Salinity stress damage in rice

Factsheets for Rice Production, East Africa

Fig 1. Leaf burning (http://www.knowledgebank.irri.org/ricebreedingcourse/Breeding_for_salt_tolerance.htm)

Fig 2. Spikelets sterility (http://www.knowledgebank.irri.org/ricebreedingcourse/Breeding_for_salt_tolerance.htm)

Fig 3. Reproductive stage damage ((http://www.knowledgebank.irri.org/ricebreedingcourse/Breeding_for_salt_tolerance.htm)

Fig 4.Spikelets sterility

Causes of salinity

- Rock weathering is primary source of salts
- Water table fluctuation can lead to salinity
- Use of saline irrigatin water
- Low rainfall to leach salts accumulated due to high evaporation rate
- inudation/ waves of sea water into inland
- The problem is severe in Hola – Bura region, Tana River, but there are isolated area in Kilifi (Malindi) county
- With climate change and rise in sea water level, flooding of agricultural land by salty water is expected to bring more area under salinity.
- Semi-arid areas where heavy irrigation and evaporation occur

Symptoms

- Morphological symptoms include: plant death, low tillering, reduced spikelets per panicle, leaf scorching, spikelet sterility and low 1000 grain weight
- The plants may be affected uniformly under sodicity and salinity but not in all cases
- White leaf tip resulting in tip burning like is the major sign of salinity stress
- Stunted growth
- Transplanting old seedlings help avoid seedling stage damage but not at flowering stage
- Plants tends to mature early to complete life cycle

Fig 5. Salinity tolerance line (Kimani,J KALRO)

Fig 6. Evaluation for salinity tolerance at Hola (Kimani, KALRO)

Fig 7. Measuring salinity at Hola (Kimani,j KALRO)

Economic loss

- Loss of Chlorophyll and photosynthetic area leads to reduced grain and biomass yields (A, B)
- Sterility can result into up to 100% grain loss and panicle death (B, C, & D)
- Incase of seedling damage this can result into complete crop loss or partial loss depending on salinity ddistribution.

Predisposing factors

- Saline soils dominated by sodium cations with electrical conductivity (EC) more than 4 dSm^{-1}, but the dominant anions are usually soluble chloride and sulphate
- Exchangeable Sodium Percentage (ESP < 15) and pH values of these soils are much lower than in sodic soils

Management Strategies

Use of tolerant varieties such as:

- Changing the growing saline environment to make it normal and suitable for the normal growth of crops
- Combined use of tolerant varieties and changing the saline production environment (this involves less resource use)
- Early seedling vigour is key to lowering stress effect at this sensitive stage

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