From Forest Nursery Notes, Summer 2009

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Acta Agriculturae Scandinavica Section B – Soil and Plant Science, 2009; 59: 326–334

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ORIGINAL ARTICLE

Light integral as an indicator of water use in commercial greenhouse nurseries

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Abstract

Irrigation strategies in pot plants of *Kalanchoë blossfeldiana* were studied in two commercial greenhouse nurseries by continuous weighing of plants on a high-precision balance. The objectives were to study actual irrigation strategies implemented by growers and to evaluate the method of continuous weighing as a potential tool for future irrigation management. Mean values of temperature, relative humidity, light, and weight were recorded every five minutes using data loggers. The change in weight over time was estimated and related to the calculated total canopy surface area of the studied plants. The rate of weight change was then statistically tested in relation to the recorded external factors.The factor with the strongest effect on total water-consumption rate over time was the light integral. As expected, water consumption was also affected by temperature and humidity, as well as the time of day. Although the growers indicated clear irrigation strategies, the study showed that these were not implemented in a true sense or correlated to the information available in greenhouse climate computers. The study also indicated that a high-precision weighing balance might be an important tool for future control of plant growth and plant architecture through irrigation in the pot plant industry.

Keywords: *Canopy surface, irrigation regime,* Kalanchoë blossfeldiana, *light integral, plant weight, pot plants.*

Introduction

Owing to the dominant role of water in regulation of plant growth (Raviv & Blom, 2001), the choice of irrigation strategy is an important issue in modern pot plant production. Despite the technically high standard of modern greenhouses with computerised systems for automatic control of irrigation (Priva, 2006; Senmatic, 2006), there are no general recommendations for choice of irrigation regime that the pot plant grower in general is willing to trust. The grower's irrigation strategies are often based on strictly perceptual and empirical methods influenced by experience and personal skills including scrutiny of plant physiognomy, outdoor climate, and apparent weight of plants (Alsanius et al., submitted manuscript). Irrigation demand and water use are dependent on several variables affecting evaporation and transpiration, e.g., climate (light integral, temperature, and relative humidity) (Rana & Katerji, 2000), biological variables (specific crop, plant developmental stages, transpiring surface area), and cultural management (growing medium, irrigation time and amount) (Bævre & Gisleröd, 1999). Methods available for water control include tensiometer measurements (Rana & Katerji, 2000), time domain reflectometry (TDR) (Pepin et al., 1992; Anisko et al., 1994; Kipp & Kaarsemaker, 1995; Da Silva et al., 1998; Kritz & Khaled, 2004; Mojid & Cho, 2004), weighting lysimeters (Earl & Davis, 2003; Da Silva et al., 2005), and lysimeters (Silva et al., 2005) which all allow continuous monitoring. Most of these methods are based on the moisture level in the growing medium and do not consider the complete water status, including transpiration of the plant (Raviv & Blom, 2001). In Sweden, none of these methods is used in commercial pot plant production. In developing and improving the irrigation regimes in commercial pot plant production, weighting equipment might be useful. As Costa et al. (2007) pointed out recently, development of monitoring systems for precise assessment of plant water status under outdoor and indoor conditions

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(Received 7 February 2008; accepted 18 April 2008)

ISSN 0906-4710 print/ISSN 1651-1913 online
DOI: 10.1080/09064710802154748