

The effect of different day and night temperatures on the growth and physiology of *Theobroma cacao* under controlled environment condition

ABSTRACT

Aims: An experiment was conducted to investigate the effect of a wide range of temperatures on the growth and physiology of *Theobroma cacao*, to study the differences between night and day temperatures and to determine the optimum temperature for the cocoa growth. **Study Design:** The experiment used five combinations of night and day temperatures (18°C and 30°C [18N30N], 18°C and 36°C; [18N 36D], 24°C and 24°C [24N24D], 24°C and 30°C [24N30D] and 24°C and 36°C [24N36D]) using complete randomized design (CRD). **Place and Duration of Study:** Crops and Environment Laboratory University of Reading and International Cocoa Quarantine Centre, between 23rd May 2016 and 25th July 2016. **Methodology:** The cocoa seedlings were put into five growth cabinets with five different night and day temperatures combinations (18°C and 30°C, 18°C and 36°C, 24°C and 24°C, 24°C and 30°C, 24°C and 36°C) for two months (63 days) under controlled environment condition where the relative humidity and vapor pressure deficit were controlled. Destructive harvest data was taken at end of the experiment which included fresh weight, dry weight, leaf area and root weight. Non-destructive measurements were height of the plant, photosynthetic rate, chlorophyll fluorescence and total chlorophyll content. **Results:** Treatment 24N30D have the best growth and treatment 24N36D had the lowest growth performances compared to other treatments. **Conclusion:** The growth was not only dependent on the day temperature, but also on the night temperature. A large gap between night and day temperatures (DIF) reduced the cocoa growth. The result also showed the optimum temperature amongst those studied for cocoa growth is the combination of 24°C night temperature and 30°C day temperature.

Keyword: Cocoa seedlings; Day and night temperatures; Climate change; Photosynthesis attributes; Cocoa physiology