

Comparative Antioxidant Potential of Essential Oils: A Mini review**Muhammad Ismail¹, Nabia Hafeez²**¹*Department of Botany, University of Swabi, Khyber Pakhtunkhwa Pakistan*²*Centre of Biotechnology and Microbiology, University of Peshawar, Khyber Pakhtunkhwa, Pakistan***Abstract:**

Medicinal plants are in practice to treat ailments since ancient human civilization. The characteristic phenolic compounds and bioactive ingredients present in these plants owe to their charismatic antioxidant potency. The derived essential oils from these plants further decrease the auto-oxidation and oxidative stress by imparting scavenging effects thereby increasing the shelf life of the product obtained. Thus, essential oils extracted from such medicinal plants are of great antioxidant value as compared to synthetic antioxidants, proving their impetus as cost effectively natural great antioxidants reservoir without any harmful effects.

Keywords: Antioxidant, hydroperoxide, phytochemicals, essential oils*Corresponding author's email: nabiahafeez@hotmail.com

The practice of using medicinal plants to treat illnesses dates back as far as human civilization. Medicinal plants are used by people all around the world. 80% of the world's population, according to the World Health Organization, uses traditional medicine to treat a range of diseases [1]. These plants are valued therapeutically because of their synthetic components that help the human body to fend against illnesses. Phytochemical research on a variety of medicinal plants demonstrated the existence of important phytochemicals that are found in the leaves, stems, fruits, and seeds of these plants. These characteristic bioactive compounds help to prevent human diseases that are caused by

oxidative stress. Since oxidative stress generates reactive oxygen species (ROS). So these ROS are linked to a variety of diseases like cardiovascular disease and muscle damage. For instance, *Senna alata* was used by Nigerians as a bacterial and parasite disease therapy [2]. Moreover, medicinal herbs showed varying degrees of antibacterial and antifungal activity against microbes. Medicinal plants include a wide range of secondary metabolites or mixtures, such as tannins, terpenoids, alkaloids, and flavonoids, which primarily affect the antibacterial properties of the plants. Similar phytochemicals like flavonoids and tannins, for example, have also been shown to be effective against pathogenic microbes [3].

Compound investigations of these traditional medicines; primarily derived from plants are currently the basis of many early medications, such as anti-inflammatory drugs (from willow bark), morphine (from the opium poppy plant), quinine (from Cinchona skin), and pilocarpine (from Maranham Jaborandi). Most commonly, the food business uses medicinal plants to produce more than half of the medications that are now available in the market [4, 5]. Since artificial antioxidants are not as effective in reducing natural oxidants as natural ones, the interest in using plants for medicinal purposes has spiked in a number of research sectors. Studies showed that lipid-containing system extracts obtained from many plants have excellent antioxidant activity that is better than synthetic antioxidants available in the market [6, 7].

Plant extracts from the Labiatae (Lamiaceae) family are popular in serving as naturally active antioxidants [6–8]. Various parts of the plants included in Lamiaceae family produce significant antioxidant effects and produce essential oils [9, 10]. Since essential oils are a combination of volatile and aromatic plant compounds with a distinct essence and low boiling point. So, such aromatic plant compounds have a number of positive health effects on both humans and animals including antioxidant, anti-inflammatory, and antiseptic properties [11-13]. Furthermore, such chemical compounds are used to prevent foods from spoilage.

After the extract is obtained, its phenolic compounds oxidize organic matter in the presence of oxygen. As a result of this oxidation, a type of oil is extracted that can be separated through the distillation process leaving behind a matrix that is non-volatile in nature. Some phenol-free essential oils also exhibit antioxidant behavior as a result of the radical chemistry of these compounds, such as eucalyptus, rosemary, and sage (e.g.,

sulfur-comprising constituents in the garlic extract) The health of humans and animals is improved by natural substances, whereas manufactured antioxidants, such as butylated hydroxyanisole (BHA) and butylhydroxytoluene (BHT), have the opposite effect [14-16]. Research revealed that essential oil derived from the family Labiatae, such as cotton seed oil, has a significant antioxidant role. Their scavenging potency is the result of eugenol and thymol-like phenolic compounds that play a key role in the inhibition of hydroxy peroxide synthesis. In a similar manner, essential oils obtained from other plants also conclude important antioxidant action [17, 18].

One such example is "Oregano" essential oil; which can be found in the isomer of thymol called carvacrol, derived from the herb "oregano" [19, 20]. Similarly, German chamomile essential oil excels at combating free radicals due to its terpenoid antioxidants. Terpenoid chemicals are typically unstable in many formulations, but one method they can be stabilized for long-term usage is using essential oils. German chamomile is ideal for pain treatment and relaxation because it is particularly known for supplying antioxidant defense by lowering inflammation. Its use as a stress- and anxiety reliever helps stop the body from producing free radicals. The effectiveness of rose essential oil is due to at least ten recognized chemical components. Rose essential oil is extensively researched for its anti-depressant properties in addition to its antioxidant properties. Rose essential oil can assist in reversing any possible free radical damage that sadness and loss may be inflicting to your body. Coriander essential oil can prevent vascular damage at the cellular level by lowering cholesterol and blood sugar. Moreover, studies are being done on coriander essential oil to prevent colon cancer and chronic inflammation that leads to neurological impairment.

Fennel essential oil, which soothes the stomach and heals wounds, is also an antioxidant. This essential oil contains over twenty phenolic and bioflavonoid components that have antioxidant properties. Fennel essential oil is a prominent essential oil for treating digestive difficulties. It can also help halt the free radical damage brought on by the chronic illness. More than a dozen health and wellness applications for cedarwood essential oil exist, one of which is its antioxidant properties. Cedarwood essential oil is perfect for use in topical remedies to fight free radicals that result in skin damage, as well as reducing inflammation associated with arthritis, mending wounds, and acting as a

natural pesticide. Moreover, cedarwood essential oil is only used topically without any internal ingestion [21].

References:

1. Farnsworth, N. R.; Akerele, O.; Bingel, A. S.; Soejarto, D. D.; et al. Medicinal plants in therapy. *Bull. World Health Organ.* 1998, 63(6), 965. PMID: 3879679; PMCID: PMC2536466.
2. De Smet, P. A. Should herbal medicine-like products be licensed as medicines. *BMJ-Brit Med J.* 1995, 310(6986),1023-4. DOI: 10.1136/bmj.310.6986.1023.
3. Trease, G.E.; Evans, W.C. *Trease and Evans Pharmacognosy. Pharmacognosy.* 15th Edition, Saunders Publishers, London, 2002.
4. Yarnell, E.; Abascal, K. Dilemmas of traditional botanical research. *HerbalGram.* 2002, 55:46–54.
5. Harvey, A. L. Natural products in drug discovery. *Drug discovery today.* 2008, 13(19-20), 894-901. <https://doi.org/10.1016/j.drudis.2008.07.004>
6. Chipault J. R.; Mizuno G. R.; Lundberg W. O. The Antioxidant Properties of Species in *Foods. Food Technol.* 1956, 10, 209–211.
7. Schuler P. *Natural Antioxidants Exploited Commercially.* Hudson BJB (Ed) Food antioxidants. Elsevier, London. 1990, 99-170.
8. Baniyas C.; Oreopoulou V.; Thomopoulos C. D. The effect of primary antioxidants and synergists on the activity of plant extracts in lard. *JAOCS,* 1992, 69, 520-524. DOI: 10.1007/BF02636101.
9. Economou K. D.; Oreopoulou V.; Thomopoulos C. D. Antioxidant activity of some plant extracts of the family Labiatae. *AOCS.* 1991, 68, 109-113.
10. Djarmati Z.; Jankov R. M.; Schwirtlich E.; Djulinac B.; et al. High Antioxidant Activity of Extracts Obtained from Sage by Supercritical CO₂ Extraction. *JAOCS.* 1991, 68, 731-734.

11. Valgimigli, L. Essential oils: An overview on origins, chemistry, properties and uses. In *Essential Oils as Natural Food Additives*, Nova Science Publishers: New York. 2012, 1– 24.
12. Bakkali, F.; Averbeck, S.; Averbeck, D.; et al. Biological effects of essential oils –A review. *Food Chem. Toxicol.* 2008, 46, 446– 475. <https://doi.org/10.1016/j.fct.2007.09.106>.
13. Adorjan, B.; Buchbauer, G. Biological properties of essential oils: An updated review. *Flavour Fragrance J.* 2010, 25, 407–426. <https://doi.org/10.1002/ffj.2024>
14. Valgimigli, L.; Valgimigli, M.; Gaiani, S.; et al. Measurement of oxidative stress in human liver by EPR spinprobe technique. *Free Radical Res.* 2000, 33, 167–178. DOI: 10.1080/10715760000300721.
15. Lanigan, R. S.; Yamarik, T. A. Final report on the safety assessment of BHT (1). *Int. J. Toxicol.* 2002, 21 (2), 19–94. DOI: 10.1080/10915810290096513.
16. EFSA Panel on Food Additives and Nutrient Sources Added to Food (ANS). Scientific Opinion on the re-evaluation of butylated hydroxytoluene BHT (E 321) as a food additive. *EFSA J.* 2012, 10, 2588–2630. DOI: <https://doi.org/10.2903/j.efsa.2012.2588>.
17. Farag R. S.; Badei A.; Hewedi F. M.; et al. *JAOCS.* 1989, 66,722-799.
18. Farag R. S.; Ali M. N.; e al. Use of some essential oils as natural preservatives for butter. *JAOCS* 1990, 68, 188-191.
19. Lawrence B. M. The botanical and chemical aspects of oregano. *Perfum Flavor.* 1984, 9, 41-51.
20. Kokkini S.; Vokou D. Carvacrol-rich plants in Greece. *Flavour Fragr J.* 1989, 4, 1-7.
21. Loren Elara. *Ten Essential Oils with Maximum Antioxidant Benefits (Plus 6 DIY Recipes and Application Tips)*. 2018. Essential Oil Sanctuary. *10 Essential Oils with Maximum Antioxidant Benefits (Plus 6 DIY Recipes and Application Tips)* (essentialoilssanctuary.com).