

The effects of fruits load on frond elongation of date palms

Introduction

Date palms serve as an important cash crop with highly nutritive fruits and are widely cultivated in the Mediterranean region. Palm fronds promote growth and bearing fruits through photosynthesis. Since both frond elongation and fruits growth consume sugar, a throughout comprehension of fruits growth effects on frond elongation under sufficient irrigation condition might be helpful in irrigation scheduling. The objective of this study was to evaluate the effects of fruits load on frond elongation and relevant physiological activities of date palms with sufficient irrigation application.

Methodology



Figure 1: The measurement of frond elongation with encoder

Twelve date palms, 6 with fruits removed (“without fruits”) and 6 untouched (“with fruits”), were irrigated with equal amounts of water for maintaining optimal soil water conditions. Rotary encoder was initially utilized to measure transient frond elongation with resolution of 0.5 mm in wireless sensor network (Fig.1).

During the experiment, daily photosynthesis, transpiration and stomata conductance of fronds were measured throughout growing season of date palms.

Results

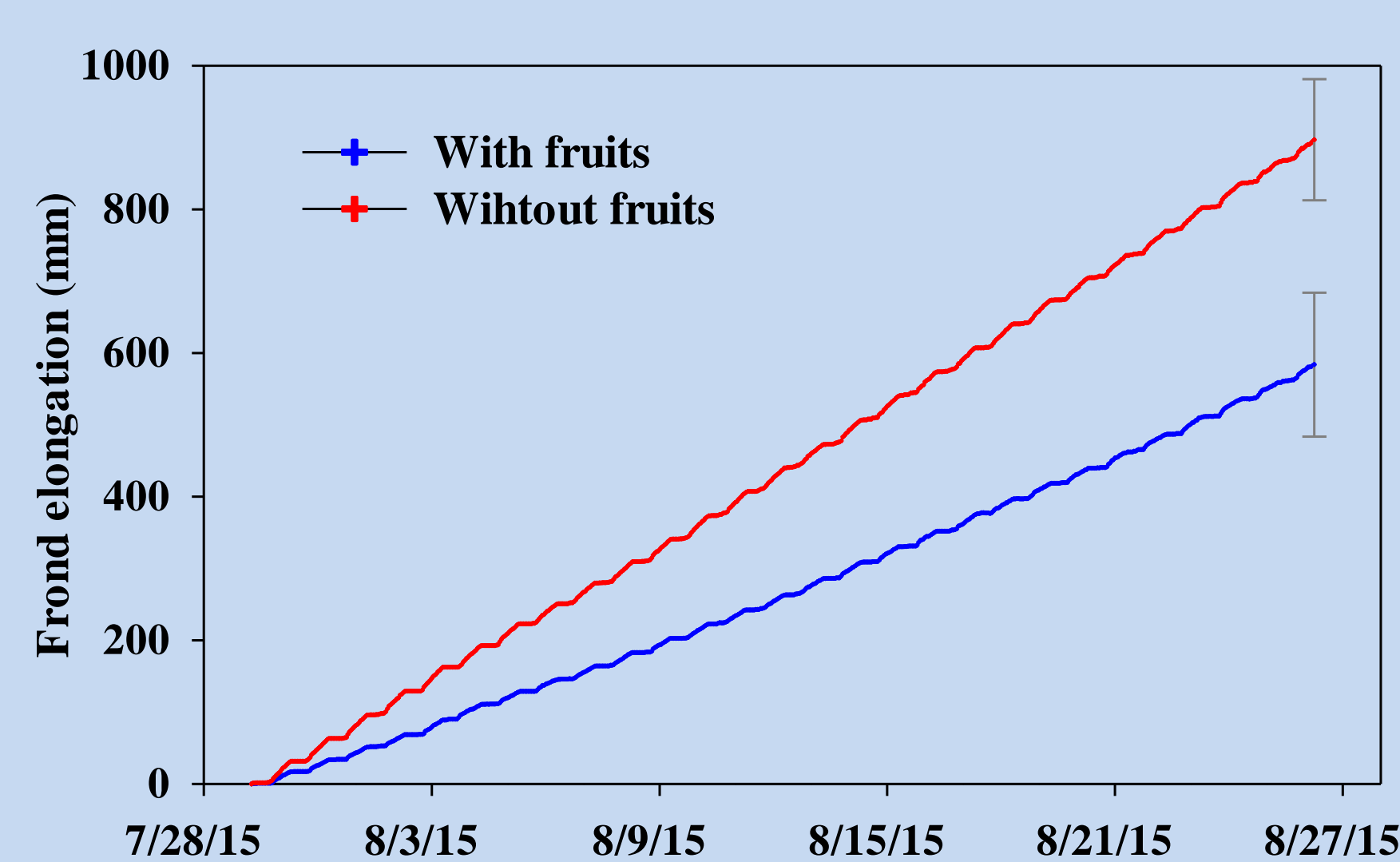


Figure 2: Frond elongation of date palms

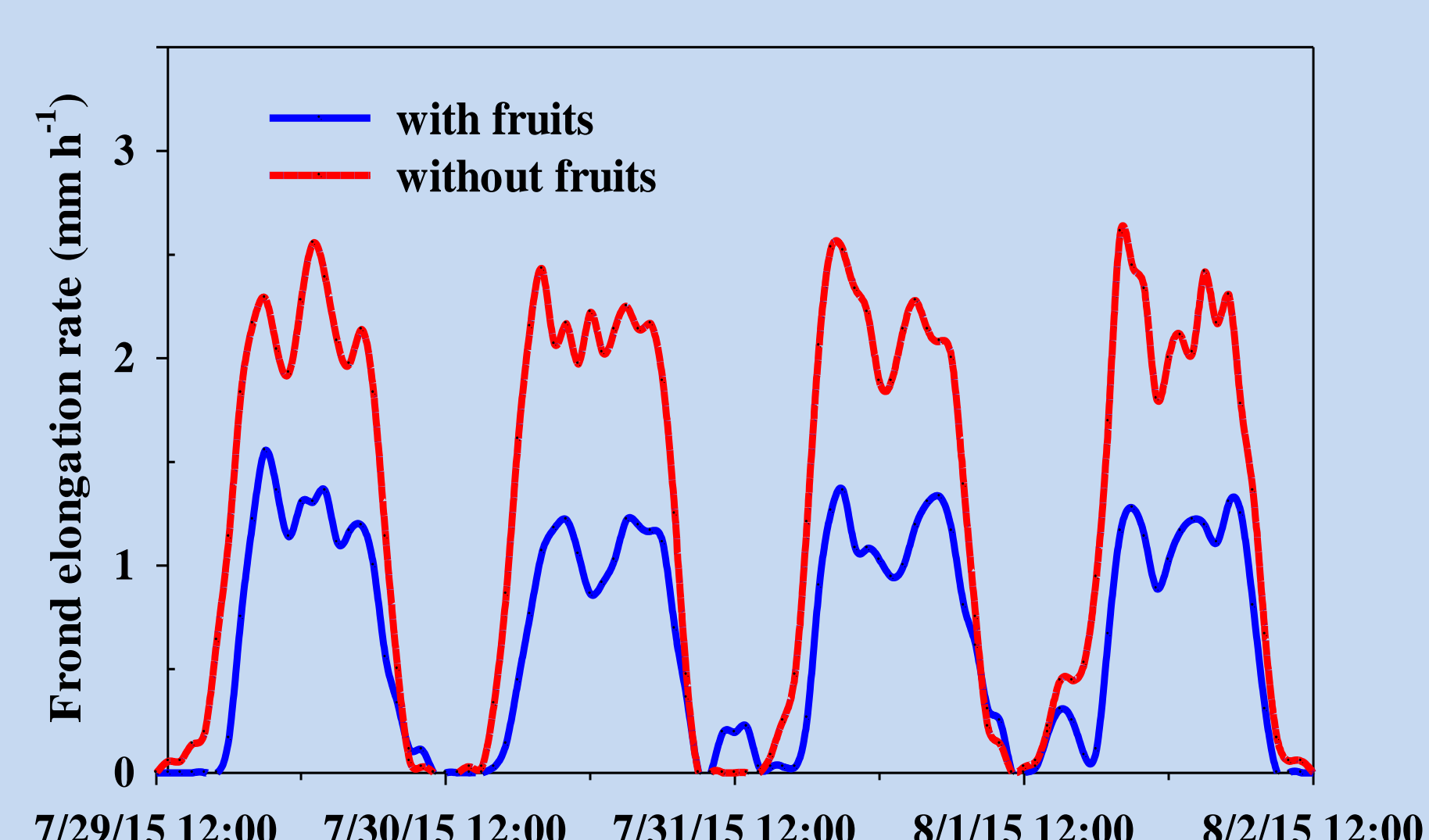


Figure 3: Daily frond elongation in four consecutive days

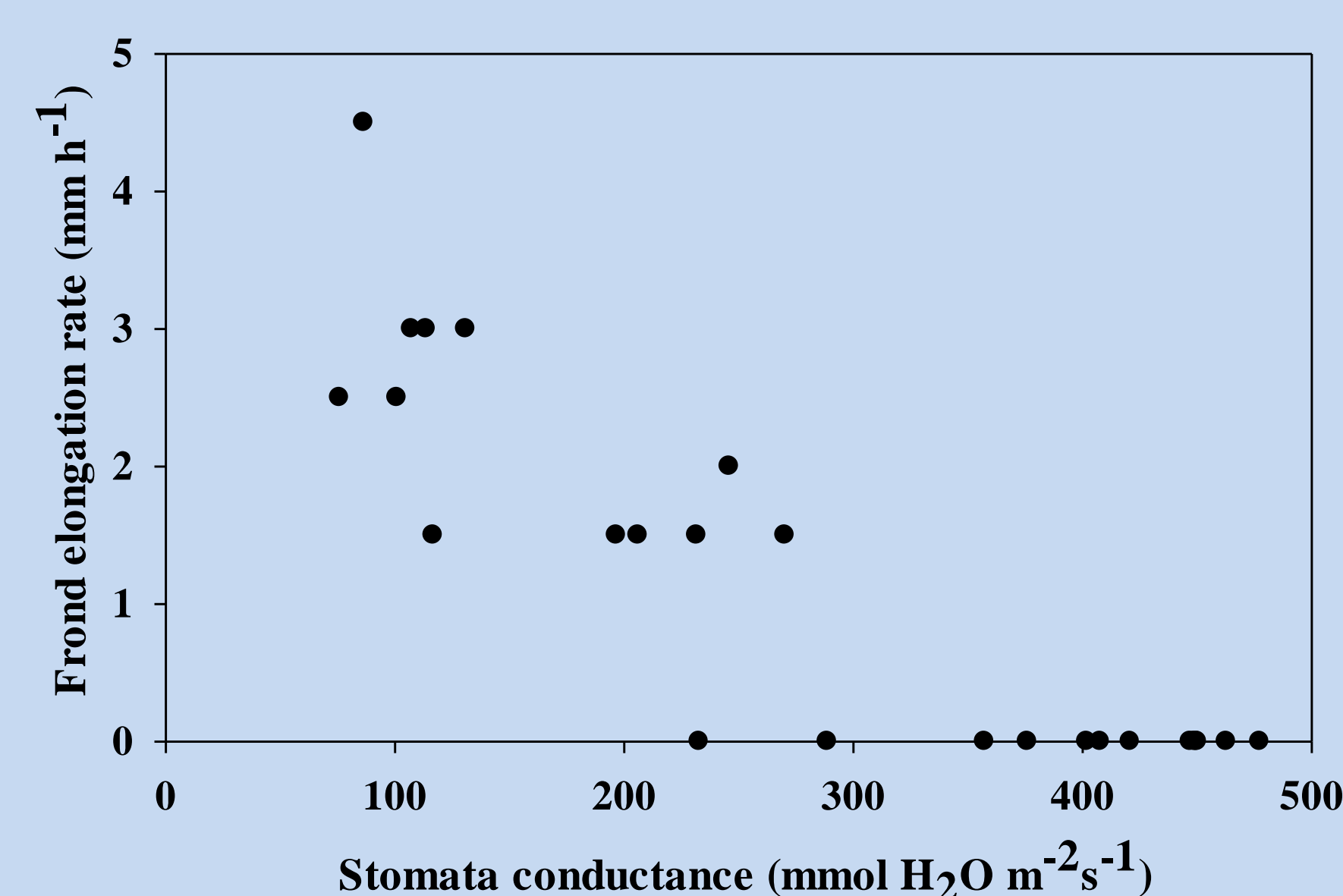


Figure 4: The relationship between stomata conductance and frond elongation rate

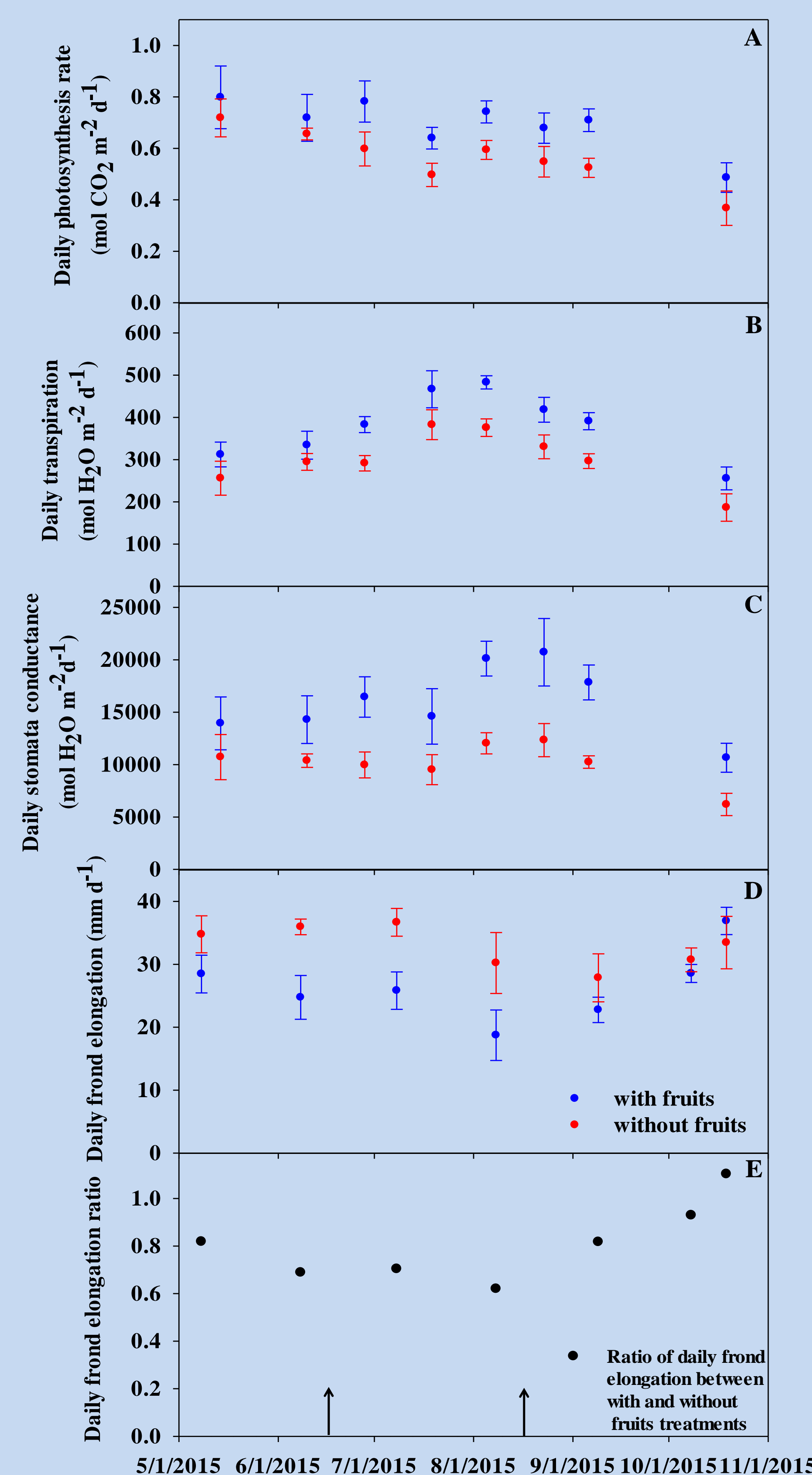


Figure 5: Daily photosynthesis rate (A), transpiration (B), stomata conductance (C) and elongation (D) of fronds throughout growing season of date palms. The daily frond elongation ratio (E) between with and without fruits treatments. Arrows represent beginning of sugar accumulation period (6/17/2015) and first harvest (8/17/2015)

The results showed that palms with fruits had significantly lower frond elongation (Fig.2 and Fig.3) and higher physiological activities (Fig.5) than those without fruits. Besides, frond elongation decreased with the increase of stomata conductance (Fig.4).

Conclusions

- 1) Fruits load reduced frond elongation due to sugar accumulation in fruits. The effects of fruits load on frond elongation of palms varied with the development of fruits.
- 2) Frond elongation rate decreased with the increase of stomata conductance. Thus frond elongation were minimized during daytime and mainly occurred at night.
- 3) Fruits load enhanced daily photosynthesis, transpiration and stomata conductance of palms.

References

- Sperling, O., Lazarovitch, N., Schwartz, A., & Shapira, O. (2014). Effects of high salinity irrigation on growth, gas-exchange, and photoprotection in date palms (*Phoenix dactylifera* L., cv. Medjool). *Environmental and Experimental Botany*, 99, 100-109.
- Tripler, E., Shani, U., Mualem, Y., & Ben-Gal, A. (2011). Long-term growth, water consumption and yield of date palm as a function of salinity. *Agricultural water management*, 99(1), 128-134.

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