World Academy of Science, Engineering and Technology
International Journal of Bioengineering and Life Sciences
Vol:19, No:06, 2025

Root System Architecture Analysis of Sorghum Genotypes and Its Effect on Drought Adaptation

Authors : Hailemariam Solomon, Taye Tadesse, Daniel Nadew, Firezer Girma

Abstract : Sorghum is an important crop in semi-arid regions and has shown resilience to drought stress. However, recurrent drought is affecting its productivity. Therefore, it is necessary to explore genes that contribute to drought stress adaptation to increase sorghum productivity. The aim of this study is to evaluate and determine the effect of root system traits, specifically root angle, on drought stress adaptation and grain yield performance in sorghum genotypes. A total of 428 sorghum genotypes from the Ethiopian breeding program were evaluated in three drought-stress environments. Field trials were conducted using a row-column design with three replications. Root system traits were phenotyped using a high-throughput phenotyping platform and analyzed using a row-column design with two replications. Data analysis was performed using R software and regression analysis. The study found significant variations in root system architecture among the sorghum genotypes. Non-stay-green genotypes had a grain yield ranging from 1.63 to 3.1 tons/ha, while stay-green genotypes had a grain yield ranging from 2.4 to 2.9 tons/ha. The analysis of root angle showed that non-stay-green genotypes had an angle ranging from 8.0 to 30.5 degrees, while stay-green genotypes had an angle ranging from 12.0 to 29.0 degrees. Improved varieties exhibited angles between 14.04 and 19.50 degrees. Positive and significant correlations were observed between leaf areas and shoot dry weight, as well as between leaf width and shoot dry weight. Negative correlations were observed between root angle and leaf area, as well as between root angle and root length. This research highlights the importance of root system architecture, particularly root angle traits, in enhancing grain yield production in drought-stressed conditions. It also establishes an association between root angle and grain yield traits for maximizing sorghum productivity.

Keywords : roor sysytem architecture, root angle, narrow root angle, wider root angle, drought
Conference Title : ICPS 2025 : International Conference on Plant Sciences
Conference Location : Toronto, Canada
Conference Dates : June 15-16, 2025