5th. Global Conference on Agriculture

Berlin, Germany 13 - 15 March 2025

Physiochemical Effects of Seed Thermo-priming on Maize (*Zea mays* L.) under Drought Stress

Saba Yasin, Francisco Zavala-García, Guillermo Niño-Medina, Pablo Alan Rodríguez-Salinas, Adriana Gutiérrez-Diez, Sugey Ramona Sinagawa-García, Eleazar Lugo-Cruz

Facultad de Agronomía, Universidad Autónoma de Nuevo León, Av. Francisco Villa S/N, Col. Ex Hacienda el Canadá, General Escobedo, Nuevo León, Mexico.

Abstract

Extreme temperature and water deficit conditions pose significant threats to crop growth and food security in changing climates. Maize, a widely distributed crop, is particularly sensitive to water deficiency during its reproductive stage. Among the recommended management techniques to cope with drought stress, seed priming, a low-cost and sustainable technology, can increase crop drought tolerance, potentially enhancing crop productivity and food security under changing climate conditions. The current study intended to investigate the physiological (photosynthetic rate, transpiration, cell membrane injury) and biochemical (total phenols, DPPH activity) response of seed thermo-priming to drought stress applied during reproductive stage using three maize genotypes (Red, White, P-3057w). The experiment was carried out in pots and was split into six treatments (control, drought, thermo-priming 40^{o}C, thermo-priming 40^{o}C + drought, thermo-priming 50^{o}C and thermo-priming 50^{o}C + drought. The drought stress was induced at stage V7 before heading, for a period of 12 days in a split plot under completely randomized design. Our results showed that the drought stress significantly reduced photosynthetic rate (34%), transpiration (41%) and cell membrane injury (70%) while increasing phenols (14%) and DPPH activity (6%) in non-primed seeds whereas thermo-priming 40^{o}C and 50^{o}C treatments reduced significantly the negative effects of drought on photosynthesis (15%; 17%), transpiration (13%; 14%) and cell membrane injury (19%; 22%) through increased DPPH activity (10%). However, there were no significant differences between thermo-priming 40^{o}C and 50^{o}C treatments. Consequently, both thermopriming treatments were found to be effective for increasing the drought stress tolerance during reproductive stage in maize.

Keywords: antioxidant activity; cross priming; photosynthesis; reproductive stage; total phenols