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(RESEARCH ARTICLE)

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Chemical composition and antioxidant activity of *Physalis angulata* AH-ZE

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Abstract

Physalis angulata AH-ZE1 form the family Solanaceae. *Physalis angulata* is considered a plant medically effective for the treatment of many diseases. The ability of Physalis to remove the reactive oxygen species ROS, strengthen the body's antioxidant system constitutes its defense mechanism. The results of the Gas Chromatography–Mass Spectrometry (GC-MS) analysis showed that the sample *Physalis angulata* isolate AH-ZE1 contained twenty-four effective compounds that have a lot of medicinal efficacy. Antioxidant content of 94% at the concentration of 140 µg / ml of the extract, and the lowest percentage of antioxidant 42% at the concentration of 20 µg / ml is as a result of the high percentage of phenolic compounds in the plant extract, which is directly proportional to the percentage of antioxidants.

Keywords: *Physalis ssp*; GC-MS; DPPH; Cis-9-hexadecenal

1. Introduction

Physalis angulata AH-ZE1 is one member of the Solanaceae family. Recently, P. angulata has become Important because of its medicinal and nutritional features. Based on the published reports biologically active compounds such as phytosterols, vitamins, with anolides make it an important food with medicinal features (Puente et al., 2011). Due to the antibacterial, antioxidant, antifungal, and anticancer properties of alkaloids, flavonoids, terpenoids, and, vitamins, these phytochemicals have physiological impacts on humans. In the contemporary medical system, many of the chemicals found in medicinal plants have been extracted and classified as important medications (Brusotti et al., 2014), and scientists are still working to screen plant extracts for potential novel compounds.

According to reports, the Physalis ssp contains of antioxidant capacity. Phytosterols are particularly recognized for this and perform their anti-cancerous action, which is connected to limiting the buildup of free radicals in tissues. (Puente et al., 2011). in recent years, a number of significant improvements in analytical techniques were made, including FTIR, High Performance Liquid Chromatography HPLC, UV, Nuclear magnetic resonance NMR, and GC-MS, which were effective tools for phytochemical separation, structure determination, and identification (Roberts and Xia, 1995).

The aim of this research is to identify the bioactive compounds with the use of GC MS, Techniques and observe the antioxidants in the leaf of *Physalis angulata* AH-ZE1

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2. Methods and Materials

2.1. Plant sample

The collection of leaf samples of *Physalis angulata* AH-ZE plant identified by (Jalab and Al-Rufaye, 2023) From Some Farms In Karbala, Iraq.

2.2. Method of Extraction

The leaves sample were washed thoroughly with tap water and It was grinded into a fine powder, and it was dried at 40°C in an oven for 24h. The fine powder sample 500mg was extracted in the 10ml ethanol for 24h using the shaker, then filtered extract,it wes stored at 4°C until using depending on the method Sumathy and Sumathy(2011).

2.3. Gas Chromatography

2.3.1. Gas Chromatography

Using a GC/MS system the chemical compounds were identified The preparation and standard settings were carried out Depending on the method Yadav et al. (2019)

2.3.2. 2,2-diphenyl-1- picrylhydrazyl DPPH Free Radical Scavenging Activity

DPPH radical scavenging activity Was used to evaluate antioxidant properties of *Physalis angulata* AH-ZE leaf extract Depending on the method used (Valko et.al 2007)

3. Results

3.1. GC-MAS technique for detecting the active compounds of Physalis

The results of the GC-MS analysis showed that the sample *Physalis angulata* isolate AH-ZE1 contained twenty-four active compounds. The active compounds were displayed with their retention time (RT), molecular formula, and surface area (table and figure). Note that the compound is Cyclohexane, 1,1'-(2). -propyl-1,3-propanediyl)bis- reached 27.639, the highest retention time was recorded, while the compound acetic acid, ethoxy reached 4.785.

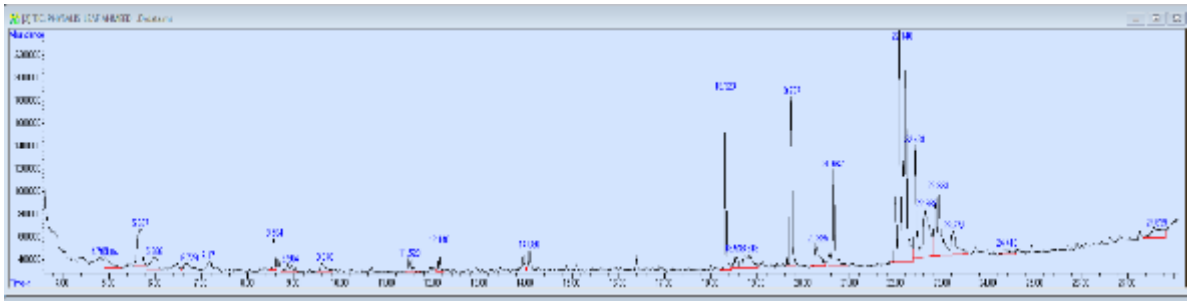

Figure 1 GC MS analysis of *Physalis angulata* leaf extract

We note the presence of the compound cis-9-hexadecenal (C-9-H), with an area record of 7.501, which is an important compound that has an anti-staphylococcal effect. C-9-H is also found in many plants such as Myristica fragrans and Aegle marmelos. and Thuja orientalis (Hoda et al., 2020). It is a natural, biologically active compound belonging to the group of C16 monounsaturated fatty aldehydes that possess numerous antimicrobial and anti-inflammatory properties. (Broni et al., 2021) It was observed that C-9-H inhibited biofilm formation in A. fumigatus and was not cytotoxic to the normal human lung epithelial cell line L-132. Some sources have also revealed that C-9-H is a stable compound under diverse physiological conditions and is safe for human consumption. (Kang et al., 2021) It has been described as a volatile, long-chain aliphatic compound that aids in the degradation of fatty acids and has a distinctive strong odor.

The results of the GC-MS analysis showed that the sample Physalis contained Isopropyl myristate, which is considered one of the important compounds that have antibacterial effectiveness. It is also a polar emollient and is used in cosmetics and topical pharmaceuticals, as it is easily absorbed by the skin. It is also used as a treatment for head lice. and in flea and tick killing products for pets. It is used to remove bacteria from the oral cavity as a non-aqueous component of a

lotion product. Isopropyl myristate is also used as a solvent in perfumery materials and in the process of removing make-up. Hydrolysis can release acid and alcohol. As it is assumed that the acid is responsible for reducing the pH value of the surface formulations (Chandra et al., 2021) in (Table 1 and Figure 1).

Table 1 GCMS analysis of *Physalis angulata* isolate AH-ZE1 leaf extract

Name	**Molecular Formula**	**Area%**	**R. Time**
Octadecenoic acid, methyl ester	C19H36O2	27.634	22.140
9,12,15-Octadecat rienoic acid, ethyl ester, (Z,Z,Z	C20H34O2	8.076	22.923
cis-9-Hexadecenal	C16H30O	7.501	22.669
Hexadecanoic acid, methyl ester	C17H34O2	6.878	19.737
Isopropyl myristate	C17H34O2	6.740	18.323
Methyl stearate	C19H38O2	5.635	`22.431
Hexadecanoic acid, ethyl ester	C18H36O2	5.125	20.662
Ethyl 9-hexadecenoate	C18H34O2	3.357	23.272
Cyclohexane, 1,1 (2-propyl-1,3-propa nediyl) bis-	C18H34	2.975	27.639
n-Hexadecanoic acid	C16H32O2	2.630	20.325
Caffeine	C8H10N4O2	2.619	18.818
Acetic acid, hydroxy-, ethyl ester	C4H8O3	2.075	5.966
Carbohydrazide	CH6N4O	1.487	5.004
Pentasiloxane, dodecamethyl-	C12H36O4Si5	1.474	8.564
Acetic acid, ethoxy-, ethyl ester	C6H12O3	1.367	8.904
Diethyl sulfate	C4H10O4S	1.350	6.729
Ethyl formate	C3H6O2	1.250	9.648
Octanoic acid, methyl ester	C9H18O2	1.212	7.171
Ethanol, 2-bromo	C2H5BrO	1.046	18.538
Acetic acid, ethoxy	C4H8O3	0.874	4.785

3.2. Effect of extract of *Physalis angulata* on the antioxidant activity of DPPH method.

DPPH is a substance that has free radicals that are stable when it accepts an electron or a hydrogen atom. With the presence of an antioxidant substance that donates the hydrogen atom, DPPH reduces the loss of the free radical and turns into H - DPPH in the laboratory. It has been proven that many extracts have the ability to neutralize DPPH as an antioxidant It has beneficial effects on human health. The results show that the percentage of antioxidants increases, that is, the inhibition of free radicals, as the concentration of the extract increases, *Physalis angulata*, if the highest percentage of antioxidants reached 94% at a concentration of 140 micrograms / ml, and the lowest percentage of antioxidants was 42% at a concentration of 20 micrograms / ml Table (). It is possible to link this result to the results of the chemical examination of the plant (Physalis). It contains a high percentage of phenol, and this confirms the found of direct relationship between the concentration of phenol and the percentage of antioxidants consistent with many studies (Gu et.al.2019) and (Vilkickyte et.al 2020) and (Vadim et.al.2022).

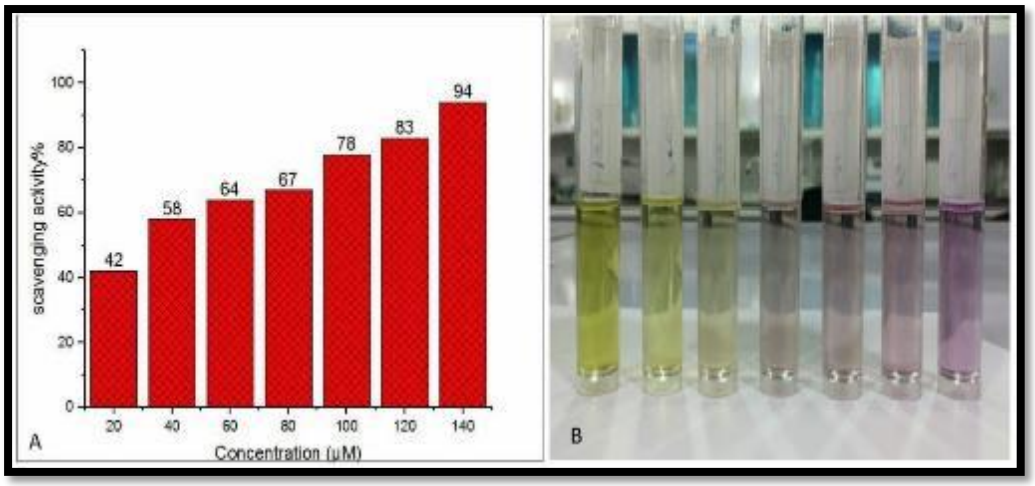

Figure 2 The antioxidant percentages of *Physalis angulata* AH-ZE1 leaf extract

4. Discussion

The fact that the vast majority of people employ herbal medicines as part of their present healthcare system suggests that plant-based traditional medicine will continue to be important to human healthcare in the near future. Due to bioprospecting, drugs derived from plants may be less expensive, toxic-free, or even have minimal toxicity(Ndhlala et.al.2010)

It is quick, easy, and affordable to test the antioxidant properties of compounds using the free radical DPPH technique, which is frequently used to assess their capacity to act as free-radical scavengers and hydrogen providers. The DPPH test depends on DPPH, a stabilized free radical, being eliminated. In fact, DPPH is a stable free-radical molecule that has a dark color and crystalline structure. It is a well-known antioxidant and radical test in particular. The DPPH radical initially exhibits a dark purple color in solution; however, after reduced and converted into DPPH-H, it becomes colorless or light yellow(Sridhar and Charles 2019) . Numerous plant extractions have been demonstrated to inhibit the DPPH radical scavenging activity in vitro(Ainiet.al,2019; Kurniawan et.al.2021; Amrulloh et.al.2021)

Because of their high sensitivity, hydroxyl radicals significantly injure organisms as a whole as well as cells and the components within them (Hayyanet.al.2016) .the result is that. The flavonoid kaempferol present in *Physalis angulata* AH-ZE1 was shown to scavenge OH radicals in a prior study . It has also been demonstrated that numerous plant and flavonoid extractions, including mangiferin and naringin, scavenge hydroxyl free radicals in a content-dependent manner Sridhar and Charles 2019; Kurniawan et.al.2021) . It has previously been shown that several flavonoids produced as secondary metabolites from diverse plants can scavenge OH radicals (Michiels,2004).

O2 is less dangerous because it is created in the biological system in plants during the process of cell respiration, but it becomes a powerfully reactive OH radical when iron is present Additionally, by creating H2O2, •OH, peroxynitrite, or singlet oxygen, superoxide anions created by insufficient oxygen metabolism injure biomolecules directly or indirectly (Dizdaroglu and Jaruga , 2012: (Treml and Šmejkal, 2016) .Unknown is the precise process of free-radical scavenging employing different *Physalis angulata* AH-ZE1 extraction. Additionally, phenolic and flavonoid chemicals were found in the stem barks of *Physalis angulata* AH-ZE1, and their amount increased with extraction volume. As a result, the presence of many polyphenols and flavonoids in *Physalis angulata* AH-ZE1 may be to blame for its antioxidant and free-radical scavenging abilities. The antioxidant and free-radical scavenging abilities of *Physalis angulata* AH-ZE1, as well as the nano-MgO it produces, may be attributed to the presence of specific vital chemicals such flavonoids, phenolics, reducing sugars, protein substances, and carbohydrates.

5. conclusions

Our study reveals that *Physalis angulata* AH-ZE1 extracts inhibited free radicals and boosted decreasing antioxidant capacity in a content-dependent approach. The inclusion of different phenolics, and components of flavonoids, among other things, may be responsible for *Physalis angulata* activity.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to disclosed.

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