

Effects of photoperiod on bio-agronomic and quality characteristics of basil (*Ocimum basilicum* L.).

Tiziana Ferreri¹, Luana Pulvirenti¹, Tonia Strano¹, Edoardo M. Napoli¹, Caterina Caruso², Sebastiano Infantino²,
Antonio Carlo Barbera^{2*}

¹Istituto di Chimica Biomolecolare - CNR – sede di Catania Via Paolo Gaifami, 18, 95126 Catania CT

² Università degli Studi di Catania - Dipartimento di Agricoltura, Alimentazione e Ambiente (Di3A) – Via Santa Sofia, 100 - 95123 – Catania - antonio.barbera@unicat.it

INTRODUCTION Basil (*Ocimum basilicum* L.), an annual herb belonging to the *Lamiaceae* family, is an aromatic plant also cultivated for the properties of its bioactive secondary metabolite compounds (carotenoids, polyphenols and anthocyanins) and for the high levels of aromatic terpenoids, also known as volatile organic compounds (VOCs), with potential use in nutraceutical formulations. The aim of the research was to evaluate the bioagronomic and metabolic response of basil genotypes to different photoperiods in a closed-loop hydroponic system.

MATERIALS AND METHODS

Four basil genotypes: 'Italiano', 'Rosie', 'Thai' and 'Greco' were grown adopting three photoperiods (light/dark: 6/4; 16/8; 18/6.), in a closed circuit hydroponics system (Tomato+) equipped with LED and programmable software for the environmental parameters (Fig 1). The experimental design was a randomized complete block with 6 replications, data were analyzed using one-way and two-way ANOVA. The agronomic measurements carried out were: SPAD, plant height, stem diameter, number of leaves and axillary shoots, leaf surface area, fresh and dry weight. As regards the chemical analysis, VOCs were determined from fresh vegetal matrices by headspace equipped with a mass spectrometer). Polyphenols (hydroxycinnamic acids) from dried vegetal matrices by the Folin-Ciocalteu colorimetric method.

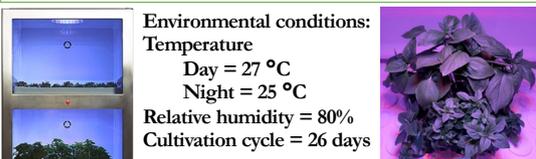


Figure 1
Hydroponic
growing cabinet

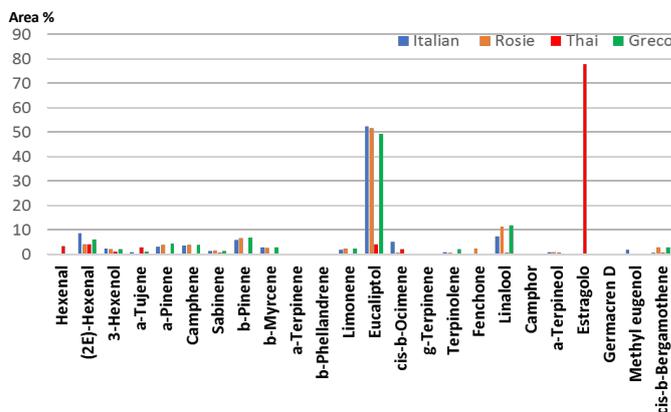


Figure 3 Volatile compounds, photoperiod 18/6

RESULTS nella media degli altri trattamenti

Among the photoperiods, 18/6, in the average of genotypes responses, promoted the highest basil aerial biomass production (Fig 2). Among genotypes 'Greek' showed a significant greatest leaves number and axillary shoots, while 'Thai' the greatest plant height. As regards VOCs, the four basil genotypes have different profiles; as in the 18/6, 'Thai' presented the estragole (about 80% on total) and the hexenal, both absent in other basil genotypes, instead lack of other VOCs (i.e., eucalyptol, camphene, limonene, etc.) contained in the other three basils (Fig 3). A significant correlation between the photoperiods with the VOCs quantity has been also detected. For example, by decreasing the photoperiod (from 18/6 to 6/4) resulting, in the Italian and Greek genotypes, in Eucalyptol significant implement; conversely, in Rosie plants the amount of eucalyptol decreases and linalool increases, whereas, in Thai the Estragole increases up to 90% while the Hexenal decreases.

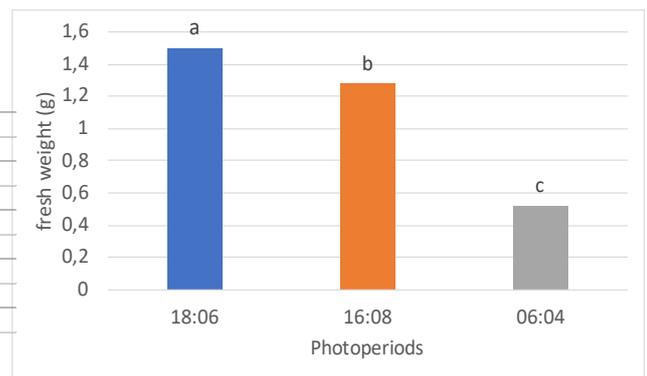


Figure 2 Aerial biomass fresh weight (g). different letters on each bar indicate significant differences for $p \leq 0.05$

CONCLUSION

Among the three photoperiods 18/6 showed the best productive performance. Thai genotype highest shoot production was mainly determined by its greater height. The study has confirmed the specific genetic VOCs expression and highlighted, for each basil, the relationship between the VOCs quantity and the photoperiod. Through manipulating the photoperiod in controlled environment, we could modify the expression and quantity of specific VOCs for each basil genotype.