

Exploration of maize landraces of Eastern Himalayan region for waterlogging tolerance at seedling and flowering stages through phenotyping of Root System Architecture

E. LAMALAKSHMI DEVI¹, Krishnappa Rangappa¹, Ingudam Bhupenchandra¹, Samarendra Hazarika¹, Ayam Gangarani¹, Konsam Sarika¹, Nongmaithem Radhakishore¹, Chongtham Meetei¹, Thokchom Singh¹, Sunil Chongtham², Sankar Das¹, Amit Kumar¹, RAVIKANT AVASTHE¹, Irengbam Singh¹, NIVEDITA SHETTIGAR¹, and Amit Kumar¹

¹ICAR

²Central Agricultural University

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Abstract

A field experiment was conducted to phenotype the root traits and screen 35 local maize landraces of Eastern Himalayan region for waterlogging tolerance at seedling and flowering stage. Microcosm screening was done at seedling stage (6-8 leaf stage) with pots maintained with flooded water to a level of 4-5 cm above the soil surface for 15 days continuously. Artificial flooding stress to a depth of 20-25 cm above the soil surface for 10 days continuously was induced at the time of flowering in the field. This was majorly performed to trace the plasticity of root architecture through phenotyping. The evaluation and selection of different maize landraces for waterlogging stress at seedling stage was established through shovelomics with the apparent calculation of response coefficient (RC) as rightful/ surrogate indication of phenotypic plasticity and waterlogging tolerance coefficient (WTC). For assessing the field performance, each stress responsive trait viz., BW, BO, BA1, BA2, BB, CN, CA and CB were assigned scoring values from one to nine visually which ideally serve as screening measure for waterlogging tolerance. The results revealed that genotypes RCM-44-19, RCM-16-19, RCM-39-19, RCM-42-19, RCM-15-19, RCM-51-19, RCM-9-19, RCM-45-19, RCM-32-19, RCM-43-19, RCM-10-19, RCM-49-19, RCM-12-19 and RCM-26-19 were identified as WL tolerant at seedling stage and some genotypes like RCM-12-19, RCM-32-19, RCM-16-19 and RCM-23-19 showed vigorous root growth and branching after waterlogged treatment at flowering stage. The genotypes like RCM-12-19, RCM-32-19 and RCM-16-19 were designated as flooding stress tolerant at both the crop growth stages which could be of appropriate utility for the upcoming maize breeding program under excess moisture-prone environments of North East hilly regions after systematic validation through advance molecular tools.

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