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A differential capacity of arbuscular mycorrhizal fungal colonization under well water condition, and its effect in drought stress mitigation of unimproved vs improved soybean genotypes

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Water use efficiency and mineral nutrient content may be improved by using crop varieties compatibles with arbuscular mycorrhizal (AM) fungi. The objective of this work was to evaluate variability of AM fungi colonization in unimproved vs improved soybean genotypes and its tolerance to drought stress. Four unimproved soybean genotypes and four improved ones (from the germplasm bank of INTA Marcos Juárez), were compared by its response to AM colonization, particularly arbuscular formation, and mycorrhizal dependency (MD), under well water and drought stress conditions. After 20 days of well water condition, all unimproved soybean genotypes showed a higher increase in arbuscular formation, mineral nutrient content in leaves and MD evaluated as shoot and root dry mass, than improved soybean ones. Tolerance to drought stress was evaluated in two improved (I-1 and I-2) and two unimproved (UI-3 and UI-4) soybean genotypes, that exhibiting the most contrasting response to AM colonization and MD, under well water conditions. At 20 days, after being under a water condition of 30% of field capacity, AM fungal colonization and arbuscular formation were higher in unimproved and showed variability between improved genotypes. Growth and oxidative stress parameters, such as malondialdehyde, antioxidant defenses as FRAP, and proline foliar content, were higher in both unimproved AM soybean genotypes followed by I-2, as compared I-1. The capacity for arbuscular formation is discussed as a selection criterion to identify improved soybean genotypes with more efficiency under well-watered condition and a better capacity to support drought stress.