SHORT COMMUNICATION

STUDIES ON PHYSICO-CHEMICAL PARAMETERS OF GUAVA (*PSIDIUM GUAJAVA* L.) CV. L-49 THROUGH DRIP IRRIGATION AND MULCHING UNDER AGRO-CLIMATIC CONDITION OF CHHATTISGARH PLAINS

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Abstract: The experiment was carried out during the year 2009-2010 in Randomized Block Design (RBD) with five replications and eight treatments allocating mulching with different irrigation levels viz., 100%, 80% and 60% of water through drip and flood irrigation. The guava variety L-49 was taken with the objectives to study scheduling of irrigation under drip irrigation systems, to workout the water requirement of guava and to assess the effect of black plastic mulch on physico-chemical composition of guava fruits. The use of 80 per cent water through drip irrigation with plastic mulch was found effective for guava plants. The plants in respect of fruit weight, fruit volume, pulp: seed ratio, TSS (maximum), pH (maximum) and non- reducing sugar (maximum) were found superior under 80 per cent water through drip with plastic mulching. Whereas, the treatment having 60 per cent water through drip with plastic mulch was found effective for fruit diameter, weight of pulp, reducing sugar (maximum), acidity (minimum) and total sugar (maximum). The treatment under 100 per cent water through drip with plastic mulch recorded maximum ascorbic acid (%) in the fruits.

Keywords : Drip irrigation, mulching, guava, physico-chemical parameters

INTRODUCTION

Guava (*Psidium guajava* L.) belonging to family "Myrtaceae" is an important and commercial fruit crop of tropical and subtropical region of India. Fruits are fair source of vitamin A (about 250 IU/100 g) and contain appreciable quantities of thiamine, niacin and riboflavin. The ascorbic acid content ranges from 75 to 260 mg/100g, which varies with cultivar, season, location and stage of maturity. Moreover, guava fruits are rich source of pectin which ranges between 0.5 and 1.8 per cent (Adsule and Kadam, 1995). The area under guava in our country is 181.7 thousand ha and production is 1823.3 thousand metric tonnes with a productivity of 10.03 t/ha, whereas in Chhattisgarh, the area and production is 10814 ha and 85863 metric tonnes, respectively with a productivity of 8t/ha, which is not encouraging (Anon., 2008).

Majority of guava orchards in Chhattisgarh are rainfed, low-yielding and produce fruit of sub-standard quality. Water stress during the critical stages of fruit growth and development is the main reason for low productivity as well as the inferior quality. In such situation, water and weed management especially during the period between fruit set to maturity plays an important role in improving the quality of the fruit. For efficient water and weed management under such situation, drip irrigation alongwith mulching is the best option which saves 25-30 per cent irrigation water. Besides, the drip irrigation has quite a large number of beneficial aspects such as maximum production per unit of water, improvement in quality of produce, less evaporation losses, uniform water distribution, easy operation and suitable for all types of soils, less weed growth, economical cultural operation, no waterlogging, soil erosion and easy installation, which make it popular among the farmers. The scheduling of irrigation adopted in orchard influences the availability of soil moisture to the plant as well as its distribution in the soil profile and thus improves yield and quality in bearing trees. The advantageous effects of drip irrigation have been proved by many workers viz., Nath and Pathak (2006), Pathak *et al.* (2002) and Sen and Deshmukh (2000) in guava and aonla, but the actual requirement of water varies in different agro-climatic conditions.

Keeping in view the importance of drip irrigation and mulching in fruit quality, an experiment was conducted to assess the effect of drip irrigation and mulching on physico-chemical parameters of cv. L-49 under agro-climatic condition of Chhattisgarh plains.

MATERIAL AND METHOD

For physico-chemical composition, five randomly selected fruits were measured for diameter, pulp weight, fruit volume, seed weight, number of seeds, pulp/seed ratio, total soluble solids of the juice, pH of the fruit juice, acidity, ascorbic acid and sugars. Fruit diameter was calculated with the help of vernier calipers, pulp weight and seed weight were estimated with the help of electronic balance. The volume of fruit was determined by the help of water displacement method using measuring cylinder. Number of seeds from five randomly selected fruits were counted and averaged. The pulp/seed ratio was calculated by dividing the weight of pulp by weight of seed. Total soluble solids of the juice were determined by using Hand Refractrometer of 0-30 per cent range at 28^0 C at room temperature. Mean value was expressed as per cent total soluble

solids in juice. The pH of the fruit juice was determined by using digital pH meter at room temperature. The acidity and ascorbic acid of the pulp was determined by the procedure given by Ranganna (1986). Sugars were determined by the method of Lane and Eynon as described by Ranganna (1986). The treatment details are given below:

T_1 : 1.0V of water (irrigation by drip system)
T_2 : 1.0V of water (irrigation by drip system) + Black plastic mulch (50 micron)
T_3 : 0.8V of water (irrigation by drip system)
T_4 : 0.8V of water (irrigation by drip system) + Black plastic mulch (50 micron)
T_5 : 0.6V of water (irrigation by drip system)
T_6 : 0.6V of water (irrigation by drip system) + Black plastic mulch (50 micron)
T_7 : 1.0V of water (irrigation by flood system)
T_8 : 1.0V of water (irrigation by flood system) + Black plastic mulch (50 micron)

RESULT AND DISCUSSION

Data with respect to effect of different levels of irrigation and mulching on physical parameters of guava viz., fruit diameter, fruit weight, fruit volume, seed weight, pulp weight, number of seeds per fruit and pulp: seed ratio are presented in Table 1.

Fruit diameter: It is obvious from the data that significantly maximum diameter of fruit was observed under treatment T_6 (7.56 cm) followed by T_4 (6.80 cm) and T_2 (6.54 cm). While, the minimum fruit diameter was recorded under the treatment T_7 (4.82 cm). Enhancement in quality parameters of guava fruit can be ascribed due to optimum availability of food material to the plants as a result of higher photosynthesis and appropriate moisture regime. The results are in close conformity with the finding of Patil and Patil (1997) in guava.

Fruit weight: Significantly maximum fruit weight was recorded under the treatment T_4 (190.16 g) followed by T_6 (189.34 g) and T_2 (187.52 g). While, significantly minimum fruit weight was observed under the treatment T_7 (180.65 g). The increase in weight of the fruit might be due to covering of soil surface with plastic mulch, which ultimately improved the soil temperature, nutritional and water regimes. The findings are in confirmation with the results of Patil and Patil (1997) in guava.

Fruit volume: Due to effect of various irrigation and mulching treatments, it was observed that significantly maximum volume of the fruit was noted in treatment T_4 (194.61 cc) followed by T_6 (192.98 cc) and T_2 (191.75 cc). While, significantly minimum fruit volume was recorded under the treatment T_7 (181.29 cc). The results are closely correlated with fruit volume as reported by Patil and Patil (2001) in guava.

Seed weight: Various irrigation levels and mulching significantly influenced the seed weight and maximum seed weight was observed under treatment T_7 (6.12 g) followed by T_8 (5.99 g) and T_5 (5.91 g). While, significantly minimum seed weight was noted under the treatment T_2 (5.33 g). The higher seed weight with polyethylene mulch may be due to the higher number of seeds per fruit in that treatment. The present findings are in good agreement with the results reported by Agrawal *et al.* (2005) in mango.

Pulp weight: Due to effect of various irrigation levels and mulching, significantly maximum pulp weight was observed under treatment T_6 (182.34 g) followed by T_4 (175.46 g) and T_2 (168.78 g). While, significantly minimum pulp weight was observed under the treatment T_7 (154.36 g). Drip irrigation alongwith mulching provides appropriate moisture, better root development in terms of number and spread of roots, which facilitate luxuriant growth of plant due to better nutrient uptake resulting more pulp weight of fruit. In conformity of this, similar results were noticed by Agrawal *et al.* (2005) in mango.

Number of seeds: Significantly maximum number of seeds per fruit were obtained with treatment T_7 (375.76) followed by T_8 (361.48) and T_5 (358.88). While, significantly minimum number of seeds per fruit was recorded under the treatment T_2 (325.88).

Pulp: seed ratio: Data reveal that significantly maximum pulp: seed ratio was recorded under the treatment T_4 (31.48) followed by T_6 (31.47) and T_2 (31.40). While, significantly minimum ratio of pulp: seed was noted under the treatment T_7 (24.54). As the maximum fruit weight was observed under the treatment T_4, ultimately the pulp: seed ratio was also found more with T_4. The findings are in agreement with the results reported by Agrawal *et al.* (2005).

Data pertaining to effect of various levels of irrigation and mulching on chemical composition of guava fruits viz., ascorbic acid, acidity, TSS, pH, reducing sugar, non-reducing sugar and total sugar are presented in Table 2.

Ascorbic acid: The ascorbic acid percentage was significantly maximum under the treatment T_2 (237.56%) followed by T_4 (231.85%), T_6 (230.69%), T_1 (230.33%), T_3 (228.38%), T_5 (222.32%), T_8 (220.84%) and T_7 (212.84%). The treatments T_4, T_6 and T_1 as well as T_5 and T_8 were statistically at par with each other. While, significantly minimum ascorbic acid per cent was noted under treatment T_7 (212.84%). Enhancement in ascorbic acid might be ascribed due to optimum availability of moisture regime. The results are in close conformity with the report of Ram and Rajput (2000) in guava.

Acidity: The acidity percentage was found significantly maximum under the treatment T_7 (0.45%) followed by T_8 (0.40%) and T_1 (0.39%). While, significantly minimum acidity was noted under the treatment T_6 (0.32%). The increase in acidity of guava fruit juice might be due to the effect of mulching and drip irrigation which resulted to higher photosynthesis and ultimately increased the

acidity. In conformity of this, similar results were reported by Ram and Rajput (2000) in guava.

Total soluble solid (TSS): It is apparent from the table that significantly maximum TSS was observed in treatment T_4 (14.74%) followed by T_6 (14.40%) and T_2 (13.93%). Whereas, significantly minimum TSS was observed under the treatment T_7 (11.89%). The treatment T_1 and T_8 were statistically at par. The present findings are in support of the results as reported by Ram and Rajput (2000) in guava.

Fruit juice pH: In respect of irrigation levels and mulching, significantly maximum pH of guava fruits was observed under the treatment T_4 (4.28) followed by T_6 (4.05) and T_2 (4.05). While, on the other hand, significantly minimum pH was noted under the treatment T_7 (3.61).

Reducing sugar: Data revealed that significantly maximum reducing sugar percentage was recorded under the treatment T_6 (3.82%) followed by T_4 (3.56%) and T_2 (3.33%). Whereas, minimum reducing sugar percentage was noticed under the treatment T_7 (2.61%). In view of the present findings, similar results were reported by Ram and Rajput (2000) in guava.

Non-reducing sugar: Due to effect of various irrigation levels and mulching, maximum non-reducing sugar percentage was observed in treatment T_4 (7.19%) followed by T_1 (7.19%) and T_5 (7.14%). While, minimum non-reducing sugar percentage was observed under the treatment T_7 (6.84%).

Total sugar: It is evident from the data that significantly maximum total sugar percentage was recorded under the treatment T_6 (10.83%) followed by T_4 (10.71%) and T_2 (10.48%). While, significantly minimum total sugar percentage was observed under the treatment T_7 (9.57%). These results are in agreement with the finding of Patil and Patil (1997) in guava.

Table 1: Effect of different levels of irrigation and black polyethylene mulches on physical parameters of guava fruits cv. L-49

Treatments	Fruit diameter (cm)	Fruit weight (g)	Fruit volume (cc)	Seed weight (g)	Pulp weight (g)	Number of seeds/ fruit	Pulp : Seed ratio
T_1 : 1.0V of water (irrigation by drip system)	5.36	184.95	189.68	5.50	160.56	333.94	29.03
T_2 : 1.0V of water (irrigation by drip system) + Black plastic mulch (50 micron)	6.54	187.52	191.75	5.33	168.78	325.88	31.40
T_3 : 0.8V of water (irrigation by drip system)	5.60	186.62	190.78	5.72	166.78	346.64	29.12
T_4 : 0.8V of water (irrigation by drip system) + Black plastic mulch (50 micron)	6.80	190.16	194.61	5.58	175.46	338.40	31.48
T_5 : 0.6V of water (irrigation by drip system)	5.80	185.15	189.69	5.91	165.72	358.88	28.89
T_6 : 0.6V of water (irrigation by drip system) + Black plastic mulch (50 micron)	7.56	189.34	192.98	5.81	182.34	351.20	31.47
T_7 : 1.0V of water (irrigation by flood system)	4.82	180.65	181.29	6.12	154.36	375.76	24.54
T_8 : 1.0V of water (irrigation by flood system) + Black plastic mulch (50micron)	5.10	181.49	182.15	5.99	156.84	361.48	26.22
SEm	0.03	0.96	0.78	0.07	0.92	1.05	0.67
CD at 5% level	0.08	2.78	2.26	0.20	2.65	3.03	1.95

Table 2: Effect of different levels of irrigation and black polyethylene mulches on chemical composition of guava fruits cv. L-49

Treatments	Ascorbic acid (%)	Acidity (%)	Total soluble solids (%)	pH of fruit juice	Reducing sugar (%)	Non-reducing sugar (%)	Total sugar (%)
T_1 : 1.0V of water (irrigation by drip system)	230.33	0.39	12.32	3.73	2.93	7.19	10.16
T_2 : 1.0V of water (irrigation by drip system) + Black plastic mulch (50 micron)	237.56	0.34	13.93	4.05	3.33	7.12	10.48
T_3 : 0.8V of water (irrigation by drip system)	228.38	0.38	13.44	3.90	3.12	7.13	10.28
T_4 : 0.8V of water (irrigation by drip system) + Black plastic mulch (50 micron)	231.85	0.32	14.74	4.28	3.56	7.19	10.71
T_5 : 0.6V of water (irrigation by drip system)	222.32	0.36	12.61	3.84	3.26	7.14	10.34

T_6 : 0.6V of water (irrigation by drip system) + Black plastic mulch (50 micron)	230.69	0.32	14.40	4.05	3.82	7.05	10.83
T_7 : 1.0V of water (irrigation by flood system)	212.84	0.45	11.89	3.61	2.61	6.84	9.57
T_8 : 1.0V of water (irrigation by flood system) + Black plastic mulch (50 micron)	220.84	0.40	12.14	3.66	2.84	6.94	9.81
SEm	0.60	0.01	0.08	0.04	0.09	0.06	0.06
CD at 5% level	1.75	0.01	0.23	0.13	0.25	0.17	0.16

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