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Difficult Time for Maize Cropping: How Can we Sustain it under Climate Extremes?

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Abstract

Climate significantly affects maize (*Zea mays*) productivity. Therefore, the objective of present study was to assess growth, physiology and yield components of maize under different cropping patterns in areas prone to weather variability. The experiment was carried out in an upland maize production area of Thailand, using a split plot design with three replicates. The treatments were (i) June planted maize monocrop, (ii) July planted maize monocrop (farmers' practice) and (iii) July planted maize relay cropped with mung beans (*Vigna radiata*). Maize growth and physiological parameters (grain yield, yield components and δ^{13}C of maize grains) and soil moisture were assessed. Weather data showed that rainfall was mostly falling from June to mid-August and mean maximum temperature was 35°C. During drought periods, the maximum temperature exceeded 40°C. As a consequence, June planted maize was less affected by extreme weather conditions during sensitive periods of maize growing, while July planted maize regardless of mono or relay cropping were negatively affected. The results showed that June planted maize had a significantly better growth performance and finally a higher yield than the other two treatments tested. N uptake of June planted maize was also significantly higher compared to the other two treatments. Light transmission ratio of June planted maize was higher, reaching up to 20 %, while July planted maize treatments were above 40 %. As July planted maize treatments were highly affected by extreme climate, maize-mung bean relay cropping was higher in demanding water than maize monocrop as indicated by soil moisture depletion. Stomatal conductance of these two treatments were not significantly different during normal condition, but during extreme climate, relay cropping was still able to keep stomata open ($P \leq 0.05$). Therefore, relay copping performed better than sole cropping when maize was planted in July. Moreover, δ^{13}C of maize grains confirmed that June planted maize had a much better water access than July planted maize. Nevertheless, July planted maize relay crop had also less water stress than the monocrop. This study indicated that maize-mung bean relay cropping can mitigate extreme weather while using a proper planting period enhances productivity of maize mono cropping.

Keywords: Climate change mitigation, mung bean, relay cropping

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