

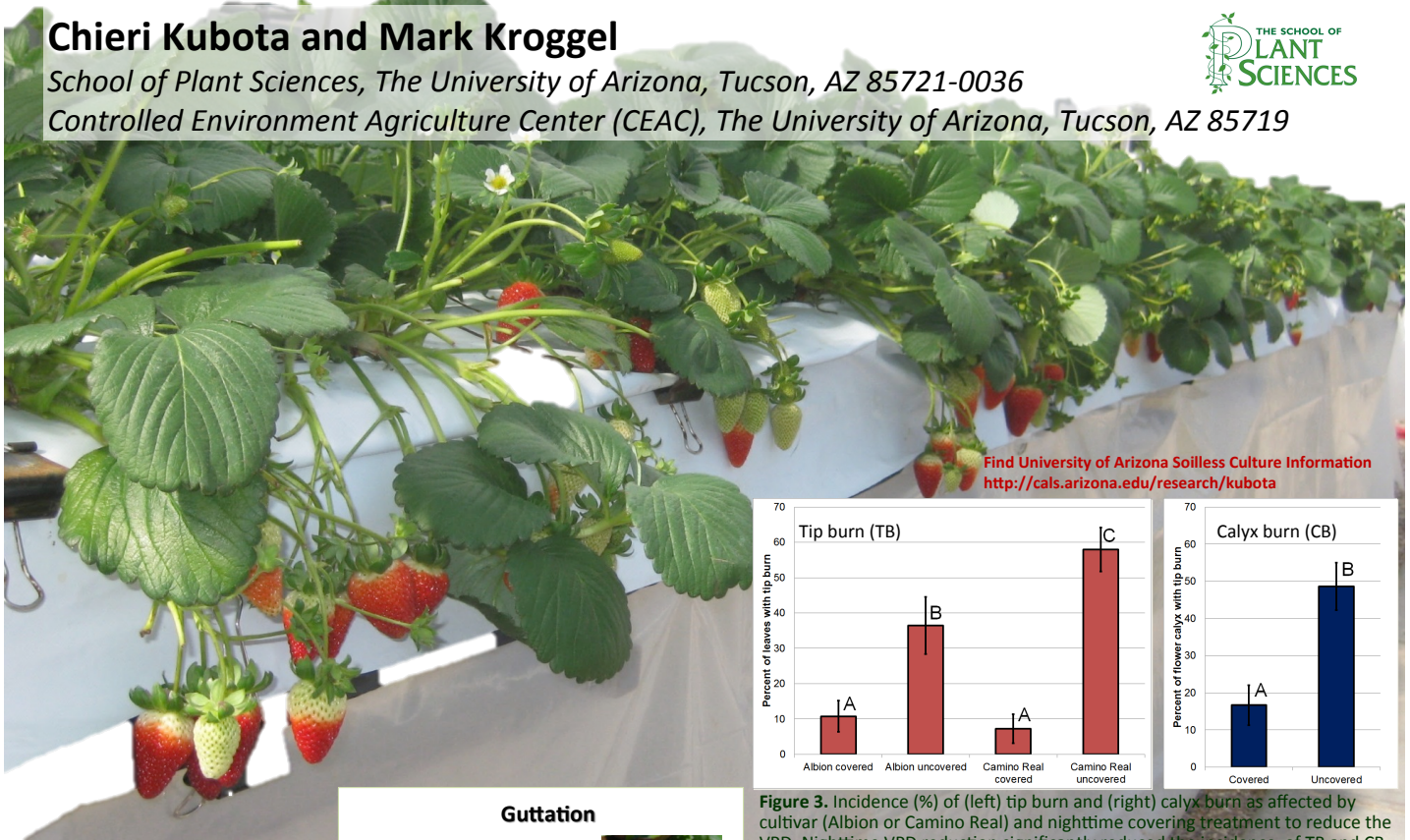
Soilless Strawberry Production in Semiarid Climate: Improving Fruit Quality by Nighttime VPD Control



Chieri Kubota and Mark Kroggel

School of Plant Sciences, The University of Arizona, Tucson, AZ 85721-0036

Controlled Environment Agriculture Center (CEAC), The University of Arizona, Tucson, AZ 85719



Find University of Arizona Soilless Culture Information
<http://cals.arizona.edu/research/kubota>

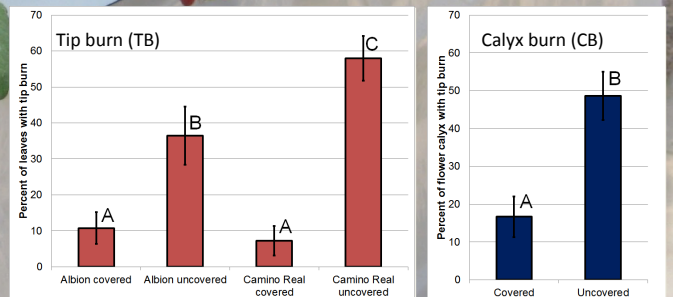


Figure 3. Incidence (%) of (left) tip burn and (right) calyx burn as affected by cultivar (Albion or Camino Real) and nighttime covering treatment to reduce the VPD. Nighttime VPD reduction significantly reduced the incidence of TB and CB and improved the fruit visual quality (i.e., less CB).

Table 1. Summary of air temperature, relative humidity (%), vapor pressure deficit (VPD) during the experiment (April 16, 2010 – May 26, 2010)

Treatment	Nighttime Temp / RH	Nighttime VPD	Daytime Temp / RH
Covered	15.5±2.4C / 63.0±12.0%	0.09 kPa	24.4±1.4 C / 47.8±5.5%
Uncovered	16.3±2.1C / 95.3±8.1%	0.88 kPa	24.4±1.4 C / 47.8±5.5%

Guttation

- Exudation of xylem sap through hydathodes at leaf tips/edges, caused by root pressure when transpiration rate is limited.
- Guttation has a significant role in nutrient transport to rapidly growing tips.
- Guttation suggests that plants have sufficient turgor to supply calcium and it occurs under low nighttime VPD (< 0.1 kPa; Bradfield and Guttridge, 1979)

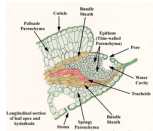


Figure 1. Tip and calyx burn, a typical issue of growing strawberry in semi-arid greenhouse climate.



Figure 2. Styrofoam trough system

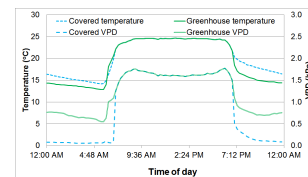


Figure 4. Averaged diurnal changes in temperature and VPD with and without nighttime covering during the experiment (April 16, 2010 – May 26, 2010).



Figure 5. Nighttime floating cover treatment.

Abstract. While the majority of US strawberries are produced in open fields, greenhouse soilless culture is considered suitable for local production in urban or suburban settings. The University of Arizona Controlled Environment Agriculture Center has initiated a small research program evaluating strawberry (*Fragaria xananassa*) as a potential alternative crop grown in semiarid greenhouse since 2009. 'Albion' and 'Camino Real' plantlets were transplanted into two rows of a raised Styrofoam trough system (Ishiguro Nozai, Japan). The troughs were filled with a mix of 50% coco-coir and 50% perlite. Drip irrigation was applied with a modified Yamazaki strawberry solution twice or three times a day to obtain a target drainage rate of ~30%, pH ~6.5 and EC 1.0. Major challenges include 1) maintaining optimum root zone environment and 2) preventing tip/calyx burn. The former issue required the selection of substrates having appropriate chemical and physical characteristics and the application of a periodic water flush of root zone to reduce excessive salts. Tip/calyx burn was associated with the relatively high VPD in the greenhouse, causing excessive transpiration and lower turgor to limit calcium supply to the growing meristematic tissues. Earlier study showed that guttation is a plant health indicator for strawberry suggesting a turgor sufficient to supply calcium and can be observed under low night time VPD (< 0.1 kPa; Bradfield and Guttridge, 1979). For this reason, we examined a night time application of floating cover over the strawberry canopy to maintain high humidity (low VPD) inside the cover. A clear polyethylene film was used for the cover and treatment was applied from sunset to shortly after sunrise every day for 40 days (4/16 – 5/26/2010). Guttation was observed for plants under floating cover almost every morning while no guttation was observed for untreated plants. The night time high humidity treatment exhibited significantly lower percent calyx burn (16.7%) and tip burn (9.0%) than non-treated control (48.6% and 47.2%, respectively) throughout the experiment. When uncovered, cultivar 'Camino Real' had more tip/calyx burn (58.9%) than 'Albion' (37.0%). The nighttime average VPD was 0.09 kPa under the floating cover and 0.88 kPa in air inside the greenhouse. No particular difference was observed for disease, as foliage was completely dry during the day (average VPD: 1.6 kPa) For a larger scale operation, automated curtains may be a possibility as a low cost solution of tip/calyx burn for strawberry grown in semiarid greenhouses.