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Identification of banana genotypes for drought tolerance

N. CHANDRASHEKAR, K.V. RAVISHANKAR[1], R.H. LAXMAN[1], A. REKHA[1] AND V. SWARUPA[1]

Members of the Research Forum

Associate Author :
[1]Indian Institute of Horticultural Research, Hessaraghatta, BENGALURU (KARNATAKA) INDIA

Author for correspondence :
N. CHANDRASHEKAR
Department of Biotechnology, University of Agricultural Sciences, G.K.V.K., BENGALURU (KARNATAKA) INDIA
Email : chandru.bio2020@gmail.com

Abstract : Banana crop bearing a mesophyte is very sensitive to water stress conditions, most of its cultivation is under irrigation and understanding the changes in banana genotypes response to water deficit conditions is very important. Keeping above points in view, the present investigation was initiated to study the physiological and biochemical changes due to moisture stress in banana. Fifteen genotypes belonging to AA genomic group and thirteen genotypes belonging to BB genomic group of banana were screened for drought tolerance using two characteristics *i.e.* leaf water retention capacity (LWRC) and carbon isotope discrimination. LWRC values for AA genotypes ranged from 57.03 to 81.75 per cent and the values for BB genotypes ranged from 71.5 to 83.44 per cent. Whereas the values on $\Delta^{13}C$ for AA genotypes ranged from15.91 to 21.03 and for BB genotypes the values ranged from 17.13 to 20.93. The result revealed that, AA genotypes recorded relatively higher water use efficiency than BB genotypes. BB genotypes had higher Leaf water retention capacity compared to AA genotypes. Based on this study two contrasting genotypes for drought tolerance were selected from AA (Calcutta-4, as susceptible) and BB (Bee hee kela, as tolerant) genomic groups. The identified contrasting genotypes can be used for physiological, biochemical and molecular studies.

Key words **:** Banana, Drought tolerance, Carbon isotope discrimination, LWRC

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Bananas and plantains are monocotyledonous plants in the genus *Musa* which belongs to the family *Musaceae* The family *Musaceae* contains three genera that are *Ensete*, *Musella* and *Musa* (Lassoudière, 2007). The genus Ensete has eight species and the genus *Musella* comprises the only one known species that is *Musella splendia*. The most important cultivar groups of bananas and plantains have arisen from two sections of *Eumusa; Musa acuminata* with AA genome and *Musa balbisiana* with BB genome (Lassoudière, 2007).

The original bananas were seedy, not pulpy and not edible. The evolution of edible banana was initiated with the *Musa acuminata* spp. that has undergone mutations that resulted to a slow decline in seed fertility. Different combinations of these wild species resulted in the development of a broad spectrum of genome groups from diploids to tretraploids; AA, AB, BB, AAB, ABB, AABB, ABBB, etc. (Simmonds, 1995; Uma *et al.*, 2005).

Water deficit is one of the principal limiting factors for crop production throughout the world. It prevents the crop plants from expressing their full genetic potential. Water deficit, which is a consequence of either intermittent or terminal period of drought, causes significant yield reduction on cultivated crops. These restrictions on yield potential are of great concern in terms of meeting food demand of increasing world population. To achieve the objectives, understanding the fundamentals of plant responses are vital for a given species of crop within a specific environment.

Bananas (*Musa* spp.) rarely attain their full genetic potential for yield due to limitations imposed by water. The banana plants' sensitivity to moisture stress is reflected in changes in reduced growth through reduced stomatal conductance and leaf size (Kallarackal *et al*., 1990; Turner, 1995), increased leaf senescence (Batalgia, 1980) ultimately limiting the plants' photosynthesis. Leaf water retention capacity (LWRC %) was considered to be a better estimation of drought resistance than stomatal conductance (Clarke and McCaig, 1982). Tesha (1984) also observed LWRC to be more