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RESPONSE OF RICE TO SILICON APPLICATION WITH SPECIAL REFERENCE TO PHYTOLITH FORMATION, NUTRIENT UPTAKE, GROWTH AND YIELD

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Rice (*Oryza sativa* L.) is a staple food for more than half of the world's population; however, its productivity is often limited by climatic, biotic, and abiotic stresses. Silicon (Si), a beneficial element for Graminaceous crops, enhances plant resilience, nutrient use efficiency, and overall productivity. One important role of Si is the formation of phytoliths microscopic silica deposits in plant tissues which improve mechanical strength, reduce lodging, increase stress tolerance, and contribute to long-term carbon sequestration through phytolith-occluded carbon (PhytOC). Despite these advantages, comparative studies on soil and foliar Si application are limited. Therefore, a pot experiment was conducted using a completely randomized design (CRD) with seven treatments, including a control, Department of Agriculture (DOA) recommendation, and combinations of soil and foliar Si applications at different rates. The study aimed to evaluate the effects of Si sources and application methods on rice growth, yield attributes, nutrient uptake, phytolith accumulation, PhytOC, and soil nutrient status. Results indicated a non-significant increasing tread in grain yield among Si treatments. However, significant increase ($p < 0.0001$) was observed in nutrient uptake (NPK), Phytolith and PhytOC in Si treatments especially in DOA+ soil applied silica at 250 kg ha^{-1}. Soil application was more efficient than foliar and 250 kg ha^{-1} soil applied Si was identified as optimum. Future studies should focus on field experiments under varying agro-climatic conditions and extended crop duration to better capture yield responses. Evaluating Si under induced stress conditions is also suggested for future studies.

Keywords: Phytolith, PhytOC, Carbon sequestration, Nutrient uptake, Si fertilization