Journal of Crop and Weed, 17(1): 242-245 (2021)
ISSN- O : 2349 9400 ; P : 0974 6315

http://cwssbckv.org
www.cropandweed.com

Standardization of trailing method and irrigation frequency for yardlong bean (*Vigna unguiculata* var. *sesquipedalis* (L.) raised in containers for urban farming

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Received : 11.04.2020 ; Revised : 15.12.2020 ; Accepted : 26.12.2020

DOI : https://doi.org/10.22271/09746315.2021.v17.i1.1431

ABSTRACT

An experiment was conducted at College of Agriculture, Vellayani, Thiruvananthapuram,Kerala during summer 2017 to study the effect of trailing methods under various irrigation frequency on the performance of container grown yardlongbean. The treatments comprised of three trailing methods viz.pandal system (R_1), trellis system (R_2) and trailing stand(R_3) and two levels of irrigation frequency viz.daily irrigation (I_1) and irrigation at temporary wilting stage (I_2). The treatments were replicated thrice adopting completely randomized design. Higher pod yield plant^{-1} was recorded when the crop was trailed on trellis system (832.03 g) and was significantly superior with daily irrigation (941.85 g) as compared to irrigation at temporary wilting stage. The root parameters viz. root volume, root weight, root shoot ratio and number of pickings were higher with daily irrigation. Interaction of trailing method and irrigation intervals influenced yield and economics of cultivation, where trailing the crop on trellis system under daily irrigation recorded superior podyield plant^{-1}(1,079.1g), net income (Rs 45.48 bag^{-1}) and BCR (2.36).

Keywords*:* Container cultivation, irrigation frequency, pandal system, temporary wilting, trailing pattern, trellis system, yardlong bean

Declining farm land availability and labour shortage are the major hindrances in promoting conventional system of vegetable cultivation in Kerala. As horizontal land expansion is limited to meet the food requirement, container gardening is a common scene in urban areas for growing organic vegetables. Urban farming is the process of utilizing novel scientific farming techniques for year-round production of high quality fresh organic food in very limited areas like terraces and balconies (Agarwal and Sinha, 2017). This can bedone anywhere in a house irrespective of space with the right growing containers and growth media. Among the fresh vegetables, vegetable type of cowpea known as yardlong bean (*Vigna unguiculata* var. *sesquipedalis*(L.) Verdcourt) is one of the most chosen crops grown in Kerala occupying an area of about 6714 ha (FIB, 2019). This crop is a warm season vigorous trailing annual which produces very long slender pods rich in vegetable protein and dietary fibre. As yardlong bean is one of the most preferred vegetables in every household, it is essential to formulate management practices for its successful cultivation in containers. Being a trailer, the performance of yardlong bean under different trailing methods varies. As part of maximum space utilization, several low-cost structures that could be easily installed on terraces, balconies, or kitchen gardens are widely used among the urban residents. The performance of the crop grown in such structures has to be compared with that of the conventional trailing methods so as to find a suitable trailing method for container grown yardlong bean. Irrigation is one of the key factors for increasing the productivity of any crop. For yardlong bean, irrigation is vital as water stress may drastically reduce the crop yield in containers. In this backdrop, the present investigation was undertaken to standardize irrigation interval and trailing method for container (grow bag) grown yardlong bean.

MATERIALS AND METHODS

The field trial was carried out in summer season of 2017 with the crop period extending from January to May at the Instructional Farm attached to College of Agriculture, Vellayani, Kerala, located at 8° 25' 46" N latitude, 76° 59' 24" E longitude and altitude of 29 m above the mean sea level. The region enjoys a humid tropical climate with a temperature of 26.9 to 42.2°C and relative humidity of 89%. A total of 244.5 mm rainfall was received in 105 days with an average weekly evaporation of 33.89 mm during the cropping period.The treatments comprised of three trailing methods *viz.*pandal system (R_1), trellis system(R_2) and trailing stand (R_3) and two levels of irrigation frequency *viz.*daily irrigation (I_1) and irrigation when plant is at temporary wilting stage (I_2).The container used was UV stabilized growbags of size 39 cm x 26 cm capable of holding 15 kg potting mixture.The potting medium consisted of soil, sand, coirpith and FYM in 1: 0.5: 0.5:

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1 ratio. The nutrient schedulefollowed was 30: 30: 20 kg N: P_2O_5: K_2O ha^{-1} where half dose of Nitrogen, full Phosphorus and Potassium were given as basal. There maining dose of Nitrogen was given in the form of fermented groundnut cake @ 10 g $L^{-1}$$bag^{-1}$applied once at fortnight continued till 50 per cent plants completed flowering. Lime and neem cake each at 10g bag^{-1}were applied uniformly to all growbags before sowing. The experiment was replicated thrice in Completely Randomized Design(CRD). Yardlong bean var. *Githika*was sown at the rate of two seeds per bag and later thinned to one plant per growbag.The experimental site was cleared and black polythene mulch sheet was spread on the site. Growbags were filled with uniform quantity of potting media (9kg) and placed at 1.5 m x 0.5 m spacing.

Trailing methods were provided as per the treatments. A trellis system for trailing the plants was erected by fixing two poles on either sides of the row and these two poles were connected by three rows of kera rope. Conventional pandal was erected at a height of 2m using wooden poles and top portion was tied with kera rope in a criss cross pattern. A trailing stand was locally fabricated using 30 cm x 30 cm galvanized weld mesh having a height of 210 cm. The circumference of the stand was 180 cm and the interval between two meshes was 30 cm.

The treatment imposition for irrigation study was started at 25 DAS. The soil moisture content at field capacity (22%), permanent wilting point (8%) and temporary wilting point (10%) were found out using Pressure plate apparatus (Hillel, 1971) for the first two parameters and latter using Core method (Gupta and Dakshinamoorthi, 1980). Moisture of the media was brought to field capacity in all the growbags. The amount of water required for irrigation was estimated as one litre and two litre, respectively for bringing the moisture content to field capacity and when plant showed temporary wilting. Uniform mulching with dry leaves (100 g) was given to all grow bags from 25 DAS. Harvesting commenced from 47 DAS. Growth and yield attributes were recorded and data analyzed statistically.

RESULTS AND DISCUSSION

(a) Effect of trailing methods on growth and yield characters of container grown yardlong bean

The three trailing methods evaluated were pandal, trellis and trailing stand. It was found that the different trailing systems did not have any influence on growth characters. Early flowering was recorded on trellis system while, trailing yardlong bean in trailing stand recorded delayed flowering, longer duration and consequently more number of pickings. Trailing the crop on trellis system recorded higher number of pods and subsequently high yield, which might be attributed to high light interception in trellis system avoiding mutual shading of leaves compared to pandal system. Higher light interception increased the photosynthetic activity of the crop and augmented the production, assimilation and translocation of photosynthates to growing parts which stimulate dearly flowering. Moreover, presence of parasitic leaves in pandal system could be a cause for reduced yield. Trellis system of trailing recorded higher dry matter yield and harvest index. Trailing yardlong bean in trellis system registered maximum net income and benefit cost ratio owing to the higher number of pods as well as pod yield.

(b) Growth and yield characters of container grown yardlong bean as influenced by irrigation intervals

Irrigation management is one of the key factors increasing productivity of container grown yardlong bean. The results of the study indicated that different frequencies of irrigation significantly influenced growth and yield characters. Between the irrigation frequencies, irrigation on a daily basis enhanced growth parameter like primary branches and functional leaves $plant^{-1}$ as moist soil could ensure better nutrient availability and growth (Prasad *et al*., 1991). Chatterjee and Bhattacharya (1986) reported that absence of moisture stress at the critical stages and higher moisture regimes results in better growth. According to Mini (1997) frequent light irrigations given to yardlong bean results in production of higher number of leaves $plant^{-1}$ during summer season. Being an indeterminate crop, pod yield was significantly influenced by crop duration and number of pickings. Daily irrigation had a positive influence on crop duration while inducing stress by increasing the irrigation interval reduced the crop duration where irrigation was given at temporary wilting stage.When the crop was subjected to moisture stress, early flowering due to the early initiation of flower buds in mild stress was observed which is in conformity with the results obtained by Babu (2015) in yardlong bean.

The key yield characteristics *viz*., number of pods $plant^{-1}$ (50.49) and pod yield $plant^{-1}$ (941.85 g) were significantly higher in daily irrigation (I_1). Similarly, daily irrigation recorded superior values ofroot parameters due to the adequate moisture in the rhizosphere zone which aided in forming a strong root system throughout the growing period. Optimum moisture supply and better root system might have solubilized, mobilized and translocated the nutrients resulting in higher pod yield.Treatment receiving daily irrigation recorded higher NPK uptake by plant biomass, increased dry matter production resulted in higher nutrient uptake. Daily irrigation recorded higher

Table 1. Effect of trailing method and irrigation on vegetative and yield attributes of container grown yardlong bean

Treatments	Crop duration (days)	Days for 50 % flowering	No. of pods plant^{-1}	Pod yield plant^{-1}(g)	Root volume (cm^3)	Total * DM yield plant^{-1} (g)	No. of pickings	Harvest index	Uptake (g plant^{-1})			Net income	BCR
									N	P	K		
Trailing method													
R_1: pandal system	102.78	40.68	39.54	626.39	37.41	360.18	18.50	0.293	0.099	9.16	7.09	18.24	0.92
R_2: trellis system	103.55	40.12	50.49	832.03	35.75	472.99	18.77	0.359	0.106	12.09	9.14	30.65	1.59
R_3: trailing stand	105.903	41.80	49.27	814.53	33.91	463.05	20.69	0.298	0.106	11.83	9.13	26.90	1.22
SEm(+)	**0.17**	**0.17**	**0.81**	**2.06**	**3.10**	**1.27**	**0.09**	**0.007**	**0.006**	**0.08**	**0.26**	**0.13**	**0.007**
LSD (0.05)	**0.526**	**0.514**	**2.492**	**6.415**	**NS**	**3.964**	**0.331**	**0.021**	**NS**	**0.262**	**0.797**	**0.418**	**0.021**
Irrigation frequency													
I_1: daily irrigation	104.63	41.32	61.77	941.85	45.88	535.43	19.87	0.355	0.135	13.71	10.48	36.17	1.78
I_2: irrigation at temporary wilting	103.52	40.41	31.10	573.46	25.50	328.72	18.77	0.278	0.072	8.35	6.43	14.35	0.70
SEm(+)	**0.14**	**0.14**	**0.66**	**1.68**	**2.53**	**1.039**	**0.09**	**0.006**	**0.02**	**0.07**	**0.21**	**0.11**	**0.005**
LSD (0.05)	**0.430**	**0.420**	**2.035**	**5.238**	**7.806**	**3.237**	**0.270**	**0.017**	**0.005**	**0.214**	**0.651**	**0.341**	**0.017**

*DM: dry matter

Table 2. Interaction effect of trailing method (R)and irrigation (I)on vegetative and yield attributes of container grown yardlong bean

Treatments	Crop duration (days)	Days for 50% flowering	No. of pods plant^{-1}	Pod yield plant^{-1}(g)	Root volume (cm^3)	Total * DM yield plant^{-1} (g)	No. of pickings	Harvest index	Uptake(g plant^{-1})			Net income	BCR	Water requirement (m^3)	Water use efficiency (kg plant $^{-1}$ m^{-3})
									N	P	K				
R_1I_1	103.77	41.26	49.11	751.52	44.00	427.23	18.99	0.31	0.127	10.94	8.34	25.32	1.28	0.0110	6.84
R_1I_2	101.80	40.11	29.98	501.28	30.83	293.13	18.02	0.28	0.071	7.39	5.85	11.16	0.56	0.0102	4.91
R_2I_1	104.13	40.32	68.55	1,079.15	45.83	613.48	19.18	0.43	0.132	15.64	11.94	45.48	2.36	0.0104	10.38
R_2I_2	102.96	39.92	32.44	584.91	25.66	332.51	18.36	0.29	0.079	8.54	6.33	15.82	0.82	0.0103	5.68
R_3I_1	105.99	42.39	67.66	994.87	47.83	565.57	21.44	0.32	0.147	14.55	11.16	37.72	1.71	0.0106	9.39
R_3I_2	105.82	41.21	30.89	634.19	20.00	360.53	19.93	0.27	0.064	9.11	7.09	16.08	0.73	0.0106	5.98
SEm(+)	**0.24**	**0.24**	**1.14**	**2.91**	**4.39**	**1.80**	**0.15**	**0.01**	**0.008**	**0.12**	**0.362**	**0.19**	**0.009**	**-**	**-**
LSD (0.05)	**NS**	**NS**	**3.524**	**9.072**	**NS**	**5.606**	**NS**	**0.030**	**NS**	**0.370**	**1.127**	**0.591**	**0.029**	**-**	**-**

available P content in plant biomass after the experiment due to the mineralization of applied P under favourable moisture regimes. Irrigation on a daily basis recorded higher dry matter yield, harvest index and number of pickings as the duration of the crop was higher (Table 1). The availability of moisture throughout the growth period could prolong the reproductive phase of the crop. Under moisture stress condition, due to vapour gap formed in the roots and turgor pressure, nutrient availability would be hindered causing a drastic reduction in dry matter production and uptake of nutrients (Phillips, 1966).

The interaction of trailing methods and irrigation intervals did not have any influence on growth characters while it influenced the yield characters (Table 2). Higher water use efficiency of 10.38 kg plant^{-1} m^{-3} was obtained with the cowpea plants in trellis system irrigated daily (Table 2). Higher pod number and pod yield per plant were registered by trellis system followed by trailing stand under daily irrigation. Higher dry matter yield and harvest index were registered in trellis under daily irrigation may be due to the higher N and K uptake by plant biomass though the interaction effect could not influence the root characters. Interaction of trailing method and irrigation interval influenced economics of cultivation where trailing the crop on trellis system under daily irrigation recorded higher profit (Rs.45.48 bag^{-1}) as well as BCR (2.36).

In the present study, it was revealed that early flowering, higher number of pods plant^{-1} (50.49), pod yield plant^{-1} (832.03g), total dry matter, yield and harvest index were recorded in container grown yardlong bean when trailed under trellis system. In terms of irrigation, daily irrigation attributed to strong root development and higher pod yield. The interaction between trailing system and irrigation interval in container grown yardlong bean (*Vigna unguiculata* var. *sesquipedalis*) influenced yield and economics of cultivation with trailing the crop on trellis system under daily irrigation recorded superior pod yield of 1,079.1g plant^{-1}and BCR of 2.36.

REFERENCES

Agarwal, H.P. and Sinha, A. 2017. Urban farming - a sustainable model for Indian cities. *Int. J. Emerging Technol.*,**8**: 236-242.

Babu, R.S.A. 2015. Stress induced source-sink modulation in yardlong bean (*Vigna unguiculata* subsp.*sesquipedalis* (L) Verdcourt). M.Sc. (Ag) Thesis, Kerala Agricultural University, Thrissur, pp. 98.

Chatterjee, B.N. and Bhattacharya, K.K. 1986. *Principles and Practices of Grain Legume Production*. Oxford and IBH Publishing Co., New Delhi, pp. 333.

FIB (Farm Information Bureau). 2019. *Farm Guide*. Department of Agriculture, Government of Kerala, pp. 352.

Gupta, R.P. and Dakshinamoorthi, C. 1980. *Procedures of Physical Analysis of Soil and Collection of AgroMeterological Data*. IARI, New Delhi, pp. 280.

Hillel, D. 1971. *Soil Water Physical Principles and Processes*. Academic Press, New York, London, pp. 288.

Mini, C.L. 1997. Response of vegetable cowpea (*Vigna sesquipedalis* (L.) Fruw) to phosphorus under varying moisture levels and plant density. M.Sc. (Ag.) Thesis, Kerala Agricultural University, Thrissur, pp. 164.

Phillips, J.R. 1966. Plant water relations – some physical aspects. *Ann. Rev. Pl. Physiol.***17**: 245-268.

Prasad, L.S., Subbaiah, G. and Venkateswari. 1991. Influence of irrigation on growth and yield of green gram. *Andhra Agric. J.***38**: 81-83.