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Antioxidant activity of Linalool

Abstract- *In recent years, Essential oils from their various aromatic plants had been reported to be used in treating of many types of cancer due to their antitumor activity. In addition, numerous studies had investigated the highest capability of chemopreventive phytochemicals compound to act as anticancer drugs. In the present research, the antioxidant activity of Linalool on free radicals compounds was studied. The Antioxidant activity was performed using two methods, DPPH and Hydrogen Peroxide (H_2O_2) Scavenging Capacity. The DPPH scavenging activity demonstrated that Linalool had antioxidant activity comparing with ascorbic acid. Linalool demonstrated moderate antioxidant activity with 50.57471% compared with ascorbic acid that showed 86%. Meanwhile, H_2O_2 scavenging capacity methods investigated that Linalool exhibited moderate scavenging activity 56.36% comparing with ascorbic acid that showed 65%. The results of this study investigated that the Linalool can be used as easily accessible source of natural antioxidants. It can able to be used in the treating several types of cancers as a result of antioxidant activity of it.*

Keywords- *Linalool, Antioxidant activity, DPPH, Hydrogen peroxide..*

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1. Introduction

In human body, there are as system that act as antioxidant defenses to save the body from the dangerous affect of ROS. Free radicals are capable to cause number of illnesses such as cancer, cardiovascular disorder, neural problems, ulcerative colitis, aging and atherosclerosis[١].

Free radical is a molecule that has an unpaired valence electron, those unpaired electrons make free radicals fairly chemically reactive in the direction of different materials, or maybe closer to themselves [2]. Those free radical formed inside the body during regular metabolic activities or with the aid of environmental conditions. Excess production of these radicals causes damage to cells via interaction with numerous bio elements of body like membrane lipids, nucleic acid, proteins and enzymes [٣].

Lianlool is an ordinary type of essential oil. Linalool is a monoterpene with chemical structure ($C_{10}H_{18}O$) which found evidently in greater than 2 hundred oils procured from herbs, leaves, flower and wooden. Plant can able to synthesis Linalool via an enzyme called Linalool synthase [4].

Linalool had many activities include antifungal and antibacterial in addition to antioxidant, and anticancer activity. Linalool is a key compound for manufacturing of a spread of domestic merchandise, cosmetics as properly thinking about it performs function within the synthesis of vitamins A and E. For this reason it is able to be assumed that the using of Linalool may enhance antioxidant action of the body [٥] .

This study is focusing on identifying and investigating the characters of Linalool and the total antioxidant activity of Linalool by using two method DPPH and Hydrogen peroxide.

2. Materials and methods

I. Materials

Linalool obtained from consolidated storefront (USA), DMSO and, Ethanol, PBS and DPPH were purchased from Sigma Aldrich (USA). Hydrogen peroxide obtained from BDH (England).

II. UV-VIS spectroscopy analysis

Linalool was characterized using UV-VIS spectrum (Sigma, USA) after diluting it into DMSO at wave length 200 - 1000 nm. The measurement of UV-VIS spectral analysis was performed in Nanotechnology center, University of Technology, Baghdad, Iraq.

III. Fourier transform infrared spectroscopy (FTIR) analysis

FTIR was used to obtain chemical bonds of Linalool. The spectral rang of Linalool was record from 500- 4000 cm^{-1}. FTIR spectrum was measured at room temperature using the NaCl cell. The assay of FTIR was performed in Nanotechnology center, University of Technology, Baghdad, Iraq.

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IV. DPPH radical scavenging assay

The scavenging activity of Linalool was determined using stable DPPH radicals with minor adjustments according to Tailor and Goyal method [6]. To test antioxidant activity, Linalool with different concentrations (10 µL) was mixed with (490 µL) of DPPH and then complete the quantity to 1 mL using ethanol, followed with incubation at room temperatures for 15 minute. The absorbance was mearued using UV-spectroscopy at wavelength 517 nm .Inhibition percentage was computed according to the formula (1)

$$\frac{Absorbance\ of\ control - Abosrbance\ of\ sample}{Absorbance\ of\ control} \text{ X } 100\% \quad (1)$$

V. H_2O_2 Scavenging Capacity

The scavenging activity of Linalool on H_2O_2 was also determined according to Ruch method [7]. A dilution of 40 mM from H_2O_2 was prepared using phosphate buffer saline. 1 ml of Linalool with different concentration were added to 2 ml of H_2O_2 solution and then incubate for 30 minutes. The absorbance of hydrogen peroxide was measured at 320 nm wavelength against a blank solution containing the PBS only [8]. The determination of H_2O_2 scavenging percentage could be done according to the equation (2)

$$\frac{Absorbance\ of\ control - Abosrbance\ of\ sample}{Absorbance\ of\ control} \text{ X } 100\% \quad (2)$$

3. Results and Discussion

I. UV- VIS spectroscopy analysis

Absorption of spectroscopy is the measurement of the attenuation of electromagnetic radiation by an absorbing substance. As seen in Figure 1, the experimental spectrum for the Linalool that present a peak with maximum intensity (max to 300 nm). The highest absorption could be seen because of aliphatic unsaturated with its double bond that found in Linalool.

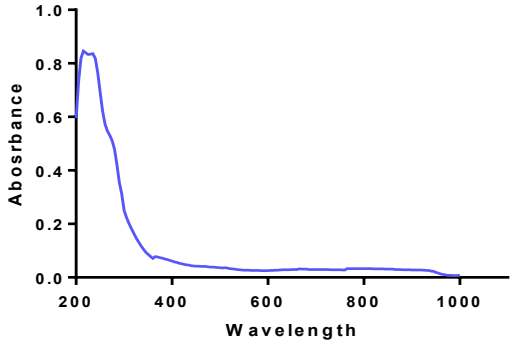


Figure 1 UV- spectrum for the Linalool

II. Fourier transform infrared spectroscopy (FTIR) analysis

The functional groups found within Linalool had been identified via comparing the vibration frequencies in wave numbers of the pattern spectrograph acquired from an FTIR spectrophotometer with the ones of an IR correlation chart.

FTIR spectra of Linalool were done in the spectral region 4000-500 cm^{-1}, Figure 2 show the FTIR analysis for Linalool. The FTIR analysis showed that Linalool contained (OH) group at 3420 cm^{-1}. C–H aliphatic band could be seen with the regions 2979 cm^{-1} and 2920 cm^{-1}. The wavenumber at 1644 cm^{-1} was attributed to C=C group.

At 1593 cm^{-1} wavenumber, (N-H) group shown at this region, while at the wavelength 1450 cm^{-1} it exhibited the presence of (C-H) group. The wavenumber 1114 cm^{-1}referred to secondary alcohol group (C-O). C–O stretching band also could be seen at 1000 cm^{-1}, while (C-H) group could be seen at 691.09 cm^{-1} that referred to the presence of aromatic compound. This result is compatible with Menezes,M et al results [9].

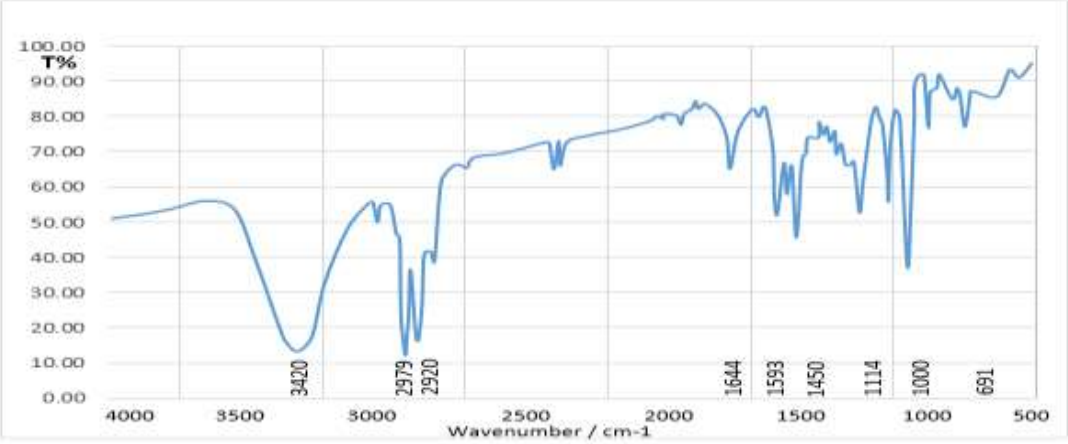
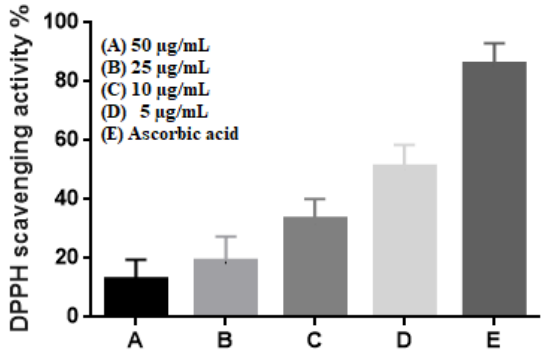


Figure 2 FTIR spectra of Linalool

III.DPPH scavenging activity

The total scavenging activity of Linalool was tested with DPPH. DPPH has a stable free radicals associated with spare electron. Free radicals of DPPH delocalizing over the entire molecule barring its dimerization. The delocalization of electron additionally offers upward thrust to the deep violet coloration, characterized by using an absorption band in ethanol solution at 517 nm. Whilst DPPH added with a substrate which can donate a hydrogen atom, this may supply rise to the reduced formula with the change of this violet to the yellow.. That the amount of radical that remain after addition of Linalool is proportional to the total amount of scavenging radical's activity. The percentage activity of Linalool on DPPH radical scavenging is shown in the Figure 3, Linalool at 50 µg/mL indicated high antioxidant activity with 50.57% scavenging activity, while at 25 µg/mL concentration of Linalool gave 33.3%. Meanwhile, at 10 µg/mL, the scavenging activity was 18.38%, Linalool with concentration 5 µg/mL, it was give 12.8% from scavenging activity. Ascorbic acid at 40 µg/mL concentration was used as control positive that gave 86% from free radical scavenging activity. This result was not compatible with Duarte, A., et al,[10]. But its agrees with Seol, G.H., et al [11]. These results revealed that Linalool can donate hydrogen atoms and remove the electron from DPPH and are



useful for the management of numerous deleterious diseases because of their scavenging activity.

Figure 3 Antioxidant activity of Linalool analyzed with DPPH.

IV. H_2O_2 scavenging capacity

As seen in Figure 4 show the scavenging ability of Linalool on hydrogen peroxide compared with Ascorbic acid as standards. The results investigated the scavenging activity of Linalool on hydrogen peroxide in an amount dependent manner that 50 µg/mL of Linalool exhibited 56.36% scavenging activity while the concentration 25 µg/mL and 10 µg/mL exhibited (20% and 16.36%) and at the concentration 5 µg/mL gave 9%.

On the other hand, the ascorbic acid (1 mg) that used as standard showed 65% hydrogen peroxide scavenging activity. This result is compatible with S.D. Priyadharshini , et al [12, 13],they proofed the high scavenging activity of Linalool on hydrogen peroxide. The results indicated high scavenging activity of Linalool on hydrogen peroxide. Hydrogen peroxide isn't always very reactive, however it may sometimes be poisonous to cell. It is able to produce hydroxyl radical inside the cells. For that reason, the eliminating of Hydrogen peroxide may be very critical for antioxidant protection in cellular.

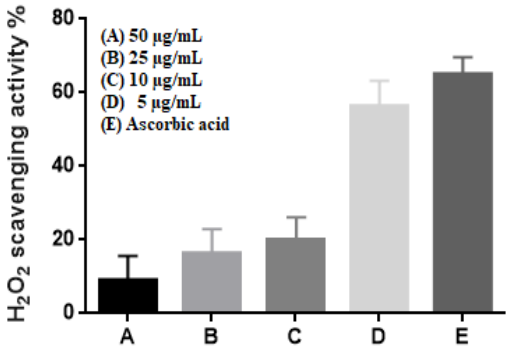


Figure 4 Antioxidant activity of Linalool analyzed with H_2O_2.

4. Conclusion

The present study demonstrated the high antioxidant activity of Linalool on Free radical scavenging in comparison with ascorbic acid as standard reference. The results confirmed that the Linalool can be used in the synthesis of several type of compound with ability to act as antioxidant and can be used as a medicine drug. It can be used in the treating several types disease and cancer and diseases as a result of antioxidant activity of it.

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