

Estimation of the Risks of Thermal Stress Due to the Microclimate for Manual Fruit and Vegetable Harvesters in Central Italy

M. Cecchini, A. Colantoni, R. Massantini, D. Monarca

ABSTRACT *Agricultural workers are exposed to various risks, including chemical agents, noise, and many other factors. One of the most characteristic and least known risk factors is constituted by the microclimatic conditions in the different phases of work (in field, in greenhouse, etc). A typical condition is thermal stress due to high temperatures during harvesting operations in open fields or in greenhouses. In Italy, harvesting is carried out for many hours during the day, mainly in the summer, with temperatures often higher than 30°C. According to ISO 7243, these conditions can be considered dangerous for workers' health. The aim of this study is to assess the risks of exposure to microclimatic conditions (heat) for fruit and vegetable harvesters in central Italy by applying methods established by international standards. In order to estimate the risk for workers, the air temperature, radiative temperature, and air speed were measured using instruments in conformity with ISO 7726. Thermodynamic parameters and two more subjective parameters, clothing and the metabolic heat production rate related to the worker's physical activity, were used to calculate the predicted heat strain (PHS) for the exposed workers in conformity with ISO 7933. Environmental and subjective parameters were also measured for greenhouse workers, according to ISO 7243, in order to calculate the wet-bulb globe temperature (WBGT). The results show a slight risk for workers during manual harvesting in the field. On the other hand, the data collected in the greenhouses show that the risk for workers must not be underestimated. The results of the study show that, for manual harvesting work in climates similar to central Italy, it is essential to provide plenty of drinking water and acclimatization for the workers in order to reduce health risks. Moreover, the study emphasizes that the possible health risks for greenhouse workers increase from the month of April through July.*

Keywords. *Heat stress, Hot environments, Greenhouses, Microclimate.*

Submitted for review in May 2008 as manuscript number JASH 7501; approved for publication by the Journal of Agricultural Safety and Health of ASABE in May 2010.

The authors are **Massimo Cecchini**, MD, Researcher, and **Andrea Colantoni**, PhD, Agricultural Mechanization, Department of Geology and Mechanical, Naturalistic, and Hydraulic Engineering for the Territory, University of Tuscia, Viterbo, Italy; **Riccardo Massantini**, MD, Professor, Department of Food Science and Technology, University of Tuscia, Viterbo, Italy; and **Danilo Monarca**, Engineer, Full Professor, Department of Geology and Mechanical, Naturalistic, and Hydraulic Engineering for the Territory, University of Tuscia, Viterbo, Italy. **Corresponding author:** Massimo Cecchini, Department of Geology and Mechanical, Naturalistic, and Hydraulic Engineering for the Territory, University of Tuscia, via S. Camillo De Lellis s.n.c., 01100 Viterbo, Italy; phone: +39-0761-357357; fax: +39-0761-357453; email: ergolab@unitus.it.