

# Antifungal edible tomato coatings containing ajwain, neroli, and rosemary essential oils

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## Abstract

The current study was aimed to investigate the antifungal activities of ajwain, neroli, and rosemary essential oils and their maltodextrin-based coatings against *Fusarium oxysporum*, one of the most locally predominant tomato fungal pathogens (Tehran, Iran). The phytochemical constituents of the essential oils were evaluated using GC and GC–MS methods. Also, the inhibitory activities of the oils were examined against spore germination, mycelial growth, and fungal infection development on tomato fruits. According to the results, ajwain oil consisted of thymol (48.74%), *p*-cymene (23.04%), and  $\gamma$ -terpinene (20.49%) as major components. The main constituents of neroli oil were identified as linalyl acetate (53.40%), linalool (19.37%),  $\alpha$ -terpineol (6.52%), and geranyl acetate (4.14%). In addition, 1,8-Cineole (37.50%),  $\alpha$ -pinene (37.03%), *o*-cymene (6.14%), and isoborneol (6.00%) were identified as the main components of rosemary essential oil. In spore germination assay, ajwain oil exhibited a high activity ( $IC_{50} = 0.083$  mg/mL), more potent than rosemary, neroli, and kresoxim-methyl ( $IC_{50} = 0.963$ , 1.320, and 0.107 mg/mL, respectively). Furthermore, ajwain completely inhibited the mycelial growth of fungus at all volumes (100% fungicidal activity). In addition, rosemary and neroli exhibited good activities with high concentration-dependence. Furthermore, the coating enriched with ajwain oil showed the most inhibitory activity to reduce fungal growth on fruits, with a severity reduction of 84.2%. Whereas, rosemary and neroli coatings showed significant activities with 66.7 and 24.6% inhibition, respectively. The results indicated that ajwain coating is a potent antifungal coating that of interest for the bioactive packaging of tomato fruits to extend their shelf life.