

Destruction of Soil-Borne Pathogens by Soil Solarization without Chemicals

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Soil solarization is one of the methods used for controlling soilborne pathogens, arthropods and weeds before planting. It is a relatively new technology for disinfestation, based on utilizing solar irradiation for mild heating of mulched (by transparent polyethylene) soil, for 4-6 weeks in the hot season. It results in increased yields. The effectiveness of solarization has been verified in many regions.

Physical (heating), chemical and biological mechanisms are involved in pathogen control by solarization. The temperature in the upper soil layers reaches lethal levels. Microbial processes are induced during and after solarization, resulting in enhanced pathogen control. For example, when pathogen propagules are exposed to sublethal temperature they are weakened and are more easily attacked by the antagonists existing in the soil.

Populations of fluorescent pseudomonad bacteria, which can control pathogens and improve plant growth, increase in the rhizosphere and roots of plants growing in soils, following solarization. Frequently, the growth of such plants is improved, even in the absence of known pathogens, due to chemical, physical and biological changes which occur during and after solarization. Simulation models for prediction of soil temperatures during solarization were developed. Integrating solarization with other pest control methods improves pathogen control and extends its effectiveness. Technologies for manual and mechanical plastic mulching are available. Soil solarization does not involve the use of pesticides and is simple to apply. Its limitations stem from its dependence on the climate and from the fact that the soil cannot be utilized for cultivation during 4-6 weeks. Approaches for future developments, to improve control by solarization and to extend its use to additional regions and situations, are described.

Key words: Disinfestation, integrated control, solar heating, soil solarization, soil-borne pathogens.

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