Available online www.jocpr.com

Journal of Chemical and Pharmaceutical Research, 2013, 5(9):219-221

Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

A comparative study on antioxidant activity of essential oils and curcumin using thiobarbituric acid reactive substances

M. S. Seema Farhath[1], P. P. Vijaya[2], P. Mumtaj[3] and M. Vimal[1]

[1]Dept. of Biotechnology, Bharathiar University, Coimbatore, Tamilnadu, India
[2]PG and Research Department of Biotechnology, Mohamed Sathak College of Arts and Science, Chennai, India
[3]Department of Bioinformatics, Mohamed Sathak College of Arts and Science, Chennai, India

---

ABSTRACT

Antioxidant compounds in food play an important role as a health protecting factor. Scientific evidence suggests that antioxidants reduce the risk for chronic diseases including cancer and heart disease. Recently antioxidants and secondary metabolites have attracted a great deal of attention for their effect in preventing disease due to oxidative stress, which leads to degeneration of cell membranes and many pathological diseases. A sensitive and simple procedure is described for measuring the antioxidant activity (AA) of essential oils(Geranial. Geranial acetate, Eugenol and Gingerol) with curcumin. using T bars. It was found that curcumin showed higher AA than essential oils. It showed that curcumin has effective AA activity at a very less concentration of 0.74mg/ml compared to Eugenol, which showed a effective AA activity at a concentration of 9.4mg/ml.

Key words: Geraniol, Geranial acetate, Eugenol, Gingerol, antioxidant activity, tbars

---

INTRODUCTION

Reactive oxygen species (ROS) including singlet oxygen ($^1O^2$), superoxide ion ($O_2^{\cdot-}$), hydroxyl ion ($OH^{\cdot}$), and hydrogen peroxide (H_2O_2) are highly reactive and toxic molecules generated in cells under normal metabolic activities. However, in response to a variety of factors including tobacco smoke, pollutants, ionising radiations, alcohol, synthetic pesticides, and solvent, their production increases [1]. ROS can cause oxidative damage to proteins, lipids, enzymes, and DNA, and they have also been linked to pathogenesis of oxidative diseases [2]. Living cells possess an excellent scavenging mechanism to avoid excess ROS-induced cellular injury; however, with ageing and under influence of external stresses, these mechanisms become inefficient, and dietary supplementation of synthetic antioxidants is required. In recent years, due to toxicological concerns associated with the use of synthetic substances in food and increasing awareness about natural foods, there has been an increased interest in the use of natural substances as food preservatives and antioxidants [3]. In this context, aromatic plants, particularly their essential oils, are being evaluated for antioxidant activity. It is, thus, pertinent to evaluate the natural antioxidant activity of essential oils, since they find extensive use in the food and beverage industry [4,5,6]. The main constituents of essential oils, for example, monoterpenes and sesquiterpenes and phenylpropanoids including carbohydrates, alcohols, ethers, aldehydes and ketones, are responsible for the fragrant and biological properties of aromatic and medicinal plants [7]. Various essential oils and their components possess pharmacological effects, demonstrating anti-inflammatory, antioxidant and anti-cancerogenic properties [8,9,10].
Curcumin is the major component of turmeric extract which have strong antioxidant activity. curcumin molecule (diferuloylmethane) have two main sites that can interact with free radicals i.e., at the aromatic rings and the methylene carbon between the two carbonyl groups (Beta-diketone system). Curcumin is a safe and potent antioxidant. Therefore, the aim of the present study was to compare the antioxidant activity of essential oils and curcumin using Thiobarbituric acid reactive substances

EXPERIMENTAL SECTION

Chemicals -All chemicals and reagents used in the study were of analytical grade and mostly purchased from Sigma chemicals (India).

Essential oil compounds

Four essential oil compounds such as (Geraniol, Geranial acetate, Gingerol and Eugenol) and curcumin were obtained from commercial producers of plant essential oils and aromatic substances were used in this study. Quality of the oils was ascertained by GC to be more than 98% pure. The oil was stored in the dark at 4°C until used within a maximum period of one week[11].

Determination of total antioxidant activity

Antioxidant activity was measured using Thiobarbituric acid reactive substances. The reaction mixture contained 0.2 mL of liver homogenate in a glass tube incubated with a 0.1 mL KCL and 0.4 mL Tris-buffer (pH 7.5). To this solution, 20 µM of adenine diphosphate was added followed by ascorbic acid (100 miM). Extract (50 µL) was added in various concentrations followed by ferrous sulphate (10µM) and the reaction mixture was incubated at 37oC for 1h. To this reaction mixture 75 µL of 1.3% thio barbituric acid (TBA) was added and reaction mixture was boiled for 15 min. The tubes were then centrifuged at 4000 rpm for 10 min and cooled. Absorbance of the resulting chromogen was recorded at 532 nm[12].

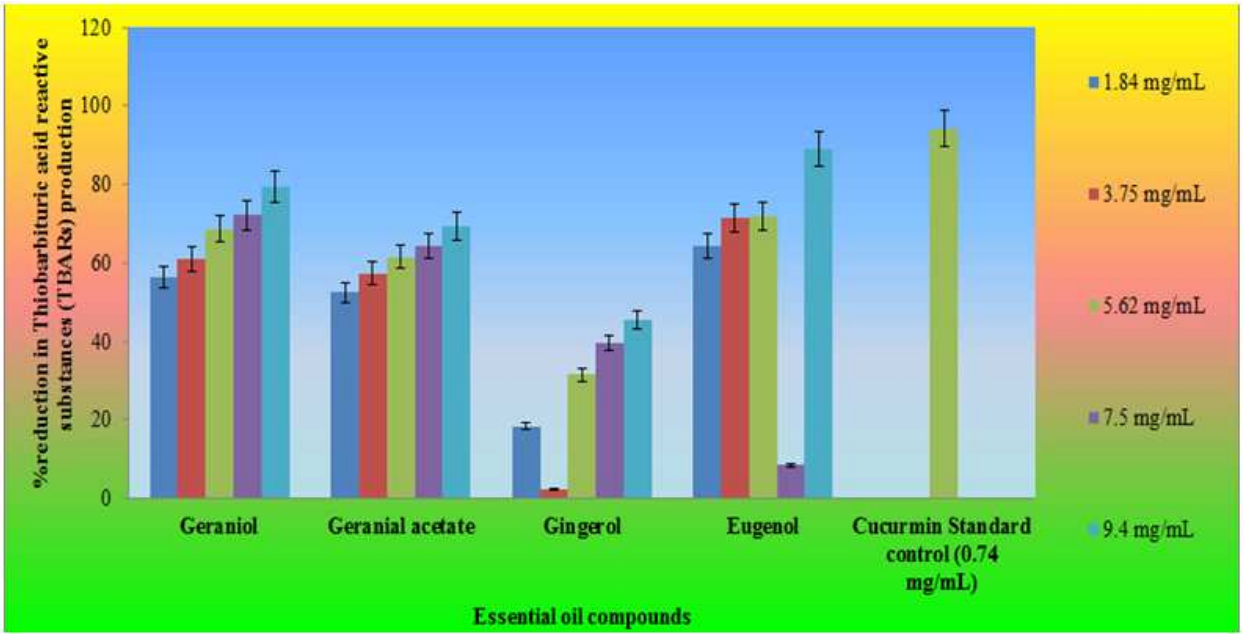
RESULTS AND DISCUSSION

Antioxidant Activity

Antioxidant tests are designed to mimic the oxidation-reduction reactions popularly occurring in the live biological systems and are used to estimate the antioxidant potentials of various chemical and biological samples. In this research, Thiobarbituric acid reactive substances is used for a comparative analysis of curcumin with that of essential oils.

Lipid peroxidation inhibition assay

The results of essential oils on tbars are presented in table. Both the curcumin and essential oils showed antioxidation activity. In Thiobarbituric acid reactive substances the AA activity of curcumin is found to be higher than essential oils. Eugenol showed a good antioxidation activity compared to other essential oils.



The antioxidant activity may be due to different mechanisms, such as prevention of chain initiation, decomposition of peroxides, prevention of continued hydrogen abstraction, free-radical scavenging, reducing capacity, and binding of transition metal ion catalysts. Compared to essential oils, curcumin has a good oxidation activity.

Table I – Effect of Selected essential oil compounds on % reduction in Thiobarbituric acid reactive substances (TBARs) production

Concentration of essential oil compounds in mg/ml	Essential oil compounds in mg/ml				Cucurmin standard control (0.74 mg/ml)
	Geranial	Geranial acetate	Gingerol	Eugenol	
1.84	56.8	52.0	18.6	64.0	94.2
3.75	61.6	57.3	2.3	71.5	
5.62	69.3	61.7	31.5	72.3	
7.5	72.3	64.3	39.7	80.6	
9.4	79.5	69.3	45.8	89.4	

CONCLUSION

In the present study, essential oils and curcumin showed varying antioxidant activities .Nowadays, there is great worldwide interest in finding new and safe antioxidants from natural sources to prevent oxidative deterioration of foods and to minimise oxidative damage of living cells. The essential oils geranial, geranial acetate, gingerol and Eugenol has antioxidant properties but less compared to curcumin.

REFERENCES

[1] Halliwell B, Gutteridge JM. Free Radicals in Biology and Medicine. Oxford, UK: Clarendon Press; **1989**.
[2] Halliwell B. *Nutrition Reviews*. **1997**;55(1):S44–S52.[PubMed]
[3] Peschel W, Sanchez-Rabaneda F, Dieckmann W, Plescher A, Gartzia I, Jimenez D. *Food Chemistry*. **2006**;97:137–150.
[4] Bozin B, Mimica-Dukic N, Simin N, Anackov G (**2006**). *J. Agric. Food Chem.*, 54:1822-1828.
[5] Vagionas K, Ngassapa O, Runyoro D, Graikou K, Gortzi O, Chinou I. *Food Chemistry*. **2007**;105(4):1711–1717.
[6] Wei A, Shibamoto T. *Journal of Agricultural and Food Chemistry*. **2007**;55(5):1737–1742.[PubMed]
[7] Reichling J. *Ann Plant Rev* —Wink M, ed. (**1999**;) 3:.Sheffield: Sheffield Academic Press. 187– 273.
[8] Golab M, Burdzenia O, Majewski P, Skwarlo-Sonta K. *J Appl Biomed* (**2005**;) 3:: 101–8.
[9]Naser B, Bodinet C, Tegtmeier M, Lindequist U. *eCAM* (**2005**;) 2::69–78.
[10] Inès Hammami, Mohamed Ali Triki2 and Ahmed Rebai1Chemical compositions, antibacterial and antioxidant activities of essential oil and various extracts of Geranium sanguineum L. flowers
[11] Adams R. Identification of Essential Oil Components by Gas Chromatography/Quadrupole Mass Spectroscopy. Carol Stream, Ill, USA: Allured Publishing Corporation; **2001**.
[12] Karthika K., S. Paulsamy and S. Jamuna. **2012**. *Journal of Chemical and Pharmaceutical Research*, **2012**, 4(6):3254-3258.