FUDMA Journal of Sciences (FJS)
ISSN online: 2616-1370
ISSN print: 2645 - 2944
Vol. 8 No. 3, June, (Special Issue) 2024, pp 119 - 123
DOI: https://doi.org/10.33003/fjs-2024-0803-2487

EVALUATION OF THE PHYTOCHEMICAL COMPOUNDS IN LEAF EXTRACT OF *APIUM GRAVEOLENS L.* GROWN IN JOS, NIGERIA, USING UV-VIS AND FTIR ANALYSES

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ABSTRACT

The present investigation was focused on the UV-VIS and FT-IR analyses of *Apium graveolens L.* (Apiaceae). The organic solvent ethanol and acetone were used for the extraction. The fresh leaf of Celery was crushed extracted with ethanol and acetone by maceration. The UV-VIS spectrum of crude ethanol extract showed the peaks at 668.00, 739.50, 773.00, and 789.00 nm with the absorbance of 0.076, 0.047, 0.044 and 0.043 respectively, while the crude acetone extract showed the peaks at 496.00, 532.50, 602.00, 663.50 nm with absorbance of 0.461, 0.418, 0.342 and 0.427 respectively. These absorption bands are in the visible region and this indicates the presence of extensively highly conjugated pi-electrons of organic pigments such as, chlorophyll, anthocyanins, β-carotene. The FTIR spectrum of ethanol leaves crude extracts confirmed the presence of compounds such as primary alcohols, amines, alcohols, carboxylic acids, conjugated alkenes, esters, azides, thiols, aldehydes and alkanes, while the following functional group such as fluoro compounds, carboxylic acids, vinyl ethers, conjugated alkenes, azides, thiols, aldehydes, alkanes, alcohols were detected in acetone crude extracts. The study confirmed that *Apium graveolens L.* leaves contain secondary metabolites that may play a pivotal role in human health care.

Keywords: *Apium graveolens L.*, Marceration, Plant extracts, UV-VIS spectroscopy, FTIR spectroscopy

INTRODUCTION

The plant *Apium graveolens L.*, commonly known as celery, belongs to the Apiaceae family, a large group of primarily aromatic flowering plants. This family derives its name from the genus Apium. Native to the Mediterranean regions of Asia, Africa, and Europe, celery thrives mainly in coastal areas. It is extensively cultivated in temperate zones as a significant garden crop, with its leaves and stalks enjoyed as a popular vegetable. (Ruchi, R *et al.*, 2017). The plant genus has had a long history of its therapeutic uses and *Apium graveolens* contains variety of bioactive components such as terpenoids, phenolic acids, alkaloids, tannins and flavonoids. These compounds have numerous biological and pharmacological properties such as hyperglycemic, analgesic, anti-inflammatory, anti-hypertensive, anticancer, antineurogenesis, anti-platelet, weight lost, natural diuretic, reduce menstrual pain and aid in digestion (Rizzo., 2009).

Celery (*Apium graveolens L., Apiaceae*) is a medicinal herb used as food, and also in traditional medicine. It contains aromatic substance in the roots, stem and leaves (Kooti., 2017). The healing properties of celery are due to the essential oils and flavonoids mostly apeginin and apiin (Asif *et al*., 2011). Apigenin, which has been shown to induce death in cancer cells (Govil, *et al*., 2007). Celery leaves and stalks are commonly consumed on their own or included in various dishes across nearly every culture in Nigeria. These leaves provide significant nutritional benefits that can enhance health (Herbst, 2001). Notably, previous research indicates that celery plants grown in Jos, Nigeria, contain phthalides, compounds reported to contribute to the bioactivity of celery (Adelakun et al., 2021). Celery extracts can be considered as a good source of natural antioxidants and antimicrobials (Sung, *et al*., 2016). The celery plant extracts grown in Jos, Nigeria showed strong antioxidant capacity (Stephen *et al*., 2020). The extracts can be considered as a good source of natural antioxidants and antimicrobials. Based on the result of free radical scavenging activity observed, the crude ethanolic extract exhibit stronger antioxidant activity as compared to standard ascorbic acid. The presence of flavonoids, terpenoids, anthocyanins and carotenoids among other secondary metabolites may be responsible for its antioxidant property and its medicinal application (Stephen, *et al*., 2020).

MATERIALS AND METHODS

Plant Material and Extraction

The fresh leaf of *Apium Graveolens L.* were collected in the month of june, 2018, at Yelwa, Jos North Local Government Area of Plateau State, Nigeria. The plant was identified and authenticated at the department of Horticulture, Federal College of Forestry Jos, Plateau State, Nigeria. The freshly collected leaves was pounded into small particle size using mortar and pestle. The crushed sample (500 g) was divided into two and immediately extracted by maceration with 400ml of ethanol and 400ml of acetone for 2 days (48 hours) with occasional stirring at intervals. The mixture was then decanted into a beaker, and filtered into a conical flask using the muslin cloth and Whatman no.1 filter paper. The crude ethanol extract of leaves and crude acetone extract of the leaves were concentrated using Rotary Evaporator (R-205) at 40^{o}C respectively to obtain the crude, both crude extracts were properly kept in an air-tight desiccator for further use.

UV-VIS

The leave ethanol crude extract and acetone crude extract were centrifuged into 3000 rpm for 10 min and after filtered that through the Whatmann No.1 filter paper. The sample was diluted into 1:10 with the same solvent. The leaves crude extracts have been scanned for the wave length ranging at 400nm to 800 nm using Perkin Elmer spectrophotometer and the characteristic peaks were detected. The peak values at the

UV-VIS were recorded respectively (Theng, KB., & Korpenwar, A., 2015).

FTIR Analysis

The FTIR analyses of the leaves of ethanol crude extract and acetone crude extract have been performed using Perkin Elmer spectrophotometer system. This was used to deck the characteristic peaks in ranging from 1000 cm^{-1} to 4000 cm^{-1} and the corresponding functional groups. The peak values of the FTIR were recorded respectively (Jain,. *et al*., 2016)

RESULTS AND DISCUSSION

UV-VIS analysis

UV VIS spectrophotometric analysis, is a simple rapid and accurate method for the determination of bioactive compound present in medicinal plants the UV spectral analysis showed the presence of highly conjugated compounds in both crude extracts. The UV-VIS analysis was performed for identification of phytoconstituents present in ethanol and acetone crude extracts of the leaves of *Apium graveolens L*. The UV- visible spectra acquired were used to identify the extensively highly conjugatedaromatic organic compounds. The qualitative UV-VIS profile of ethanol crude extract and acetone crude extract of *Apium graveolens L*. leaf was taken at the wavelength range: 400 nm to 800 nm. The ethanol leaves crude extract showed the peaks at 789.00, 773.00, 739.50, and 668.00 with the absorption 0.043, 0.044, 0.047, and 0.076 nm in table 1. The UV-VIS spectrum of the ethanol leaves crude extract 0f *Apium graveolens L* plant extract is shown in Figure1. The acetone leaves crude extract showed the peaks at 663.50, 602.00, 532.50, 496.00 and 408.50 nm with the absorption 40.427, 0.342, 0.418, 0.461 and 1.052 nm in table 2. The UV-VIS spectrum of the acetone leaves crude extract of *Apium graveolens L* plant extract is shown in Figure 2. (Stephen, *et al*., 2020) had reported that the crude ethanol extract of celery leaf exhibit stronger antioxidant activity as compared to standard ascorbic acid. The presence of flavonoids, terpenoids, anthocyanins and carotenoid may be responsible for the antioxidant properties.

Table 1: UV-VIS Peak values of ethanol leaf crude extract of *Apium graveolens L*.

S.NO	Wavelength (nm)	Absorption peak
1	789.00	0.043
2	773.00	0.044
3	739.50	0.047
4	668.00	0.076

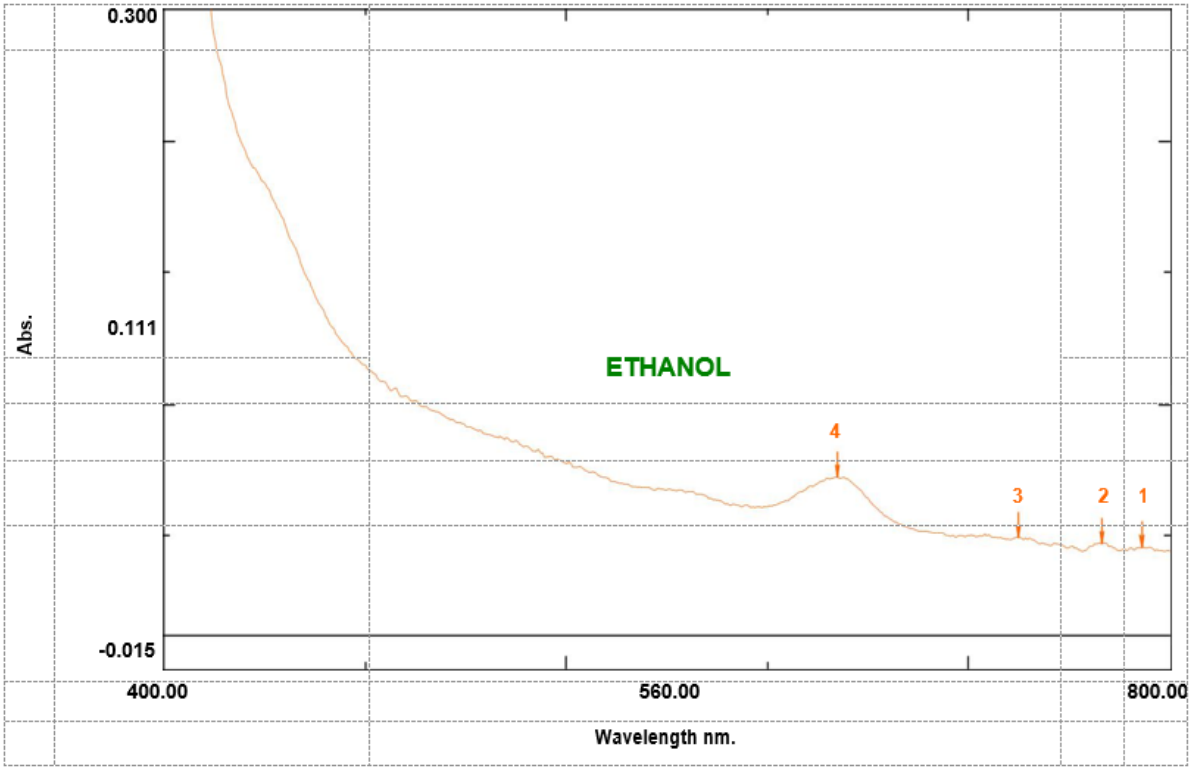

Figure 1: UV-VIS Spectrum of ethanol leaf crude extract of *Apium Gravelens L*. leaf

Table 2: UV-VIS peak values of ethanol leaf crude extract of *Apium graveolens L*.

S.NO	Wavelength (nm)	Absorption peak
1	663.50	0.427
2	602.00	0.342
3	532.00	0.418
4	496.50	0.461
5	408.50	1.052

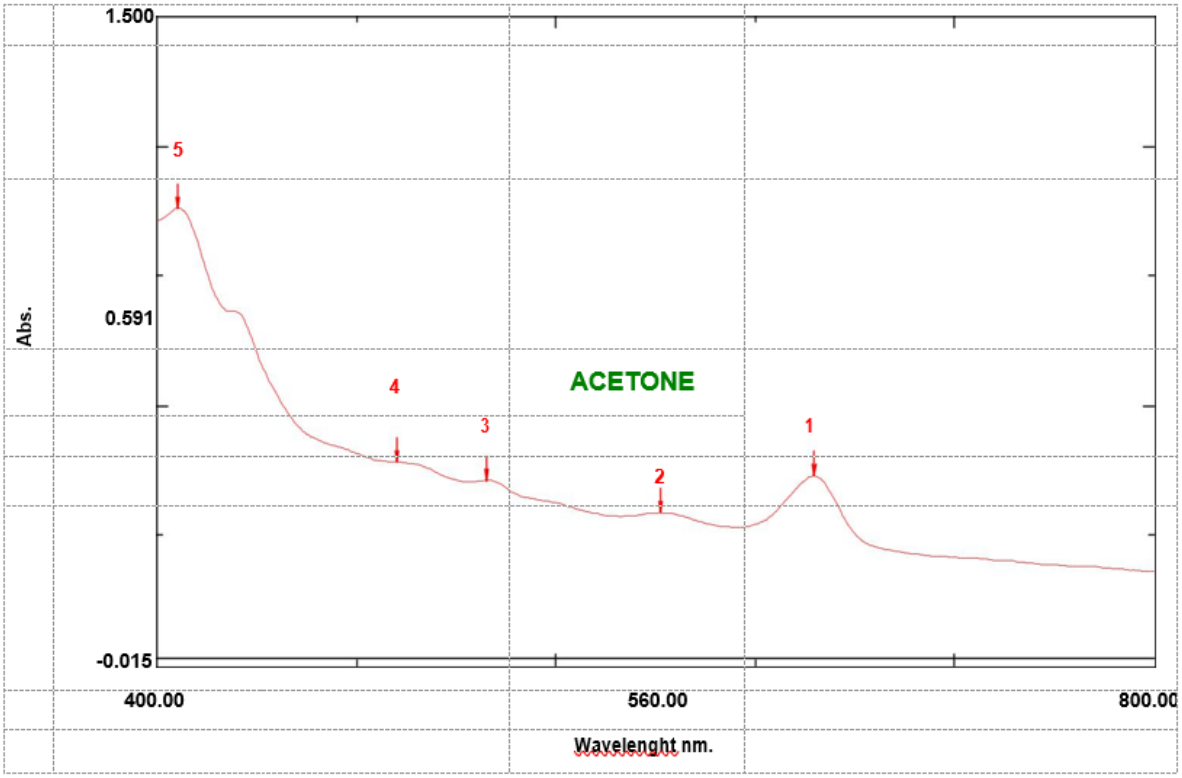

Figure 2: UV-VIS Spectrum of acetone leaf crude extract of *Apium Gravelens L*.

FTIR Analysis

The FTIR spectrums have been used to identify the functional groups of the active components based on the peak value in the region of infrared radiation. The results of FTIR peak values and functional groups were presented in (Table 3 and 4) where-as the FTIR spectrum of ethanol leaf crude extracts and acetone leaves crude extracts are shown in Figures 3 and 4 respectively. The FTIR spectrum of the ethanol crude extract of the leaves indicated the presence of primary alcohols, amines, alcohols, carboxylic acids, conjugated alkenes, esters, azides, thiols, aldehydes and alkanes in crude ethanol extracts of the leaves and the FTIR spectrum of the acetone crude extract of the leaves confirmed the presence of fluoro compounds, carboxylic acids, vinyl ethers, conjugated alkenes, azides, thiols, aldehydes, alkanes, alcohols or phenols respectively. Hence, the ethanol and acetone leaves crude extracts subjected to FTIR analysis is used for the identification of chemical constituents' presents in *Apium graveolens L*. proved to be a reliable and remedial method for detection of phytochemicals. (Suleman *et al*., 2022) had reported that phthalide, terpenoid and flavones were identified in the celery grown in Nigeria which may be responsible for the medicinal value of the plant. Previous studies reported that water and 70% ethanol extract of celery have antioxidant, anticancer, and antihypertensive activities (Eris *et al*., 2022).

Table 3: Functional Group present in crude Ethanol extract of *Apium Gravelens L.* leaf

S.NO	PEAKS CM^{-1}	FUNCTIONAL GROUP AND VIBRATION TYPE	SUSPECTED FUNCTIONAL GROUP NAME
1	3387.11	O-H Streching	H-bonded
2	2885.60	C-H Streching	Alkane
3	2816.16	C-H Streching	Aldehyde
4	2330.09	S-H Streching	Thiol
5	2137.20	N=N=N Streching	Azide
6	1705.13	C=O Streching	Esters
7	1635.69	C=C Streching	Conjugated alkene
8	1419.66	O-H bending	Carboxylic acid
9	1365.65	O-H bending	Alcohol
10	1226.77	C-N Streching	Amine
11	1057.03	C-O Streching	Primary alcohol

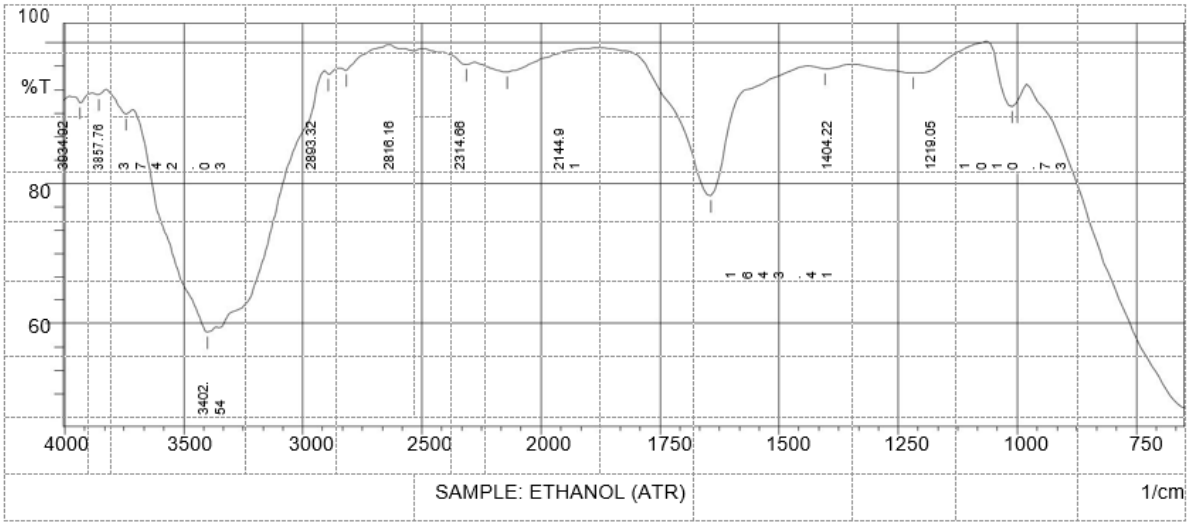

Figure 3: FTIR Spectrum of ethanol crude extract of *Apium Gravelens L.* leaves

Table 4: Functional Group present in crude acetone extract of *Apium Gravelens L.* leaf

S.NO	PEAKS CM^{-1}	FUNCTIONAL GROUP AND VIBRATION TYPEBOND TYPE	SUSPECTED FUNCTIONAL GROUP
1	3402.54	O-H Streching, H-bonded	Alcohol, Phenols
2	2893.32	C-H Streching	Alkanes
3	2816.16	C-H Streching	Aldehyde
4	2314.66	S-H Streching	Thiol
5	2144.91	N=N=N Streching	Azide
6	1643.41	C=C Streching	Conjugated alkene
7	1404.22	O-H bending	Vinyl ether
8	1219.05	C-O Streching	Carboxylic acid
9	1010.73	C-F Streching	Fluoro compound

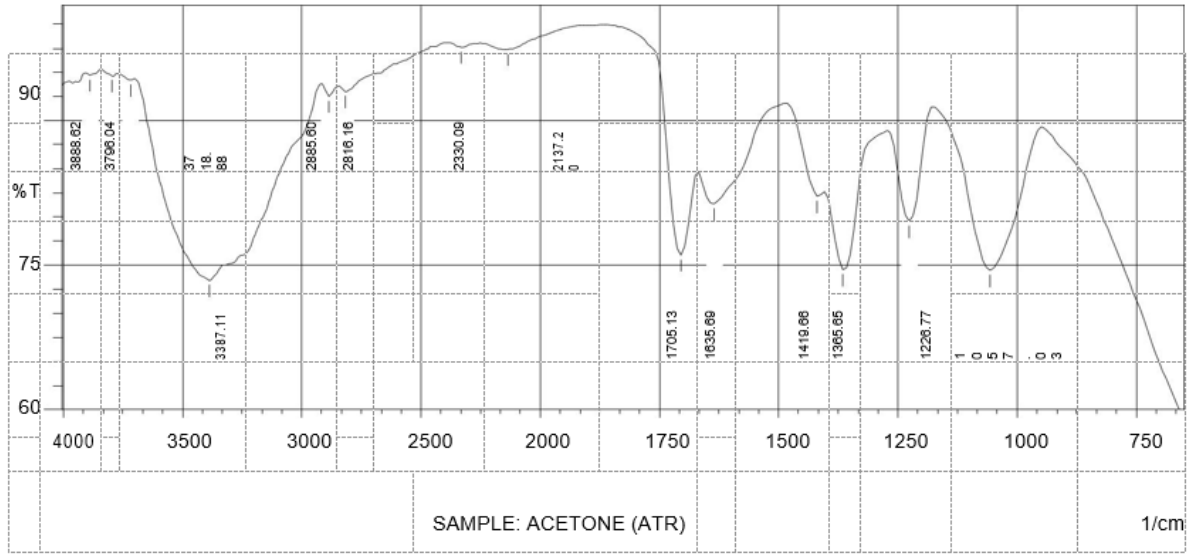

Figure 4: FTIR Spectrum of the acetone crude extract of *Apium Gravelens L.* leaf

CONCLUSION

This investigation has given preliminary information to determine the phytochemical composition of *Apium Gravelens L.* using spectral of UV-VIS, and FTIR. The UV-VIS absorption bands are in the visible region and this indicates the presence of extensively highly conjugated pi-electrons of organic compounds. The FTIR spectral analysis showed the presence of characteristics functional groups in ethanol leaf crude extracts and acetone leaf crude extract of *Apium Gravelens L.* plants offer credence to its use by the human community, it is recommended as a plant of phytopharmaceutical importance in traditional and modern medicine. However, more functional groups were identified in the ethanol crude extract which may be a suitable solvent for the extraction of celery, Further studies will need to be undertaken to ascertain fully its bioactivity.

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