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Effects of Insulating and Shading Liquid Foam Injected Between Double Polyethylene Films on Greenhouse Microclimate and Productivity of Tomato Crop©

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Greenhouse growers invest considerable sums to maintain adequate growing conditions in the winter. On the other hand, excess light and temperature in summer are major concerns that can reduce productivity in the greenhouse enclosure. The infusion of liquid foam between two polyethylene films (*SUNARC* technology) used as greenhouse covering materials is an innovative and promising method of increasing thermal insulation in the winter and can contribute to creating a favourable microclimate in the summer. Two greenhouses were used in this experiment: (1) a control greenhouse; and (2) a prototype greenhouse utilising *SUNARC* liquid foam technology. The first experiment (winter and early spring) consisted of injecting liquid foam between the two polyethylene films during the night to increase the thermal insulation of the greenhouse and reduce energy consumption. In the second experiment, this technology was used during the summer as a shading method. A hydroponic tomato (*Lycopersicon esculentum* Mill) crop was grown. In the winter, high-pressure sodium lamps (HPS) providing 120 $\mu mol \cdot m^{-2} \cdot s^{-1}$ for 16 h were used. Greenhouse climate (air and relative humidity), light transmission and spectral quality were measured in each greenhouse. In addition to increasing thermal insulation in the greenhouse (40% to 60% energy savings), liquid foam also increased artificial light reflection by 5% to 10%. In the summer, the use of liquid foam as shading can reduce natural light by 10% to 60%. The effects on microclimate in summer were important as liquid foam helped decrease air temperature an increase relative humidity and that could lead to improved yield among the grown crops.