Evaluation of Fogger and Fogger-heater Efficiency in Frost Protection

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Extended Abstract

Introduction
Generally there are two ways for frost protection: active methods and passive ones. Passive methods should be carried out much earlier than the frost occurrence, for these methods are not the direct ways of frost protection but are the ways of avoiding and escaping from the frost. Active methods are the ways of frost protection that are carried out right before the frost or at the time of its occurrence. These methods include garden heaters, spray irrigation, wind machines, etc. In the present study, 3 ways of frost protection namely fogger, heater and fogger-heater were compared with the control treatment.

Fogger can play a protective role by creating artificial fog, against the emission of the garden heat especially at the nights when there is inversion. These machines have a powerful pressure pump that directs the water into the pipes and with a lot of pressure pumps it out of the pipes and in this way makes small drops of water (fog). These particles' absorb the infra-red (rays) that are emitted from the garden and reflex them back to the ground and maintain much garden's heat in comparison with the condition in which there is no cloud.

Materials and Methods
The present study was carried out randomly in a garden of 20 hectares in a farm located in the north-west of Isfahan (Alavijeh region) in the fall and spring of 2007. In order to investigate the function of the fogger machine, 4 plots were considered. One of these plots which was considered as a control plot was allocated 1000 meters away from the other three plots and it dimension were 50×50cm. Three other plots of the same size were considered as the treatments of the forger, heater and heater- fogger. A 50-meter distance was considered between the treatments (plot(s)). All plots had same conditions regarding the numbers, the soil characteristics and geographically they had the same angle of slope. In each of these plots a wooden cottage of
standard Stevenson, which is currently in use in the national weather forecasting stations, was installed. In each of these cottages, there was weather forecasting equipments including minimum and maximum thermometer and a thermograph. After installing this equipment in each plot, the person who was in charge of reading the climatic parameters was trained. Reading the parameters was regularly done every six hours, for the parameters of minimum and maximum temperature as well as the dry temperature data from for casting stations were daily recorded in special tables. Watching the parameters was continued during March, April and May of 2007. It is worth mentioning that the data taken from thermometer were used along with the aforementioned data. The person who was in charge of watching the data used to change the graph paper of the thermometer every Monday.

Results and Discussion
The results obtained from ANOVA showed that there is a significant difference of 5 percent among the averages of treatments (frost protection method). And this depicts that there is a difference at least between two treatments. Based on this, and in order to find out that between which treatments there is a difference Duncan's multiple test was used to compare each treatment with the control treatment.

Since the fogger maintains the heat and prevents its emission particularly in inversion coldness, it cannot alone play an important role in the prevention of frost. For this reason, the heater was used in a separate block along with the fogger machine. In this way the treatment could produce heat and have an extra role in addition to the protective role that the fogger played. The results showed that the increase of temperature by applying these two methods could show a significant difference of 5% level in their comparison with the control treatment. The increase of temperature in the best condition reached 1.8 (°C) and the average increase was 0.9 (°C).

Conclusion
Spring coldness often causes a loss in the new blooms and fruits on the trees of Isfahan. Often these coldnesses are radative types and their continuation can result in the loss of all the crops. Although predicting the inversion is not easy to do, but probably, farmers prepare to protect their crops against the sudden fall of the temperature and frost by being informed before the frost starts.

The result of this study shows that the application of foggers accompanied by heaters can have effective results in frost protection. For the heater generates the heat and the fogger keeps the heat in the garden. In the studied farm, case temperature increased 1.8 (°C) in the best condition.

Keywords: Frost, Active and passive methods, Heater, Fogger, Damage.