

**Course: Water Management in Horticultural Crops 2(1+1),**  
**Class: 1<sup>st</sup> year, 2<sup>nd</sup> semester**  
**Topic: Relationship between the Crop Et (Et<sub>c</sub>) & Potential Et (Et<sub>0</sub>)**  
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## **RELATIONSHIP BETWEEN THE CROP ET (ET<sub>C</sub>) & POTENTIAL ET (ET<sub>0</sub>)**

$$ET_c = ET_0 \times K_c$$

### **Where**

Etc = Crop Evapo Transpiration

ET<sub>0</sub> = Potential Evapo Transpiration

Kc = Crop Coeficient

**Potential Evapo-Transpiration:** Maximum quantity of water capable of being evaporated in a given climate from a continuous stretch of vegetation covering the whole ground and well supplied with water.

**Crop Evapo-Transpiration:** It includes water loss (mm/day) through transpiration and evaporation from the soil surface and wet leaves under sufficient soil moisture.

At early stage crop covers only a fraction of soil and covers as it matures. The rate at which plants grow and cover the soil depends on the crop. In the early stage main component of ET is evaporation, while under fully covered condition transpiration is the main component. ET of a crop depends on plant height and leaf area index. Tall plants with high LAI transpire more water than short plants with low LAI.

## **Relationship between Crop Evapo-Transpiration & Growth Stages:**

- (1) Seedling stage:** It represents germination and early growth when the soil surface is hardly covered by the crop and the ground cover is less than 10 per cent. Evaporation is the main component.
- (2) Active vegetation stage:** It is from the end of initial stage to attainment of effective full ground cover which is less than 80 percent coverage. Transpiration is the main component.
- (3) Reproductive stage:** This is from attainment of full ground cover to first sign of maturity as indicated by discolouration of leaves ,leaf falling etc. Transpiration is the main component.
- (4) Maturity stage:** It is from reproductive stage to full maturity. Transpiration decreases steeply and rate of evaporation increases continuously. Evaporation is the main component.

**Crop Coefficient (Kc):** It is the ratio between crop evapo-transpiration to pan-evaporation when crop is raised in large field under optimum growing conditions.

Crop coefficient depends on soil cover, soil moisture and crop height. Crop coefficients vary with relative humidity and wind velocity. Strong winds and low RH causes more transpiration. In brief Kc values vary with crop development stage of the crop and to some extent with wind speed and RH. For most of the crops, Kc value increases from a low value at the time of emergence to a maximum value during the period when the crop reaches flowering and declines as the crop approaches maturity. Kc value is inbuilt with crop and soil characteristics and management practices and varies with in the crop duration.

## **Relationship between Crop Coefficient & Growth Stages:**

- (1) Crop coefficient ( $K_c$ ) value varies with the development stage of the crop.
- (2) For most crops the value for total growing period is between 0.85 and 0.9 with the exception of higher value for banana, coffee and cocoa and lower value for citrus, grape, and pineapple.
- (3) In general,  $K_c$  is higher in hot, windy and dry climates than in cool, calm and humid climates.
- (4) The values vary among crops due to differences in reflectivity, crop height and roughness, degree of ground cover and canopy resistance to transpiration.
- (5) In the case of annual crops,  $k_c$  typically increases from a low value at seedling emergence to a maximum when the crop reaches full ground cover, continues at that value during the stage of full activity and declines as the crop matures.

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