

Cold damage in rice



Fig 1. A. Cold damage signs (green spikelets indicate unfilled while brown ones are filled)



Fig 2. B. Low temperature injury in rice
Kimani, J, KALRO



Fig 3. Seedling cold damage



Fig 4. White and necrotic tips

Importance

- Cold damage in rice is a widespread phenomenon affecting over 25 countries globally
- It occurs during germination, seedling, vegetative, reproductive and grain maturity stage when temperatures drop to below 17°C
- It affects seedling vigour and pollination resulting in weak crop and empty spikelets thus reducing grain formation.
- This phenomenon affects irrigated and upland rice and is severe in high land regions of East Africa (EA) such as Central Kenya
- Cases of zero grain formation per plant have been observed in farmers fields, un aware farmers spray thinking it is a disease

Predisposing factors

- Panicle initiation coinciding with cold season
- Application of cold irrigation water
- Flowering during cold season.
- When the sky is clear at night resulting in temperature inversion of below 17°C <https://www.bing.com/images>

Symptoms

- The filled spikelets normally turn from green to brown as they mature.
- Pollen abortion during pollen formation (microsporogenesis) at booting stage
- There is generally delayed maturity
- Reduced chlorophyll content
- Leaf blade has a white line where soil was during cold period due to cold injury.



Fig 5. White panicle tips due to cold damage
(Kimani, J, KALRO)

Damage on rice crop

- In normal cases (no cold damage), the panicle bends from upright to inverted U due to weight of filled spikelets.
- Causes abnormalities at anthesis & non-functional anthesis,
- There is chlorosis, necrosis and growth retardation
- Panicle sterility. Sterility is determined by comparing/ estimating the proportion of empty spikelets to filled grain. e.g. if 70 spikelets are unfilled out of 100, it means 70% yield loss (red)

Management Strategies

- **Crop calendar:** Planting should be planned in a way that the cold season does not coincide with PI, flowering or early reproductive phase in EA.
- In Central Kenya, between 15th February to Mid May, it is not advisable to plant during this period.
- **Planting cold tolerant varieties:** Generally Japonica varieties are cold tolerant compared to the popular Indica varieties.
- **Use of Nitrogen fertilizer:** This has been shown to reduce cold damage.



White panicle tips due to cold damage
(Kimani, J, KALRO) Fig 6.

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