

## **Drought Tolerant and Seedling Vigor Screening in Groundnut (*Arachis hypogaea*) using Photogrammetry in a Breeding Program in Ghana.**

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Drought is the main abiotic factor limiting groundnut production in Ghana. Accurate selection of drought tolerant genotypes will therefore increase the quality and quantity of groundnut production. A field trial consisting of 58 groundnut genotypes selected from the African germplasm collection together with 2 checks from the groundnut breeding program from CSIR-SARI was conducted at Golinga in the Northern Region of Ghana during the 2021 dry season. The aim of this study was to assess the effectiveness of using photogrammetry for phenotyping seedling vigor and drought tolerance traits in groundnut breeding program in Ghana. Well-watered and water-stress were the growing conditions created for the experiment. The genotypes were arranged in a 2 × 30 row-column design in three replications. The investigated parameters were seedling vigor, days to 50% flowering, canopy temperature, red-green-blue imaging, canopy wilting, dry biomass weight, pod weight/plot and pods/plant. Data was analyzed using the mixed linear model with R statistical program, version 4.0.2. Differences were observed in how the accessions responded to drought imposition. Tog-HG08:201909, Sen-ICGV 96894:201909 and CHINESE exhibited low canopy temperatures with higher yields under water-stress condition. On the other hand, Nig-ICGVIS 07890:201909, Nig-ICGVIS 79103:201909, Oug-KadonokhoX3590 Tan:201909 and Zam-ICGV-SM-06637:201909 showed higher canopy temperature values and low yields under water-stress condition. Positive and significant associations were observed between canopy temperature and canopy wilting ( $r = 0.58$ ,  $p < 0.000$ ) and between crop senescence index and canopy wilting ( $r = 0.47$ ,  $p < 0.000$ ). Green area, number of green pixels with Hue angle between 60 and 120 °, was significantly associated with seedling vigor at 21 days ( $r = 0.76^{***}$ ) and 30 days ( $r = 0.78^{***}$ ) after planting. Greener area, number of green pixels with Hue angle between 80 and 120 °, was also significantly associated with seedling vigor at 21 days ( $r = 0.70^{***}$ ) and 30 days ( $r = 0.61^{***}$ ) after planting. Dry biomass weight was best associated with greener area at 90 days after planting ( $r = 0.55^{***}$ ). Green area, greener area, and their ratio had broad sense heritability values ranging from 62 to 73% under genetic control, thus they were less influenced by environment. Traditional traits (dry biomass weight, and wilting) had smaller broad sense heritability values of 51 and 54%, thus they were more influenced by the environment than the photogrammetric traits.