Tropentag, September 14-16, 2010, Zurich

"World Food System —
A Contribution from Europe"

Identifying Potassium-use-efficient Cotton Genotypes for Low Potassium Input Sustainable Agriculture

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Abstract

The identification of cotton (*Gossypium hirsutum* L.) genotypes, efficient in potassium (K) uptake and utilisation, for low-K-input sustainable cotton production represents an important environmentally friendly approach in relation to genetic resource management. It would reduce the costly input of K-fertilisers and manage K resources in agro-ecosystems. K use efficiency of 25 cotton genotypes was evaluated under adequate and deficient K conditions in hydroponics. Although low K supply reduced the growth of all genotypes, a considerable genotypic variation was found among genotypes for their biomass production (dry weight of shoot and root, and leaf area). K-efficient and K-inefficient genotypes were identified on the basis of their growth responses at deficient K supply. Cotton genotypes that had higher growth at deficient K supply were K-efficient. The correlation analysis revealed that K-efficient genotypes had more capacity to uptake K under its deficient condition. However, ranking of genotypes by two different methods showed that the only most desirable, 'efficient-responsive' genotype was NIBGE-2 with excellent adaptation potential to both the K levels. The genotypes CIM-506 and Desi okra were 'non-efficient' and 'non-responsive' at deficient and adequate K conditions, respectively, with low shoot dry weight. For the first time, such a big number of cotton genotypes are screened and identified for their K-use efficiency, in order to exploit their potential for sustainable production under K deficiency stress. Also, for the first time, we are recommending the ranking of crop genotypes in screening experiments involving different methods to ensure the validity of results to be utilised in future studies focusing on developing nutrient-efficient crop genotypes for low-nutrient input sustainable agriculture.

Keywords: Genotypic variation, *Gossypium hirsutum*, K uptake, K use efficiency, K utilisation, sustainable agriculture

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