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VIBRATIONAL SPECTROSCOPY MEASUREMENTS OF LINALOOL WITH TWO FLAVONOIDS

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Abstract

Linalool is a normally happening intensify that has been utilized widely as a seasoning operator and scent. Human introduction to linalool likewise happens through its utilization as a pain relieving and from clove cigarettes. Linalool goes about as regular cancer prevention agent on oleogenous nourishments and furthermore goes about as an enemy of carminative, hostile to uncontrollable and disinfectant in drug store and as an antimicrobial specialist. Since the majority of the medications utilized in the malignant growth are apoptotic inducers, the apoptotic impact and anticancer instrument of linalool were researched against colon cancer cells. Vibrational (FT-IR and FT-Raman) spectral measurements were performed for an analysis of one of the Tulasi leaf ingredients, Linalool without and with the presence of two flavonoids Quercetin and Hesperidin nanoparticles.

keywords: Linalool, FT-IR, FT-RAMAN, Flavonoids.

1. INTRODUCTION

Linalool (L) is a monoterpene, and is often positioned as crucial issue in crucial oils of various species of fragrant flowers inclusive of Lavandula angustifolia Mill. (Lamiaceae), Jasminum subtriplinerve Blume (Oleaceae), Rosmarinus officinalis L. (Lamiaceae), Melissa officinalis L. (Lamiaceae), Stapf (Poaceae) Cymbopogon citratus (DC.) and Ocimum sanctum L. (Lamiaceae) (Elisabetsky et al. 1995; Re et al. 2000; Batista et al. 2008; Linck et al. 2009, 2010; Cheng et al. 2012; Khan et al. 2014). It is broadly utilized by industry as an essence within the manufacture of soaps detergents perfumes and shampoos (Mitic Culafic et al. 2009). Linalool (L, 3,7-dimethyl-1,6-octadien-three-ol) is a obviously happening terpene alcohol observed in spices of plants (such as anise, pepper and fennel) with several business applications, in particular in every day chemicals and perfume flavour, cosmetics and medical industries (Backtorp et al. 2006; Scheman et al. 2014; Mitropoulou et al. 2015). Linalool is related to several pharmacological activities, along with antitumor (Gu et al. 2010; Miyashita & Sadzuka 2013), antidepression (Coelho et al. 2013; Guzman- Gutierrez et al. 2015), anti-inflammatory (Li et al. 2015; Miraghazadeh et al. 2015), analgesia (Peana et al. 2003; Batista et al. 2008, 2010) and antimicrobial action (Jedlickova et al. 1992; Park et al. 2012). Linalool is a monoterpene antioxidant, volatile oils of numerous aromatic species, utilized in Indian medicine systems. Linalool possesses strong antioxidative property and scavenges ROS generated by diverse toxicants (Wang et al.2012). Furthermore, linalool suggests anticancer assets in tumor cells (Loizzo et al.2008), and it induces apoptosis in human leukemia cells (Paik et al.2005). The present study demonstrated the availability of FTIR and FT-RAMAN spectroscopy for quantitative analysis. Nanoparticles(np) of flavonoids [quercetin (Q), hesperidin(H)] have interaction with linalool and yield the complex formation between them.

2. EXPERIMENTAL

Linalool (L) and the flavonoids, [quercetin (Q) and hesperidin (H)] were bought in its most purity from Sigma-Aldrich and used without further purification. Stock solutions of the Linalool had been prepared at a consciousness of 10-3 M and saved in dark with a view to shield them from light. For the identical motive, to limit a probable photodegradetion of flavonoid molecules, the examined solutions were encompass from light slight throughout the out of measurement times. All answers were freshly prepared with triple distilled water earlier than experiments and used at once. The vibrational infrared spectra of samples of Linalool and flavonoids had been recorded 4000 at room temperature, with an AGILENT CARY 630 FTIR Spectrometer. The normal Raman spectra were acquired at once from FT-Raman measurements. The FT-Raman spectra have been acquired by means of using a BRUKER RFS - 27 STAND FT -Raman Spectrometer.

3. RESULTS AND DISCUSSION

Fourier transformed infrared spectroscopy is one of the most widely employed techniques for functional groups identification. Fig 1 and Table 1 showed the infrared spectra and the characteristic bands observed in linalool without and with quercetin and hesperidin nanoparticles in the range of 4000 – 500 cm.

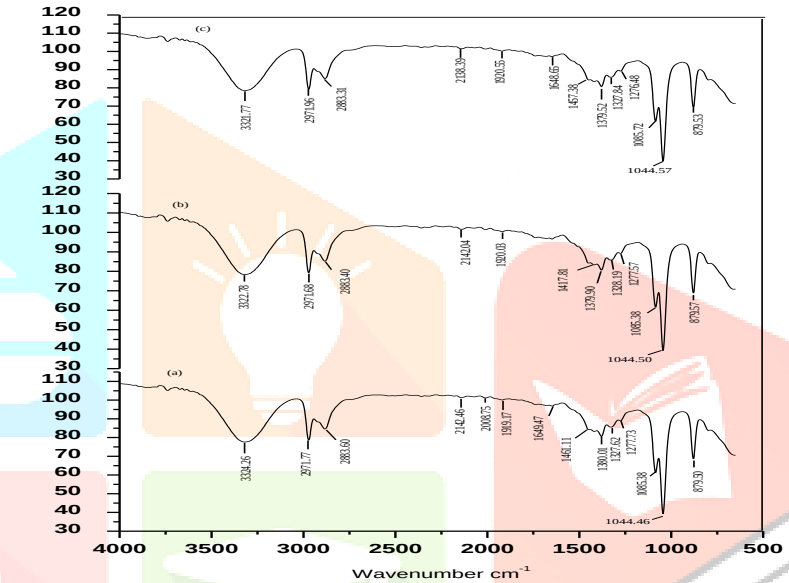

Fig - 1: FTIR Spectra of (a) L (b) L +Q np and (c) L+H np) complex

These spectra display broad absorption band centered at 3600 cm^{-1} for linalool which are attributed to alcohol OH stretch.

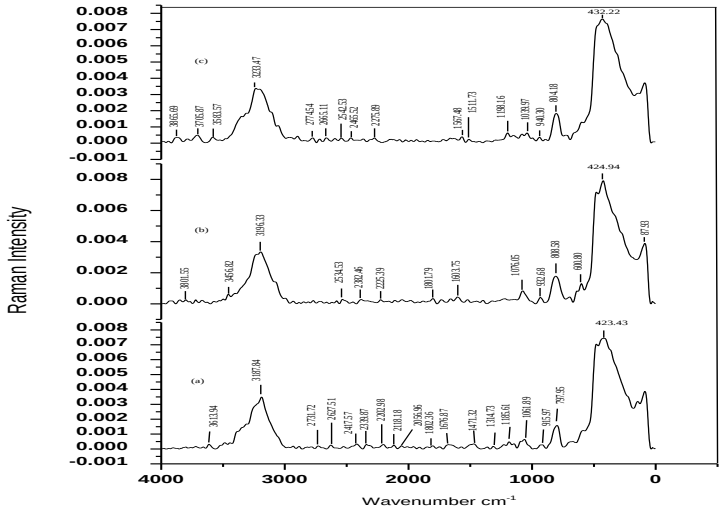

Fig -2: FT-Raman Spectra of (a) L (b) L +Q np combination and (c) L + H np complex

The absorption bands in the region of 2900-2980 cm^{-1} in linalool spectrum are assigned to the C-H stretching vibrations. The strong bands in the region of 1085 cm^{-1} in linalool spectrum are assigned to the C- O stretching vibrations. There are many studies on the composition of linalool reporting important variations in the proportion of its major components. (Zheljazkov et al.2008:Chalchat et al.2008). The most important bands in the Raman spectrum of apper at 1672,1431,1314 and 1185 as shown in Fig 2 and Table 1. These bands are similar to those observed in an earlier reported Raman spectrum of Linalool (Daferera et al.2002). The strong bands at 1672, attributed to C=C stretching mode and the band at 1431 cm^{-1} appears in the typical region for CH_3 /CH_2 bending modes.

Table 1: FTIR and FT- Raman peak assignments of L, L+ Q np and L+ H np complex

L Wavenumber (cm^{-1})		L+ Q Wavenumber (cm^{-1})		L+ H Wavenumber (cm^{-1})		Peak assignment
FTIR	FT-RAMAN	FTIR	FT-RAMAN	FTIR	FT-RAMAN	
3322.25		3321.48		3320.84		OH bond
	3619		3456		3583	
2971.65		2971.69		2971.54		C- H Stretching
2883.30		2883.37		2882.87		CH_3 Symmetric Strecthing
	1672		1608		1567	C=C Stretching
1417.87	1431	1418.27		1418.47		C-H symmetrical bending
1379.87	1314	1379.85		1379.78		CH_3 Asymmetric bending
1328.35		1329.07		1328.74		CH_3 symmetric Strecthing
1277.55		1277.46		1277.61		OH in plane bending
1085.35	1185	1035.35	1076	1085.36	1039	C-C stretching
1044.48		1044.47		1044.52		C-H in plane bending
879.54		879.54		879.60		C–C ring stretching

There are two CH_3 groups directly attatched to a C=C in the chemical structure of linalool; therefore, the band at 1314 cm^{-1} can be assigned to a CH_3 bending mode. The band at 1185 cm^{-1} scens to be related to the C-C stretching mode of linalool.

4. CONCLUSON

Linalool is the one of the most commercially important products. The interaction of linalool with the nanoparticles of flavonoids (quercetin and hesperidin) has been studied successfully by using FTIR and FT-RAMAN spectroscopic techniques. It can be concluded that the nanoparticles of flavonoids interact well with linalool and as a result of interaction it yield the formation of complex between then. These complexes have value due to their applications in medicine.

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