(195)

Impact of Silicon Amendments on Insect Pest Infestation and Yield in Parachute Established Rice Seedlings

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Abstract

Rice (*Oryza sativa* L.), the staple food crop in Sri Lanka, faces severe threats from various insect pests, leading to significant yield losses. Use of insecticides is the primary pest control method used by farmers in Sri Lanka. However, insecticides can have adverse effects, including the development of insect resistance, pest resurgence, and chemical residue buildup. For sustainable development, pest management systems must follow ecological principles and should be economically viable. Silicon (Si) has gained attention as an eco-friendly, cost-effective strategy in integrated pest management (IPM) for rice cultivation. Therefore, this study aims to elucidate the potential of Si as a crucial component in environmentally friendly pest management strategies. In this experiment, research plots of 20.25 m^2 were established with Bg 94-1 parachute seedlings treated with Si at different rates. The experiment was conducted in a randomized complete block design with 3 replicates over 3 seasons: 2020/21 *maha*, 2021/22 *maha*, and 2022 *yala*, at the Regional Rice Research & Development Centre, Bombuwela. During the 2020/21 *maha* season, parachute seedlings were treated with 35 g and 25 g of granular SiO_2 (Agrisilica), 9 g and 6.5 g of powdered SiO_2 (amorphous silica), and a control group without Si amendment to evaluate the impact of Si on the occurrence of major insect pests in rice. Different rates of SiO_2 were added to the parachute trays at the time of seeding. Twenty-one-day-old parachute seedlings were established in the research field, and insect pest counts were taken under natural infestation conditions. The results showed no significant differences in the percentage of infested galls or the number of Brown Plant Hoppers (BPH) among treatments. Therefore, the Si application rates were increased to 70 g and 50 g of granular SiO_2 (Agrisilica) and 18 g and 13 g of powdered SiO_2 (amorphous silica) per parachute tray. During the 2021/22 *maha* season, the numbers of thrips and paddy bugs were significantly lower ($p \leq 0.01$) in Si-treated seedlings than in the control. In the 2022 *yala* season, infested gall percentages and paddy bug counts were also significantly lower ($p \leq 0.01$) in Si-treated seedlings compared to the control. Further, there was a significant yield increase ($p \leq 0.01$) in Si-treated plots compared to the control. Our results indicate that Si amendment at the rate 50 g of granular SiO_2 (Agrisilica) & 13 g of powdered SiO_2 (amorphous silica) per tray can provide substantial protection from some of the rice pests under field conditions. These findings support the recommendation of Si amendment as a key component of IPM in rice cultivation.

Keywords: *Parachute seedlings, Rice, Silicon amendments*