



## Effect of diatomaceous earth on flowering, yield and quality of pomegranate

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**Abstract:** Experiment was carried out in the farmer's field to study the effect of soil application of Diatomaceous earth (as a source of silicon) on pomegranate var. Kesar. The treatment T<sub>9</sub> (RDF+ DE @ 900 kg/ha) recorded higher number of flowers (708.20) per plant, number of fruits per plant (71.36), yield (21.33 kg per plant) followed by T<sub>8</sub> (RDF + 600 kg/ha DE). With respect to quality parameters fruit weight (298.66 g), fruit volume (315.00 ml), fruit girth (82.69 mm) and fruit length (83.68 mm) were recorded highest in plants applied with T<sub>9</sub> (RDF+ DE @ 900 kg/ha). Application of Diatomaceous earth has influenced the yield and quality of pomegranate by higher absorption and translocation of nutrients.

**Key words:** Diatomaceous earth, Pomegranate, Yield and quality

### Introduction

Pomegranate (*Punica granatum*L.) is being grown from ancient times for its sweet-acidic fruits, ornamental and medicinal purposes. In India pomegranate is commercially cultivated in Maharashtra, Karnataka, Gujrat, Rajasthan, Tamil Nadu, Andhra Pradesh, Punjab and Haryana. It occupies an area of 113.20 thousand hectares with a production of 745.00 thousand metric tonnes and productivity of 6.6 metric tonnes/ha. Maharashtra is the leading producer in India which produces 54.80 per cent of total production followed by Karnataka (20.20 %). (Anon, 2013). Pomegranate is used as table fruit; for preparation of juice, wine, jelly and syrup; for extraction of tannins and phenols; preparation of anarrab (pomegranate jam), anardana (seeds used as spice); rind powder is used in leather, pharmaceutical, dying and herbal industries. Pomegranate is being grown in marginal soils and recorded very low productivity. The growth, yield and quality of pomegranate can be increased by application of manures and fertilizers because it is well respond to application of fertilizers. Silicon is the most abundant element in the earth's crust region next to oxygen and comprises 28 per cent of its weight, out of which 3-17 per cent is present in soil solution (Epstein, 1999). It is most commonly found in soils in the form of solution as silicic acid (H<sub>4</sub>SiO<sub>4</sub>) and is taken up directly as silicic acid (Ma *et al.*, 2001). Being a dominant component of soil minerals it has many important functions in environment, although silicon is not considered as an essential plant nutrient because of its ubiquitous presence in the biosphere and most plants can be grown from seed to seed without its presence (Epstein, 1999). With this background, an experiment was carried out to know the effect of Diatomaceous earth (source of silicon) on flowering and yield of pomegranate var. Kesar.

### Materials and Methods

The present investigation was carried out in the farmer's field during 2013-2014 to study the effect of Diatomaceous Earth on

flowering and yield of pomegranate var. Kesar. The experiment was laid out on red loamy soil and in an established pomegranate orchard of 5 year old plants with spacing of 3.5 m x 3.5 m. The source of silicon used is Diatomaceous earth (DE), applied as basal dose to the respective treatment. The dosage of DE used was 300, 600 and 900 kg/ha. DE was applied after bahar treatment as whole basal application and recommended dose of fertilizer at the interval of 0, 45 and 90 days after bahar treatment. These nutrients were applied to the respective treatment according to the package of practice (400:200:200 g NPK/Plant) of UHS, Bagalkot. (Anon, 2014). The design adopted for the experiment was Randomised Block Design (RBD) with nine treatments. The experiment was replicated thrice and treatments were T<sub>1</sub> - Absolute control, T<sub>2</sub> - Recommended dose of fertilizer (400:200:200 g NPK/plant), T<sub>3</sub> - Half of Recommended dose of fertilizer, T<sub>4</sub> - Half of RDF + 300 kg/ha of DE, T<sub>5</sub> - Half of RDF + 600 kg/ha of DE, T<sub>6</sub> - Half of RDF + 900 kg/ha of DE, T<sub>7</sub> - RDF + 300 kg/ha of DE, T<sub>8</sub> - RDF + 600 kg/ha of DE and T<sub>9</sub> - RDF + 900 kg/ha of DE. The number of flowers per plant was recorded at fortnightly interval after imposing the treatments and mean values of five plants were recorded. The fruits were harvested at matured stage. At the time of harvest the total number of fruits produced per plant, weight of the total number of fruits per plant was recorded and later that is converted to yield per hectare. Fruit characteristics like weight, volume, length and girth were recorded for comparing among the treatments.

### Results and Discussion

The influence of Diatomaceous Earth on number of flowers was significant. After 15 days (145.60 flowers) and 30 days (371.76 flowers) days of treatment imposition, more number of flowers were recorded in T<sub>9</sub> (RDF + 900 kg/ha of DE), while minimum number of flowers were recorded in T<sub>1</sub> (Absolute control) at 15 (45.66 flowers) and 30 (143.66 flowers) days of treatment imposition. After 45 and 60 days, number of flowers produced has shown the non-significant

**Table-1:** Effect of Diatomaceous earth on number of flowers of pomegranate var. Kesar

Treatments	Number of flowers				Total number of flowers
	15 DAT	30 DAT	45 DAT	60 DAT	
T <sub>1</sub>	45.66	143.66	45.00	31.66	266.00
T <sub>2</sub>	114.60	277.73	60.86	50.73	503.93
T <sub>3</sub>	105.40	245.00	79.53	58.86	488.80
T <sub>4</sub>	116.90	301.26	65.93	46.46	530.56
T <sub>5</sub>	130.50	277.33	98.93	60.76	567.53
T <sub>6</sub>	113.66	313.10	99.00	66.66	526.40
T <sub>7</sub>	113.06	257.06	53.93	50.53	448.66
T <sub>8</sub>	123.90	274.70	74.83	46.56	523.73
T <sub>9</sub>	145.60	371.76	130.13	60.70	708.20
S.Em±	13.76	26.18	-	-	45.74
CD @ 5%	41.26	78.51	NS	NS	137.15

NS = Non-significant

**Table-2:** Effect of Diatomaceous Earth on yield of pomegranate var. Kesar

Treatments	Number of fruits per plant	Yield (kg/plant)	Yield (t/ha)
T <sub>1</sub>	34.33	6.60	5.36
T <sub>2</sub>	62.10	15.10	12.33
T <sub>3</sub>	44.56	10.73	8.73
T <sub>4</sub>	51.83	13.36	10.86
T <sub>5</sub>	56.93	14.10	11.50
T <sub>6</sub>	54.73	15.33	11.40
T <sub>7</sub>	54.36	14.13	11.80
T <sub>8</sub>	65.73	15.60	12.73
T <sub>9</sub>	71.36	21.33	17.40
S.Em±	4.81	1.83	1.47
CD @ 5%	14.43	5.50	4.40

**Table-3:** Effect of Diatomaceous earth on fruit weight, volume, girth and length of fruits of pomegranate var. Kesar

Treatments	Weight (g)	Volume (ml)	Girth (mm)	Length (mm)
T <sub>1</sub>	193.99	197.43	70.90	70.13
T <sub>2</sub>	246.86	272.20	76.48	76.26
T <sub>3</sub>	239.75	258.30	76.35	76.26
T <sub>4</sub>	260.63	283.30	78.47	80.75
T <sub>5</sub>	247.90	263.83	76.32	79.26
T <sub>6</sub>	255.36	284.40	71.93	77.95
T <sub>7</sub>	264.08	296.63	79.17	80.67
T <sub>8</sub>	232.41	255.50	76.33	75.91
T <sub>9</sub>	298.66	315.00	82.69	83.68
S.Em±	16.91	18.52	2.11	1.99
CD @ 5%	50.72	55.54	6.34	5.99

In table 1 to 3 treatments are: T<sub>1</sub> - Absolute control; T<sub>2</sub> - Recommended dose of fertilizer (RDF); T<sub>3</sub> - Half of Recommended dose of fertilizer; T<sub>4</sub> - Half of RDF + 300 kg/ha of DE; T<sub>5</sub> - Half of RDF + 600 kg/ha of DE; T<sub>6</sub> - Half of RDF + 900 kg/ha of DE; T<sub>7</sub> - RDF + 300 kg/ha of DE; T<sub>8</sub> - RDF + 600 kg/ha of DE; T<sub>9</sub> - RDF + 900 kg/ha of DE

results with respect to all treatments. However, maximum number of flowers (708.20) were recorded in T<sub>9</sub> (RDF + 900 kg/ha of DE), while minimum number of flowers (266.00) were recorded in T<sub>1</sub> (Table 1). As silicon influenced the plants to capture more light and increases chlorophyll content in leaf, led to more production of photosynthates and early growth, thus helps in early flowering and

harvesting. These results are in accordance with Ghasemi *et al.* (2013) in broad bean, and Cai and Rian (1995) in pecan nut.

Results revealed the highest values for number of fruits per plant (71.36), yield kg per plant (21.33) and yield per hectare in tonnes (17.40) were found for the plants which were supplied with T<sub>9</sub> (RDF + 900 kg/ha DE), and was on par with T<sub>8</sub> (RDF + 600 kg/ha DE), whereas the lowest values were observed in the treatment T<sub>1</sub> with the values of 34.33, 6.60 and 5.36 respectively (Table 2). 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. Silicon had many positive effects on the growth and yield as well as 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 uptake of other nutrients. Similar results were also noticed by Ghasemi *et al.* (2013) in broad bean, Bhavya (2010) in Bangalore Blue grapes, Reaple and Laane (2008) in papaya, Miyake and Eiichi (1986) in strawberry and Adatia and Besford (1986) in cucumber. Maximum values for fruit characters like weight (298.66 g), volume (315.00 ml), girth (82.69 mm) and length (83.68 mm) were recorded in T<sub>9</sub> (RDF + 900 kg/ha DE). Minimum values were recorded in treatment T<sub>1</sub> 193.99 g, 197.43 ml, 70.90 mm and 70.13 mm respectively (Table 3). This might be due to cell division in the initial stages and later due to cell expansion associated with movement of water and other metabolites into the cell causing increase in overall weight, volume, length and girth of the fruit. Similar results were noticed by Ghasemi *et al.* (2013) in broad bean, Nesreen *et al.* (2011) in beans and Bhavya (2010) in grape. From the study it can be concluded that the application of DE has helped in higher and quality production of pomegranate.

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