The Pharma Innovation Journal 2023; 12(11): 559-564

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(11): 559-564

www.thepharmajournal.com
Received: 14-08-2023
Accepted: 29-09-2023

E Padma
Department of Vegetable Science, College of Horticulture, Venkataramannagudem, West Godavari, Andhra Pradesh, India

K Uma Jyothi
Department of Vegetable Science, College of Horticulture, Venkataramannagudem, West Godavari, Andhra Pradesh, India

G Ramanandam
Department of Vegetable Science, College of Horticulture, Venkataramannagudem, West Godavari, Andhra Pradesh, India

P Subbaramamma
Department of Vegetable Science, College of Horticulture, Venkataramannagudem, West Godavari, Andhra Pradesh, India

K Umakrishna
Department of Vegetable Science, College of Horticulture, Venkataramannagudem, West Godavari, Andhra Pradesh, India

Corresponding Author:
E Padma
Department of Vegetable Science, College of Horticulture, Venkataramannagudem, West Godavari, Andhra Pradesh, India

Comparison of the performance of Dolichos Bean (*Lablab purpureus* L.) under open field and Shadenet circumstances with varied sowing dates, growth regulators, and their interactions on yield

E Padma, K Uma jyothi, G Ramanandam, P Subbaramamma and K Umakrishna

Abstract
Currently being conducted is a study with the "Comparison of the performance of Dolichos Bean (*Lablab purpureus* L.) under open field and shadenet circumstances with varied sowing dates, growth regulators, and their interactions on yield" was carried out during summer at Horticultural Research Station, Ambajipeta, East Godavari District of Andhra Pradesh. The experiment included a Factorial Randomized Block Design (FRBD) with 36 possible treatment combinations, each replicated three times in an open field and beneath a shade net. Using four different varieties-Arka Jay, Arka Amog, Arka Sambhram, and Arka Sowmya and three different planting dates-December 15th, January 1st, and January 15th-the experiment was conducted. Foliar sprays of growth regulators-NAA 25 ppm, Triacontanol 2 ppm, and control-were applied to the plants. The yield and quality metrics were collected, and the data were statistically evaluated using ANOVA. In an open field and under a shade net, Arka Sowmya (V4) recorded the significantly greatest leaf area per plant (1065.9 cm^2 and 770.02 cm^2, respectively). In open field and under shade net, the January 1st planting recorded leaf areas of 1028.3 cm^2 and 870.1 cm2, respectively, whereas Triacontanol 2 ppm recorded leaf areas of 1077.0 cm^2 and 911.0 cm^2, respectively, in open field and under shade net. When sowed on January 1st and the plants were sprayed with Triacontanol 2 ppm (V4S2G2) in open field and under shade net (262.12 q and 163.27 q, respectively), Arka Sowmya recorded the highest pod production per ha. Being a crop that prefers light, the field bean responded well in open field as opposed to shade net, producing greater leaf area and pod yield per hectare.

Keywords: Sowing dates, dolichos bean, growth regulators, pod yield, triacontanol

Introduction
In India, lablab is a field crop that is mostly grown in the peninsular region and is extensively grown in the neighboring districts of Tamil Nadu, Andhra Pradesh, and Maharashtra as well as in Karnataka. Karnataka makes a significant contribution, making up about 90% of the nation's area and production. Field bean often grows during the Kharif and Rabi seasons. Once February month has passed, the beans are no longer available in Andhra Pradesh. Beans can be grown in the summer, which is out of season, and will be available to consumers all year long. Farmers will also be able to sell their produce for more money. The best sowing time among agronomic methods is regarded as a significant non-cash input that significantly improves yield and quality. The majority of vegetable crops' productivity is influenced by the current environmental circumstances to which different phenological stages of the crop are exposed. The crop's growth, flowering, and yield may be impacted by the spaced-out planting dates. By adjusting the hormonal levels in various plant organs at different growth stages of the plant's life cycle, plant growth regulators—which can be either natural or synthetic—modify either developmental or morphological structure or both in order to improve yield and quality. There is a lack of information regarding field bean performance in open fields and under shade nets, ideal planting dates, and growth regulators. Therefore, the goal of the current study is to identify the best field bean varieties for coastal Andhra Pradesh that may be grown in open fields and under shade nets during the off-season.

Materials and Methods

The study "Comparison of the performance of Dolichos Bean (*Lablab purpureus* L.) under open field and shadenet circumstances with varied sowing dates, growth regulators, and their interactions on yield " was conducted in the summer at Horticultural Research Station, Ambajipeta, East Godavari District of Andhra Pradesh, which is located at 16.40 N latitude and 81.50 E longitudes at an altitude of 34 m above mean sea level. The annual rainfall total at the test site is 1186 mm. The irrigation water's pH was 7.3 and its EC was 0.7 dSm^{-1}. The experiment used a Factorial Randomized Block Design (FRBD) with 36 possible treatment combinations, each reproduced three times in an open field and beneath a shade net. The experiment used four different varieties: Arka Jay (V1), Arka Amog (V2), Arka Sambhram (V3), and Arka Sowmya (V4), with three different sowing dates: December 15 (S1), January 1 (S2), and January 15 (S3), as well as foliar sprays of growth regulators: NAA 25 ppm (G1), Triacontanol 2 ppm (G2), and control (G3). The application of growth regulators occurred at 30 and 60 DAS. The test area was completely tilled and made into a beautiful tilth. Before the last ploughing, the recommended FYM dose and the basal dose of fertilizers were mixed into the soil. Urea, single super phosphate, and muriate of potash were used to apply the necessary doses of N, P, and K (20:60:50 kg per ha), respectively. The application of nitrogen was done in two parts; the first half, or 10 kg, was used as a base dose, and the second half, or 10 kg, was used as a top dressing at 30 days after sowing. At the time of sowing, the complete phosphorus and potash dose was administered as the basal dose. On five plants that were tagged, several observations on growth and yield metrics were made. The yield and quality metrics were recorded over the course of two years, and the pooled results were statistically analyzed using ANOVA.

Results and Discussion

In Table 1, information on the effects of plant varieties, sowing dates, growth regulators, and their interactions on leaf area in open fields and shade nets is provided. In an open field, Arka Jay (V1) had the lowest leaf area (910.2 cm^2) and Arka Sowmya (V4) had the maximum leaf area per plant (1065.9 cm2 after harvest). At harvest, the leaf's surface area shrank. It may be linked to senescence and leaf shedding in all kinds at all planting dates, whether or not growth regulator spray was used.

With reference to the amount of leaf area per plant, there were noticeable variances between the planting dates. Significantly, the January 1st sowing (S1) produced the maximum leaf area per plant (1028.3 cm^2 at harvest), whereas the January 15th sowing (S3) produced the lowest leaf area per plant (975.7 cm2) at harvest. When compared to other sowing dates, field bean planting on January 1st recorded the highest leaf area per plant. This may be because favorable climatic conditions, such as the temperature, day length, and light intensity, were present at the time. Abido and Seadh (2014) [1] found comparable outcomes in the dolichos bean.

The influence of growth regulators on leaf area per plant was also significant. Significantly the/highest leaf area (1077.0 cm^2 at harvest) was recorded with Triacontanol 2 PPM whereas, lowest leaf area (933.0 cm^2 at harvest respectively) was recorded in control. The increase in leaf area due to Triacontanol foliar spray may be attributed to an increase in meristematic activity of leaf primordia. The interaction between varieties and sowing dates was found significant with respect to leaf area per plant at all dates of observations recorded. Significantly the highest leaf area per plant (1113.8 cm^2 at harvest) was recorded by Arka Sowmya with January 15th sowing (V_4S_3) whereas, the lowest leaf area per plant 854.4 cm^2 at harvest respectively) was recorded by Arka Jay sown on December 15th (V_1S_1). Significant interaction was observed between varieties and growth regulators with respect to leaf area per plant at all dates of observations recorded Significantly the highest leaf area per plant (1142.6 cm^2 at harvest respectively) was observed by Arka Sowmya sprayed with Triacontanol @ 2ppm (V_4G_2) whereas, lowest leaf area (779.5 cm^2 at harvest respectively) was observed by Arka Jay without growth regulator spray (V_1G_3). Among SxG interactions, no significant differences for leaf area at harvest. Among VxSxG interactions, significant differences for leaf area was observed at harvest.

The data pertaining to the effect of varieties, dates of sowing, growth regulators and their interactions on leaf area of field bean under shade net are presented in Table 1. The data was found significant with regard to leaf area per plant with different varieties, dates of sowing and growth regulators and their interactions. Significantly the highest leaf area per plant (901.9 cm^2 at harvest) was observed by Arka Sowmya (V_4), whereas the lowest leaf area per plant (770.02 cm^2 at harvest) was observed with Arka Jay (V_1). Leaf area was significantly increased due to greater assimilation of food material by the plant which resulted in greater meristematic activities of cells. Similar results have been reported by Esakkiammal *et al.* (2015) [5] in dolichos bean and Prakash *et al.* (2015) [12] in French bean.

Dates of sowing had a considerable impact on leaf area. Significantly, the January 1st sowing (S2) yielded the maximum leaf area per plant (870.1 cm2), while the January 15th planting (S3) produced the lowest leaf area per plant (825.6 cm2) at harvest. The favorable environmental circumstances at this time of year, such as the temperature, length of the days, and light intensity, may have contributed to the large growth in leaf area following sowing on January 1. Growth regulators had a considerable impact on leaf surface area. With Triacontanol 2 ppm, the leaf area per plant was significantly higher (911.0 cm2 at harvest), whereas the control had the lowest leaf area (790.0 cm2 at harvest). The increased photosynthetic activity and effective assimilation of photosynthetic products may be the cause of the increase in leaf area per plant with Triacontanol foliar spray. At 30, 60, 90 DAS, and at harvest, substantial changes in leaf area were seen among VxS interactions. Significantly, Arka Sowmya, seeded on January 15 (V4S3), had the maximum leaf area per plant (1199.5 cm2 at 30, 60, and 90 DAS, respectively), while Arka Jay, sown on December 15 (V1S1), had the lowest leaf area (723.0 cm2 at harvest, respectively). When sown on January 1st (V2S2), ArkaAmog had the largest leaf area per plant at harvest (934.2 cm^2), while when sown on January 15th (V1S3), Arka Jay recorded the lowest leaf area per plant at 90 DAS (829.30 cm^2). At harvest, there were noticeable changes in leaf area among VxG interactions. Significant variations in leaf area were seen among VxSxG interactions during harvest.

In Table 2, the findings on the pod yield per hectare of field beans as influenced by planting dates, varieties, and growth regulators in open fields are shown. For pod yield per hectare, there were notable variances amongst the types. The maximum pod yield per ha was notably obtained by Arka Sowmya (V4), followed by Arka Sambhram (V3) (184.78 q). Arka Jay (V1) had the lowest pod production per hectare (144.66 q). The findings of the current study, which indicated a higher number of branches and more leaf area and, consequently, a higher number of pods (78.03), may be attributed to the increase in pod yield per hectare. Additionally, the genetic makeup of the cultivar affects yield. The results are consistent with those of studies on the dolichos bean conducted by Pan *et al*. (2004) [9], Patel *et al*. (2011) [10], Ravinaik *et al*. (2012) [16], Sharma *et al*. (2014) [17], and Prakash *et al*. (2015) [12].

The dates of sowing had a big impact on the amount of pods produced per hectare. Crops sown on January 1st (S2) and January 15th (S3) had significantly higher pod yields per hectare (204.43 q and 173.69 q, respectively). The lowest pod yield per hectare (152.30 q) was obtained for the crop seeded on December 15 (S1). Growth regulator spraying significantly affected the pod production per hectare. The maximum pod yield per hectare was reported by Triacontanol 2 ppm as a foliar spray (G2), followed by NAA 25 ppm (G1) (176.66 q). The control (G3) group had the lowest pod yield per hectare (163.66 q). Triacontanol may have a good effect on plant output because it affects the carbon cycle in plants, leading to increased CO2 fixation and more effective CO2 translocation to the sink. (Menon and Srivastava 1984) [7]. On the pod yield per hectare, the interaction between cultivars and sowing dates was highly significant. When sown on January 1st (V4S2), Arka Sowmya had the highest pod yield per ha (227.36 q), followed by Arka Sambhram (217.14 q) with the same sowing date (V3S2). The crop Arka Jay, which was seeded on December 15 (V1S1), had the lowest yield per hectare (131.53 q). The interactions between growth regulators and planting dates and types did not significantly affect the amount of pods produced per hectare.When sown on January 1 and the plants were sprayed with Triacontanol 2 ppm (V4S2G2), Arka Sowmya recorded the highest pod production per ha (262.12 q), followed by the same variety when sown on January 15 and the plants were sprayed with Triacontanol 2 ppm (V4S3G2) (237.94 q). The crop Arka Jay had the lowest yield per hectare (112.26 q) on December 15 when it was grown without growth regulator spray (V1S1G3).

In Table 2, the effects of cultivars, planting dates, and growth regulators on the pod production per hectare of field beans grown under shade net are shown. For pod yield per hectare, there were notable variances amongst the types. The maximum pod production per hectare was substantially obtained by Arka Sowmya (V4) at 132.06 q, while Arka Jay (V1) had the lowest pod yield at 96.02 q. More branches, larger leaves, and more pods could be the cause of the rising output. These traits depend on the genetic traits of the variety and favor the plant's greatest conversion into yield. The results are consistent with those reported for chillies grown under shade net by Vethamoni and Natarajan (2008) [18], broccoli produced under shade net by Nooprom *et al*. (2013) [8], and cauliflower grown under shade net by Ranjith *et al*. (2013) [14].

Due to different sowing dates, the results on pod production per hectare varied dramatically. The crop sown on December 15th (S1) recorded the lowest pod yield per hectare (107.67 q), whereas the crop sown on January 1st (S2) recorded the significantly greatest pod yield per hectare (129.26 q). When grown under shade net circumstances, Bibi *et al*. (2012) [2], Guha *et al*. (2013) [6], and Ranjit *et al*. (2015) [15] reported that sowing dates had an impact on the number of pods produced per hectare of tomato, coriander, and French bean, respectively.

Growth regulators caused a considerable difference in the pod yield per hectare values. The largest pod production per hectare was observed by Triacontanol 2 ppm (G2) (125.72 q), followed by NAA 25 ppm spray (G1) (115.97 q). The control (G3) group had the lowest pod yield per hectare (103.48 q). Triacontanol may have a good effect on plant output because it affects the plant's carbon cycle, increasing CO2 fixation and improving CO2 translocation (Menon and Srivastava, 1984) [7]. Prateek *et al*. (2017) [13] reported that under shade net cultivated capsicum, NAA increased yield.

The pod yield per ha differed considerably in the interaction of VxS. The maximum pod yield per ha (153.52 q) was achieved by ArkaSowmya, which was sown on January 1st (V4S2), and the lowest yield per ha (91.05 q) was recorded by Arka Jay, which was sown on January 1st (V1S2). For pod yield per hectare, the relationship between cultivars and growth regulators as well as sowing dates and growth regulators was not significant. Pod yield per hectare was greatly impacted by VxSxG interactions. The maximum pod yield per ha was recorded by Arka Sowmya, sown on January 1st, sprayed with Triacontanol 2 ppm foliar spray (V4S2G2), which was comparable to Arka Sowmya, sown on January 1st, sprayed with NAA 25 ppm (V4S2G1) (154.86 q), and Arka Jay, sown on January 1st, without growth regulator.

Table 1: Performance of field bean varieties with different dates of sowing, growth regulators and their interaction on leaf area in open field and under Shadenet

Varieties (V)	Leaf area per plant(cm2)in open field				Leaf Areaper plant(cm2)at harvest under shadenet				
	Dates of sowing (S)				Dates of sowing (S)				
	S_1	S_2	S_3	Mean	Varieties (V)	S_1	S_2	S_3	Mean
V_1	854.4	1013.4	862.9	910.2	V_1	723.0	857.5	730.20	770.02
V_2	1055.2	1104.1	1016.7	1058.7	V_2	892.80	934.20	860.30	895.8
V_3	1068.6	995.9	909.3	991.3	V_3	904.20	842.70	769.40	838.0
V_4	1083.9	999.9	1113.8	1065.9	V_4	917.20	846.10	942.50	901.9
Mean	1015.5	1028.3	975.7	--	Mean	859.30	870.10	825.60	--
Varieties (V)	Growth Regulators (G)				Varieties (V)	Growth Regulators (G)			
	G_1	G_2	G_3	Mean		G_1	G_2	G_3	Mean
V_1	940.2	1011.0	779.5	910.2	V_1	795.60	855.50	658.60	770.02
V_2	1066.7	1102.7	1006.5	1058.7	V_2	902.60	933.10	851.70	895.8
V_3	983.0	1049.9	940.9	991.3	V_3	831.80	888.40	796.50	838.0
V_4	1049.5	1142.6	1005.5	1065.9	V_4	888.10	966.80	850.80	901.9
Mean	1010.0	1077.0	933.0	--	Mean	855.0	911.0	790.0	--

Dates of sowing(S)		Growth Regulators (G)				Dates of sowing (S)		Growth Regulators (G)			
		G_1	G_2	G_3	Mean			G_1	G_2	G_3	Mean
S_1		1013.0	1083.0	951.0	1015.5	S_1		857.0	916.0	805.0	859.30
S_2		1024.0	1106.0	955.0	1028.3	S_2		867.0	936.0	808.0	870.10
S_3		992.0	1041.0	893.0	975.7	S_3		840.0	881.0	756.0	825.60
Mean		1010.0	1077.0	933.0	--	Mean		855.0	911.0	790.0	-
Interaction (VxSxG)		Growth Regulators (G)				Interaction (VxSxG)		Growth Regulators (G)			
		G_1	G_2	G_3				G_1	G_2	G_3	Mean
V_1	S_1	881.29	971.16	710.85	--	V_1	S_1	745.71	821.75	601.49	--
	S_2	1060.74	1121.39	858.04	--		S_2	897.55	948.87	726.03	---
	S_3	878.65	940.53	769.55	--		S_3	743.47	795.83	651.15	--
V_2	S_1	1056.52	1076.97	1032.01	--	V_2	S_1	893.98	911.29	873.24	--
	S_2	1099.93	1132.27	1080.07	--		S_2	930.71	958.07	913.90	--
	S_3	1043.72	1098.99	907.41	--		S_3	883.15	929.91	767.81	--
V_3	S_1	1034.88	1051.63	1019.15	--	V_3	S_1	875.67	974.45	862.35	--
	S_2	982.5	1021.81	983.30	--		S_2	831.34	864.61	832.02	--
	S_3	931.72	976.20	820.10	--		S_3	788.36	826.01	693.93	--
V_4	S_1	1078.16	1131.74	1041.86	--	V_4	S_1	912.29	957.62	881.57	--
	S_2	954.52	1147.38	897.83	--		S_2	807.67	970.86	759.70	--
	S_3	1115.90	1148.71	1076.92	--		S_3	944.22	971.98	911.24	--

Source	S.Em ±	C.D at 5%	S.Em ±	C.D at 5%
V	10.49	29.28	8.95	24.99
S	9.08	25.36	7.75	21.64
G	9.08	25.36	7.75	21.64
VxS	18.17	50.72	15.51	43.29
VxG	18.17	50.72	15.51	43.29
SxG	15.74	NS	13.43	NS
VxSxG	31.48	87.86	26.86	74.99

Varieties (V)
V_1 - Arka Jay
V_2 - ArkaAmog
V_3 - ArkaSambhram
V_4 - ArkaSowmya

Dates of sowing (S)
S_1 - December 15th
S_2 - January 1st
S_3 - January 15th

Growth Regulators (G)
G_1 - NAA 25 ppm
G_2 - Triacontanol 2 ppm
G_3 - Control

Table 2: Performance of field bean varieties with different dates of sowing, growth regulators and their interaction on green pod yield per hectare in open field and under shadenet

Varieties (V)		Pod yield (q/ ha) in open field				Pod yield (q/ ha) under shadenet					
		Dates of sowing (S)				Dates of sowing (S)					
		S_1	S_2	S_3	Mean	Varieties (V)		S_1	S_2	S_3	Mean
V_1		131.53	169.90	132.53	144.66	V_1		98.07	91.05	98.92	96.02
V_2		155.04	203.34	182.94	180.44	V_2		103.37	134.77	97.22	111.79
V_3		169.18	217.14	168.02	184.78	V_3		109.75	137.69	113.62	120.36
V_4		153.46	227.36	211.25	197.36	V_4		119.49	153.52	123.19	132.06
Mean		152.30	204.43	173.69		Mean		107.67	129.26	108.54	--
Varieties (V)		Growth Regulators (G)				Varieties (V)		Growth Regulators (G)			
		G_1	G_2	G_3	Mean			G_1	G_2	G_3	Mean
V_1		145.43	158.12	130.42	144.66	V_1		94.12	106.00	87.93	96.02
V_2		181.68	191.57	168.06	180.44	V_2		112.45	116.99	105.92	111.79
V_3		186.77	189.36	178.21	184.78	V_3		117.56	134.55	108.96	120.36
V_4		192.77	221.34	177.96	197.36	V_4		139.74	145.34	111.10	132.06
Mean		176.66	190.10	163.66		Mean		115.97	125.72	103.48	
Dates of sowing(S)		Growth Regulators (G)				Dates of sowing (S)		Growth Regulators (G)			
		G_1	G_2	G_3	Mean			G_1	G_2	G_3	Mean
S_1		151.22	164.33	141.35	152.30	S_1		108.24	118.67	96.10	107.67
S_2		204.52	216.78	192.01	204.43	S_2		129.02	139.08	119.68	129.26
S_3		174.24	189.19	157.62	173.69	S_3		110.65	119.42	94.65	108.54
Mean		176.66	190.10	163.66	--	Mean		115.97	125.72	103.48	--
Interaction (VxSxG)		Growth Regulators (G)				Interaction (VxSxG)		Growth Regulators (G)			
		G_1	G_2	G_3				G_1	G_2	G_3	Mean
V_1	S_1	128.35	153.99	112.26	--	V_1	S_1	92.92	112.16	89.15	--
	S_2	168.87	174.17	166.66	--		S_2	93.06	100.25	79.85	--
	S_3	139.06	146.20	112.34	--		S_3	96.39	105.58	94.78	--
V_2	S_1	154.80	166.31	143.99	--	V_2	S_1	103.91	103.93	102.28	--
	S_2	207.83	209.41	192.77	--		S_2	131.80	141.50	131.02	--
	S_3	182.41	198.98	167.41	--		S_3	101.66	105.55	84.47	--
V_3	S_1	170.74	173.06	163.74	--	V_3	S_1	107.18	121.30	100.78	--

	S_2	226.46	221.40	203.55	--		S_2	136.38	151.28	125.43	--
	S_3	163.11	173.63	167.32	--		S_3	109.14	131.06	100.66	--
V_4	S_1	151.00	163.97	145.41	--	V_4	S_1	128.96	137.30	92.20	--
	S_2	214.90	262.12	205.06	--		S_2	154.86	163.27	142.42	--
	S_3	212.40	237.94	183.41	--		S_3	135.41	135.47	98.68	--
Source	**S.Em ±**				**C.D at 5%**	**S.Em ±**				**C.D at 5%**	
V	2.45				6.83	2.09				5.84	
S	2.12				5.92	1.81				5.05	
G	2.12				5.92	1.81				5.05	
VxS	4.24				11.84	3.62				10.11	
VxG	4.24				NS	3.62				NS	
SxG	3.67				NS	3.13				NS	
VxSxG	7.35				20.51	6.27				17.52	

Varieties (V)	**Dates of sowing (S)**	**Growth Regulators (G)**
V_1 - Arka Jay	S_1 - December 15th	G_1 - NAA 25 ppm
V_2 – Arka Amog	S_2 - January 1st	G_2 - Triacontanol 2 ppm
V_3 – Arka Sambhram	S_3 - January 15th	G_3 - Control
V_4 – Arka Sowmya		

Conclusion

Arka Sowmya (V4) recorded the significantly greatest leaf area per plant (1065.9 cm^2 and 770.02 cm^2, respectively). In open field and under shade net, the January 1st planting recorded leaf areas of 1028.3 cm^2 and 870.1 cm2, respectively, whereas Triacontanol 2 ppm recorded leaf areas of 1077.0 cm^2 and 911.0 cm^2, respectively, in open field and under shade net. When sowed on January 1st and the plants were sprayed with Triacontanol 2 ppm (V4S2G2) in open field and under shade net (262.12 q and 163.27 q, respectively), Arka Sowmya recorded the highest pod production per ha. Being a crop that prefers light, the field bean responded well in open field as opposed to shade net, producing greater leaf area and pod yield per hectare.

References

1. Abido WAE, Seadh SE. Rate of variations between field bean Cultivars due to sowing dates and foliar spraying treatments. Science International. 2014;2(1):1-12.
2. Bibi B, Sajid M, Rab A, Shah ST, Ali N, Jan I, *et al*. Effect of partial shade on growth and yield of tomato cultivars. Global Journal of Biology, Agriculture & Health Sciences. 2012;1(1):22-26.
3. Desai SB, Bendale VW, Bhave SG, Madav RR. Genetic analysis of growth and development characters in lablab bean (*Lablab purpureus* (L.) Sweet). International Journal of Agricultural Science. 2006;2(1):85-89.
4. Dhivya R, Venkatesan K, Jeyakumar P, Pugalendhi L. Seasona influence on physiological parameters and yield of dolichos bean (*Dolichos lablab* (Roxb.) (L.) *var. typicus*) genotypes. Madras Agricultural Journal. 2013;100(1/3):57-61.
5. Esakkiammal B, Lakshmibai L, Sornalatha S. Studies on the combined effect of vermicompost and vermiwash prepared from organic wastes by earthwarms on the growth and yield parameters of *Dolichos lablab*. Asian Journal of Pharma. Science and Technology. 2015;5(4):246-252.
6. Guha S, Sharangi AB, Debnath S. Effect of different sowing times and cutting management on phenology and yield of off season coriander under protected cultivation. Trends in Horticultural Research. 2013;3:27-32.
7. Menon KKG, Srivastava HC. Increasing plant productivity through improved photosynthetic process. Indian Academic Science (Plant Science). 1984;23:359-78.
8. Karistsapola N, Quanchitb S, Te-Chato Sompong. Effect of shading and variety on the growth and yield of broccoli during the dry season in southern Thailand. International Journal of Plant, Animal and Environmental Sciences. 2013;3(2):111-115
9. Pan RS, Singh AK, Rai M, Krishna Prasad VSR, Kumar S. Genetic variation and character association in photosensitive dolichos bean (*Lablab purpureus* L. SWEET). Vegetable Science. 2004;31(1):22-25.
10. Patel BV, Parmar BR, Parmar SB, Patel SR. Effect of different spacings and varieties on yield parameters of cowpea (*Vigna unguiculata* (L.) Walp.). The Asian Journal of Horticulture. 2011;6(1):56-59
11. Pimentel CC, Perez AJ. de la. Establishment of parameters for water stress tolerance evaluation on bean genotypes. Pesquisa Agropecuaria Brasileira. 2000;35(1):31-39
12. Prakash J, Ram RB, Meena ML. Genetic variation and characters interrelationship studies for quantitative and qualitative traits in French bean (*Phaseolus vulgaris* L.) under Lucknow conditions. Legume Research. 2015;38(4):425-433.
13. Prateek Singh, Devi Singh, Deepak Kumar Jaiswal, Singh DK, Vaibhav Singh. Impact of Naphthalene Acetic Acid and Gibberellic Acid on growth and yield of capsicum (*Capsicum annum* (L.)) cv. Indra under shade net conditions. International Journal of Current Microbiology. 2017;6(6):2457-2462
14. Ranjit Chatterjee, Sandip Mahanta Chatterjee, Mahanta. Performance of Off-season Cauliflower (*Brassica oleracea* var. *botrytis* L.) under Agro Shade Net as influenced by Planting Dates and Nutrient Source. International Journal of Advances in Agricultural Science and Technology. 2013;1(1):56-62.
15. Ranjit Chatterjee, Ravi Kiran T, Dipika M. Off season production of French bean (*Phaseolus vulgaris* L.) cultivation inside agro shade net: Influence of planting dates and nutrient sources. Journal of Agricultural Technology. 2015;2(1&2):87-91.
16. Ravinaik K, Hanchinmani CN, Paul MG, Ashok Hugar, Goud IS, Hosamani AC, *et al*. Performance of dolichos bean genotypes (*Dolichos lablab* L.). Environment and Ecology. 2012;30(1):148-152.
17. Sharma A, Sharma M, Sharma KC, Singh Y, Sharma RP, Sharma GD. Standardization of sowing date and cultivars

for seed production of garden pea (*Pisum sativum* var. Hortense L.) under north western Himalayas. Legume Research. 2014;37(3):287-293.

18. Vethamoni IP, Natarajan S. Effect of natural resources on plant growth, yield and quality in Chilli cultivars (*Capsicum annuum* L.). The Asian Journal of Horticulture. 2008;3(2):319-322.