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Variation in yield and yield components of different coconut cultivars in response to within year rainfall and temperature variation

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ABSTRACT

The yield (no. of nuts/palm/year) of coconut (*Cocos nucifera* L.) is highly influenced by the amount and distribution of rainfall and year-round temperature. This study was conducted to evaluate the variation in yield and yield components of two groups of coconuts; talls (two cultivars) and dwarf x tall hybrids (four hybrids) in response to within year variation of rainfall and temperature under average management conditions in Wanathawilluwa, dry zone (DL_3) of Sri Lanka. No. of inflorescence, no. of female flowers, no. of button nuts, and no. of mature nuts were recorded at monthly intervals from July 2013 to May 2015 at Wanathawilluwa. For comparison, no. of mature nuts was recorded at Raddegoda in the wet intermediate zone (IL1a) of Sri Lanka. Daily rainfall and temperature were collected from the nearest weather stations. The results revealed that the no. of inflorescences produced by a palm within a year is not different among cultivars. However, tall cultivars produced a significantly lower no. of female flowers/palm/year than hybrids but, no difference was observed within groups. The no. of female flowers/inflorescence showed a significantly positive correlation with the mean monthly rainfall received during 7, 8 and 9 months prior to opening of the respective inflorescence. This observation was recorded for the first time and can be used to mitigate the effect of drought. Number of nuts set/inflorescence varied significantly with the month in which the inflorescence opened. Both at Wanathawilluwa and Raddegoda, hybrids showed a significantly higher yield compared to that of tall cultivars, Raddegoda however, showed a higher yield in all cultivars attributing to the favourable soil and weather conditions. When the inflorescences were not exposed to temperature stress during the first three months, dwarf x tall hybrids showed a significantly higher nut set/inflorescence and mature nuts/bunch than tall cultivars. In conclusion, the main yield components affected by moisture and temperature stresses were the no. of female flowers/inflorescence and the no. of nut set/inflorescence. The moisture stress at the time of floral primordia initiation and the temperature stress at the time of nut setting are the most critical factors affecting the coconut yield.

1. Introduction

Global food production threatened by climate change is one of the most important challenges in the 21st century to supply sufficient food for the increasing population (Lal et al., 2005). The climate change driven temperature rise and variation in the rainfall patterns create abiotic stresses for many crops. Coconut (*Cocos nucifera* L.) is one of the major plantation crops with versatile uses. It plays a significant role in food security and economy of people in many developing countries. Among different abiotic stresses affecting coconut, drought and high temperature are considered as major stress factors with high negative impact on nut yield. Coconut could be successfully grown in areas where the annual rainfall is 1300 mm or above (Abid et al., 2007), under conditions of high humidity, at temperatures between 27–30 °C and on moderately to well-aerated soils (Perera et al., 2009).

Coconut shows an indeterminate growth pattern and generally produces an inflorescence at each leaf axil at intervals varying from 25 to 30 days, depending on the environmental conditions and the age of the palm (Liyanage, 1950; Ranasinghe et al., 2015). However, some axils fail to throw out inflorescences due to abortion of inflorescences developed inside the leaf axil. The total number of female flowers in a coconut inflorescence is dependent on genetic and environmental factors and varies from zero to a few hundreds. However, normal inflorescence has several thousands of male flowers (Thomas and Josephrajkumar, 2013). Initial nut set (female flowers transformed into button nut three months after an inflorescence opened), in coconut can

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