



Tropentag, September 10-12, 2025, hybrid conference

“Reconcile land system changes
with planetary health”

Assessment of seedling early vigour in lowland rice under different thermal environment

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Abstract

Low temperature is a major limitation to allow double rice cropping in high altitude production systems. Stress caused by low temperature affects rice plants throughout its growth stages leading to significant yield losses because of poor germination and seedling establishment, stunted growth, non-vigorous plants, high spikelet sterility, delay in flowering, and lower grain filling. However, the increase in global temperature due to climate change offers good conditions for double rice cropping in these areas. This experiment aimed to assess seedling early vigour of selected lowland rice varieties sown in monthly staggered sowing dates following the mini rice garden protocol. Early vigour is important for crop establishment in rice. Growth parameters such as speed of germination, seedling establishment, phyllochron, shoot biomass, tiller number and plant height were measured at a regular interval. Weather parameters such as air temperature, soil and water temperature were monitored during the experiment. The field experiment was carried out from February 2016 to June 2017 in two different locations in Madagascar. The temperature range from sowing to transplanting were between 8 °C to 25° C. Five varieties with different responses to cold temperature were used. The leaf appearance rate fluctuated throughout the sowing dates therefore the total number of leaves was influenced by the temperature. Plant height and tiller number and thus shoot biomass were influenced by temperature fluctuation. Sensitive variety did not recover from the low temperature. The early seedling vigour assessment needs to be coupled with final grain yield to complete the information about cold tolerance in early stage in a given variety.

Keywords: Cold stress, early vigour, high altitude, oryza sativa, phyllochron