Developing Crop Coefficients for Processing Tomatoes under Subsurface Drip Irrigation

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INTRODUCTION

Irrigated agriculture accounts for a major share of consumptive water use in the United States. However, with the increasing demand for water due to population growth and environmental directives as well as uncertainty linked with climate change, water allocation to the agriculture sector may be declining in the future. Therefore, improving on-farm water use efficiency and optimizing estimation of crop water requirements will be critical to the sustainability of irrigated agriculture.

Crop water requirements are usually estimated by multiplying reference evapotranspiration (ETo) with coefficients specific to a particular crop (Kc). Coefficients have been compiled for many crops but were developed under very specific management practices that do not always reflect current cultural and irrigation practices in California.

OBJECTIVE

Determine crop coefficients for processing tomato grown under sub-surface drip irrigation
Develop relationship between crop coefficients and ground cover
Determine water use efficiency

RESULTS

Data indicated that coefficients obtained at peak season were relatively higher than those generally reported for tomatoes.
Results also showed good correlation between fractional cover and Kc (r^2 = 0.91).
The Kc increased curve linearly until canopy reached about 75% of fractional cover.

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Methodology

Study Description:
- Location: UC Westside Research & Extension Center- Five Points, CA
- Crop: Processing tomatoes

Irrigation:
- Sub-surface drip irrigation (12”)
- When equivalent of 2 mm (0.08”) crop ET measured by scale, irrigation system is turned on (100% ET)
- Surrounded field irrigated based on lysimeter ET

Measurements:
- ETo, Kc, Water application
- Ground cover
- Yield, Water use efficiency

RESULTS CONT’D

Fig. 1. Lysimeter are in the field station
Fig. 2. Planting in Lysimeter area
Fig. 3. Fractional Ground Cover

Table.1. DAT vs Fractional ground cover
Table.2. Kc vs Fractional ground cover

Fig. 4. ET rate over time
Fig. 5. Kc comparison

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Seasional ETc (in) 21.4
Yield (tons/ac) 38.8
Water Use Efficiency (tons/ac/in) 1.81

(FU E WUE = yield / ETc)

FUTURE DIRECTION

New Kc curve for tomato under sub-surface drip
Relationship between Kc and ground cover; WUE
Develop same information for new crops: biofuels
Integrate DSS with CIMIS and Wateright
Develop standard method for estimating irrigation scheduling