Transpiration from a maize field during a dry year

F. Matejka, T. Hurtalová
Geophysical Institute of the Slovak Academy of Sciences[1]

J. Rožnovský
Department of Landscape Ecology, Mendel University of Agriculture and Forestry[2]

M. Kohut
Czech Hydrometeorological Institute[3]

A b s t r a c t: Seasonal changes in transpiration were analysed in a maize stand during the period between 3rd May and 18th October 2000. The hourly sums of transpiration and evapotranspiration were calculated using an experimentally verified mathematical model. The cumulative evapotranspiration was simultaneously determined over the season using the method of the water balance. The examined maize stand suffered the heavy water stress practically during the whole vegetation period. Especially critical situation occurred in the first decade of June when the soil moisture in the root zone dropped near to the wilting point. The actual transpiration from the maize stand was strongly reduced up to 27% of the potential transpiration. The seasonal sums of the transpiration and evapotranspiration over the whole analysed period reached 163.5 mm and 295.65 mm, respectively. The maximum daily total of the transpiration with the value of 3.05 mm/day fell on 14th August, when the sufficient soil moisture was accompanied with high values of the leaf area index. However, the daily maximum of the evapotranspiration occurred already on 11th June and reached the value of 4.24 mm/day. It was found out that decreasing of soil moisture in the root zone below 28.9% of volume has as a result the significant reduction of the transpiration, while above this value, the actual transpiration practically equals the potential transpiration. Further decline of soil moisture up to 18.6% of volume quite stops the transpiration.

Key words: transpiration, soil moisture, soil drought, maize, water balance, mathematical model

[1] Dúbravská cesta 9, 845 28 Bratislava, Slovak Republic
e-mail: geofmate@savba.sk, geoftahu@savba.sk
[2] Zemědělská 1, 613 00 Brno, Czech Republic; e-mail: roznovsky@chmi.cz
[3] Kroftova 43, 616 67 Brno, Czech Republic; e-mail: kohut@chmi.cz,