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Response of Guava cv. L-49 to Urea and murate of potash fertigation levels

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Abstract

Farmer's practices of guava cultivation in trend with basin irrigation and basal fertilizer application, which has low application and use efficiencies. However, some farmers in the state are reluctant to adopt drip technology, due to lack of information on fertigation scheduling and high cost of water soluble fertilizers (WSF) this practice not in vogue. Now need to assess basal fertilizer doses application through drip for better use efficiency. Guava cv. L-49 imposed to apply eleven treatment combinations comprised viz., Farmer's practice (basin & basal application) with urea and murate of potash fertigation levels viz., Farmer's practices (basin &basal application) (T_1), drip irrigation and basal application of fertilizers (T_2), 50 % RDF (N+K) at 3 days interval through fertigation(T_3), 50 % RDF (N+K) at 5 days interval through fertigation(T_4), 50 % RDF (N+K) at 7 days interval through fertigation(T_5), 75 % RDF (N+K) at 3 days interval through fertigation(T_6), 75 % RDF (N+K) at 5 days interval through fertigation(T_7), 75 % RDF (N+K) at 7 days interval through fertigation(T_8), 100 % RDF (N+K) at 3 days interval through fertigation (T_9), 100 % RDF (N+K) at 5 days interval through fertigation(T_{10}) and 100 % RDF (N+K) at 7 days interval through fertigation(T_{11}). All observations were recorded from winter season crop. Treatment T_{11} (100 % RDF (N+K) at 7 days interval through fertigation) additional produced fruit yield of 8.12 q ha^{-1} in comparison to the farmer's practices (T_1).

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Introduction

Guava (*Psidium guajava* L.) is an important fruit crop grown in almost all parts of India and is one of the preferred fruit crops in Southern Rajasthan. Commercial varieties in this area are L-49, Allahabad Safeda and Burfkhan genotype. Farmer's practices of guava cultivation in trend with basin irrigation and basal fertilizer application, which has low application and use efficiencies. However, some farmers in the state are reluctant to adopt drip technology,

due to lack of information on fertigation scheduling and high cost of water soluble fertilizers (WSF). Earlier experiments results have clearly revealed that through fertigation in guava could be saved about 40-50 per cent nutrients (Ramniwas et al. 2013; Sarolia et al. 2015). One of the reasons might be limited adoption of fertigation despite savings of fertilizer is attributed to non availability of water-soluble fertilizer at affordable cost. Hence, the present study was undertaken to work out the suitable doses of water soluble common fertilizers (urea & MOP) on the basis of fertigation experiment. It is fact that drip irrigation improves the water and fertilizer use efficiency besides improving the yield and quality of produce (Singh et al. 2003; Shukla et al. 2017). Keeping in view the present experiment was conducted

Materials and Methods

A field experiment on guava cv. L-49 was conducted at Horticulture Farm, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan during the year 2012-15. Experimental orchard was situated at 24º34' N latitude and 73º42' E longitude at an elevation of 582.17 meters above mean sea level. The soil of the experimental field was clay loamy in texture, slightly alkaline in reaction (8.5 pH), low in available nitrogen (253.5 kg ha^{-1}), medium in organic-carbon (0.75%), available phosphorus (27.5) and available potassium (271.4 kg ha^{-1}). Selected three year old guava cv. L-49 plants for study planted at 5 x5 metre spacing and treatments were allocated under randomized block design fashion with thrice replications. Constantly applied drip irrigation at 0.75 CPE at alternate day on cumulative pan evaporation basis.

Eleven treatment combinations comprised with viz., Farmer's practice (basin & basal application) (T_1), drip irrigation and Basal application of fertilizers (T_2), 50 % RDF (N+K) at 3 days interval through fertigation(T_3), 50 % RDF (N+K) at 5 days interval through fertigation(T_4), 50 % RDF (N+K) at 7 days interval through fertigation(T_5), 75 % RDF (N+K) at 3 days interval through fertigation(T_6), 75 % RDF (N+K) at 5 days interval through fertigation(T_7), 75 % RDF (N+K) at 7 days interval through fertigation(T_8), 100 % RDF (N+K) at 3 days interval through fertigation (T_9), 100 % RDF (N+K) at 5 days interval through fertigation(T_{10}) and 100 % RDF (N+K) at 7 days interval through fertigation (T_{11}).

Calculated dose of fertilizers and method of application

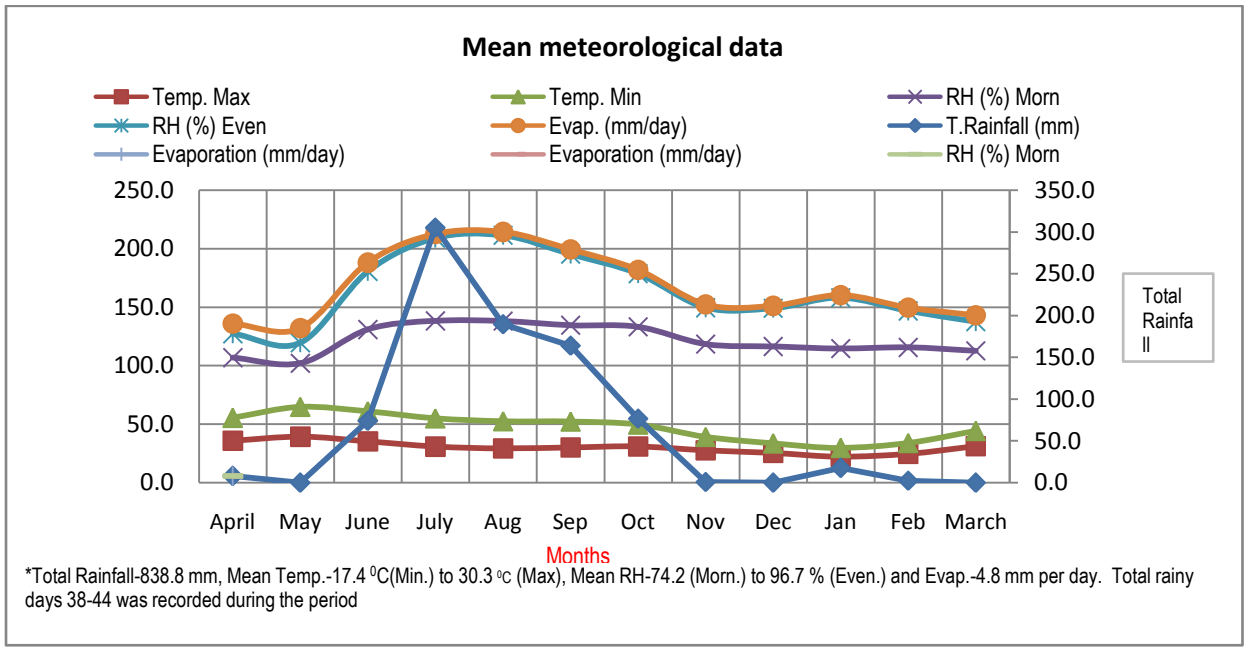
Fertilizers	Amount of fertilizers g/plant/year			Application method
	50%	75%	100%	
Urea	165	245	330	Splits through drip
SSP	187.5	280	375	Basal
MOP	125	187.5	250	Splits through drip

***** Fertilizer dose NPK $plant^{-1}$ @ 50: 20 50 g $year^{-1}$ and 150:60:150 g for three year old plant.

Time and methods of treatment application: Basal application of recommended dose of single super phosphate, FYM (10 kg $plant^{-1}$ $year^{-1}$) were applied on

July first week. Fertigation in ten equal split doses (after fruit set stage**)** were supplied.

Fig 1. Meteorological observations during experimentation



Observations recorded: Growth parameters viz., plant height, spread (EW & NS), canopy height measured by tape and girth by use of verneer caliper with these recorded data calculated canopy volume (m^3) by formula = r^3 x (2/3 X + X^3/3) whereas r= canopy radius and x =canopy height (Singh et al. 2003). Fruit number was counted, weight with help of balance and size with verneer caliper was recorded at fruit maturity stage. Mature fruits were harvested periodically from each treatment separately and the weight was recorded with the help of single pan balance and expressed in kg. Further, for each harvest were recorded and fruits/ha were calculated by multiplying the fruit yield/plant to the number of plants/ ha (400). Quality test were carried out on 10 fruits from all the directions of a plant for TSS (^{o}B) with the help of hand refractometer, acidity by 0.1N NaOH and ascorbic acid by DCIP dye titration method (AOAC 1995) as well as seed index on count of 100 seeds and also counted total seeds per fruit as per standard methods. Available NPK status of soil (Jackson 1967) and pH determine (Linder 1944). The data obtained on various characters were subjected to Factorial Randomized Block Design analysis and interpretation of the data was carried out in accordance to Panse & Sukhatme (1985).

Results and Discussion

This trial were initiated on three year old uniform plants and applied treatments as per programme, in this plot fruiting were observed. The initial results indicated that irrigation at 0.75 CPE with 100 % RDF recorded higher vegetative and yield attributes. Growth of the plant with regards to plant height, spread, stem diameter, canopy height and canopy volume recorded and

observed no any specific trends with applied treatments. However, canopy volume of the treatments T_1 to T_3 have same value i.e., 0.10 m3 might be due to initial years main axis growth of the plant. Maximum plant height (2.54 m), spread (2.45 m EW x 2.18 m NS), stem girth (5.81 cm), canopy volume (0.29 m^3) were recorded in treatment T_{11} (100 % RDF (N+K) at 7 days interval through fertigation).

Table 1. Vegetative growth of guava cv. L-49 under drip irrigation

Treatments	Plant height (m)	Stem girth (cm)	Plant spread (m)		Canopy height (m)	Canopy volume (m^3)
			EW	NS		
T_1	1.58	4.50	1.50	1.50	0.56	0.10
T_2	1.55	3.21	1.10	1.15	0.60	0.10
T_3	1.63	3.72	1.70	1.23	0.51	0.10
T_4	1.73	4.26	1.78	1.88	0.50	0.16
T_5	1.70	3.55	1.70	1.77	0.49	0.11
T_6	2.01	3.10	1.80	1.80	0.48	0.15
T_7	2.16	3.12	1.79	1.91	0.50	0.17
T_8	2.13	3.09	1.95	1.80	0.45	0.20
T_9	2.26	5.12	2.35	1.84	0.44	0.29
T_{10}	2.30	3.80	2.15	2.03	0.49	0.25
T_{11}	2.54	5.81	2.45	2.18	0.46	0.29
SEm ±	0.29	0.20	0.32	0.26	0.06	0.05
CD at 5%	0.87	0.60	0.96	0.78	NS	0.15

Table 2. Yield parameters of guava cv. L-49 under drip irrigation

Treatments	No. of fruits per plant	Fruit weight (g)	Fruit size (cm)		Yield plant^{-1} (kg)	Estimated yield ha^{-1} (q)
			Length	Breadth		
T_1	25	210.0	5.14	4.25	5.25	21.00
T_2	31	219.3	5.13	4.90	6.80	27.20
T_3	25	190.0	4.98	4.24	4.75	19.00
T_4	27	167.8	4.52	4.32	4.53	18.12
T_5	26	170.0	4.59	4.30	4.42	17.68
T_6	27	177.0	4.58	4.26	4.77	19.08
T_7	26	160.7	4.45	4.26	4.18	16.72
T_8	30	195.5	4.84	4.63	5.86	23.44
T_9	33	214.4	4.96	4.75	7.06	28.24
T_{10}	30	216.6	4.92	4.80	6.50	26.00
T_{11}	33	220.8	5.30	4.95	7.28	29.12
SEm ±	1.87	9.12	0.26	0.24	0.58	2.32
CD at 5%	5.61	27.36	0.72	NS	1.74	6.96

First harvest obtained with the range of different fruiting and yield parameters as number of fruits 25-33, fruit weight 190-220.8 g and yield per plant 4.18-7.78 kg. Treatment T_{11} showing better effect and more yield attributes *i.e.*, fruit weight (220.8 g), number,

diameter (5.30 cm polar x4.95 cm Equatorial) and yield (7.28 kg/ plant). These results are with the cognitions of the findings of Sarolia et al. (2014& 2015) in guava. Quality (TSS, acidity content, seed index seed hardness and shelf life) attributes wise not much variation were observed with the fertigation treatments. Treatment level T_1 to T_5 has same and higher value of TSS over rest of the treatments. Similar trend were observed in acidity (0.30%), Seed content per fruits range value 138-154 and ascorbic acid 172 to 182.1 mg per 100g. T_8 (75 % RDF) level recorded higher fruit quality in terms of TSS (12.4 ^{0}B), vitamin C (182.1 mg/100g) and shelf life (4.2 days). This probably might be due to sometime higher dose of fertilizers only can be enhanced physical parameters (weight and grade) of fruit need not the bio-chemical attributes. The results also found analogous with this findings of Firake & Kumbhar (2002), Ramniwas et al. (2012) and Lahoty et al. (2016).

Table 3. Fruit quality parameters of guava cv. L-49 under drip irrigation

Treatments	TSS (^{O}B)	Acidity (%)	No. of seeds/fruit	100 seed weight (g)	Ascorbic acid (mg/100)	Shelf life (Days)
T_1	12.4	0.32	154	1.50	175.5	4.1
T_2	12.4	0.32	146	1.46	179.3	4.1
T_3	12.4	0.31	142	1.44	182.1	4.2
T_4	12.4	0.32	147	1.48	179.5	4.1
T_5	12.4	0.31	140	1.45	180.4	4.2
T_6	12.2	0.33	138	1.42	180.7	4.0
T_7	12.2	0.33	155	1.50	173.7	4.0
T_8	12.2	0.31	154	1.60	172.5	4.5
T_9	12.2	0.32	148	1.55	175.5	4.6
T_{10}	12.0	0.31	144	1.53	177.6	4.2
T_{11}	12.0	0.31	145	1.52	180.7	4.4
SEm ±	0.15	0.04	2.80	0.20	3.13	0.20
CD at 5%	NS	NS	8.40	NS	9.39	NS

Table 4. Soil nutrient status

Soil parameters	Available NPK (kg/ha.) and pH status in soil					
	30 cm		60 cm		90 cm	
	April	Nov.	April	Nov.	April	Nov.
Available N	330.63	374.52	283.42	320.71	255.65	280.64
Available P	19.34	21.16	17.55	19.23	13.80	15.42
Available K	361.22	392.71	310.60	348.71	275.65	288.90
pH	8.0	8.0	8.1	8.3	8.4	8.5

Available NPK and pH status with depth of the soil i.e., 30, 60 and 90 cm during April and Nov. months. Reduced NPK status with increasing the depth and November month these nutrient content status higher over April month in all the depths. While, pH value enhanced with the depth and marginal increment was recorded in Nov., over April month. The present results are in partial agreement with the findings of Ramniwas et al. (2013). Thus, plant received treatment 100 % RDF (N+K) at 7 days interval through fertigation resulted in better vegetative growth, higher fruit yield and satisfactory fruit quality attributes. This level was yielded additional 8.12 q ha^{-1} fruits in comparison to the farmer's practices (T_1) at first fruiting.

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