EFFECTS OF SOIL MOISTURE REGIMES, PLANTING DENSITY AND INTERCROPPING ON GROWTH AND YIELD OF SELECTED SOYBEAN CULTIVARS IN KENYA

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A Thesis Submitted to Graduate School in Partial Fulfilment of the Requirements for Doctor of Philosophy Degree in Agronomy of Egerton University

EGERTON UNIVERITY

NOVEMBER 2019

ABSTRACT

Soybean [*Glycine max* (L) Merrill] yields in Kenya range from 445-1200 kg ha^{-1} against potential yields of 3500 kg ha^{-1}. The low yields are attributed to soil moisture stress and use of poor agronomic practices. The objectives of the study were to determine effect of soil moisture regimes on CO_2 assimilation, growth and yield of selected soybean cultivars; to determine effect of planting density on yield and yield components of soybean and to determine effect of soybean and maize intercropping on stomata conductance, shoot characteristics and yield of soybean. A greenhouse moisture stress study was laid out in a randomized complete block design (RCBD) in a 6 by 4 factorial treatment arrangement and was replicated three times. Soil moisture regimes (80, 60, 40 and 20% of field capacity) and cultivars (Gazelle, Nyala, EAI 3600, DPSB 8, Hill and DPSB 19) were first and second factors, respectively. Field moisture stress study used RCBD in a split plot arrangement with three replicates. Moisture regimes (100, 75, 50 and 25% of soybean crop water requirement) and cultivars (as in experiment 1) were main plot and sub plot factors, respectively. The third experiment evaluated effects of planting density on yield and yield components of soybean using a 5 by 2 factorial arrangement in RCBD. Planting densities (10, 12, 20, 40 and 80 plants per m^2) and cultivars (EAI 3600 and DPSB 19) were first and second factors respectively. The fourth experiment determined effect of soybean and maize intercropping on stomata conductance, shoot characteristics and yield of soybean. The experiment was conducted using RCBD with 3 replicates. Soil moisture stress significantly ($p < 0.001$) reduced soybean shoot and root growth of all tested cultivars. Leaf relative water content, stomata conductance, photosynthetic rate and sub-stomatal CO_2 levels significantly ($p < 0.001$) declined with increasing soil moisture stress. Cultivar DPSB 19 had higher stomata conductance but reduced transpiration rate at lower soil moisture levels. Highest number of nodules per plant were attained at 10 plants m^{-2} which was 34.76% more than number of nodules obtained at 80 plants m^{-2}. Soil moisture depletion at 80 plants m^{-2} was 15.22% higher than at the lowest plant population of 10 plants m^{-2}. Intercropping maize and soybean significantly ($p < 0.01$) reduced soybean leaf area, IPAR, stomatal conductance and photosynthetic rate. Intercropping reduced soybean yield by 80.72% though 1M:1S row pattern gave relatively higher soybean yields than other intercropping patterns. Soybean cultivar DPSB 19 is recommended for production under soil moisture stress conditions while planting soybean at 20 plants m^{-2} is recommended for optimum soybean yields. Planting maize and soybean in 1M:1S row pattern should be used when intercropping the two crops.

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