AgriCos e-Newsletter
ISSN: 2582-7049
Volume: 02 Issue: 09 September 2021 Article No: 24

Essential Oils: An Important Tool for Management of Postharvest Pathogens of Fruits

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SUMMARY

Essential oils play an important role in controlling postharvest pathogens of fruits. Most of the essential oils have been studied for elucidating their efficacy in vitro but only a few of them have been investigated in vivo. However, they are usually applied by fumigation, spraying or dipping on the fruit surface. The synergy of different chemical components helps them in the management of fungal pathogens. Often essential oils are be employed also together with other control methods to increase their efficacy. This article provides an insight into the application of essential oils to control postharvest diseases of fruits, by displaying information on their efficacy, safety and their integrated use.

INTRODUCTION

Over the most recent 20 years, another course in the pursuit of choices to control postharvest diseases has been attempted, with the emphasis on devices ready to forestall spoils with negligible effect on human health and environment (Tripathi and Dubey 2004; Spadaro and Gullino 2004). Organic practices against postharvest microorganisms of foods grown from the ground incorporate the utilization of microbial adversaries, normal mixtures, or inducers of opposition dynamic on the host. For hundreds of years, various countries, like India, have been utilizing plant extracts and essential oils with remedial movement on people and for crop insurance. Somewhat recently, normal items organically dynamic have been concentrated by taking on a logical way to deal with assess their conceivable use in horticulture to forestall and control various adjustments. Plants, especially, furnish a wide range of secondary metabolites with antimicrobial action, including aromatics, essential oils, glucosinolates, or extricates. A few accumulate are for the most part viewed as protected on human health and the ecosystem, so interest in their utilization has developed and the examination performed showed that few plant items have pharmacological or addictive properties. The prime objective of the current article is to provide an overview of the studies about the use of various essential oils to control fruit and vegetable diseases, with special emphasis on fruit pathogens.

Essential Oils

Plant essential oils and concentrates are acquiring popularity because of their protected nature, their wide consumer acknowledgement, and their multiple applications. Specifically, plant essential oils are considered non-phytotoxic compounds conceivably successful as biopesticides for crop insurance (Isman 2000; Bajpai et al. 2008). Fundamental oils are gotten by extraction from fragrant plant material, wealthy in forces. Characters can have allelopathic or anti-infection activities and can be pollinator attractants. Antimicrobial activities of fundamental oils and plant extricates are perceived for a long time: Myrtaceae and Lamiaceae fundamental oils have been generally utilized for postharvest control of grains and heartbeats (Isman 2000). Logical exploration on the natural movement of fundamental oils showed that they have harmfulness through contact and fumigation on a few financially significant vermin and infections. Extraction strategies acknowledged characterizing a fundamental oil incorporate refining under steam, mechanical virus pressing factor, or articulation. The fundamental oil is a phytochemical extricate, specifically eliminated from the plant, which disconnects a minor segment of the plant i.e around 0.01% to 2 %.

Antimicrobial potential of Essential Oils

The adequacy of essential oils ought to be considered concerning oil components. Mono-and sesquiterpene hydrocarbons and some phenolic compounds, the significant parts of plant fundamental oils, have solid inhibitory action against microbial microorganisms (Bajpai et al. 2008). The antimicrobial action of lemongrass oil is because of the presence of alkaloids, tannins and cardiovascular glycosides (Tzortzakis and Economakis 2007). A checked fungicidal action of carvacrol (from oils of thyme and oregano) and p-anisaldehyde (oxidation result of anethole, found in the oil of anise) has been displayed against various postharvest sicknesses in fundamental oils got from types of *Thymus*, *Origanum* and *Anethum*. Essential oils and plant extracts are

promising gatherings of regular mixtures for the advancement of safe fungicidal dynamic fixings. The oils have been thought about in contrast to a few parasitic animal varieties, including strains pathogenic for people or plants, and it has been shown that they are frequently fungistatic as opposed to fungicidal. A few studies about the utilization of fundamental oils and their parts against contagious microbes have shown that their antifungal movement was emphatically connected with monoterpene phenols, for example, thymol, carvacrol, and eugenol. The significant segments of fundamental oils of *Silene armenia* are 1-butene, methyl cyclopropane, 2-butene, and caryophyllene oxide, which showed moderate or high adequacy against a few plant microbes (Bajpai et al. 2008). The impact of the fundamental oils relied upon the dissolvable utilized for the extraction and it was higher utilizing methanol, ethyl acetic acid derivation and assume a significant part in chloroform.

Essential Oils against post-harvest pathogens

Most essential oils have been accounted for as inhibitors of post-harvest fungal pathogens *in vitro* and the action of a few mixtures separated from these oils has likewise been accounted for on microbes of stone organic products (Tsao and Zhou 2000; Lopez-Reyes et al. 2011). *In vivo*, a couple of fundamental oils were contemplated (Tzortzakis 2007; Spadaro et al. 2012). The organic movement of essential oils and their constituents can have fungistatic as well as fungicidal action, contingent upon the focus utilized. A similar essential oil, as well as their mixtures, might be dynamic against a wide scope of microorganisms, albeit the base inhibitory fixation (MIC) fluctuates as indicated by the microbial species and to products of the soil species. Bouchra et al. (2003) stated that the oils of *Origanum compactum* and *Thymus glandulosus*, comprising predominantly of carvacrol and thymol, were the most proficient in the control of *Botrytis cinerea,* as they can hinder the *in vitro* mycelial development at 100 mg/l. The cassia oil restrained the *in vitro* development of *Alternaria alternata*, following openness to 300 or 500 mg/l for 6 and 3 days. When applied to tomatoes, cassia oil at 500 mg/l diminished the decays by 40–50 % (Feng and Zheng 2007). At the point when used to control the post-reap dark decay of grapes brought about by *B. cinerea,* the essential oils of *Ocimum sanctum, Prunus persica* and *Zingiber officinale* showed MIC upsides of 200, 100 and 100 mg/l, individually, and broadened the timeframe of realistic usability of 4–6 days (Tripathi et al. 2008).

Table 1. **Representative List of few plant species producing essential oils**

S.N	Plant	Family	Target pathogen
1)	Oregano	Lamiaceae and Verbenaceae	*Aspergillus niger* v. Tieghem, *A. flavus* Link, *A. ochraceus* Wilhelm, *Fusarium oxysporum, Penicillium* sp., *Pseudomonas aeruginosa, Staphylococcus aureus*
2)	Thymes	Lamiaceae	*B. cinerea, Monilinia fructicola, P. italicum, P. citrophthora, Rhizopus stolonifer*
3)	Marjoram	Lamiaceae	*P. citrophthora, R. stolonifer, P. savastanoi* and *P. syringae* pv. *phaseolicola*
4)	Spearmint	Lamiaceae	*B. cinerea and P. expansum*
5)	Basil, Fennel, Lavender	Lamiaceae	*B. cinerea and P. expansum*
6)	Vervain	Verbenaceae	*Monilinia. laxa, M. fructicola, M. fructigena*
7)	Magnolia	Magnoliaceae	*B. cinerea, Colletotrichum capisci, F. oxysporum, F. solani, P. capisci, Rhizoctonia solani*
8)	Clove	Myrtaceae	*B. cinerea, P. expansum, M. fructigena, Phlyctema vagabunda*

CONCLUSION

New pest management strategies can exist together with those generally available and they ought to likewise end up being monetarily feasible over the long run. Essential oils are described by solid fungitoxicity and low MIC (least inhibitory fixation), thermostable nature, fungistatic or fungicidal activity against post-harvest microorganisms, and productivity even at higher inoculum rates. Summing up essential oils possess all the characteristics of an ideal tool against disease and can be recommended as natural fungi toxic compounds. It

should anyway be recollected that the utilization of essential oils to control post-harvest ailments requires further examinations concerning their biological activities and diffusion in the plant tissues, notwithstanding the need to recognize definitions that can restrain the development of microbes at not harmful concentrations.

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