

ABSTRACT

Study of Drought Resistance in Cacao (Theobroma cacao L.). The Identification of Physiological and Morphological Characters Contributing to Drought Resistance

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Drought stress is frequently a severe limiting factor in cacao (Theobroma cacao L.) production in the various cacao producing countries.

The objective of this greenhouse investigation was to determine drought resistance attributes in cacao (Theobroma cacao L.). Six cacao genotypes of diverse origins (ICS 1, ICS 95, TSH 1188, TSH 865, SCA 12 and IMC 67) were evaluated for their relative degrees of drought resistance and whether this was related to leaf diffusive resistance, water potential, hair density, stomatal density and transpiration rate.

The research was conducted in three different experiments using cuttings (approx. 14 months old) grown in peat - sand potting mix (1 : 1 v/v) in 4.4 litre black plastic bags. The experiments were (i) screening for drought resistance (ii) measurement of stomatal, leaf water potential and transpiration responses to three watering treatments and (iii) a study of stomata and leaf hair densities among the tested genotypes.

The relative degree of drought resistance amongst the genotypes tested, in a descending order, were ICS 1, TSH 865, SCA 12, ICS 95, IMC 67 then TSH 1188. There was no significant correlation between this ranking and any of the leaf parameters. The use of multiple regression analysis demonstrated an interaction between various leaf characteristics which confer drought resistance in cacao. Their relative importance as drought resistance attributes, in a descending order, were a low transpiration rate, stomata sensitive to water stress, high leaf diffusive resistance, high water potential, high leaf hair frequency, then a low stomatal frequency. Drought resistance was positively related with leaf diffusive resistance, leaf water potential, leaf stomatal sensitivity and leaf hair frequency but negatively related with transpiration rate and leaf stomatal frequency.

Results of this study indicate that the selection of drought resistant genotypes in cacao would be reliable when it is based on a combination of leaf characteristics. The two parameters which can be used to determine overall genotype drought resistance in cacao are (i) transpiration rate and (ii) stomatal sensitivity to moisture stress.