Adapting lowland rice cultivation to climate change – thermal stress tolerance breeding in the Sahel region of West Africa

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The Sahel region of West Africa is characterized by extreme diurnal and seasonal temperature variation subjecting the rice crop to thermal stress at different growth stages. The Africa Rice Center in collaboration with partners is aims to identify rice genotypes and associated traits for use in breeding varieties adapted to the Sahel climate. In one set of field trials established at Ndiaye, Senegal, 244 diverse rice genotypes, including four checks, were sown in February, March, April and July subjecting the rice plants to cold and heat stress at different growth stages. Daily minimum temperatures fell below 20 °C in the months of February and March whilst maximum temperatures regularly rose above 40 °C in April, May and June. The rice crop is thus subjected to cold stress in February and March and to heat stress in April to June. Across the planting dates, total biomass production was highest on average for the February planting date (293.8g/plant) followed by the April planting date (281.0g/plant) and lowest for the July planting date (215.4g/plant). However, spikelet sterility was highest for the April planting date on average relative to other planting dates and lowest for the July planting date. On average plantings in July were earliest (100 days from sowing to maturity) relative to other planting dates whilst plantings in February which corresponded to the sowing date for the dry season crop had the longest crop durations (137 days from sowing to maturity). With regards to crop duration across the planting dates, Chromrong a cold tolerant check from Nepal had the shortest duration across all dates whilst N22 the international heat tolerant check had the longest duration. IR64 an international irrigated lowland check variety and Sahel 108 a local check variety had crop durations generally intermediate between these two checks. Large genotypic variations detected in these traits will be exploited in selecting parents to develop new varieties better adapted to the seasonal Sahelian climate.

Keywords: Genotype, adaptation Sahel region, cold stress, heat stress, biomass, spikelet sterility

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