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Effect of micro irrigation on growth, yield and quality of sardar guava under semi arid conditions of Rajasthan

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Abstract

A field experiment on guava (*Psidium guajava* L.) cv. Sardar was carried out at Department of Horticulture, Udaipur. There were seven treatments *i.e.*, drip irrigation at 25%ET through 2drippers/ plant per day (T_1), irrigation at 50% ET through 3 Drippers/plant daily (T_2), irrigation at 75% ET through 4 drippers/plant daily (T_3), irrigation at 25% ET through 2 dripper/plant on alternate day (T_4), irrigation at 50% ET through 3 dripper/plant on alternate day (T_5) and irrigation at 75% ET through 4 dippers plant on alternate day (T_6) and conventional flow irrigation at 0.75 CPE (T_7). Plants were planted at a spacing of 6x6metre under randomized block design with three replications and age of plant three years. Result revealed that the irrigation at 75% ET through 4 dippers per plant per day (T_3) exhibited significantly higher plant height (350 cm), canopy volume (24.83 cubic metre), fruit weight (135g) and per plant yield (14.89 kg). While, in quality wise highest TSS in T_3 (irrigation at 75% ET through 4 drippers/plant daily) and vitamin C content in control (T_7).

Key Words: Drip irrigation, guava cv. L-49, semi-arid, Sardar guava

Introduction

Guava (*Psidium guajava* L.) is most popular fruit of India. Conventionally, guava orchard is irrigated through basin method which require large amount of water. It also favours the losses of water due to seepage and over flooding. However, many advanced methods of irrigation have been developed at global level to maximize the production per unit of water use. Micro irrigation technology innovations are to be achieving the twin objectives of higher

productivity and optimum use of water under irrigation system excels over other methods. In drip irrigation every drop of the water is judiciously utilized within the root zone of the tree. Keeping in view the present experiment planned (Agnihotri et al. 2016; Yadav et al. 2017).

Materials and Methods

The experiment was conducted on 3 year old guava plants cv. Sardar at Department of Horticulture, RCA campus, Udaipur during 2007-08 and 2008-09. The soil of experimental field was low in available nitrogen (201 kg ha^{-1}), medium to low available phosphorus (20.2 kg ha^{-1}) and potassium (280.3 kg ha^{-1}) content. There were seven treatments i.e., drip irrigation at 25% ET through 2drippers /plant per day (T_1), irrigation at 50% ET through 3 Drippers/plant daily (T_2), irrigation at 75% ET through 4 drippers/plant daily (T_3), irrigation at 25% ET through 2 dripper/plant on alternate day (T_4), irrigation at 50% ET through 3 dripper/plant on alternate day (T_5) and irrigation at 75% ET through 4 dippers plant on alternate day (T_6) and conventional flow irrigation at 0.75 CPE (T_7). Plants were planted at a spacing of 6x6metre. The experimental was carried out in a randomized block design with three replications. A recommended dose of 15 kg FYM applied through basal and NPK @ 180g, 120g and 120g dose per plant through fertigation except control. Growth (plant height, girth, spread and canopy volume) and yield attributes (fruit weight and yield) were recorded from five randomly selected fruits. The quality parameters (TSS & Vitamin C content) analyzed as per standard method (AOAC 1975). Leaf samples were collected as per procedure describe by Bhargava & Chadha (1993) and were analyzed using standard methods for estimation of nitrogen (Snell & Snell 1939), phosphorus (Jaction 1967) and zinc (Elwell & Grindely1967).

Results and Discussion

Data revealed that the treatment T_3 that is 4 dippers daily having maximum value with respect to growth parameters viz., plant height (3.50 m), plant spread (3.10m EWx3.10mNS) and canopy volume (24.83 cubic metre), but stem diameter maximum was recorded in recorded in control and plant spread and canopy recorded in T_4 (Table-1). Reduce growth parameters under conventional system might be due to poor aeration in root zone. These findings with the cognitions of the findings of Sarolia et. al (2005).

Table1. Vegetative growth parameters of guava cv. "Sardar" as influenced by various levels of drip irrigation (pooled data of two year)

Treatments	Plant height (m)	Growth parameters			
		Plant girth (cm)	Plant Spread (m) EW	NS	Canopy volume (cubic m)
(T_1) 2 drippers /plant daily	2.55	5.54	2.30	2.46	5.70

(T_2) 3 drippers /plant daily	3.40	5.88	3.00	3.00	19.87
(T_3) 4 drippers /plant daily	3.50	6.05	3.10	3.10	24.83
(T_4) 2 drippers /plant alternate day	2.45	6.52	1.80	1.95	3.00
(T_5) 3 drippers /plant alternate	2.61	7.95	2.40	2.65	7.88
(T_6) 4 drippers /plant alternate	2.70	8.27	2.65	2.90	11.91
(T7) Control	2.00	5.00	2.00	2.10	3.38
SEm±	0.11	0.14	0.08	0.07	0.30
CD at 5%	0.29	0.35	0.20	0.17	1.01

About yield attributed, yield and quality parameters study the treatment T_3 recorded maximum fruit weight (135g), per plant yield (14.89 kg) and TSS (12%) along with significantly higher vitamin C content while, non significantly higher in control (T_7). These value lowest recorded in control (T_4) except quality parameters, which were lowest noticed in T_6 (TSS) and T_5 (vitamin C). Further, yield in T_3 treatment 46.3 per cent more compare to control (T_7) (Table 2). Higher yield obtained under drip irrigation over conventional method due to lesser amount of water application may be attributed to better moisture conditions in the rhizosphere throughout the growing periods. The results are partial accorded with the findings of Ramniwas et al. (2012 & 2013) in guava.

Table2. Yield attributes and quality components of guava cv. "Sardar" as influenced by various levels of drip irrigation (pooled data of two year)

Treatments	Fruit weight (g)	Yield (kg) plant^{-1}	TSS (%)	Ascorbic acid (mg/100g)
(T_1) 2 drippers /plant daily	115.00	10.05	12.0	160.00
(T_2) 3 drippers /plant daily	105.00	14.50	12.0	155.00
(T_3) 4 drippers /plant daily	135.50	14.89	12.5	172.33
(T_4) 2 drippers /plant alternate day	96.00	9.89	12.0	156..67
(T_5) 3 drippers /plant alternate	110.50	10.0	11.0	148.33

(T_6) 4 drippers /plant alternate	122.50	13.89	9.5	176.67
(T_7) Control	123.0	10.18	10.0	180.00
SEm ±	4.777	0.39	0.280	4.868
CD at 5%	14.012	1.26	0.827	14.360

Leaf nutrient status parameters nitrogen content maximum observed in plant leaf that received irrigation at 25% ET through 2 dippers per plant daily (T_1) whereas, phosphorus and potassium content maximum recorder in treatment T_3 i.e. irrigation at 75% ET through 4 dippers per plant daily (Table-3). The pronounced effect on counter balancing of 'dilution effect' in nutrient deficit soils could also be seen which, in turn finally increased nitrogen, phosphorus and potassium content in leaf.

Table 3. Leaf nutrient status of guava cv. Sardar as influenced by various levels of drip irrigation (pooled data of two year)

Treatments	Nitrogen (%)	Phosphorus (%)	Potassium (%)
(T_1) 2 drippers /plant daily	1.407	0.400	1.096
(T_2) 3 drippers /plant daily	1.357	0.425	1.103
(T_3) 4 drippers /plant daily	1.396	0.465	1.172
(T_4) 2 drippers /plant alternate day	1.397	0.430	1.106
(T_5) 3 drippers /plant alternate	1.305	0.315	1.065
(T_6) 4 drippers /plant alternate	1.332	0.360	1.072
(T_7) Control	1.333	0.390	1.102
SEm ±	0.031	0.010	0.024
CD at 5%	0.092	0.029	0.072

It is thus concluded that drip irrigation could judiciously be used in areas having limited supply of irrigation water, reasonably sustaining crop yield in fruit based orchard. On 3 year old guava orchard 75% ET through 4 dippers per plant daily (T_3), with discharge rate 2.5 litre water per hours sufficient for attributing to better growth, yield and satisfactory quality of the crop.

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