World Academy of Science, Engineering and Technology
International Journal of Environmental and Ecological Engineering
Vol:15, No:11, 2021

Variation in N_2 Fixation and N Contribution by 30 Groundnut (Arachis hypogaea L.) Varieties Grown in Blesbokfontein Mpumalanga Province, South Africa

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Abstract : In Africa, poor nutrient availability, particularly N and P, coupled with low soil moisture due to erratic rainfall, constitutes the major crop production constraints. Although inorganic fertilizers are an option for meeting crop nutrient requirements for increased grain yield, the high cost and scarcity of inorganic inputs make them inaccessible to resource-poor farmers in Africa. Because crops grown on such nutrient-poor soils are micronutrient deficient, incorporating N_2-fixing legumes into cropping systems can sustainably improve crop yield and nutrient accumulation in the grain. In Africa, groundnut can easily form an effective symbiosis with native soil rhizobia, leading to marked N contribution in cropping systems. In this study, field experiments were conducted at Blesbokfontein in Mpumalanga Province to assess N_2 fixation and N contribution by 30 groundnut varieties during the 2018/2019 planting season using the ^{15}N natural abundance technique. The results revealed marked differences in shoot dry matter yield, symbiotic N contribution, soil N uptake and grain yield among the groundnut varieties. The percent N derived from fixation ranged from 37 to 44% for varieties ICGV131051 and ICGV13984. The amount of N-fixed ranged from 21 to 58 kg/ha for varieties Chinese and IS-07273, soil N uptake from 31 to 80 kg/ha for varieties IS-07947 and IS-07273, and grain yield from 193 to 393 kg/ha for varieties ICGV15033 and ICGV131096, respectively. Compared to earlier studies on groundnut in South Africa, this study has shown low N_2 fixation and N contribution to the cropping systems, possibly due to environmental factors such as low soil moisture. Because the groundnut varieties differed in their growth, symbiotic performance and grain yield, more field testing is required over a range of differing agro-ecologies to identify genotypes suitable for different cropping environments

Keywords : ^{15}N natural abundance, percent N derived from fixation, amount of N-fixed, grain yield
Conference Title : ICPFEB 2021 : International Conference on Plant, Food and Environmental Biotechnology
Conference Location : Cape Town, South Africa
Conference Dates : November 04-05, 2021