Water Conserving Srategies: Crop Coefficients and ET_0 for Economical Irrigation

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Crop coefficients for container crops will provide nursery and landscape managers with a tool to optimize water conservation by grouping plants with similar water needs in the nursery or landscape. The first objective of this project was to determine the crop coefficients (Kc) of 12 woody ornamental plant species (frequently used species and California natives) from the liner stage up to two years. The following species of woody ornamentals were selected for the study and grown in 1-gallon containers at the University of California Riverside and Davis campuses:

Photinia fraseri

Heteromels arbutifolia

Pittosporum tobira 'Wheeler's Dwarf'

Arctostaphylos densiflora

Buxus microphylla japonica 'Green Beauty'

Ceanothus 'Concha'

Rhaphiolepis indica 'Springtime'

Prunus ilicifolia

Juniperus sabina 'Buffalo'

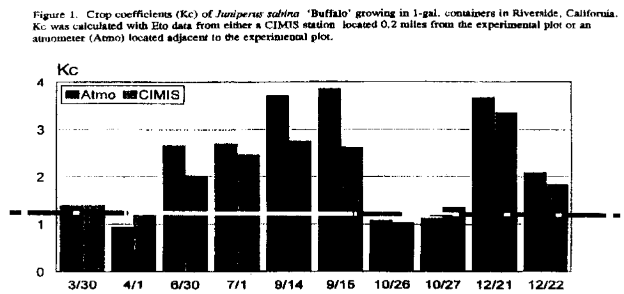
Rhamnus californica 'Eve case'

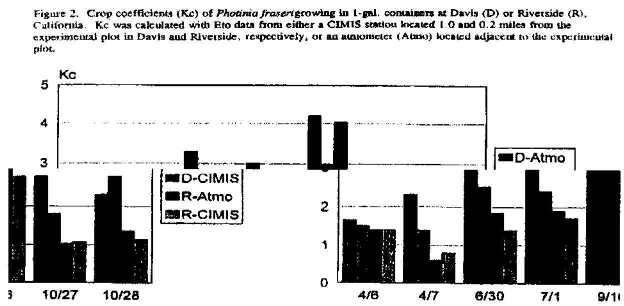
Cercis occidentalis

Cercocarpus minutiflorus

Data for water use and plant height were collected starting in December 1992 at two- to three-months intervals and were coordinated between the two experiment locations. Kc values ranged between 0.8 and 4.2 with differences between species, experimental locations, and substantial changes over time, even from one day to the next (Fig. 1 and 2).

***Figure 1.** Crop coefficients (Kc) of Juniperus sabina 'Buffalo' growing in 1-gal. containers in Riverside, California. Kc was calculated with Et_0 data from either a CIMIS station located 0.2 miles from the experimental plot or an*





The second objective of this study was to compare crop coefficients as determined with Et_0 data from CIMIS, atmometers, or a reference crop growing in containers. Kc was calculated with evaporation data from CIMIS or an atmometer located adjacent to the nursery plots. Kc as calculated with atmometer evaporation data was up to 50% higher in Davis and up to 25% lower in Riverside compared to Kc calculated with CIMIS data (Fig. 2). This indicates that Et_0 as collected with CIMIS, even less than a quarter mile from the experimental plots, may be quite different from the Et_0 adjacent to or in the canopy of the plants.

A close correlation between Eto as determined by atmometer or CIMIS was found and characterized with the equation: $y = 0.09 + 0.805\,x$ ($r = 0.987$). A correction factor of 1.2 needs to be multiplied with atmometer Et_0 to predict CIMIS Et_0. This data suggests that an atmometer can be used to calibrate a

***Figure 2.** Crop coefficients (Kc) of Photinia fraseri growing in 1-gal. containers at Davis (D) or Riverside (R), California. Kc was calculated with Et_0 data from either a CIMIS station located 1.0 and 0.2 miles from the experimental plot in Davis and Riverside, respectively, or an atmometer (Atmo) located adjacent to the experimental plot.*

nursery or landscape microclimate against a nearby CIMIS station. If the correlation between atmometer and CIMIS Et_o remains stable over a season, then a single correction factor will be sufficient to calculate Et_o for a location. If the correlations are variable, then several correction factors may be necessary or atmometer data needs to be collected continuously on site.

Tall fescue was established as a reference crop in 1- and 5-gal. pots in spring 1993 and was placed among the ornamental plants. Water use of the turfgrass was measured periodically during one year, however, maintenance of the pots proved too difficult to be of practical value. Frequent establishment of new pots would be required to maintain optimum growth rates. As the turf matures, roots become potbound and thatch starts to accumulate, thus decreasing maximum growth rates. Growing tall fescue in pots to measure Et_o of a reference crop was not a viable alternative compared to atmometers, which are easy to install and maintain.

In a follow-up study we will address the third objective of this project: Determine the range for which CIMIS will provide reliable Et_o data to predict irrigation needs for landscape sites and nurseries, and provide alternatives to determine Et_o in areas that are not covered by CIMIS.

We are currently using the collected data to establish models that will predict the water use of potted ornamental plants during several growth stages. During 1994, we will collect data in nurseries to validate the model, expand the current database and develop Kc recommendations for 20 ornamental plant species. This information will help nursery and landscape managers to minimize water use in production and maintenance of ornamental plants.

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