**Membership function model for defining optimality of vapor pressure deficit in closed-field cultivation of tomato**

ABSTRACT

Estimation of plant's evapotranspiration (ET) or water loss to the atmosphere depends on the vapor pressure deficit (VPD) of the closed-field environment (greenhouse). The objective of this work was to develop a membership function model for defining optimal VPD of greenhouse air for tomato cultivation (Lycopersicon esculentum) at different growth stages (GS) and light conditions (sun, cloud, night). Mathematical descriptions of a peer-reviewed published growth response (GR) model for optimal greenhouse air temperature (T) and relative humidity (rH) were derived and implemented in a computer program. An incremental algorithm was written in MATLAB© based on definitive concepts in VPD equations and the GR model. Non-linear regression was applied to describe mathematical relationship between the incremented outputs of the model and the calculated VPD values (R2=0.999 to 1). Results were validated with three published literatures and were shown to be capable of exploring optimal levels of VPD by means of real numbers between 0 and 1. This study can contribute to knowledge-based information and decision support systems in greenhouse climate control and management by quantifying comfort level of microclimate.

**Keyword:** Vapor pressure deficit; Optimal value; Greenhouse; Tomato; Growth response; Membership functions