Silicon Deficiency in Rice

Factsheets for Rice Production, East Africa

Fig 1. Silicon deficiency showing dead tips and drooping heads (Gary Breiteneck, LSU AgCenter)

Fig 2. Silicon deficiency showing blotches on old leaves (rice :knowledge bank.irri.org)

Fig 3.Silicon deficiency showing panicle discoloration and bending over (assnet.org))

Importance

- Silicon deficiency negatively affects the development of a thick silicate epidermal cell layers making the plants weak and susceptible to fungal, bacterial diseases, mites, pests
- The deficiency is more common in upland rice than in paddy rice
- Si deficiency also negatively affects development of strong leaves, stems and roots
- It make rice vulnerable to stress like drought, storms and salt

Prevalence

- Low levels are found in low silicon weathered soils such as Oxisols and Ultisols
- Deficiency is common in areas with poor soil fertility in upland rice cultivated systems and also in old and degraded paddy soils
- This nutrient is likely in upland rice growing areas of Busia, Kwale and Kilifi counties

Fig 3. Si rich rice grains

Fig 4. Low Si, Neck blast, dead panicle (https://www.slideshare.net/Rakeshsarma7/role-of-silicon-in-alleviating-biotic-and-abiotic-stresses-in-plants-59485514)

Fig 5. Adequate Si, No neck blast, healthy panicle neck. (https://www.slideshare.net/Rakeshsarma7/role-of-silicon-in-alleviating-biotic-and-abiotic-stresses-in-plants-59485514)

Symptoms

- The rice panicle bends over, breaks and dies (a condition known as neck blast)
- Leaves become soft and droopy
- Grain sterility normally observed in deficient plants resulting in empty white spikelets called “white heads”
- Deficient plants often show increased incidences of rice blast (*Magnaporthe oryzae*) and brown spot (*Helminthosporium oryzae*) leading to low yields
- Decreased photosynthetic activity and reduced yields
- Plants are susceptible to lodging and exhibit low number of panicles

Management Strategies

- Carry out soil and plant sample testing to confirm Silicon deficiency status
- If deficient, apply, silicon at recommended rates (500 kg/ha of Silicon)
- Use recommended rates of nitrogen fertilizer. Do not apply excess of it as it predisposes the crop to insect and disease attack
- Incorporate straw and rice husks into the soil instead of completely removing or burning it
- If available, apply rice hulls and rice hull ash into the soil to replenish Si in the soil
- Incorporate rice straw (5-6% Si) and husks (10% Si) in soil after harvest
- Apply Phosphorus to enhance soil Manganese and Aluminium uptake
- Application of silicon rich materials to enhance yields biomass production and reduce neck blast infection

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