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Evaluation of Essential Oils as Biocide in Cucumber from Farm to Consumer

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Abstract

To enhance and maintain food security, agricultural systems need to be screened to increase application of environmentally fertiliser and pesticides. Key benefits of essential oils are to progress food security without further polluting soil and water resources. The present study was conducted to investigate the effects of 5 essential oils (0, 500 and 1000 $\mu\text{l l}^{-1}$) including pepper, garlic and onion, thyme, cumin and savory as fungicide on food safety and pathogen disease of cucumber in comparison to common fungicide carboxin - Thiram. The first treatments were done by seed soaking in volatile oils for three days; for control, seed soaked in %0.2 concentration of Carboxin -Thiram. Followed sowing, seeds were irrigated by the same treat from germination to forth leaf development stage. Germination percentage, percent survival, seedling height, and diameter were evaluated at 8 weeks. During growth season, cultural practice was performed when necessary by bio-fertilisers and bio-pesticides. Followed fruiting, the first fruits and soil were evaluated to investigate the amount of fungicide and pathogen residues. The growth rate of the pathogens was partially or completely inhibited by all the essential oils at concentrations up to 500 $\mu\text{l l}^{-1}$; they were not different from the fungicide. Garlic and onion, thyme, and cumin essential oils showed fungicidal effect on soil-borne pathogens at the concentration 500 $\mu\text{l l}^{-1}$. However, pepper and savory oils, at a concentration 1000 of $\mu\text{l l}^{-1}$, were lethal for this pathogen. The persistence of antifungal activity was different among essential oils. Therefore seedling survival ranged from 80 to 95 %, although in the control, it was 30%; with increasing essential oils concentration germination percentage and seedling survival significantly increased. Observations revealed alteration in the residues of essential oils and fungicide was present in fruits and soil. Essential oils had significantly less residues incidence in fruits and, improved fruit safety, however the residues of fungicide was detectable in the fruits belonging to seed treated with fungicides. These results were also observed in the soil samples. Findings suggest that essential oils possess strong inhibitory potential against pathogens that could be recommended as a potential source of biological fungicide in order to produce safer and healthier product.

Keywords: Cucumber, essential oils, food safety, fungicides