ABSTRACT

Ph.D. Thesis

INVESTIGATION THE EFFECTIVENESS OF SOIL TEMPERATURE WITH DIFFERENT PLASTIC COVERS AND BIOFUMIGATION AT APPLICATION OF SOLARIZATION IN GREENHOUSES

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Experiments of this thesis were carried out at the Suleyman Demirel University, Agricultural Research and Implementation Area in 90 m^2 plastic cover greenhouse for two years, at 2011 and 2012. Four different solarization cover materials such as traditional solarization, bubbled solarization, water containing bubbled solarization and bio-fumigation were tested with subject to soil temperature increment. Solarization was realized throughout 8 week at 2x2 m plots with 3 replicates. Plots were irrigated using 4 liter per hour capacity drip irrigation system. During the experiment, hourly soil temperatures have been recorded at the soil depths of 5, 10, 20 and 30 cm. In greenhouse temperature values were recorded by HOBO whereas ambient temperature values were obtained from Turkish State Meteorological Service. At the end of solarization applications soil samples from 0-15 cm and 15-30 cm depths to evaluate their NO^-_3, NO^-_2, NH_4^+, organic matter, microbial biomass carbon (MBC) contents, CO_2 production and number of fungi, bacteria and actinomyces.

Among the experimental years, the highest soil temperature values were recorded as 53 and 58.5 ^oC for 2011 and 2012 at bubbled and conventional solarization applications, respectively. Although temperature increments in top layer were more significant than the sub layers; in contrast, temperature increments in sub layers at the variants of bubbled and water containing bubbled solarization were higher. These variants have also been conserved gained heat for longer time comparing to other applications.

Availability of the nitrogen forms in the soils were increased depends on the solarization applications. The highest soil mineral nitrogen contents were determined in bio-fumigation in first year of the experiment whereas in bubbled solarization at second year. Microbial activity of the soil showed fluctuation as a matter of experimental years; however, considering to pre-trial soil activity, solarization applications were positively effective on soil micro-biota.

Results obtained revealed that, solarization application in greenhouses may successfully practice in the relatively cool areas such as Isparta region. Moreover, firstly introduced water containing bubbled solarization material has a unique effects on soil parameters; therefore, it is promising for the future.

Keywords: Solarization, biofumigation, solarization cover material, microbial activity, soil temperature

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