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FT-IR AND UV-VIS SPECTROSCOPY PHOTOCHEMICAL ANALYSIS OF DRAGON FRUIT

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ABSTRACT

The present was carried out to investigate the active substance present in ethanolic extract of *Hylocereus undatus* (dragon white fruit) by using the analysis of UV-VIS and FT-IR.The result of UV-VIS spectroscopic analysis confirm the present of flavonoids and anthocyanin in the fruit extract. For FT-IR analysis confirmed the presence of Alcohols, phenols, alkenes, amines, aromatics, aliphatic amines, alkynes compounds which show major peaks at 3436.45, 2984.50, 1637.16, 1415.69, 1078.55, 1045.82, 650.65 respectively.The present study demonstrated the *Hylocereus undatus* (white dragon fruit)t has rich source of secondary metabolites.

KEYWORDS: Dragon fruit**,** UV-VIS and FT-IR Anti-cancer; Antioxidant,. *Hylocereus undatus* (white dragon fruit).

INTRODUCTION

Dragon fruit or pitaya is one of the tropical fruit the cactus family, *Cactaceae*. In general, there are two species of dragon fruits commonly found in market i.e. red dragon fruit (*Hylocereus polyrhizus*) and white dragon fruit (*Hylocereus undatus*). Their differences lie on the size and shape of the fruit, as well as the colour of their pulps i.e. red(*H. polyrhizus*) or white (*H. undatus*). The average weight of a dragon fruit is around 350 g. The best climate condition for dragon fruit plantation is dry, tropical or subtropical with annual rainfall ranges from 20-50" per year. As for the fruit production, one plant can produce up to four to six

cycles of fruits per year and fruits are harvested when they are fully expanded and the skins become 85% red in colour.[1]

Dragon fruit (*Hylocereus undatus*), also known locally as pitahaya fruit, is grown commercially in many farm in Malaysia. The plant climb on everything from trees to brick walls using aerial roots and can grow to about 20 ft high with ribbed stems, green and growing spinier with age. The fruits vary in size, color and flavor depending on the variety. There are two identified type of fruit, the red dragon fruit and white dragon fruit. It is rich in ascorbic acid (vitamin C), at levels far higher than most imported and local fruits. The fruit, especially the red-fleshed varieties contain fair amount of lycopene. Some vitamin B such as thiamin (B1), riboflavin (B2), niacin and B3 are also found in the fruit. In addition, it also contains a fair amount of carotene, calcium and zinc.[2]

Dragon fruit, as in many other fruits and vegetables, is also rich in antioxidants that help to reduce the incidence of degenerative diseases such as arthritis, arteriosclerosis, cancer, heart disease, inflammation and brain dysfunction. In addition, antioxidants were reported to retard ageing (Vaiserman, 2008; Grodstein *et al*., 2003) besides preventing or delaying oxidative damage of lipids, proteins and nucleic acids caused by reactive oxygen species. These include reactive free radicals such as superoxide, hydroxyl, peroxyl, alkoxyl and non radicals such as hydrogen peroxide and hypochlorous acid. They scavenge radicals by inhibiting initiation and breaking of chain reaction, suppressing formation of free radicals by binding to the metal ions, reducing hydrogen peroxide and quenching superoxide and singlet oxygen. Among the most abundant antioxidants in fruits are polyphenols and ascorbic acid. The polyphenols, most of which are flavonoids, are present mainly in ester and glycoside forms.[3]

Dragon fruit, also known as pitahaya or strawberry pear is the fruit of several cactus species, especially of the genus Hylocereus. Native to Mexico and Central and South America, these vine-like epiphytic cacti are also found in Taiwan and are also cultivated in Southeast Asian countries such as Malaysia, Vietnam, and the southeast coast of China. They are also found in Taiwan. The flesh, which is eaten raw, is mildly sweet and low in calories. The flavour is sometimes likened to that of the kiwifruit. The fruit may be converted into juice or wine; the flowers can be eaten or steeped as tea. Sesame seed-sized seeds are embedded throughout the flesh. Although the tiny pitahaya seeds are eaten with the flesh, the seeds are indigestible. The red flesh variety is believed to be rich in antioxidants and has an exceptionally high

content of soluble fiber[4], It is considered a good source of vitamin C. The scientific name of these fruits comes in three types all with leathery, slightly leafy skin:

1) *Hylocereus undatus*, white flesh with pink skin

2) *Hylocereus polyrhizus*, red flesh with pink skin

3) *Selenicereus megalanthus*, white flesh with yellow skin.[4]

In the present study,we recorded both UV-VIS and FT-IR profile of fruit extract to known the various phytoconstituents and determine the functional group present in *Hylocereus undatus* (white dragon fruit).

MATERIALS AND METHODS

1. Sample collection and identification

The fruits of white dragon fruits were collected from the local market Chennai,Tamilnadu and identified.

2. Ethonal extraction

The collected fruits were washed thoroughly in distilled water to remove contaminants; the peels were removed, then it was cut into small pieces and subjected to extraction (100 g) by maceration in 250 ml of pure ethanol (100%) at room temperature. The macerates were filtered, and the filtrate was dried at low temperature (40-50 °C) under vacuum. The extracts were stored in air-tight containers at 4 °C until further use.[5]

3. UV-Visible analysis

The extracts were examined under visible UV-Visible spectrum. The extracts were scanned in the wavelength ranging from 200-1100 nm using Systronic Spectrophotometer. These solutions were scanned in turn at intervals of 50 nm and the characteristic peaks were detected. The peak value of the UV-Visible was recorded.

4. Fourier Transform Infrared (Ftir) Spectroscopic Analysis

Spectra were obtained with the aid of an OMNI-sampler attenuated total reflectance (ATR) accessory on a FTIR spectrophotometer (Perkin Elmer Spectrophotometer system, USA) followed by previous methods with some modification (Liu *et al*., 2006). A small amount of liquid of extract was placed directly on sample holder of the infrared spectrometer with constant pressure applied and data of infrared absorbance, collected over the wave number ranged from 4000 cm^{-1} to 400 cm^{-1} and computerized for analyses by using the 21 CFR part

11 software. The reference spectra were acquired from the cleaned blank crystal prior to the presentation of each sample replicate. The peak values of FTIR were recorded. Each and every analysis was repeated twice and confirmed the spectrum.

RESULT

UV-visible spectral analysis of sample

The flavonoids spectra typically consist of two absorption maximum in the range 214.4 nm(band1)and 974.6nm (band 2).The precise position and relative intensites of these of these maximum give valuable information(reference 5neha sahu jyoti saxena 2013). The result of FT-IR spectrum and its peak value with functional groups were represented in Fig 1 and table 1. Result of UV-Visible spectroscopic analysis confirm the presence of tannin and flavonoids in the fuit extract.

FT-IR spectrum analysis of sample

The FT-IR spectrum was used to identify the functional group of the active components.Based on the peak value in the region of infrared radiation.The result of FT-IR spectrum and its peak value with functional groups were represented in Fig 2 and table.

2. When the *Hylocereus undatus*

Fruit extract was passed in to the FT-IR,the functional group of the component were separated based on its peak ratio.The results of FT-IR analysis confirmed the presence of Alcohols, phenols, alkanes, amines, aromatics, aliphatic amines, alkynes peaks at 3436.45, 2984.50, 1637.16, 1415.69, 1078.55, 1045.82, 650.65 respectively.[6]

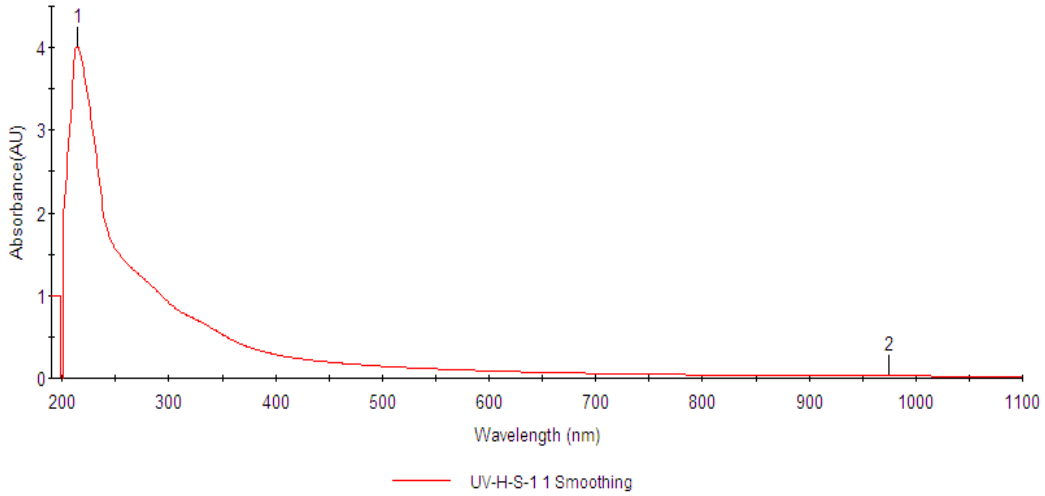

Fig. 1: UV Visible Spectrum.

Table 1: Uv Visible Spectrum Peak Values

PEAK NO.	Absorbance (AU)	Wavelength (nm)
1	4.000	214.4
2	0.035	974.6

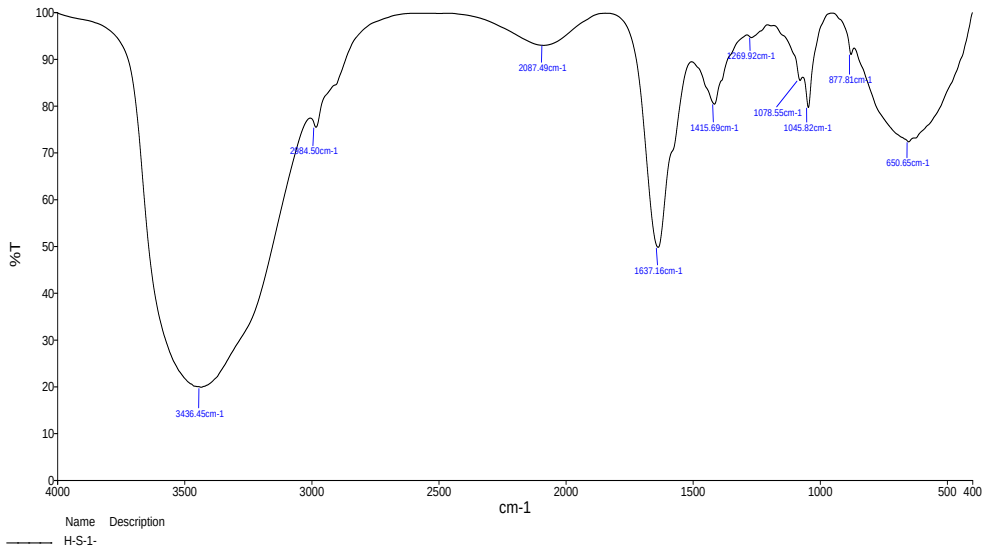

Fig. 2: Fourier Transform Infrared spectroscopy (FTIR).

Table. 2: Functional group identifications.

S.NO.	Frequency (Cm^{-1})	Bond	Functional Group
1.	3436.45	O–H Stretch, H–Bonded	Alcohols, Phenols
2.	2984.50	C–H Stretch	Alkanes
3.	1637.16	N–H Bend	1˚ Amines
4.	1415.69	C–C Stretch (In–Ring)	Aromatics
5.	1078.55, 1045.82	C–N Stretch	Aliphatic Amines
6.	650.65	–C≡C–H: C–H Bend	Alkynes

DISCUSSION

Spectroscopic method have become a powerful tool for secondary metabolite profiling as well as for qualitative and quantitative analysis of the pharmaceutical and biological material. The present study of UV-visible spectrophotometer revealed that the presence of phenolic like tannin and flavonoids compound which indicates the medicinal properties of this fruit. Phenolic compound tannin used as antioxidant, anti-inflammatory and anticancer and flavonoid compound used as antioxidative activity, hepatoprotective, anti-inflammatory anticancer and antiviral activity of this fruit extract also observed from this study.

By using FT-IR spectrum, we can confirm the functional constituents presence in the given fruit extract and even evaluate the qualities of medicinal materials. The result of the present

spectrum also revealed the functional constituents present in the ethanolic fruit extract of *Hylocereus undatus*. The result of the present study confirms the presence of Alcohols, phenols, alkanes, amines, aromatics, aliphatic amines, alkynes compound in ethanolic fruit extract of Alcohols, phenols, alkanes, amines, aromatics, aliphatic amines, alkynesz *Hylocereus undatus*. The result of the present study suggest that various medicinal properties of the *Hylocereus undatus.*

CONCLUSION

The present study demonstrated that *Hylocereus undatus* has rich source of secondary metabolites. These findings suggested that *Hylocereus undatus* could be a potential source of natural antioxidative aand preventing oxidative stress related degenerative diseases. Further purification identification and characterization of the active compound would be our priority in future studies. Result revealed that the fruit have several chemical constituents of high therapeutic efficacy. Further studies are required to investigate the extract of for potential pharmacological properties.

CONFLICT OF INTEREST

The authors declare that there are no conflict of interest. The research received no specific grand from any funding agency in the puplic, community or non-for profit sectors.

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