Possibility for modification of microclimate in orchards
by using evaporative cooling irrigation

Laszlo LAKATOS1), Andrzej ŻYROMSKI2),
Małgorzata BINIAK-PIERÓG2)

1) University of Debrecen, Centre for Agricultural Sciences and Engineering, Department of
Agrotechnology, Bőszörményi str. 138, 4032 Debrecen, Hungary, tel. +36-52-508-325 e-mail:
lakatos@agr.unideb.hu
2) University of Environmental and Life Sciences, Institute of Environmental Development and
Protection, pl. Grunwaldzki 24, 50-363 Wroclaw, Poland, tel. +48 71 320-55-69, e-mail:
andrzej.zyromski@up.wroc.pl

Abstract

Micro irrigation is a horticultural practice mainly used to supply water to the orchard. Nevertheless the micro sprayed irrigation has a powerful influence on fruit microclimatic parameters as temperature and air humidity. By the application we can improve the fruit quality parameters as anthocianine, C-vitamin, sugar content of the fruits. When the air’s temperature is high (about 20°C or higher) the evaporative cooling irrigation significantly decreases the plants’ surface temperature and air temperature. The cooling effect is stronger when the air is dryer. The beneficial effect of cooling irrigation is the temperature reduction and frost protection. In March 2010, one month earlier than the expected blooming an irrigation system was established to produce anti-frost treatment and regulate the micro-climate of a apricot, peach, plum, apple and pear orchard which belongs to the University of Debrecen (Hungary). The objective of sprinklers was to cool the air by increasing water evaporation and relative humidity.

The results showed that the water sprayed in the orchard by micro-jet influenced decisively the temperature of the plantation. At higher temperatures (around 20°C), the drop of temperature may attain 5–7°C. A low relative humidity of the air may increase the relative effect. When water was applied at 15 minutes intervals for ten times a day, the temperature could be kept low also in the buds. The beginning of bloom could be delayed for 8–14 day at different fruit species. Blooming dynamics was characterized by a logistic curve in the treated as well as in the control plot. In the treated plot, the curve was steeper than in the control one, in spite of equal temperatures measured in the plots. Under Hungarian climatic conditions, the method was successfully used to delay blooming dates. The main result was the diminution of the frost damage in the spring that assured fruit yields.

Key words: evaporative cooling irrigation, microclimate modification, delay of blooming