

Effect of Drip Irrigation Scheduling on Growth and Yield of Guava (*Psidium guajava* L.) in Madhya Pradesh

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Abstract A long term experiment was conducted to evaluate the effect of irrigation scheduling on growth and yield of guava (*Psidium guajava* L.) in Madhya Pradesh. The present study was conducted during 2006 to 2014. The highest plant height (5.85 m) was recorded in treatment T₆ where 4 dripper/plant were imposed at alternate day. The highest canopy height of 6.07m was recorded in treatment T₃ where 4 dripper/ plant daily were imposed. The highest spread in N-S and E-W of 6.98 m and 7.07

m respectively was recorded in treatment T₃ where 4 dripper /plant daily were imposed. The maximum no. of fruit (589.00) were recorded in treatment T₆ (4 dripper/plant alternate day) followed by treatment T₅ (3 dripper/plant alternate day), maximum fruit weight (211.00 g) was recorded in treatment T₃ (4 dripper/plant daily). The maximum fruit yield (110.80 kg/tree) was recorded in treatment T₃ (4 dripper/plant daily) followed by treatment T₆ (4 dripper/plant alternate day) where 99.85 kg/tree yield was recorded. Maximum B : C ration of 6.4 was recorded in treatment T₃ (4 dripper/plant daily).

Keywords Guava, Irrigation scheduling, Growth, Yield.

Introduction

Guava (*Psidium guajava* L.) belonging to the family Myrtaceae, is one of the important fruit crop in India. Guava is onsidered as one of the wonderful, nutritionally valuable and remunerative fruit crop of the world. Besides India, it is grown widely throughout the tropics of the world. Its cultivation is getting popularity due to increasing international trade, better nutritional contents and recessing of its value added products like jam, jelly. It is a hardy fruit crop thriving well under a wide range of soil type varying from sandy loam to clay loam with pH of 4.5 to 8.2. Guava fruit is rich in vitamin-C minerals like cal-

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cium, iron and phosphorus with pleasant aroma and flavor [1]. Drip irrigation proved efficiently in providing irrigation water to the roots of plants, while maintaining high yield production. Modern drip irrigation has arguably become the world's most valued innovation in agriculture since the invention of the impact sprinkler, which replaced flood irrigation. This is because high water application efficiencies are often possible with drip irrigation, since there is reduced surface evaporation less surface runoff, as well as minimal deep percolation. Moreover, a drip irrigation system can easily be used for thorough growth of the crop by which crop nutrient requirements can be met accurately. In the present-day context, improvement in irrigation practices, including schedules and method, is needed to increase crop production and to sustain productivity level. Irrigation is the conventional method widely used in most of the fruits crops in India. However, this method uses more water compared to other high-tech water-saving methods such as sprinkler, drip. Many researchers have reported the higher application efficiency of drip irrigation systems over the conventional basin irrigation systems [2—4] in fruits and 40 to 60% savings of water has been observed. Singh et al. [5] reported that irrigation requirement met through drip irrigation along with polythene mulch gave the highest yield of guava (37.70 t/ha) with 164% greater yield as compared to ring basin irrigation [5]. Hence, the present study was undertaken to examine the growth and yield using different irrigation schedules by drip irrigation and to suggest the most efficient irrigation schedule that would attain the highest growth and yield of the crop.

Materials and Methods

The experiment was laid out in factorial randomized block design (RBD) under All India Coordinated Research Project on fruits. To standardize level of daily irrigational water of guava orchard, a field experiment was laid out in 2001 on cultivar Dhareedar with the objectives to standardize level of irrigational water for increasing the productivity of guava tree and to determine the effect of alternate day irrigational water on productivity and quality of guava fruits. In total seven treatments were imposed with three replications. The treatments comprised of 3 irrigational methods namely (1) irrigation water-IW level = 3 (25, 50, 75 mm) daily, (2) irrigation water IW level = 3 (25, 50, 75 mm) alternate day and control. Thus, the seven treatment combinations including T₁ -2 dripper per plant daily, T₂ -3 dripper per plant daily, T₃ -4 dripper/plant daily, T₄ -2 dripper/plant alternate day, T₅ -3 dripper/plant alternate day, T₆ -4 dripper/plant alternate day and T₇ -Control were imposed during rest period. The data were recorded on tree height (m), trunk girth (cm), canopy height (m) and plant spread (m) using meter scale and vernier calliper. No. of fruit, fruit weight, yield tree⁻¹, yield ha⁻¹ and benefit : cost ratio of different treatments were also recorded. Mature fruits were harvested periodically from each treatment separately and the weight was recorded with the help of single pan balance and expressed in kilogram. Further fruits/ha were calculated by multiplying the fruit yield/plant to the number of plants/ha. The net income was obtained by subtracting the treatment cost from gross income. It was expressed on net excess income over

Table 1. Morphological characters of guava influenced by various levels of drip irrigation during 2013-14.

Sl. No.	Treatments	Plant height (m)	Canopy height (m)	Circumference (cm)		Spread (m)	
				Root stock	Scion	N-S	E-W
1	T ₁ -2 dripper per plant daily	5.93	5.67	76.5	66.67	7.05	6.95
2	T ₂ -3 dripper per plant daily	6.83	6.03	73.83	66.5	6.93	7.1
3	T ₃ -4 dripper/plant daily	6.62	6.07	72.67	70.5	6.98	7.07
4	T ₄ -2 dripper/plant alternate day	5.73	5.33	71.5	57.33	6.52	6.86
5	T ₅ -3 dripper/plant alternate day	6	5.8	68.33	63.17	6.57	7.07
6	T ₆ -4 dripper/plant alternate day	5.85	5.02	63.67	58	6.5	7.13
7	T ₇ -Control	5.1	4.38	67.33	54.67	6.45	6.63
	SEm ±	0.25	0.20	1.65	1.29	0.12	0.14
	CD at 5%	0.39	0.31	2.54	1.99	0.19	0.22

Table 2. Effect of various levels levels of drip irrigation on yield of guava cv Dhareedar during 2013-14.

Sl. No.	Treatments	No. of fruits	Fruit yield (kg/plant)	Av. fruit wt (g)
1	T ₁ -2 dripper per plant daily	533.33	103.64	194.33
2	T ₂ -3 dripper/ plant daily	540.67	111.02	205.33
3	T ₃ -4dripper/plant daily	575.67	121.47	211
4	T ₄ -2 dripper/ plant alternate day	531.67	108.99	205
5	T ₅ -3 dripper/plant alternate day	579.33	117.8	203.33
6	T ₆ -4 dripper/plant alternate day	589	123.1	209
7	T ₇ -Control	417.67	77.57	185.73
	SEm±	5.391	2.789	2.11
	CD at 5%	15.25	7.89	5.97

the control. The data obtained on various characters were subjected to factorial RBD analysis and interpretation of the data was carried out in accordance to Panse and Sukhatme [6].

Results and Discussion

The results indicate that various level of irrigational water exhibited significant effect on canopy, yield and quality of the fruits. The maximum plant height (6.83 m) was observed in treatment T₂ (3 dripper per plant daily) followed by T₃ -4 dripper/plant daily (6.62 m). However, minimum plant height (5.10m)

was recorded in control. The maximum canopy height (6.07) was recorded with the treatment T₃ -4 dripper/plant daily. However, minimum (4.38 m) was recorded in treatment T₇ -Control. The maximum tree spread in E-W and N-S of 7.10 m and 6.93 m respectively was observed in the treatments T₂ -3dripper per plant daily. However, minimum tree spread in E-W and N-S of 6.45 m and 6.63 m respectively was recorded in treatment T₇ -control. The detailed data for these parameters have been shown in Table 1. The maximum no. of fruit (589.00) was recorded in treatment T₆. However, the minimum no. of fruit (417.67) were recorded in control. The highest average fruit weight of 211.0 g was observed in the treatment T₃ where 4 dripper/plant daily was implemented. This was followed by treatments T₆ where 209.00g average fruit weight was recorded. The minimum fruit weight of 185.73 g was recorded in control. The detailed data for no. of fruits, fruit yield and average fruit weight has been shown in Table 2.

The 8 years pooled yield data clearly indicated that maximum fruit yield tree⁻¹ and yield ha⁻¹ of 110.80 and 306.91 qt respectively was recorded in treatment T₃ where 4 dripper/plant daily was implemented. This was followed by T₆ (4 dripper/plant alternate day) and respectively 99.85 and 276.59 qt fruit yield tree⁻¹ and yield ha⁻¹ were recorded. The detailed data of each treatment for fruit yield tree⁻¹ and yield ha⁻¹ have been provided in Table 3. It has been reported 164% greater yield in case of drip (VD)

Table 3. Effect of various of drip irrigation on cumulative yield of guava cv Dhareedar during 2006-07 to 2013-14.

Sl. No.	Treatments	Yield tree ⁻¹ (kg)								Mean yield tree ⁻¹ (kg)	Yield Q/ha	B : C ratio
		2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14			
1	T ₁ -2 dripper per plant daily	48.9	55.24	76.69	98.07	100.95	110.23	112.25	103.64	88.25	244.44	4.1
2	T ₂ -3 dripper per plant daily	54.8	63.45	86.33	107.63	113.65	120.25	123.59	111.02	97.59	270.32	5.6
3	T ₃ -4 dripper/plant daily	66.2	77.73	97.23	120.53	125.6	137.63	140	121.47	110.8	306.91	6.4
4	T ₄ -2 dripper/ plant alternate day	42	47.46	75.95	98.07	99.9	109	108	108.99	86.17	238.69	4.9
5	T ₅ -3 dripper/plant alternate day	49.7	56.57	77.63	103.53	103.33	115.43	119.43	117.8	92.93	257.41	5.3
6	T ₆ -4 dripper/plant alternate day	52.4	60.24	80.97	106.93	112.3	130.3	132.58	123.1	99.85	276.59	5.7
7	T ₇ -Control	28.9	31.5	49.37	64.33	68.5	80.97	90	77.57	61.39	170.06	3.7
	SEm±	4.6	2.84	1.68	1.24	4.98	0.48	4.21	2.79			

as compared to that of ring basin irrigation in guava [7]. Patel and Patel [8] reported that the increase in yield was mainly because of better growth of the plant under optimum amount of nutrients in pomegranate crops [8]. The benefit cost ratio was also found highest (6.4-hectare basis) with the treatment T_3 where 4 dripper/plant daily was implemented. The minimum B : C ratio registered with the treatment T_7 in control. The results are in conformity with the finding of various previous studies [8, 9]. In this way, treatment T_3 having 4 dripper/plant daily showed better results and hence, are recommended for irrigational purpose in guava orchard to increase the productivity and quality of fruits as compared to other treatments in orchards of guava.

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