014; Jeberson et al., 2021). The same or related genes may regulate agronomic traits that exhibit positive and strong correlations, genes with pleiotropic effects on these traits, or genes with close relationships (Caligari et al., 2020). Pod length showed high heritability and genotypic coefficient of variation values, so they could be used as reference criteria in the initial selection. According to Hapsari et al. (2010), high heritability followed by high genotypic coefficient of variation can provide opportunities for genetic progress. On the other hand, number of pod per bunch, days to 75% of flowering, days to first hsrvest, pod diameter, number of pods per plant, number of seeds per pod, weight of 100 seeds, seed length, diameter of seed, and potential yield pods per hectare have genotypic coefficient of variation and heritability which were not linear. Effendy et al. (2018) mentioned that environmental factors affected the heritability.

Published with open access at journalbinet.com
EISSN: 2312-7945, ©2023 The Authors, Research paper

V. Conclusion

For potted plants to be effective, the right growing media is required. The growing media composition significantly influenced plant growth and productivity of the harvested plants. Due to its strong water-holding capacity, aeration, and increased uptake of nutrients, growth media are effective for increasing crop yield. The study mixture of soil and cocopeat media in pot could be suggested to obtain better quality and yield for yard long bean. Different potting media had a substantial impact on the majority of the examined parameters. In potting media M_2 (soil and cocopeat), plant parameters such as leaf number, plant height, leaf length, leaf breadth, and branch number were determined to be highest, whereas M_1 (cocopeat) had the lowest performance. As opposed to Xinxiang-1820 with control media (V_2M_0), reproductive parameters such as fruit production (number of fruits per plant, fresh and dry weight of fruits per plant, yield per pot) were better seen in V_1M_2, a kagornatki variety with soil and cocopeat media. The yard long bean is sensitive to the cocopeat medium. However, plants grown in cocopeat medium drastically reduced the morphological characteristics of yard long bean in pot culture experiments. Soil and cocopeat potting media showed positive responses against control for all the parameters regarding growth and yield characteristics of yard long bean.

VI. References

[1]. Abad, M., Noguera, P., Puchades, R., Maquieira, A. and Noguera, V. (2002). Physico-chemical and chemical properties of some coconut coir dust for use as a peat substitute for containerised ornamental plants. Bioresource Technology, 82(3), 241-245. https://doi.org/10.1016/S0960-8524(01)00189-4

[2]. Ba, F. S., Pasquet, R. S. and Gepts, P. (2004). Genetic diversity in cowpea [*Vigna unguiculata* (L.) Walp.] as revealed by RAPD markers. Genetic resources and crop evolution, (51), 539-550. https://doi.org/10.1023/B:GRES.0000024158.83190.4e

[3]. BBS (2020). Yearbook of Agricultural Statistics-2019. Bangladesh Bureau of Statistics. Statistics and Informatics Division (SID). Ministry of Planning Government of the People's Republic of Bangladesh.

[4]. Bilderback, T. E., Warren, S. L., Owen, J. S. and Albano, J. P. (2005). Healthy substrates need physicals too! HortTechnology, 15(4), 747-751. https://doi.org/10.21273/HORTTECH.15.4.0747

[5]. Caligari, Brown, J. and P.D.S. (2008). An Introduction to Plant Breeding. Oxford, UK.: Blackwell Publishing Ltd. p. 203.

[6]. Coker, C., Ely, M. and Freeman, T. (2007). Evaluation of yardlong bean as a potential new crop for growers in the southeastern United States. HortTechnology, 17(4), 592-594. https://doi.org/10.21273/HORTTECH.17.4.592

[7]. Divyaramakrishnan, C. K. and Savithramma, D. L. (2014). Tailoring genetic diversity of mungbean [*Vigna radiata* (L). Wilczek] germplasm through principal component and cluster analysis for yield and yield related traits. International Journal of Agronomy and Agricultural Research, India, 5(2), 94-102.

[8]. Effendy, Respatijarti and Waluyo, B. (2018). Keragaman genetik dan heritabilitas karakter komponen hasil dan hasil ciplukan (*Physalis sp*.). Jurnal Agro, 5(1), 30-38. https://doi.org/10.15575/1864

[9]. Grunert, O., Perneel, M. and Vandaele, S. (2008). Peat-based organic growbags as a solution to the mineral wool waste problem. Mires & Peat, 3.

[10]. Hapsari, R. T. and Adie, M. M. (2010). Pendugaan parameter genetik dan hubungan antar komponen hasil kedelai. Journal Penelitian Pertanian Tanaman Pangan, 29(1), 18-23.

[11]. Hatibarua P, Machahary R K, Bharati R and Paswan L. (2003). Effect of some growing media on production of Anthurium andreanum Lind. under Assam conditions. (In). Compendium of papers of the National Symposium on Recent Advances in Indian Floriculture, pp. 79–82.

[12]. Huque, A. M., Hossain, M. K., Alam, N., Hasanuzzaman, M. and Biswas, B. K. (2012). Genetic divergence in yard long bean (*Vigna unguiculata* (L.) Walp. ssp. Sesquipedalis Verdc.). Bangladesh Journal of Botany, 41(1), 61-69. https://doi.org/10.3329/bjb.v41i1.11084

[13]. Jeberson, M. S., Shashidhar, K. S., Wani, S. H. and Singh, A. K. (2017). Multivariate analysis in Mungbean (*Vigna radiata* L. Wilczek) for genetic diversity under acidic soils of Manipur, India. International Journal of Current Microbiology and Applied Sciences, 6(7), 760-769. https://doi.org/10.20546/ijcmas.2016.502.095

Published with open access at journalbinet.com
EISSN: 2312-7945, © 2023 The Authors, Research paper

[14]. Khalaj, M. A., Amiri, M. and Sindhu, S. S. (2015). Study on the effect of different growing media on the growth and yield of gerbera (*Gerbera jamesonii* L.). Journal of Ornamental Plants, 1(3), 185-189.

[15]. Khayyat, M., Nazari, F. and Salehi, H. (2007). Effects of different pot mixtures on pothos (*Epipremnum aureum* Lindl. and Andre 'Golden Pothos') growth and development. American-Eurasian Journal of Agricultural and Environmental Science, 2(4), 341-348.

[16]. Kongjaimun, A., Kaga, A., Tomooka, N., Somta, P., Vaughan, D. A. and Srinives, P. (2012). The genetics of domestication of yard long bean, *Vigna unguiculata* (L.) Walp. ssp. unguiculata cv.-gr. sesquipedalis. Annals of botany, 109(6), 1185-1200. https://doi.org/10.1093/aob/mcs048

[17]. Lata, K., Choudhary, M. R., Sharma, R. and Ghormade, A. S. (2018). Effect of Growing Media and Fertigation Schedules on Growth and Yield of Cucumber (*Cucumis sativus* L.) under polyhouse condition. International Journal of Current Microbiology and Applied Sciences, 7(12), 1457-1463. https://doi.org/10.20546/ijcmas.2018.712.173

[18]. Mahadeen, A. Y. (2009). Influence of organic and chemical fertilization on fruit yield and quality of plastic-house grown strawberry. The Journal of Agricultural Science, 167-177.

[19]. Mazahreh, N., Nejatian, A. and Mousa, M. (2015). Effect of different growing medias on cucumber production and water productivity in soilless culture under UAE conditions. Merit Research Journal of Agricultural Science and Soil Sciences, 3(9), 131-138. http://meritresearchjournals.org/asss/index.htm

[20]. Mohammadi Ghehsareh, A. (2013). Effect of date palm wastes and rice hull mixed with soil on growth and yield of cucumber in greenhouse culture. International Journal Of Recycling of Organic Waste in Agriculture, (2), 1-5. https://doi.org/10.1186/2251-7715-2-17

[21]. Nair, A., Ngouajio, M. and Biernbaum, J. (2011). Alfalfa-based organic amendment in peat-compost growing medium for organic tomato transplant production. HortScience, 46(2), 253-259. https://doi.org/10.21273/HORTSCI.46.2.253

[22]. Pandiyan, M., Senthil, N., Packiaraj, D., Gupta, S., Nadarajan, N., Pandian, R. T. and Jagadeesh, S. (2012). Characterisation and evaluation of 646 greengram (*Vigna radiata*) genotypes for constituting core collection. Wudpecker Journal of Agricultural Research, 1(8), 294-301.

[23]. Purseglove, J. W. (1968). Tropical crops: DicotyledonsLongman group limited.

[24]. Rani, N., Kumar, R. and Dhatt, K. K. (2005). Effect of nitrogen levels and growing media on growth, flowering and bulb production of Lilium cultivars. Journal of Ornamental Horticulture, 8(1), 36-40.

[25]. Rubatzky, V. E. and Yamaguchi, M. (2012). World vegetables: principles, production, and nutritive values. Springer Science & Business Media.

[26]. Sarwar, G., Schmeisky, H., Hussain, N., Muhammad, S., Ibrahim, M. and Safdar, E. (2008). Improvement of soil physical and chemical properties with compost application in rice-wheat cropping system. Pakistan Journal of Botany, 40(1), 275-282.

[27]. Schmilewski, G. (2007). Growing medium constituents used in the EU. In International Symposium on Growing Media 2007, (819) pp. 33-46. https://doi.org/10.17660/ActaHortic.2009.819.3

[28]. Schroeder, F. G. and Sell, H. (2007). Use of compost made from livestock manure as an organic substrate for cucumber (*Cucumis sativus* L.) grown in greenhouse. In International Symposium on Growing Media 2007 (819) pp. 367-372. https://doi.org/10.17660/ActaHortic.2009.819.44

[29]. Sitawati, S., Suryanto, A. and Nurlaelih, E. E. (2016). Optimization of plant growth and yield through innovation of the verticultural materials and media. Research Journal of Life Science, 3(1), 55-64. https://doi.org/10.21776/ub.rjls.2016.003.01.8

[30]. Tariq, R., Qureshi, K. M., Hassan, I., Rasheed, M. and Qureshi, U. S. (2013). Effect of planting density and growing media on growth and yield of strawberry. Pakistan Journal of Agricultural Research, 26(2).

[31]. Thekkayam, S. G. (2021). Ornamental plants. New India Publishing Agency (NIPA).

[32]. Umar, I., Wali, V. K., Kher, R. and Jamwal, M. (2009). Effect of Fym, Urea and Azotobacter on Growth, Yield and Quality of Strawberry Cv. Chandler. Notulae Botanicae Horti Agrobotanici Cluj-Napoca, 37(1).

[33]. Vaughn, S. F., Deppe, N. A., Palmquist, D. E. and Berhow, M. A. (2011). Extracted sweet corn tassels as a renewable alternative to peat in greenhouse substrates. Industrial crops and products, 33(2), 514-517. https://doi.org/10.1016/j.indcrop.2010.10.034

Published with open access at journalbinet.com
EISSN: 2312-7945, ©2023 The Authors, Research paper

[34]. Verhagen, J. B. G. M. and Blok, C. (2007). Trends in rooting media in Dutch horticulture during the period 2001-2005: The new growing media project. In International Symposium on Growing Media 2007 (819) pp. 47-58. https://doi.org/10.17660/ActaHortic.2009.819.4

HOW TO CITE THIS ARTICLE?

Crossref: https://doi.org/10.18801/jbar.300223.310

MLA
Datta, P. et al. “Effects of growing mediums on the growth and yield of pot-grown Yard long bean (*Vigna unguiculata*)”. Journal of Bioscience and Agriculture Research, 30(02), (2023): 2570-2580.

APA
Datta, P., Zahid, Z. H. and Rubel, M. H. (2023). Effects of growing mediums on the growth and yield of pot-grown Yard long bean (*Vigna unguiculata*). *Journal of Bioscience and Agriculture Research*, 30(02), 2570-2580.

Chicago
Datta, P., Zahid, Z. H. and Rubel, M. H. “Effects of growing mediums on the growth and yield of pot-grown Yard long bean (*Vigna unguiculata*)”. Journal of Bioscience and Agriculture Research, 30(02), (2023): 2570-2580.

Harvard
Datta, P., Zahid, Z. H. and Rubel, M. H. 2023. Effects of growing mediums on the growth and yield of pot-grown Yard long bean (*Vigna unguiculata*). Journal of Bioscience and Agriculture Research, 30(02), pp. 2570-2580.

Vancouver
Datta, P, Zahid, ZH and Rubel, MH. Effects of growing mediums on the growth and yield of pot-grown Yard long bean (*Vigna unguiculata*). Journal of Bioscience and Agriculture Research, 2023 October, 30(02): 2570-2580.

Access by Smart Phone

Journal BiNET | Scientific Publication

- ✓ Faster processing & peer review
- ✓ International editorial board
- ✓ 29 business days publication
- ✓ Greater audience readership
- ✓ Indexing &bibliographic integration
- ✓ Social sharing enabled

Submission or email to submit@journalbinet.com

Published with open access at journalbinet.com
EISSN: 2312-7945, © 2023 The Authors, Research paper