Frost protection in Avocado orchards

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Abstract

Avocado (*Persea americana*) is an important evergreen fruit crop, grown in several countries with tropical and subtropical climates[1]. Damage from frost, an environmental condition in which the temperature drops below the freezing point of water, is an important factor in reducing avocado crop yields[2]; for example, during 2016 financial loss from frost damaged avocado in Israel was estimated at 15 million USD[3]. In many cases, frost damage can be significantly reduced by active measures such as stirring air layers with wind machines[4] and sprinkling water over trees during the frost[5]. However, little is known about the efficacy of these methods in avocado orchards. The present study aimed to evaluate and compare the efficiency of several frost mitigation techniques in commercial avocado orchards in Israel. For this purpose, over-canopy water irrigation sprinklers (WIS), a horizontal wind machine (HWM), and a vertical wind machine (VWM) were deployed and operated during several consecutive frost events. Frost mitigation efficiency was assessed by measuring air temperature and bud damage, and by assessing flowering intensity in the following spring.

Of the tested methods: WIS successfully raised air temperature, reduced bud damage and maintained high flowering intensity; similar effects were observed with the HWM at ranges up to 150 or 50 m`, respectively, when the air could or could not pass freely between the trees; in contrast, the positive effect of VWM in frost damage prevention was very minor, extending only for 20 m`. In conclusion, among the different methods examined in this study, WIS appeared to show the best overall efficiency in frost damage prevention. Further research should be conducted, to confirm and extend these results.

Recent Publications

(1) Silva, T. A., and Ledesma, N. (2014) Avocado History, Biodiversity and Production, in: D. Nandawani (Ed.), Sustainable Horticultural Systems, Springer International Publishing, Switzerland, 2014, pp 157–205.

(2) Perry, K. B. (1998) Basics of frost and freeze protection for horticultural crops. *HortTechnology 8*, 10–15.

(3) Milopri LTD. Israel. (2016) No Title. *Commer. data*.

(4) Hu, Y. G., Wu, W. Y., De Melo-Abreu, J. P., Shapland, T. M., Zhang, H., and Snyder, R. L. (2015) Comparative experiments and effectiveness evaluation on vertical blowing fans (VBF) for frost protection. *Int. J. Agric. Biol. Eng. 8*, 36–42.

(5) Hu, Y. G., Zhao, C., Liu, P. F., Asante, E. A., and Li, P. P. (2016) Sprinkler irrigation system for tea frost protection and the application effect. *Int. J. Agric. Biol. Eng. 9*, 17–23.



Biography

Lior Rubinovich, Ph.D. graduated from the Hebrew University of Jerusalem and has expertise in sub-tropical crops, especially avocado. Among his avocado-related research topics are: Improving frost tolerance using frost mitigation techniques; Identifying the physiological factors involved in frost tolerance and sensitivity; Development of frost-tolerant avocado plants; Development of avocado tissue culture; Development of new high-quality varieties; and Improving yield and lowering alternate bearing.

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