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GENOTYPIC DIFFERENCES IN CARDINAL TEMPERATURES FOR *IN VITRO* POLLEN GERMINATION AND POLLEN TUBE GROWTH OF COCONUT HYBRIDS

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SUMMARY

Successful fruit set in coconut depends on several reproductive processes including pollen germination and pollen tube growth. High temperature (>33 °C) during flowering reduces fruit set in coconut. Therefore, identification and development of coconut varieties or hybrids with high reproductive heat tolerance will benefit the coconut industry in view of the climate changes. This experiment was conducted to quantify the response of pollen germination and pollen tube growth of seven coconut hybrids to increasing temperature from 16 to 38 °C. A Principal Component Analysis (PCA) was carried out to classify coconut hybrids on the basis of their temperature tolerances to pollen germination. Pollen germination and pollen tube length of the hybrids ranged from 56 to 78% and 242 to 772 µm, respectively. A modified bilinear model best described the response to temperature of pollen germination and pollen tube length. Cardinal temperatures (T_{min}, T_{opt} and T_{max}) of pollen germination and pollen tube length varied among the seven hybrids. PCA identified T_{max} for pollen germination and T_{opt} for pollen tube length as the most important parameters in describing varietal tolerance to high temperature. PCA also identified SLGD × Sri Lanka Tall and Sri Lanka Brown Dwarf × Sri Lanka Tall as the most tolerant hybrids to high temperature stress and Sri Lanka Tall × Sri Lanka Tall and Sri Lanka Green Dwarf × San Ramon as less tolerant ones based on cardinal temperatures for pollen germination and pollen tube length. T_{max} for pollen germination of the most tolerant and less tolerant hybrids were 41.9 and 39.5 °C, respectively. T_{opt} for pollen tube length in the most tolerant and less tolerant hybrids were 29.5 and 26.0 °C, respectively.

INTRODUCTION

Coconut plantations are managed as intensive mono or mixed cultures in tropical regions. The optimum climatic conditions required for coconut production are mean annual temperature of 27–28 °C, abundant sunlight (at least 120 h per month) and a well-distributed annual rainfall between 1300 and 2300 mm (Rajagopal and Ramadasan, 1999). Reduced fruit set and yield due to high temperature stress is one of the major constraints faced by the coconut producing countries in the tropics (Ranasinghe *et al.*, 2014, 2015; Thomas *et al.*, 2012). High temperature stress causes strong yield fluctuations, affecting growers, local consumers and the supply chain of the coconut products to the global market.

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