

Irrigation and its influence for microclimate of maize in Hungary

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The weather of the Carpathian basin is capricious. This weather feature results irrigation need in some of the seasons. Investigations on timing irrigation were carried out at Keszthely, Hungary (*46°46'N, 17°14'E, alt. 116 m above msl*) in maize during the past two decades. By following the seasonal variation of CWSI (Crop Water Stress Index after Jackson) and passing a limitation value of the index the crops sign even moderate water necessity. The basis of the index is the difference in crop- and air temperatures, but the effect of other environmental elements are also included in the calculation. If there is enough water in the soil, the difference is close to zero or produces negative value. The higher the temperature difference, the more intensive the plant water demand is.

The crop temperature was measured daily on clear sky and calm conditions around solar noon with infrared thermometer of RAYNGER type with 2° field of view and an 8 to 14 μm spectral band filter. The thermometer was hand held 1 m above the plants using an oblique angle of about 30° to the horizontal. The sampling time was 30 seconds with 5 repetitions in each treatment at around solar noon in all measuring days, including holidays. The emissivity was set at 0.96 (maize). Field study work and collection of meteorological data were conducted at the same place (Keszthely) by a local normal climate station (QLC-50). Plots were irrigated when the CWSI exceeded the limitation value 0.25 by using drip irrigation system. The amount of water used per irrigation was between 20 and 40 mm.

In Hungary the geographical position causes the vegetation seasons with colorful weather conditions. There are humid, semi-humid (arid) and arid summers of different temperatures and precipitation amounts and distribution. The consequence of this changeable weather is that there is no need of irrigation in every growing season. The time-course of CWSI for the humid seasons showed that no irrigation is necessary. In semi-humid weather the yield surplus of maize produced by means of irrigation is not enough to cover the extra costs of watering. We found that economic irrigation can be waited in every second or third season, when the weather character is completely arid.

Parallel with observations in irrigation scheduling, changes in microclimate of irrigated maize were also studied. The size of modification in inside canopy air temperatures and humidity were measured at cob level of maize with combined psychrometer

sensors connected to data loggers. In case of irrigation appearance of changes in elements of microclimate, their time duration and regional extension were also mapped. This information may have of importance in spreading plant diseases or making prognoses for plant protection.