



Lysimetric Determination of Cuminum Crop Coefficients during Different Growth Stages in Region of Birjand

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Introduction: Water is one of the most important factors limiting agricultural developments in arid and semiarid regions in the world. To avoid and exit from water crisis, a proper agricultural and water resource management is required. One of the important parameters in this regard, is determination of crops' evapotranspiration. Evapotranspiration, water evaporation from the soil surface and transpiration of vegetation cover have a major trend and a key element in hydrological cycle for management of water resources, particularly in arid and semi-arid. Evapotranspiration is function of the soil, climate, land use, aerodynamic resistance levels and topography of the area. To provide a suitable irrigation schedule and apply an optimal water use management, determination of water requirement and crop coefficients in various growth stages seems necessary. Crop coefficient can be found through dividing the actual evapotranspiration by the potential evapotranspiration. Since the cuminum is commonly used in Birjand and has cultivated in farm and crop coefficients has not been determined, this study aimed to determine the crop coefficients of cuminum using lysimeter water balance in arid and semi-arid climatic conditions.

Materials and Methods: In this research, in order to determine cuminum crop coefficients, that is one of the important herbs, a lysimetric experiment was conducted during growth season in faculty of agriculture, Birjand university. This project, was done in lysimeter. For this purpose and due to the size and plant height in three lysimeter (as replications) with a diameter of 20 and a height of 16 cm was used order to the cultivation of Cuminum. In order to drainage at the bottom of each lysimeter was built orifice. For easily of lysimeters drainage, lysimeter floor was poured by small and large sand and lysimeter was filled by soil and animal Fertilizers for better plant growth. Three lysimeters were used; and water requirement of cuminum was calculated using water balance method. To calculate potential evapotranspiration, grass with 12 centimeters height was used as the reference plant. Crop coefficient can be achieved by dividing the actual evapotranspiration to reference evapotranspiration and is not fixed growth period. The cumin plant growth period was divided four stages (initial, development, middle and end). The initial phase of up to 10% on seed germination and plant growth, from 10 percent to flowering development stage, middle stage and final stage of the start of flowering to product reaches to harvest is the end of the middle stage. In each lysimeter average number of 20-15 of seed to increasing germination, were planted on the February 9, 2012. To control weeds, weed was done handing during the growing season. Drainage water is controlled over a period of time measured with weighting method and deep and volume of water was measured. Soil moisture at field capacity using pressure plates was measured. Measuring soil water content and determine irrigation time.

Results and Discussion According to the results obtained for the crop coefficient can be concluded that in the initial stages of plant growth that plant size is small, transpiration is low and therefore Kc have low value. In the middle and development stage increases canopy and increased transpiration rate and increases Kc. At the end stage to reducing activity of the leaves (old leaves) reduced transpiration. The average crop coefficient of cumin in the initial phase of growth during the study to 0.65, then with increasing plant growth, leaf area index were increased and crop coefficient increased to 0.92 in development stage. In the middle of this amount is 1.21 and in the end the 0.85 reached. Average crop coefficients for a four-stage is 0.9. Duration of growth stages for cuminum crops in Birjand region is 24 days for initial stage, 40 days for middle stage and 31 days for development and 19 days for end stage of growth stages.

Conclusions In this study according to important of drug and economic for cuminum plant and that there isn't report for crop coefficient cuminum and Birjand region, we cultivate cuminum in arid area of Birjand in 2011 year. The results of lysimeters showed that Duration of plant growth stages and value of crop coefficients

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in the initial , development, middle and end stages, respectively (24, 40, 31 and 19 days) and (0.65, 0.921.21 and 0.85) respectiely.

Keywords: Evapotranspiration, Water Balance, Water Crisis, Water Requirement