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## Effect of diatomaceous earth on crop duration and yield of guava cv. Sardar

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### Abstract

A field experiment was carried out to know the response of soil application of diatomaceous earth as a source of silicon on crop duration and yield of guava cv. Sardar at Kittur Rani Chennamma College of Horticulture, Arabhavi, Karnataka India. The results indicated that the application of silica heaving the significant response of different treatments. With respect to total crop duration, treatment heaving RDF + 3 kg/plant of DE has took less number of days (21.73 days), while delayed harvesting was noticed in the treatment control. Maximum total number of flowers and yield per hectare (14.53 t/ha) was recorded in RDF + 3 kg/plant of DE while minimum total number of flowers and yield per hectare was recorded in Absolute control.

**Keywords:** Diatomaceous earth, silicon, crop duration, yield

### Introduction

Although silicon is not considered an essential element for plant nutrition, many authors report on beneficial effects when its supply to various cultivated plants is enhanced. In most cases, the favorable effects of Si on crop plants seem to originate from reinforcement of the cell walls due to deposition of Si in form of amorphous silica ( $\text{SiO}_2 \cdot n\text{H}_2\text{O}$ ) and opal phytoliths (Epstein, 1999) [4]. The role of silicon in plant biology is to reduce multiple stresses including biotic and abiotic stresses. It is also known to increase drought tolerance in plants by maintaining plant water balance, photosynthetic activity, erectness of leaves and structure of xylem vessels under high transpiration rates (Melo *et al.*, 2003) [11]. Silicon application improved water economy and dry matter yield (Gong *et al.*, 2003) [8]. It enhanced the leaf water potential under water stress conditions, reduced the incidence of micronutrient and metal toxicity (Matoh *et al.*, 1991) [10]. Silicon has positive growth effect including increased dry mass and yield, enhanced pollination and most commonly increased disease resistance (Gillman *et al.*, 2003) [7]. Numerous laboratories, greenhouse and field experiments have showed the benefits of silicon fertilizers on agriculture and horticulture crops and the importance of silicon fertilizers as a component in sustainable agriculture was reported by Ma and Takahashi (2002) [9]. Realizing the beneficial effects of silicon in sustainable crop production and the response of several crops to silicon nutrition for sustained crop yields; it has become a component of integrated nutrient management in certain countries. Diatomaceous earth (DE) is used as silicon source in the present experiment. With this brief information and based on the possible benefits of silicon, the present study was carried out to know the effect of Diatomaceous Earth (as source of silicon) on crop duration and yield of guava cv. Sardar.

### Material and methods

Experiment was carried out in an established guava orchard of 6 years old plants with spacing of 6 m x 6 m. The source of silicon used is Diatomaceous earth (DE), applied as basal dose to the respective treatment in this experiment. The dosage of DE used in this experiment was 1, 2 and 3 kg/plant. The inorganic nutrient *i.e.* nitrogen was applied in the form of urea (46% N), phosphorus in the form of single super phosphate and potassium in the form of muriate of potash (60% K). These nutrients were applied to the respective treatment according to the package of practice of UHS; Bagalkot (200:80:150g NPK/plant), (Anon, 2015). The design adopted for the experiment was Randomized Block Design (RBD) with nine treatments and three replication. The treatments are

T<sub>1</sub> - Absolute control

T<sub>2</sub> - Recommended dose of fertilizer (RDF) @ 200:80:150 g NPK/plant

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- T<sub>3</sub> - Half of RDF  
 T<sub>4</sub> - Half of RDF + 1kg/plant of Diatomaceous Earth (DE)  
 T<sub>5</sub> - Half of RDF + 2kg/plant of DE  
 T<sub>6</sub> - Half of RDF + 3kg/ plant of DE  
 T<sub>7</sub> - RDF + 1kg/plant of DE  
 T<sub>8</sub> - RDF + 2kg/plant of DE  
 T<sub>9</sub> - RDF + 3kg/ plant of DE

### Result and discussion

The soil application of diatomaceous earth treatments had significant influence on initiation of flowering, duration of flowering, and days from flowering to harvesting and total number of flowers. Minimum days taken for initiation of flowering (16.35 days) was found in the plant receiving treatment T<sub>9</sub> (RDF + 3 kg/Plant of DE) while delayed flowering (23.95 days) was observed in T<sub>1</sub> (Absolute control), which was found on par with T<sub>3</sub> (23.75days) and T<sub>2</sub> (23.00 days). The maximum duration of flowering was found in the treatment T<sub>9</sub> (RDF +3kg/ plant of DE) (21.73days) while minimum flowering duration was observed in treatment T<sub>6</sub> (16.87days). The early harvesting was noticed in the treatment T<sub>9</sub> (RDF + 3 kg/plant of DE (119.35 days), while delayed harvesting (128.17days) was noticed in the treatment T<sub>1</sub>. Regarding the total number of flowers, maximum number was recorded in T<sub>9</sub> (RDF + 3 kg/plant of DE), while less number of flowers was recorded in T<sub>1</sub> (Table 1 and 2). As silicon influenced the plants to capture more light and increased chlorophyll content in leaf, led to more production of photosynthates and early growth, thus helps in early flowering and harvesting. These results are conformity with Ghasemi *et*

*al.* (2013) <sup>[6]</sup> in broad bean, Gang and Jiashu (2005) <sup>[5]</sup> in melon and Cai and Rian (1995) <sup>[3]</sup> in pecan nut.

The maximum number of fruits per plant was recorded in T<sub>9</sub> (346.50) and the least number of fruits was recorded in T<sub>1</sub> (141.50) In case of yield plant, the maximum was recorded in the treatment T<sub>9</sub> (52.48 kg per plant), whereas the least yield was recorded in treatment T<sub>1</sub> (14.75kg per plant). The maximum yield per ha was recorded (14.53 t/ ha) in the treatment T<sub>9</sub>where as the least yield was recorded treatment T<sub>1</sub> (4.03 t/ ha).

The yield parameters *viz.* number of fruits per plant, yield (Kg/plant) and yield per hectare were maximum in soil applied with diatomaceous Earth when compared to control treatment. Pandey and Yadav (1999) <sup>[13]</sup> reported that spraying silicon increased the yield of wheat and increased yield was attributed to increase in plant water status, chlorophyll content, coupled with reduced values of water potential, increase in dry matter accumulation, dry matter production rate, leaf area and decrease in transpiration rate coupled with decrease in stomatal conductance.

Silicon had many positive effects on the growth and yield as well physiology and metabolism of different crops. Increased yield might be attributed to leaf erectness which facilitated better penetration of sunlight leading to higher photosynthetic activity of plant, more formation of carbohydrates and more uptakes of other nutrients. Similar results were also noticed by Ghasemi *et al.* (2013) <sup>[6]</sup> in broad bean, Bhavya (2010) <sup>[2]</sup> in Bangalore Blue grapes, Reaple and Laane (2008) in papaya, Miyake and Eiichi (1986) <sup>[12]</sup> in strawberry and Adatia and Besford (1986) <sup>[1]</sup> in cucumber.

**Table 1:** Effect of diatomaceous earth (DE) on crop duration of Guava

Treatments	Crop duration (Number of days)			
	Initiation of flowering	Duration of flowering	Flowering to harvesting	Total duration
T <sub>1</sub> - Absolute control	23.95	19.76	128.17	131.87
T <sub>2</sub> - Recommended dose of fertilizer (RDF)	23.00	19.65	123.17	124.62
T <sub>3</sub> - Half of Recommended dose of fertilizer	23.75	17.90	126.00	124.50
T <sub>4</sub> - Half of RDF + 1 kg/plant of DE	21.60	17.93	123.96	123.63
T <sub>5</sub> - Half of RDF + 2 kg/plant of DE	20.37	18.88	124.75	127.58
T <sub>6</sub> - Half of RDF + 3 kg/plant of DE	21.43	16.87	123.50	127.37
T <sub>7</sub> - RDF + 1 kg/plant of DE	19.82	19.12	124.72	124.00
T <sub>8</sub> - RDF + 2 kg/plant of DE	18.77	19.80	121.20	124.00
T <sub>9</sub> - RDF + 3 kg/plant of DE	16.35	21.73	119.35	121.91
S.Em±	0.33	0.27	0.48	0.61
CD @ 5%	1.01	0.81	1.46	1.84

**Table 2:** Effect of diatomaceous earth (DE) on yield parameters of guava

Treatments	Number of fruits/plant	Fruit yield (kg/plant)	Fruit yield (t/ha)
T <sub>1</sub> - Absolute control	141.50	14.75	4.03
T <sub>2</sub> - Recommended dose of fertilizer (RDF)	163.25	18.13	5.02
T <sub>3</sub> - Half of Recommended dose of fertilizer	245.25	31.76	8.79
T <sub>4</sub> - Half of RDF + 1 kg/plant of DE	248.00	30.88	8.55
T <sub>5</sub> - Half of RDF + 2 kg/plant of DE	281.12	35.83	9.92
T <sub>6</sub> - Half of RDF + 3 kg/plant of DE	288.00	37.99	10.52
T <sub>7</sub> - RDF + 1 kg/plant of DE	280.50	34.38	9.52
T <sub>8</sub> - RDF + 2 kg/plant of DE	293.25	40.33	11.16
T <sub>9</sub> - RDF + 3 kg/plant of DE	346.50	52.48	14.53
S.Em±	2.69	0.61	0.17
CD @ 5%	8.08	1.82	0.51

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