

Aung Moe Myo Tint 2011: Physiological Responses of Selected Soybean Cultivars [*Glycine max* (L.) Merrill] under Different Water Regimes. Doctor of Philosophy (Tropical Agriculture), Major Field: Tropical Agriculture, Interdisciplinary Graduate Program. Thesis Advisor: Associate Professor Ed Sarobol, Ph.D. 157 pages.

Soybean has a fairly wide range of adaptation involving a wide array of climates and soil, though it is mostly grown on rain-fed land. Drought is a major environmental factor determining crop yield under rain-fed conditions due to erratic rainfall. At present scenario of climate changes, it has been predicted that drought is more likely to occur. Therefore, improving drought tolerant cultivars with better water use efficiency has been concerned as a priority for drought prone area and forwarding to water saving agriculture. However; many mechanisms are underlying plant response to drought stress. The situation devoted for cost effective selection criteria for drought tolerant cultivar improvement. This study aimed at investigating on physiological responses of soybean cultivars to seek for potential cost effective selection criteria for selecting drought tolerant cultivars with a numbers of experiments, conducted in the greenhouses and in the field.

Among the soybean cultivar, SJ.4 was the most appropriate cultivar not only for cultivar improvement but also for crop production in drought prone area because its physiological properties responding to drought and better yield potential in drought stress environments. Stress tolerance index (STI) was the most appropriate yield based index for selecting drought tolerant cultivar, followed by geometric mean productivity (GMP). The specific leaf weight (SLW) trait showed significant correlation with photosynthetic parameters, fluorescence parameters, water use efficiencies parameters and number of seed yield; followed after shoot dry matter (SDM) accumulation of a given genotype. Therefore, SLW trait could be used as an alternative potential cost effective criterion for selecting productive genotypes for both favorable and drought stress environments. N<sub>2</sub> fixation is sensitive to water deficit. Nitrogenase activity (NA) of nodulated root had significantly decreased 17.73% of control since 7 DAV<sub>4</sub> (R<sub>3</sub>). Not only NA of nodulated root severely diminished, 87.10% of control at 12 DAV<sub>4</sub> (R<sub>4</sub>) under progressive soil drying and did not recovered well after re-watering but also in nodule growth (NDM). For selecting greater soybean cultivar for N<sub>2</sub> fixation tolerant under water deficit, nitrogen concentration in accumulated shoot biomass under well watered could be used as an alternative indicator. SPAD (M-502) could be used as a powerful tool for selecting not only for productive genotypes but also for N<sub>2</sub> fixation drought tolerant soybean cultivars since it had significant high correlations with those potential traits; SLW, SDM and NDM.

Drought occurrence at late reproductive stage (R<sub>4</sub>) caused greater soybean seed yield reduction (23%) than occurred at V<sub>4</sub>; just before flowering (21 %) even sufficient rain occurred during imposed drought period for 14 days which started at R<sub>4</sub>.

Student's signature

Thesis Advisor's signature