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**- Short communication**

# EFFECTS OF DATOMACEOUS EARTH ON THE INCIDENCE OF SUCKING PEST OF GUAVA

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**Abstract**

Effects of diatomaceous earth (DE) as a source of silicon on incidence of *Helopeltis antonii* Signoret and *Aleurodicus dispersus* Russell in Guava var. Sardar were investigated. In the month of September and October maximum infestation (2.79) was observed in control plots and the least infestation (1.93) was observed in treatment with RDF + 3kg/plant of DE. In the month of November, the maximum infestation (3.62) was found in control, while the least infestation (1.89) was noticed in RDF + 3 kg/plant of DE. Again, in the month of December the maximum infestation (3.60) of tea mosquito bug was observed in the Half of RDF + 3 kg/plant of DE, followed by control (3.48) and the least infestation (2.83) was noticed in RDF + 3 kg/plant of DE.

Silicon plays an important role in plant biology by reducing multiple stresses including biotic and abiotic stresses. Silicon minerals are deposited in epidermal layer of cell wall and thus provide disease and pest resistance in plants. Silicon is used as fertilizer for both agronomic and horticulture crops to improve yield and quality. It is also known to increase drought tolerance in plants by maintaining plant water balance, photosynthetic activity, and erectness of leaves and structure of xylem vessels under high transpiration rates (Melo *et al*. 2003). Gong *et al.* (2003) reported improved water economy and dry matter yield by silicon application. Matoh *et al.* (1991) showed enhanced leaf water potential under water stress conditions, reduced incidence of micronutrient and metal toxicity. Silicon depositions in monocots may provide a mechanical barrier against insect's pests. It has been reported that silicon suppresses insect pests such as brown plant hopper, white backed plant hopper and non- insect pests such as spider mites by acting as physiological barrier in rice crop (Savant *et al*.1997a, Ma and Takahashi 2002). However, this passive role of silicon is now being contested and an active role of silicon have been shown in physiological resistance of crops to diseases and pest. With this background information and based on the possible benefits of silicon, the present study was carried out to know effects of diatomaceous earth (as source of silicon) on incidence of *Helopeltis antonii* Signoret and *Aleurodicus dispersus* Russell in Guava.

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), phosphorous 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). The design adopted for the experiment was Randomized Block Design (RBD) with nine treatments and three replications. The treatments are$T_1$-Absolute control, $T_2$ -Recommended dose of fertilizer (RDF) @200:80:150 g NPK/plant,$T_3$ -

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Half of RDF,$T_4$ - Half of RDF + 1 kg/plant of Diatomaceous Earth (DE), $T_5$ - Half of RDF + 2 kg/plant of DE,$T_6$ - Half of RDF + 3 kg/plant of DE,$T_7$ - RDF + 1 kg/plant of DE,$T_8$ - RDF + 2 kg/plant of DE,$T_9$ - RDF + 3kg/plant of DE. The incidence of pest *viz. H. antonii* and *A. dispersus* were recorded at monthly interval, the leaves were randomly selected and the number of infected fruits for *H. antonii* and number of *A. dispersus* were counted and below mentioned score card were used during the period of investigation. Scale for scoring pest incidence1-2: 20 per cent pest incidence, 2-3: 40 per cent pest incidence3-4: 60 per cent pest incidence**,** 4-5: 80 per cent pest incidences**,** >5: 100 per cent pest incidences.

**Table 1. Effect of diatomaceous earth (DE) on incidence of *Helopeltis antonii*in guava fruits and incidence of *Aleurodicus dispersus*in guava leaves.**

| Treatments | Number of *Heliopeltis antonii* per fruit | | | | Number of *Aleurodicus dispersus* per leaf | | | |
|---|---|---|---|---|---|---|---|---|
| | September | October | November | December | September | October | November | December |
| $T_1$ - Absolute control | 1.37 (1.37)* | 2.81 (1.82) | 3.62 (2.03) | 3.48 (1.99) | 2.40 (1.70)* | 2.35 (1.69) | 2.51 (1.73) | 3.08 (1.89) |
| $T_2$ - Recommended dose of fertilizer (RDF) | 1.31 (1.35) | 2.56 (1.75) | 3.34 (1.96) | 3.22 (1.93) | 1.22 (1.31) | 2.53 (1.74) | 2.20 (1.64) | 2.38 (1.70) |
| $T_3$ - Half of Recommended dose of fertilizer | 1.04 (1.24) | 2.12 (1.62) | 3.17 (1.92) | 3.15 (1.91) | 1.54 (1.43) | 1.96 (1.57) | 1.98 (1.57) | 2.20 (1.64) |
| $T_4$ - Half of RDF + 1 kg/plant of DE | 1.32 (1.35) | 2.35 (1.69) | 2.83 (1.82) | 3.05 (1.88) | 1.67 (1.47 | 1.67 (1.47) | 1.74 (1.50) | 1.88 (1.54) |
| $T_5$ - Half of RDF + 2 kg/plant of DE | 1.46 (1.40) | 2.30 (1.67) | 2.31 (1.68) | 2.99 (1.87) | 1.69 (1.48) | 1.54 (1.43) | 1.63 (1.46) | 1.77 (1.51) |
| $T_6$ - Half of RDF + 3 kg/plant of DE | 1.42 (1.39) | 2.19 (1.64) | 2.82 (1.82) | 3.60 (2.02) | 1.66 (1.47) | 1.63 (1.46) | 1.71 (1.49) | 1.91 (1.55) |
| $T_7$ - RDF + 1 kg/plant of DE | 1.25 (1.32) | 2.15 (1.63) | 2.72 (1.79) | 3.43 (1.98) | 1.67 (1.47) | 1.38 (1.37) | 2.01 (1.58) | 2.36 (1.69) |
| $T_8$ - RDF + 2 kg/plant of DE | 1.84 (1.53) | 2.05 (1.60) | 2.22 (1.65) | 3.37 (1.97) | 0.48 (0.99) | 1.21 (1.31) | 1.95 (1.57) | 3.03 (1.88) |
| $T_9$ - RDF + 3 kg/plant of DE | 1.20 (1.30) | 1.97 (1.57) | 1.65 (1.47) | 2.83 (1.82) | 0.46 (0.98) | 1.00 (1.22) | 1.55 (1.43) | 2.07 (1.60) |
| S.Em± | 0.04 | 0.01 | 0.07 | 0.04 | 0.01 | 0.02 | 0.01 | 0.05 |
| C.D @ 5% | 0.07 | 0.05 | 0.24 | 0.08 | 0.06 | 0.06 | 0.05 | 0.29 |

*Figures in parenthesis are square root of transformed values.

During the period of investigation two important pests *viz.*, spiraling white fly and tea mosquito bug incidences were noticed. The effects of Diatomaceous Earth on infestation of tea mosquito bug varied significantly among different treatments (Table 1). In the month of September, the maximum tea mosquito bug infestation (1.84) was observed in $T_8$ followed by $T_5$ (1.46), $T_6$ (1.42) while the least was observed (1.04) in the treatment $T_3$. In case of October month significant variation was observed with maximum infestation (2.81) in $T_1$ and the least infestation (1.97) in $T_9$. In the month of November also, the effects of diatomaceous earth on infestation of tea mosquito bug varied significantly due to treatments. The maximum infestation (3.62) was found in the treatment $T_1$ while the least infestation was noticed in $T_9$ (1.65). In the December month, significant variation was observed. The maximum infestation (3.60) of tea mosquito bug was observed in the treatment $T_6$, followed by $T_1$ (3.48) and the least infestation (2.83) was noticed in $T_9$. The effects of diatomaceous earth on infestation of white fly varied significantly among treatments (Table 1). In the month of September the maximum white flies infestation (2.40) was observed in $T_1$ followed by $T_5$ (1.69), While the least (0.46) was observed in the treatment $T_9$ which was on par with $T_8$ (0.48). In case of October month, all the treatments were found to be significant. The maximum infestation (2.53) was observed in $T_2$ and the least infestation (1.00) was observed in $T_9$. In the month of November also, the effects of diatomaceous earth on infestation of white flies varied significantly, among the treatments the least infestation (1.55) was observed in $T_9$ and the maximum infestation (2.51) was observed in $T_{1.}$ In the December month, the maximum infestation (3.08) of white flies was observed in the treatment $T_1$, which was on par with $T_8$ (3.03) and the least infestation (1.77) was noticed in $T_5$.

In December month, the maximum infestation (3.08) of white flies was observed in the treatment $T_1$, which was on par with $T_8$ and the least infestation (1.77) was noticed in $T_5$. Eswaran and Manivannan (2007) stated that, the main cause for the death of the insects (white fly) upon ash (which contain silicon) application was wearing off of the main feeding organs of the insects. The feeding organs were made function less and insects remained without food. When such white flies were examined by dissection, the ash particles were found to settle at various point of their alimentary canal. This might have hindered the digestion of the food consumed along the pathway of the gut of whitefly in papaya. Similar results were observed by Puterka *et al.* (2000) in pear against psylla, Braham *et al*. (2007) in citrus against medfly and Saour (2005) in pecan nut against psylla. It has been reported that silicon suppresses insect pest such as brown plant hopper, white backed plant hopper and non- insect pest such as spider mites by acting as physiological barrier (Savant *et al*. 1997b, Ma and Takahashi 2002. Silicon depositions in monocots may provide a mechanical barrier against insect pest. However, this passive role of silicon is now being contested and an active role of silicon have been shown in physiological resistance of crops to diseases and pest. Silicon is now considered to have a catalytic role in the expression of physiological resistance. Two hypotheses for the Si-enhanced resistance to diseases and pests have been proposed. One is that Si deposited on the tissue surface acts as a physical barrier. It prevents physical penetration and makes the plant cells less susceptible to enzymatic degradation by fungal pathogens. This mechanism is supported by the positive correlation between the Si content and the degree of suppression of diseases and pests. The other one is that Si functions as a signal to induce the production of phytoalexin (Cherif *et al*. 1994).Through the production among other chemicals, tannic and phenolic compounds (Laing *et al.* 2006).Silicon deficiency promoted the synthesis of phenolic compounds (Carver *et al.* 1998). The phenylalanine ammonia-lyase activity was enhanced by Si deficiency. The reason why Si deficiency exerts opposite effects on the synthesis of phenolic compounds, as a disease response in different plant species, has not been elucidated. Recently, Kauss e*t al.* (2003) have reported that during the induction of systemic all acquired resistance (SAR) in cucumber, the expression of a gene encoding a novel proline-rich protein was enhanced. This protein has C-terminal repetitive sequences containing an unusually high amount of lysine and arginine. The synthetic peptide derived from the repetitive sequences was able to polymerize orthosilicic acid to insoluble silica, which is known to be involved in cell wall reinforcement at the site of the attempted penetration of fungi into epidermal cells. This study provided a biochemical and molecular basis of Si-enhanced resistance to disease.

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