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Extraction, Identification and Quantification of Vitexin and p-Coumaric Acid from *Basella alba* L. Cultivated in Iraq

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Abstract

The study aimed to isolate, characterize, and quantify two bioactive compounds from *Basella alba* (Malabar spinach), a plant of nutritional and therapeutic value. Vitexin and p-coumaric acid were isolated and quantified using high-performance liquid chromatography (HPLC), and their characterization was carried out using Fourier transform infrared spectroscopy (FT-IR), liquid chromatography-tandem mass spectrometry (LC-MS/MS), Nuclear Magnetic Resonance (NMR) and the spiking method, where the isolated compound was compared with the standard for confirmation. In *Basella alba* the concentrations of p-coumaric acid and vitexin were found to be 144 µg/g and 220 µg/g, respectively, which exceeded those identified in previous studies. Important Several factors that play a significant role in influencing secondary metabolite production in plant such as environmental factors, particularly light exposure and geographical conditions. Soxhlet apparatus was employed to extract compounds. The compounds, demonstrating high recovery rates consistent with previous findings. These results highlight the potential of *Basella alba* as a valuable plant for further research into its health benefits. Future studies should explore its applications in nutraceuticals and pharmaceuticals.

Keywords: *Basella alba*, Vitexin, p-coumaric acid, HPLC, LC-MS/MS, FT-IR

Introduction

Scientists have discovered and characterized over 100,000 natural compounds from plants, primarily classified as terpenes, phenols, and alkaloids. Among these, flavonoids are part of a large group of phenolic compounds, and these compounds are an essential component of plant cells [(1)]. Medicinal plant use, however, is not limited to developing countries; in fact, demand for herbal medicine is increasing in many developed countries [(2)]. Phenolic compounds consist of one or more aromatic rings with hydroxyl groups or their derivatives. Plants produce these compounds as secondary metabolites, which are organic chemicals crucial for defense, signaling, and stress adaptation, but are not directly involved in growth or reproduction. The antioxidant capacity of natural phenols is important for foods, especially functional foods, medicinal foods, and nutritional supplements, as multiple phenols are associated with a wide range of physiological properties including anti-inflammatory, antimicrobial, antioxidant and powerful radical scavengers [(3)]. The major classes of phenolic compounds are flavonoids, phenolic acids, tannins, stilbenes, and lignans. Flavonoid-rich plant extracts from different species have been reported to possess antimicrobial activity against a wide range of microorganisms. Thus, their mode of antimicrobial action may be related to their ability to inactivate microbial adhesions, enzymes and cell envelope transport proteins, among other targets. Additionally Microbial cell membranes may easily interact with lipophilic flavonoids, which are defined by the presence of nonpolar alkyl or methoxy groups that increase their solubility in lipid environments. This can cause membrane breakdown and cellular content leakage.[(4)]. Because they are antioxidants and provide protection against heart disease, some types of cancer, and age-related cell component deterioration, flavonoids are considered to be highly beneficial bioactive substances. Superoxide and hydroxyl radicals are among the harmful free radicals that can be scavenged because of their polyphenolic nature [(5)]. *Basella alba* L., a perennial vine that grows quickly and is tolerant to high temperatures, is a member of the Basellaceae family [(6,7)]. Vine spinach, Malabar spinach, Indian spinach, and Ceylon spinach are some of its common names [(8)]. It has long been used widely in Chinese and Indian medicine because of its

therapeutic properties, which include its use as a diuretic, cleaning agent, and anti-inflammatory effects [9]. The plant exhibits diverse pharmacological activities, including antiviral, anticancer, antioxidant, anti-inflammatory, anti-cholesterol, anti-ulcer, antibacterial, hypoglycemic, wound-healing, and androgenic properties [10]. Environmental variables and cultivar type are important determinants of *Basella alba*'s phytochemical content. Research has indicated notable differences in antioxidant activity, phytochemical concentration, and proximate composition based on geographic location [11]. *Basella alba* contains various bioactive substances such as phenolic compounds, peptides, and saponins. Carotenoids, organic acids, water-soluble polysaccharides, betacyanin, bioflavonoids, and vitamin K are abundant in the leaves. A number of triterpenes oligoglycosides, including momordins IIb and IIc, betavulgaroside I, and basella saponins A, B, C, and D were also yielded by the plant [12].

The antioxidant activity of *Basella alba* is closely linked to flavonoids and other polyphenols, which shield cells from oxidative damage [13]. Despite *Basella alba*'s well-established advantages, little is known about the precise nature and levels of two of the plant's main bioactive substances, vitexin and p-coumaric acid. The flavone glycoside vitexin is well-known for its neuroprotective [14], anti-inflammatory, and antioxidant qualities [15], while hydroxycinnamic acids p-coumaric acid is an important components of plant defense and have potent antibacterial and antioxidant capabilities [16]. This study aims to describe and quantify vitexin and p-coumaric acid in *Basella alba* by using advanced method such as infrared (IR) spectroscopy, high-performance liquid chromatography (HPLC), and liquid chromatography-tandem mass spectrometry (LC-MS/MS), this work attempts to describe and quantify vitexin and p-coumaric acid in *Basella alba*.

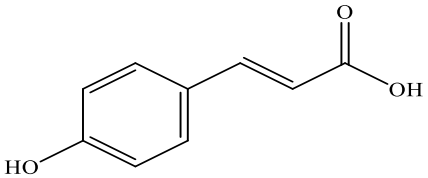

Figure 1. chemical structure of p-coumaric acid.

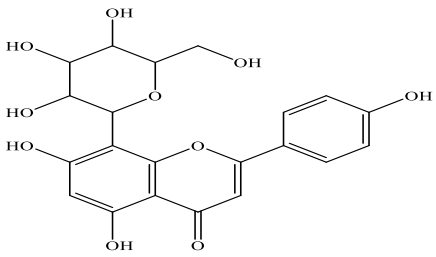

Figure 2. chemical structure of Vitexin.

Materials and Methods

Preparation of plant materials

The whole *Basella alba* plant was acquired in September 2024 from a farm in the city of Baghdad. The University of Baghdad's Biology Department's Assistant Professor Dr. Israa Abdulrazaq Majeed has discovered the authenticity of the plant. A mechanical grinder was used to grind the plant into a coarse powder after it had been washed and allowed to dry in the shade.

Extraction and fractionation

First, the plant material was defatted by macerating it for three days in n-hexane. After defatting, the plant material was extracted using a Soxhlet device for 12 hours with 1 liter of aqueous ethanol (ethanol-water 85:15 v/v). After filtration, the alcoholic extract was concentrated using a rotary evaporator to obtain the crude extract. The crude extract was suspended in 250 milliliters of distilled water and subjected to fractionation using a separatory funnel. It was first partitioned three times with 250 milliliters of petroleum ether to remove non-polar components. Afterward, the aqueous layer was further partitioned three times with 250 milliliters of ethyl acetate. Both petroleum ether and ethyl acetate fractions were collected separately, filtered, dried over anhydrous sodium sulfate, evaporated under reduced pressure using a rotary evaporator, and then weighed.

Preliminary phytochemical screening

Flavonoids test

Shinoda test: A small piece of magnesium ribbon was added to the alcoholic solution of the crude extract, followed by the dropwise addition of concentrated HCL, which reveals the presence of flavonoids by the formation of a color ranging from orange to red within one to two minutes [17].

Test for phenols

Ferric chloride test: Two milliliters of 10% aqueous ferric chloride were added. The appearance of a bluish color indicated the presence of flavonoids in the extracts [17].

P-coumaric acid and Vitexin identification using high performance liquid chromatography (HPLC)

At the Department of Environmental and Water Research/Ministry of Sciences and Technology, the HPLC analysis was carried out using the instrument model SYKMAN (Germany) to select the p-coumaric acid and vitexin contained in the fraction of ethyl acetate. The retention times of the investigated samples under identical circumstances were compared to those of standard materials. A gradient mobile phase comprising 95% acetonitrile + 0.01% Triflouroacetic acid as solvent A and 5% acetonitrile + 0.01% Triflouroacetic acid as solvent B was used to prepare the HPLC analysis using a C18-ODS column (250 × 4.6 mm, 5 µm). The injection volume was 100 µL, and the flow rate was set at 1 mL/min. The gradient program was as

follows: 10% A from 0 to 5 minutes; 25% A from 5 to 7 minutes; 40% A from 7 to 12 minutes; and then going back to the initial circumstances. The chemicals were found using a UV visible detector at 278 nm [18].

Isolation of p-coumaric acid and Vitexin by Repeated analytical high performance liquid chromatography (HPLC) .

Analytical HPLC was used to collect the target compounds (vitexin and p-coumaric acid) by repeated injections. Fractions were pooled over many runs to provide sufficient amounts for LC-MS and NMR analysis. Despite being initially intended as an analytical HPLC unit, this system can operate at a semi-preparative scale and isolate individual phytochemical peaks thanks to its larger-volume injection loop, higher flow capability, and integrated FOXY R1 fraction collector.The compounds were separated using methanol:water (80:20, v/v) as the mobile phase on a 25 cm × 4.6 mm C18-ODS column [19]. A FOXY R1 collector unit was used for fraction collection, and an S5200 autosampler was used. Detection was done using the UV absorbance at 254 nm. With a 200 µL injection volume and a flow rate of 3 mL/min, each run lasted 13 minutes [20,21].

Equipement for characterization of the isolated compounds:

The extracted p-coumaric acid and vitexin were characterized using several chromatographic and spectroscopic techniques. FTIR analysis was performed using a Shimadzu IRAffinity-1 spectrometer (Japan). The ^{1}H-NMR (400 MHz) spectra was obtained using a Bruker Avance III spectrometer in DMSO-d_6 (deuterated dimethyl sulfoxide). LC-MS/MS analysis was carried out using a Shimadzu Triple Quad 4500 system (Japan) equipped with a GL-Science C18 column (100 mm × 4.6 mm, 5 µm), operated at 35°C, with a 5 µL injection volume, 1 mL/min flow rate, and a 25-minute run time. The isocratic mobile phase consisted of water with 0.1% formic acid and a mixture of acetonitrile: methanol (50:50, v/v) with 0.1% formic acid. Data acquisition was performed in positive ESI mode over an m/z range of 50–800 [21,22].

Results and Discussion

Quantity and percentage yield of fractions

Different percentages were obtained from the extracts of *Basella alba* based on extraction and fractionation using ethyl acetate solvent A crude extract of 20 g was obtained from 100 g of dried *Basella alba*; Table 1 illustrates the amounts of ethyl acetate fraction as well as the yield percentages.

Table 1. The quantity and percentage yield of the extracts of *Basella alba*

Fraction of plant extract	Quantity in gram	Percentage yield
Aqueous ethanol	20	20%
Ethyl acetate	0.5	2.5%

It was determined by the initial phytochemical analysis that flavonoids and phenols were present.

Table2. Preliminary screening of flavonoids and phenols in ethyl acetate fraction.

Test	Result
Flavonoids	+ pink to reddish color
Phenols	+ Deep green color

Identification of the two compounds by high-performance liquid chromatography (HPLC)

The ethyl acetate fraction in Figure .3 showed peaks with retention times extremely similar to the standards when compared to the chromatograms of the p-coumaric acid and vitexin standards (Figures 4 and 5). This confirmed the existence of these compounds in the isolated fraction.

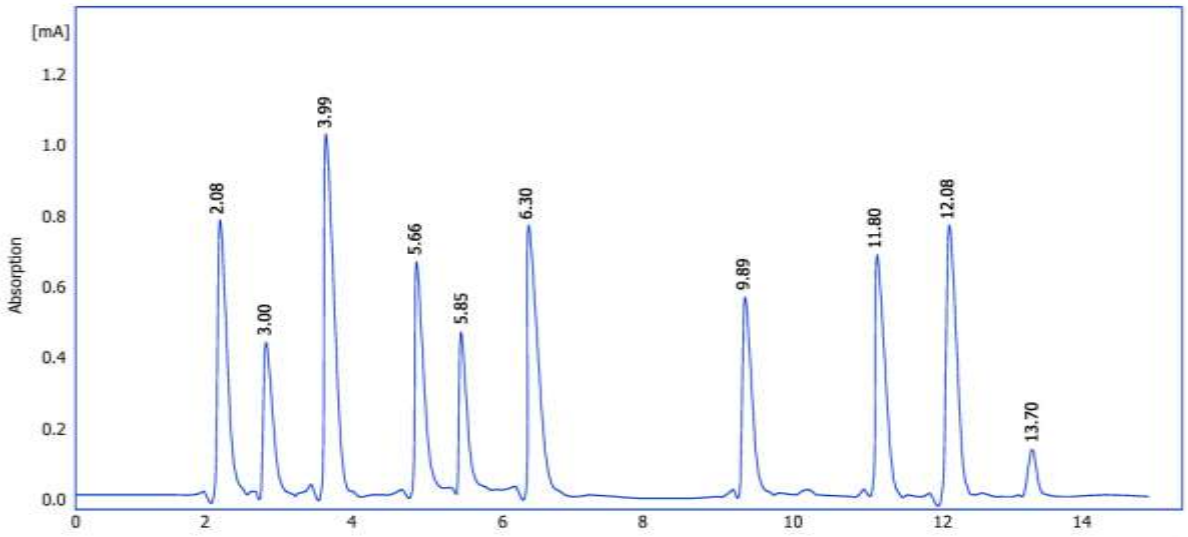

Figure 3. HPLC chromatogram for the fraction of ethyl acetate.

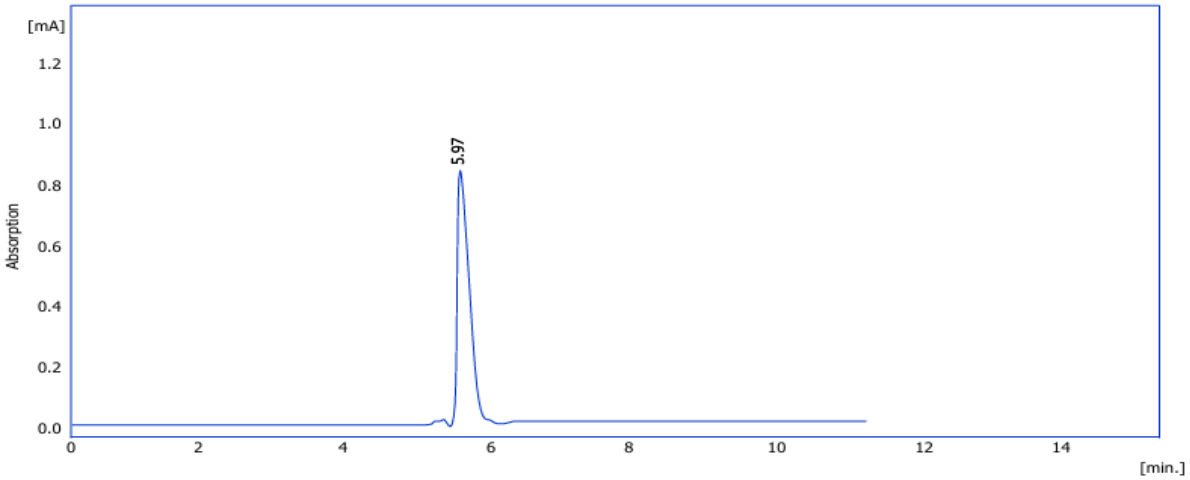

Figure 4. HPLC chromatogram for the standard p-coumaric acid.

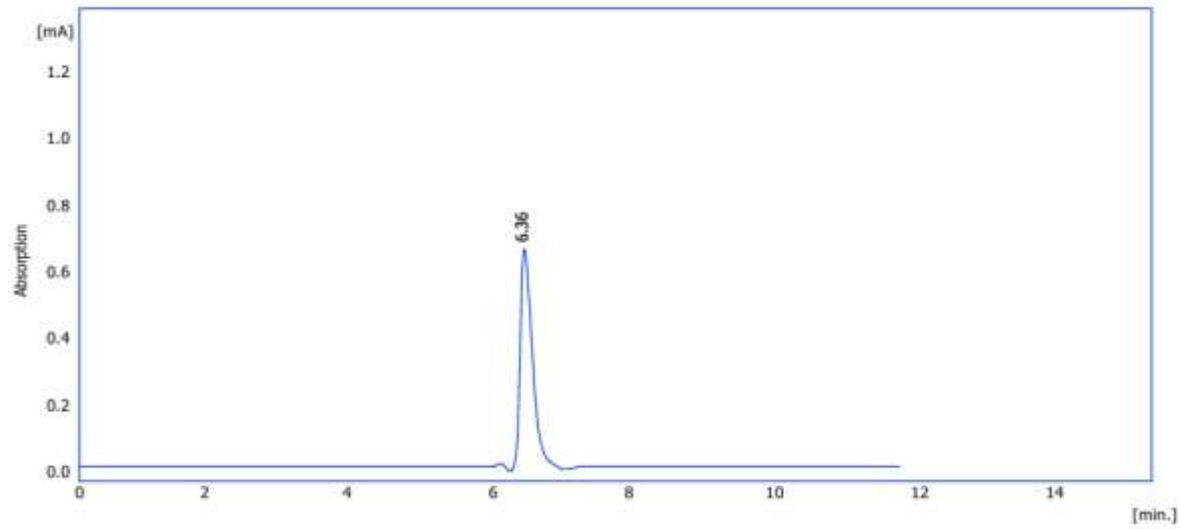

Figure 5. HPLC chromatogram for the vitexin standard.

Spiking analysis by HPLC

P-coumaric acid and vitexin retention times in Iraqi *Basella alba* extract were identified and confirmed using High-Performance Liquid Chromatography (HPLC) analysis. To confirm the existence of the discovered compounds, their retention times (Rt) were compared to those of the matching standards.

There was a close match between the standard retention time of 5.97 minutes and the actual retention time of 5.85 minutes for p-coumaric acid in the sample. Likewise, the sample's vitexin retention time was 6.30 minutes, whereas the standard's was 6.36 minutes. Given that their retention times closely match those of the corresponding standards, our findings validate the existence of p-coumaric acid and vitexin in the Iraqi *Basella alba* extract. The peak areas and retention times of the isolated compounds are summarized in Table 3. The HPLC chromatograms of vitexin and p-coumaric acid, which include the isolated and spiked samples, are displayed in Figures 6–9.

Table 3. Retention Time and Peak Area of the Isolated Compounds

Compound	RT (standard)	RT (isolated)	RT (spiked)	Area of standard	Area of isolated	Area of spiking
P-coumaric acid	5.85	5.97	5.98	415.08	985.07	1389.11
Vitexin	6.30	6.36	6.38	520.11	1421.00	1932.44

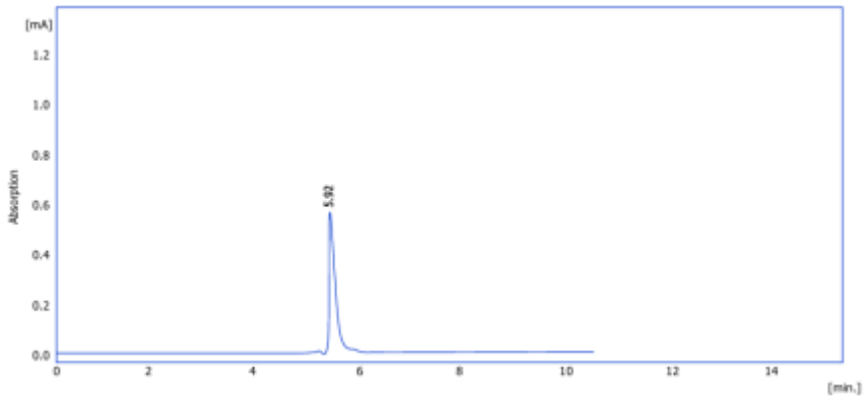

Figure 6. Chromatogram of HPLC for isolated p-coumaric

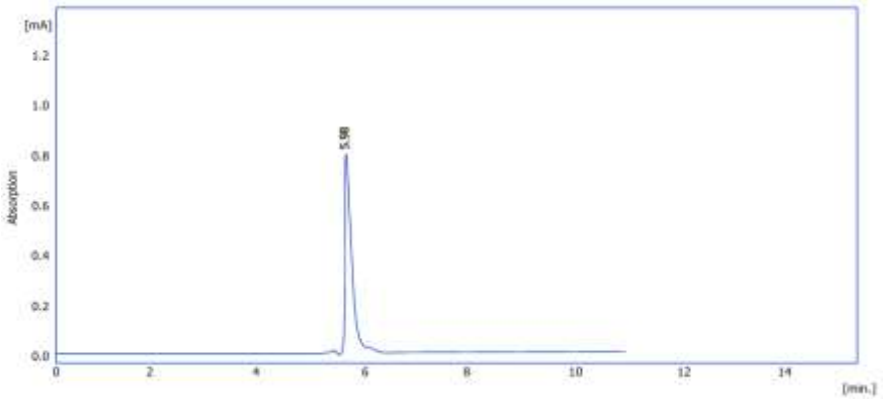

Figure 7. Chromatogram of HPLC isolated P-coumaric acid spiked with P-coumaric standard HPLC chromatogram

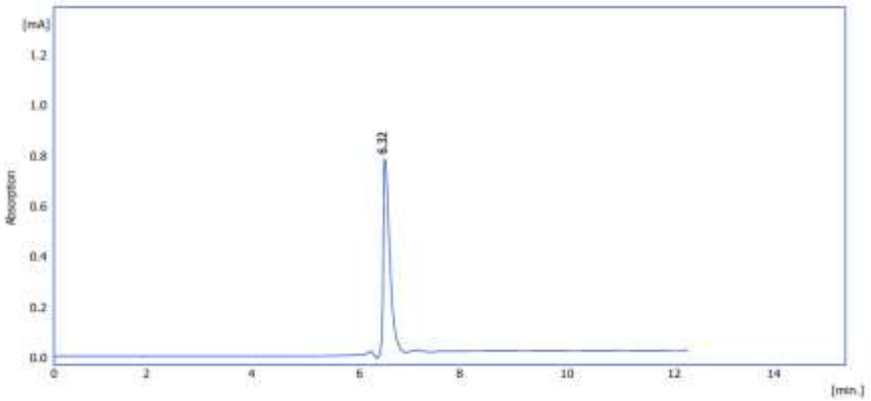

Figure 8. Chromatogram of HPLC for isolated vitexin

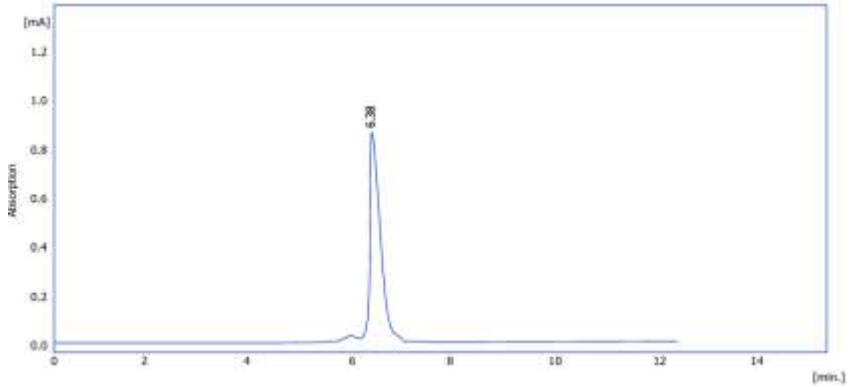

Figure 9. Chromatogram of HPLC for Vitexin spiked with Vitexin standard HPLC chromatogram.

Quantification of the compounds detected by HPLC:

The amount of the proposed p -coumaric acid and vitexin in the ethyl acetate fraction was determined by the regression equation obtained from the calibration curve. Table 4 provides a summary of the quantitative results, and Table 5 displays the compound standards calibration equations. Figures 10 and 11, respectively, provide representative calibration curves for the p-coumaric acid and vitexin standards.

Table 4. Quantitative analysis of ethyl acetate fraction

compound	Result
p-coumaric acid	144 µg/g
vitexin	220 µg/g

Table 5. Equations of calibration curves obtained for compound standards

Standard	Equations	R^2
p-coumaric acid	**Y=102.50667* x**	**0.9998**
vitexin	**Y 105.66667*X**	**0.9998**

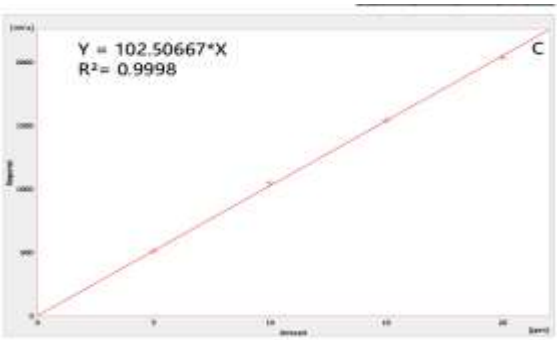

Figure 10. Standard calibration curve p-coumaric acid

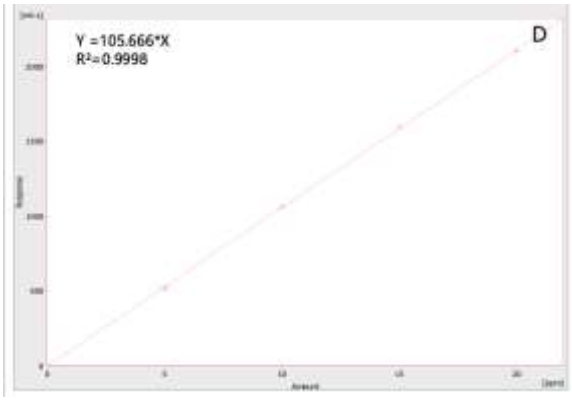

Figure 11. Standard calibration curve vitexin

Infrared spectroscopy using the Fourier transform *(FTIR)*

FTIR analysis was carried out on isolated compounds; Figure 12 shows the FTIR spectrum of isolated p-coumaric acid, and Table 6 provides the band interpretation and similarly, Figure 13 displays the FTIR spectrum of isolated vitexin, while Table 7 provides a summary of the corresponding band assignments. The existence of functional groups compatible with the structures of p-coumaric acid and vitexin was confirmed by the FTIR spectra of both compounds, which showed distinctive absorption bands corresponding to hydroxyl (–OH) stretching, aromatic C=C vibrations, and carbonyl (C=O) groups.

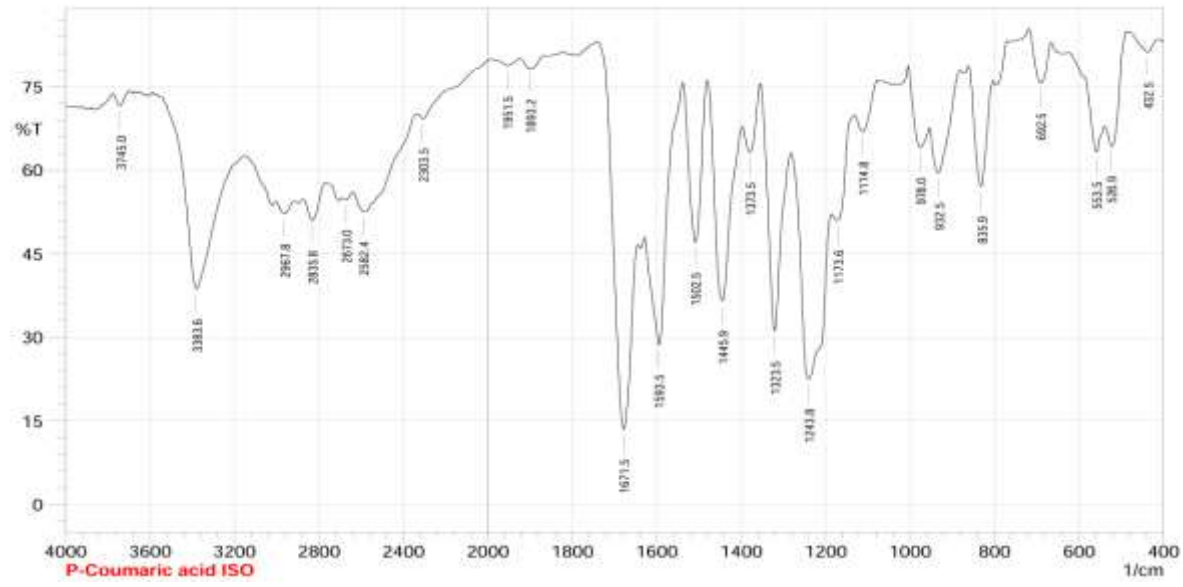

Figure 12. FTIR spectrum of isolated p-coumaric acid .

Table 6. Interpretation of the isolated p-coumaric acid's FTIR bands [23].

Functional groups	Wave-number cm^{-1}	Interpretation
O-H	3383.6	O-H stretching vibration
C-H	2967.8	C-H stretching vibrations
C=C	1593.5	Alkene C=C stretching vibration
C=C	1502.5. 1445.9, 1373.5	Aromatic C=C stretching vibration
C-O	1243.8	C-O stretching vibration of phenol
C=O	1617.5	C=O stretching vibration

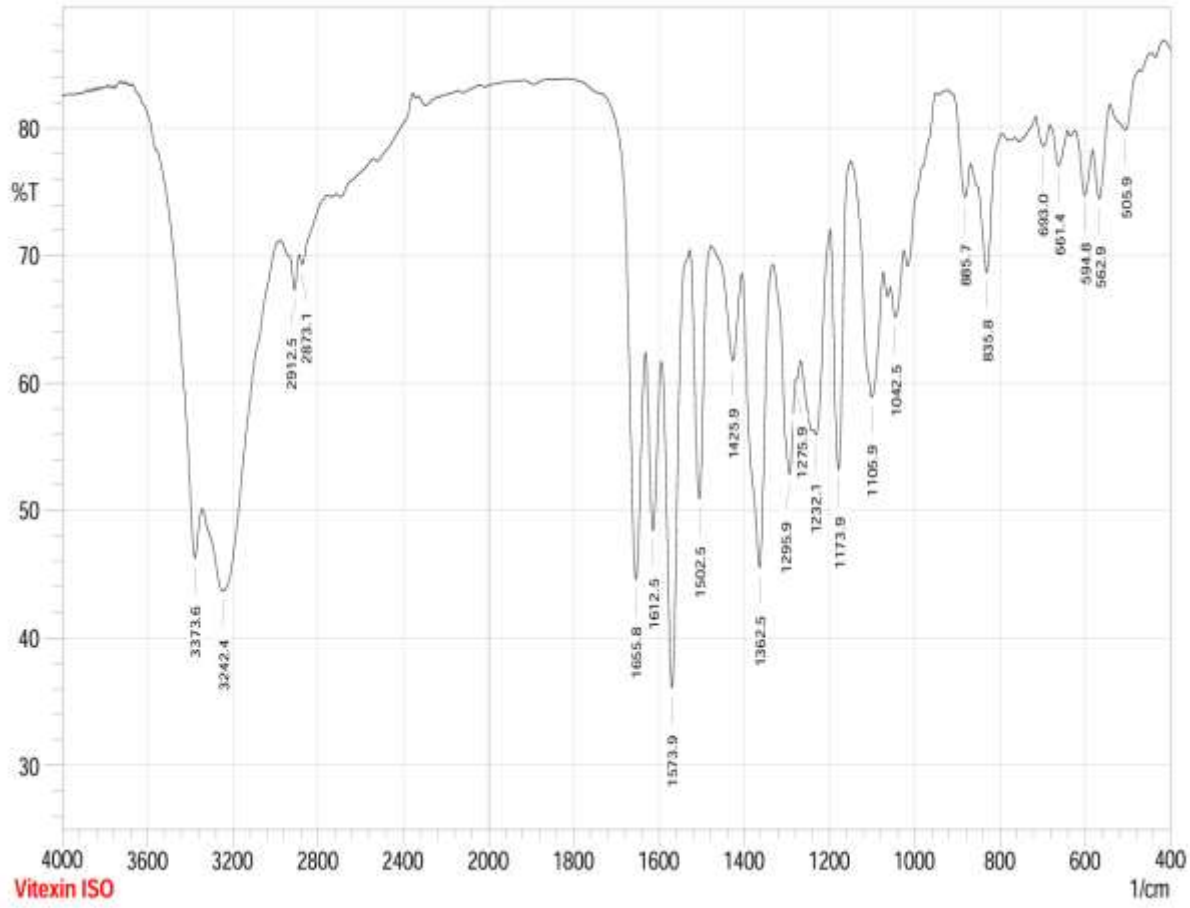

Figure 13. FTIR spectrum of isolated vitexin .

Table 7. interpretation of the isolated Vitexin's FTIR bands [24]

Functional groups	Wave-number cm^{-1}	Interpretation
OH	3242.4	OH stretching vibrations
CH	2912.5,2873.1	C-H stretching vibrations
C=C	1612.5,1573.9, 1502.5	CH stretching of aromatic alkene
C=O	1655.8	C=O stretching vibrations
CO	1232.1,1042.5	CO two stretching vibrations of phenyl alkyl ether
CO	1173.5	CO stretching vibrations of cyclic ether

Liquid chromatography mass spectrometry (LC-MS/MS)

LC MS/MS was performed on the isolated chemicals in order to further identify and characterize them. Figures 14 and 16 display the ion fragmentation spectrum and the interpreted fragmentation pattern for p-comuaric acid and vitexin , respectively. Likewise, Figure 15 displays the ion fragmentation spectrum for vitexin, and Figure 17 presents the corresponding interpreted pattern.

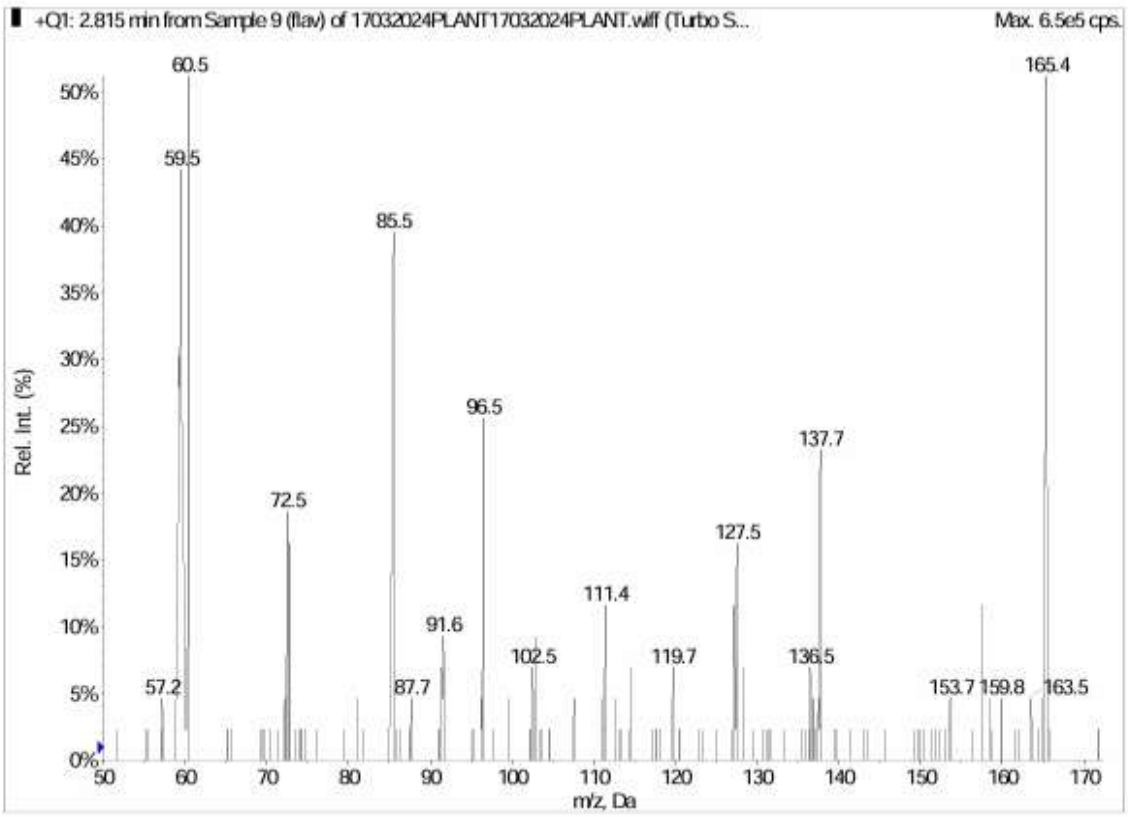

Figure 14. Ion mass fragmentation spectra of p-coumaric acid that were separated

According to data in Figure. 15, the [M+H] ion with m/z 165.06, was considered as a molecular ion peak.

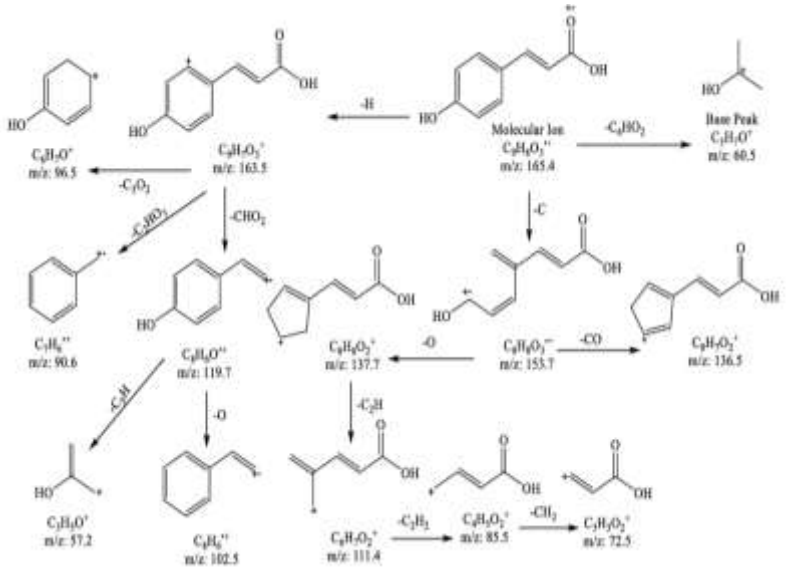

Figure 15. LC- MS/MS fragmentation of p-coumaric acid[25,26].

The protonated molecular weight of p-coumaric acid is confirmed by the molecular ion $[M+H]^+$ at m/z 165.4. The base peak at m/z 60.5 ($C_3H_7O^+$), which represents a stable tiny fragment, most likely originates from side chain cleavage and loss of aromatic structure. The loss of one hydrogen atom (–H) from the molecular ion causes the fragment at m/z 163.5 ($C_9H_7O_3^+$). The loss of carbon monoxide (–CO), a frequent cleavage in phenolic acids, is shown by the fragment at m/z 136.5 ($C_8H_8O_2^+$). The existence of the phenylpropanoid structure is supported by m/z 102.5 and 96.5, which are indicative of cleavage in the aromatic ring with side chain loss. The smaller pieces from the side chain's continuous cleavage are represented by m/z 85.5, 72.5, and 57.2 in line with the hydroxycinnamic acid structure breaking down. The fragmentation pattern validates the phenylpropanoid biosynthesis route and shows that the chemical is derived from phenylalanine via common enzyme conversions such as PAL and C4H [25,26].

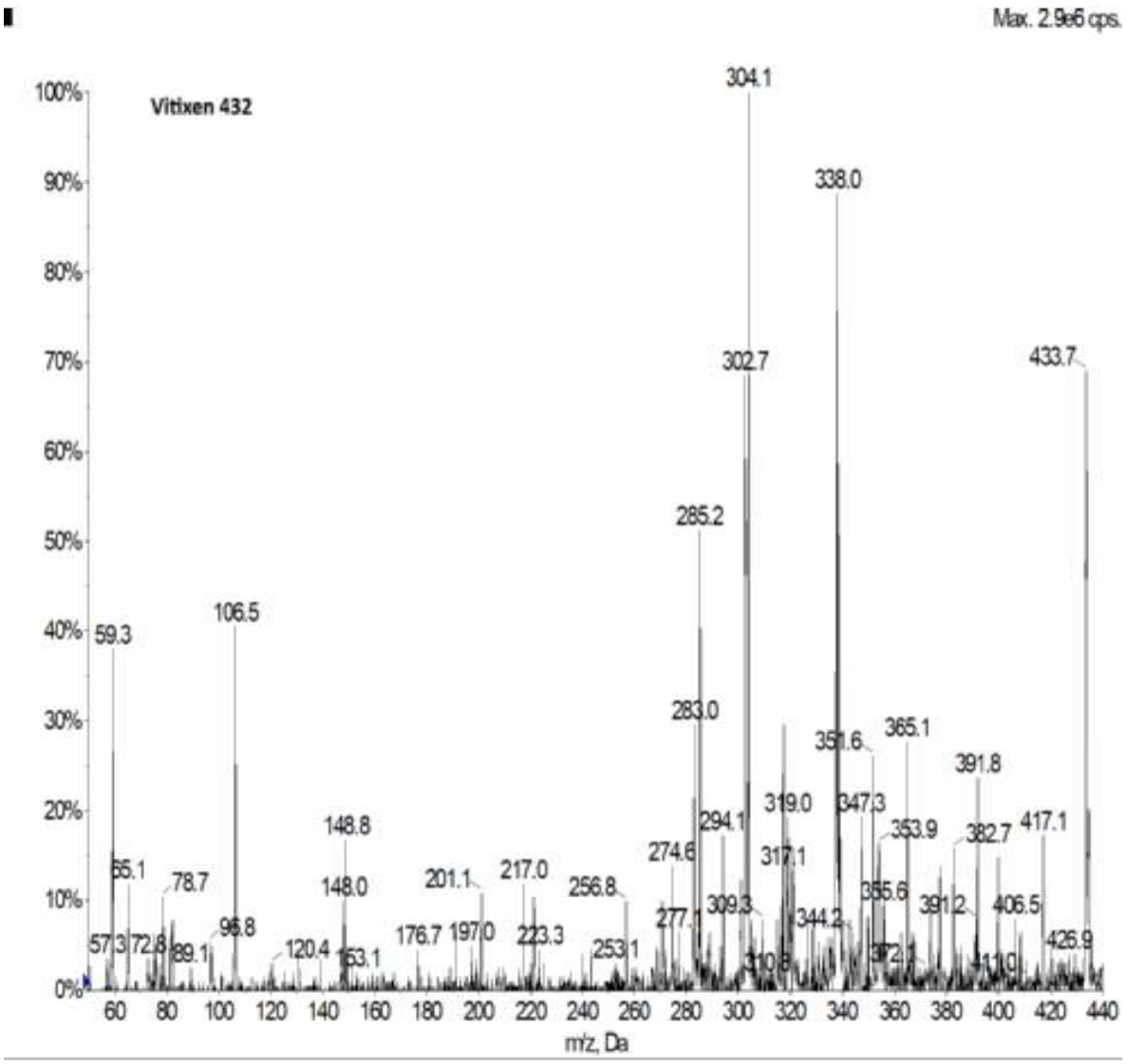

Figure 16. ion mass fragmentation spectra of Vitexin that were separated

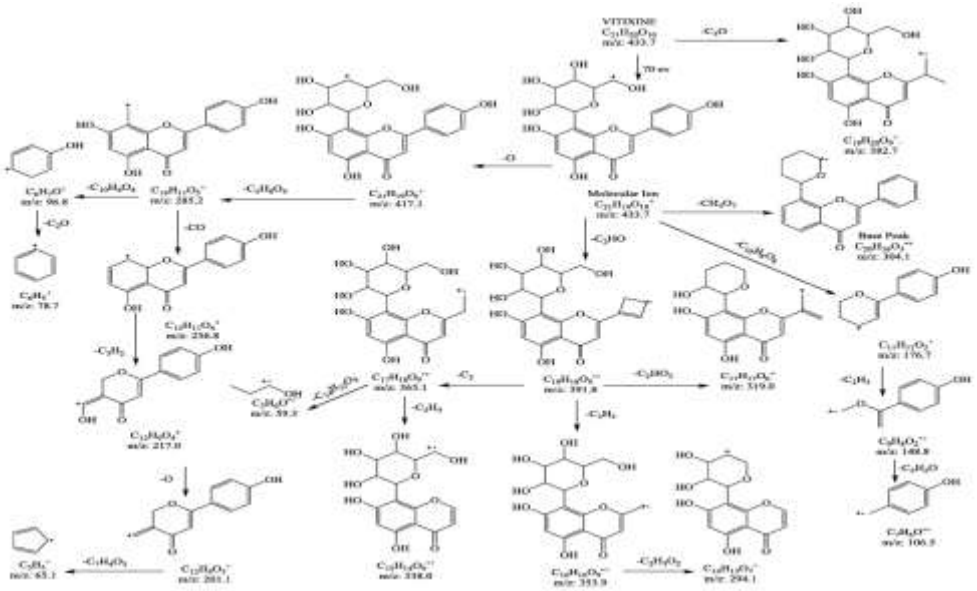

Figure 17. LCMS/MS fragmentation of Vitexin[27-29].

Vitexin's MS/MS fragmentation pattern (m/z 433.7) showed distinctive fragment ions that were the consequence of successive losses of carbonyl-containing fragments, methyl groups (-CH_3), and sugar moieties. Like with C-glycosyl flavonoids, the breaking of the C-glycosidic bond is represented by the main fragment at m/z 304.1 (base peak). The breakdown of the flavone core is supported by other notable ions (such as m/z 285.2, 217.0, and 176.7), which also validate the existence of methoxy and hydroxyl substituents. These fragmentation routes mirror the production of vitexin through the flavonoid branch of the phenylpropanoid pathway, which involves important enzyme steps like flavone synthase and C-glycosyl transferases, and offer compelling structural evidence for its identification [27-29].

^{1}H-NMR Spectroscopy of the Isolated Compound

The isolated compounds' ^{1}H NMR spectra were obtained in order to elucidate their structural features. The spectra of vitexin (Figure 18, Table 8) had signals consistent with its flavonoid structure, whereas those of p-coumaric acid (Figure 19, Table 9) exhibited signals typical of a hydroxycinnamic acid.

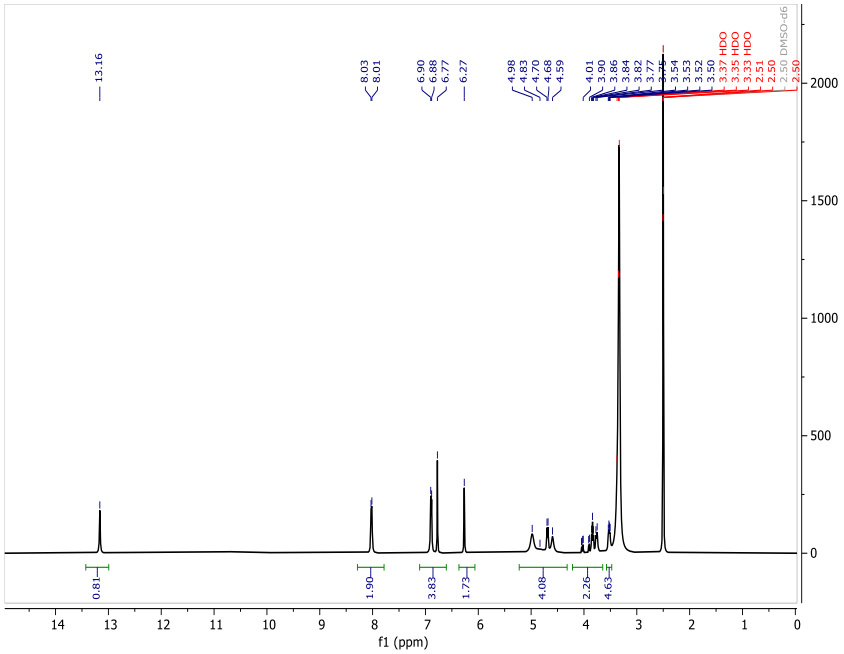

Figure 18. ^{1}H-NMR spectrum of vitexin.

The exact chemical shifts, multiplicities, integrations, and proton assignments for vitexin and p-coumaric acid are summarized in Tables 8 and 9.

Table 8. Vitexin's ^{1}H NMR spectra (400 MHz, DMSO) [25].

δ (ppm)	Interpretation	Proton Assignment
2.50–2.51	s	DMSO-d_6 solvent
3.33–3.37	s	HDO (residual water in DMSO)
3.50–3.54	(d,5H)	Protons in saturated rings(sugar protons) and methylene groups
3.75–3.91	(d , 2H , J=~9-10Hz)	Saturated ring proton(Anomeric proton confirming the β-configuration of the glycoside).and hydroxyl proton attached to methylene
4.60 –4.9	(s, 3H)	Protons of hydroxyl groupe bonded to the saturated ring
6.27	(s, 2H)	Aromatic and olefinic protons
6.77–6.90	(d, 4H)	aromatic ring protons
8.01–8.03	(s, 2H)	phenolic hydroxyl protons (In the aromatic ring directly connected to sugar ring)
13.16	(s, 1H)	phenolic hydroxyl proton

Notes: δ = chemical shift in ppm; s = singlet; d = doublet.;m=multiplet

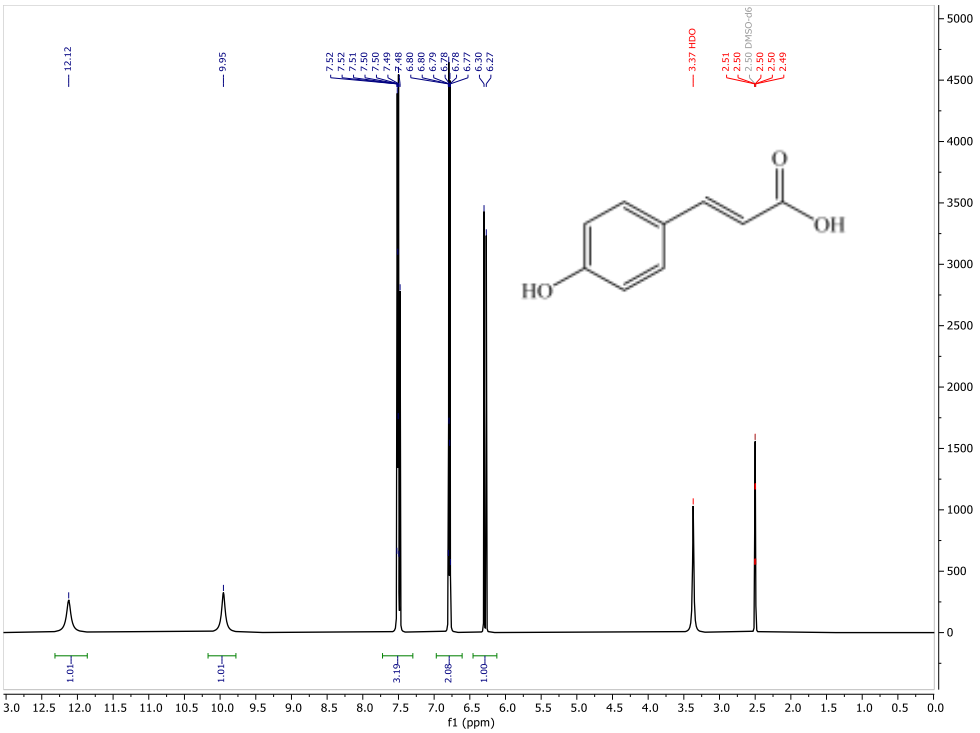

Figure 19. ^{1}H-NMR spectrum of p-coumaric acid.

Table 9. p-coumaric acid 's ^{1}H NMR spectra (400 MHz, DMSO) [30].

δ (ppm)	Interpretation	Proton Assignment
2.49–2.51	s	DMSO-d_6 solvent
3.37	s	HDO (residual water in DMSO)
6.27–6.30	(d,1H **,** J ≈ 16 Hz)	trans-olefinic proton (H-α)
6.77–6.80	(m, 2H ,J ≈ 8 Hz,)	aromatic protons (ortho to OH)
7.40-7.45	(m, 2H, J ≈ 8 Hz)	aromatic protons (ortho to C=C–COOH)
7.48–7.52	(d, 1H , J ≈ 16 Hz)	trans-olefinic proton (H-β)
9.95	(s, 1H)	phenolic hydroxyl proton (O–H phenol)
12.12	(s, 1H)	the hydroxyl proton of the carboxylic acid group (O–H carboxylic acid)

Notes: δ = chemical shift in ppm; s = singlet; d = doublet.;m=multiplet

Discussion

The previous study has indicated the separation of secondary metabolites from plants using either ethanolic or methanolic extracts [31]. Specifically, secondary metabolites from *Basella alba* were extracted in the current study using ethanol. P-coumaric acid and vitexin were separated using HPLC. For accurate identification and structural confirmation of these two compounds, LC-MS, ¹H-NMR, and FTIR investigations were then used. This study concentrated on the isolation and characterization of p-coumaric acid, a phenolic acid, and vitexin, a flavonoid C-glycoside, confirming their presence in *Basella alba* and highlighting the plant's potential as a source of bioactive compounds, even though the HPLC chromatogram showed several peaks. with concentrations of 220 µg/g and 144 µg/g, respectively. Prior research only found p-coumaric acid in the stem of *B. alba*, measuring 59.65 µg/g (0.05965 mg/g). However, the current study used the whole plant, and the content was significantly greater at 144 µg/g (0.144 mg/g) [27]. Similar to this, previous studies that only investigated vitexin extracted from leaves reported a concentration of 14.1 mg/g, whereas the present study found a lower quantity of 220 µg/g (0.22 mg/g) [32]. It is crucial to consider some limitations when evaluating the results of the study. Vitexin and p-coumaric acid quantities in Basella alba may vary depending on the part of the plant used and its development stage. B. alba is a perennial; so, it grows and produces metabolites all year long, which might naturally result in differences in the quantity of secondary metabolites in different plant sections and at different ages [33]. Environmental factors such as temperature, light exposure, and soil composition are examples of how these compounds can be accumulated [34]. In this study, Soxhlet extraction was utilized due to its efficiency in extracting bioactive compounds from *Basella alba*. This method has been widely recognized for its high extraction performance, providing larger yields with minimal solvent usage [35]. A variety of biological activities, such as cardioprotective, antibacterial, anticancer, anti-inflammatory, and anti-diabetic effects, have attributed to p-coumaric acid making it a potential treatment for a number of illnesses [36]. The effect of Vitexin has been observed in the treatment of cancer and is further highlighted by the fact that it has strong anti-inflammatory, antioxidant, and angiogenesis-inhibiting properties [37]. Due to therapeutic potential of these bioactive compounds, *Basella alba* may have a possible uses in the creation of medicines and neutraceuticals in the future. Various advanced analytical techniques were used to precisely identify, isolate, and characterize these bioactive compounds. The presence of flavonoids and phenolic acids suggests possible pharmacological effects, so caution should be taken regarding their continuous use, and further clinical studies are required to evaluate their impact on human health and to establish safe consumption guidelines. Standardization of *B. alba* intake is essential to maximize its therapeutic potential while minimizing potential risks.

Conclusion

Standardizing herbal products containing vitexin and p-coumaric acid will benefit from their successful isolation, identification, and characterization. The recommended HPLC method is linear, sensitive, accurate, and precise, and can be used to measure the concentration of P-coumaric acid and vitexin in a range of samples from various herbs and formulations. It also has a shorter run time and exceptional efficiency. We confirmed the chemical characterization and structural elucidation of the isolated compounds by LC-MS/MS, FTIR and NMR, which confirmed their identification with excellent sensitivity and specificity. Other bioactive compounds in *B. alba* should be a study in future research and evaluated for their pharmacological potential in preclinical or clinical settings, and determine how the environment and seasons affect the accumulation of metabolites.

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Conflicts of Interest

Regarding the publishing of my paper, there are no conflicts of interest

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Ethics Statements

Since there were no human or animal studies in the publication, ethical approval is not required for this study.

Author Contribution

Sara H. Hachim and Nabaa M. Ibrahim made equally significant contributions. They carried out a phytochemical examination of *Basella alba*, focusing on the separation and quantification of p-coumaric acid and vitexin. HPLC was utilized to separate the compounds, while LC-MS,FTIR, and NMR were utilized to characterize and structural elucidation of compounds . The article was reviewed and approved by both authors.

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استخلاص، وتحديد، وتقدير مركبي الفيتيكسين وحمض الكوماريك من نبات الباسلا ألبا المزروع في العراق

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الخلاصة

هدفت الدراسة إلى عزل وتوصيف وتحديد كمية مركبين حيويين من نبات الباسيلا ألبا(سبانخ مالابار)، وهو نبات ذو قيمة غذائية وعلاجية. تم عزل كل من حمض البارا-كوماريك والفيتكسين وتحديد كميتهما باستخدام كروماتوغرافيا السائل عالية الأداء (HPLC)، وتم تحديد توصيفهما باستخدام مطيافية الأشعة تحت الحمراء بتحويل فورييه (FT-IR)، وكروماتوغرافيا السائل-مطياف الكتلة الترادفية (LC-MS/MS)، والرنين المغناطيسي النووي (NMR)، وطريقة التضخيم، حيث قورن المركب المعزول بالمعيار للتأكيد. وُجد أن تركيزي حمض البارا-كوماريك والفيتكسين في نبات الباسيلا البا ١٤٤ ميكروغرام/غرام و٢٢٠ ميكروغرام/غرام على التوالي، وهي أعلى من تلك التي حُددت في دراسات سابقة. يشير هذا إلى أن العوامل البيئية، وخاصة التعرض للضوء والظروف الجغرافية، قد تلعب دورًا هامًا في تعزيز إنتاج هذه المستقلبات الثانوية. استُخدم استخلاص سوكسليت لعزل المركبات، مما أظهر معدلات استخلاص عالية تتوافق مع النتائج السابقة. تُبرز هذه النتائج إمكانات نبات البازيلا البيضاء كنبات قيّم ٦لإجراء المزيد من البحوث حول فوائده الصحية. ينبغي أن تستكشف الدراسات المستقبلية تطبيقاته في مجال المستحضرات الغذائية والأدوية.

الكلمات المفتاحية: البازيلا البيضاء، فيتكسين، حمض البارا-كوماريك، كروماتوغرافيا سائلة عالية الأداء (HPLC)، كروماتوغرافيا سائلة-مطيافية/مطيافية، تحويل فورييه-أشعة تحت الحمراء (FTIR).