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Study of the Effective Medical compounds in Two Onion (Allium Cepa L.)

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I. Abstract:

This experiment was conducted in the unit of medical plants Aromatic / Agriculture college / Basra University in 2025 to study the effective medical compounds in two onion plant (white and red) onions (Allium Cepa L.) which belongs to the Alliaceae family from vegetable plants The effectiveness of the medical effect is on a wide range of secondary metabolism such as flavonoids, sulfur compounds, organic acids, and other compounds as well as some vitamins and minerals. Where onions are used medical as antioxidant, free roots, bacterial injuries, respiratory disease, diabetes and gastric ulcer. The GC-MS is used to detect effective compounds in the alcoholic extract for onion leaves, which showed the results of this study by revealing many effective medical compounds in both categories. n-Hexadecanoic Acid and 1-Methyl-5-Fluorouraci and 5-HydroxymethylFurFural) in red onions on a higher rate (4.80, 14.15 and 8.23) % Relay compared with white onions while gave the boat (2,4-Dihydroxy-2,5-dimethyl-3 (2h) -Furan-3-one) Top ratio (3.24)% white onion compared with red onions.

Keywords: *Effective Medical Compounds , Allium Cepa, Onione, GC-MS.*

II. Introduction

Onion (Allium cepa L.), which belongs to the Alliaceae family, is a winter vegetable crop with medicinal properties (Hassan, 2000). The medicinal properties and nutritional value of the onion plant lie in its content of some important vitamins (A, B2, B1C). It also contains protein and carbohydrate substances, as well as iron and calcium (Al-Khafaji and Al-Mukhtar, 1989). Onions also contain pectin, flavonoid, phenolic compounds, and allicin compounds, which have an antioxidant, antibacterial, and anticancer effect (Hassan, 1988, et al.). Onions contain three groups of medicinal compounds: the Organosulfur group, which includes Cepaenes and Glutathione; the Fructans group; and the Flavonoids group, which includes Quercetin and Kaempferol (Durant et al., 1994). Glutathione has been found to be an antioxidant and a preventative against cancer (Sheen et al., 1999). Onions also play a role in regulating blood sugar levels and treating colds, coughs, and bronchitis (Kumar et al., 2010). Onions are considered a good antibiotic against parasites, bacteria, and fungi due to their active chemical compounds, especially the sulfur compounds that make up onions. This is achieved through the direct inhibition of deoxyribonucleic acid (DNA) RNA. They also eliminate free radicals and inhibit the development of microorganisms that cause stomach ulcers (El-Meleig et al., 2010; McDevitt & Foster, 1994). Some research has shown that onion oil plays a role in regulating blood sugar, lipid, and cholesterol levels. It also has an anti-oxidative stress effect, mitigating the effects of diabetes (Hanaa, 2011). Furthermore, it prevents blood clots and atherosclerosis. Historically, onions were used as an alternative treatment for inner

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ear infections, particularly Eustachian tube inflammation (Gates et al., 1998). Onions are also a food crop rich in natural pigments (purple, red, yellow, and white) (Fredotoeic et al., 2020)

III. Materials and Methods:

This study was conducted in the laboratories of the Medicinal and Aromatic Unit, College of Agriculture, University of Basra, in 2025. Onions were obtained from the local market, and two varieties (white and red) were selected for analysis of the active medicinal compounds in each.

The fleshy leaves of the onions were sliced and placed in dishes for drying. They were then placed in an electric oven at 70°C for one week. After drying, the samples were ground, and 1.5 g of the powder was mixed with 7.5 g of 96% pure ethyl alcohol. The mixture was centrifuged for 24 hours at 3000 rpm at 40-45°C, and then filtered using filter paper (No. 1).

The solution was then filtered. The solution was then placed in an electric oven at 40°C for 24 hours to convert it to a powder. The powder was dissolved in 3 ml of pure ethyl alcohol (Okafor and Nowsu, 1995).

The active ingredients were then determined using a Shimadzo GCMS2010 plus gas chromatography-mass spectrometry (GC-MS) under the operating conditions shown in Table 1.

Table (1) Operating conditions of the GC-MS device

Shimadzo GCMS2010 plus chromatograph Mass spectrometry	Instrument type
Split 1:30	Injection type used
Rtx-5MS Capillary Column (Crossbond 5% diphenyl -95% dimethysiloxane) ; 30m(L)*0.32mm(i.d.)with a 0.25 mm film thickness	Separation column type
280°C	Injection temperature
Starts at 60°C and remains at that temperature for 3 minutes, then increases to 280°C and remains there for 5 minutes, then cools.	Column temperature
Helium (He) 99.99% purity	Gas used
Electron Impact Ionization (EI); Recorded in intervals for m/z 40 to 600	Mass spectrometer
1 microliter	Sample volume at injection

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IV. Results and Discussion:

Identification of Active Compounds in White and Red Onions Using GC-MS

The results of GC-MS analysis of two onion varieties, white and red, shown in Tables (2) and (3) and Figures (1) and (2), revealed 24 and 20 compounds, respectively. The highest concentrations in the alcoholic extract of red onion leaves were n-Hexadecanoic acid, 1-Methyl-5-fluorouracil, and 5-Hydroxymethylfurfural, reaching 4.80%, 14.15%, and 8.23%, respectively. This contrasts with the alcoholic extract of white onion leaves, where the concentrations were 4.22%, 13.78%, and 7.01%, respectively. This aligns with the findings of Putnik et al. (2019) and Fredotovic et al. (2020), who concluded that red onions contain high levels of phenolic, flavonoid, and sulfur compounds, which are responsible for their color. The outer layer of the onion is considered a valuable antioxidant, making red onions one of the best varieties (Siti et al., 2011). The medicinal efficacy of onions increases with their phenolic compound content (Emad et al., 2022). The compound 2,4-Dihydroxy-2,5-dimethyl-3(2H)-furan-3-one was found in the highest concentration in white onions compared to red onions, at 3.24% and 3.06%, respectively. Other compounds detected in white onions include 2-Methoxy-4-vinylphenol, 9,12-Octadecadienoic acid (Z,Z), 1H-Imidazole-4-methanol, and 1-(3-hydroxy-4-methoxyphenyl) Ethanone, at concentrations of 1.48%, 1.83%, 3.64%, and 0.18%, respectively. This aligns with the findings of Al-Thamer et al. (2007), who noted that white onions contain [a specific type of onion]. It contains a high percentage of secondary metabolites compared to other varieties. Maleic anhydride was detected at a concentration of 0.29%, as shown in Table 2. This confirms that, as Lordana et al. (2017) demonstrated, malic acid is the most abundant organic acid in white onions. This is attributed to the varying activity of metabolic pathways in the Krebs cycle. Organic acids also play a significant role in altering onion properties (Terry et al., 2005). Other compounds were also detected in red onions (cis-7,cis-11-Hexadecadien-1-yl acetate, Phenol, 5-ethenyl-2-methoxy-, 4-Cyclopentene-1,3-dione, Acetoisovanillone, and trimethylacetate) at concentrations of 2.09%, 1.02%, 0.98%, and 2.12%, respectively. Onions are characterized by their rich content of bioactive metabolites. Onions possess significant medicinal and health benefits (Halser, 1998). They contain a wide variety of phytochemicals, including a large number of secondary metabolites such as flavonoids, alkaloids, and tannins, as confirmed by Cowan (2001). The variation in the medicinally active compounds in onions, as well as the percentage of protein, carbohydrates, sulfates, and secondary metabolites, is attributed to differences in genetic makeup among varieties (Al-Habar, 2018) and environmental conditions (Hanaa, 2011). Therefore, onions are considered a plant of high nutritional value and significant medicinal efficacy. We recommend consuming them raw, cooked, or as a natural remedy.

Table (2) shows the percentages of active chemical compounds in white onions that were detected by the GC-MS device.

	Vessel Name	Detention Time,	Percentage %
1	2-Propenoic acid, ethenyl ester	4.743	3.566733
2	2-Buten-1-ol, propanoate	5.656	0.901901

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3	Maleic anhydride	6.467	0.296474
4	Propane, 2-fluoro-2-methyl-	6.493	0.54604
5	1H-Imidazole-4-methanol	7.087	3.640521
6	l-Alanine, N-methoxycarbonyl-, methyl ester	7.797	4.343494
7	3-(1'-pyrrolidinyl)-2-butanone	8.708	1.497979
8	Silicon tetrafluoride	8.776	0.236841
9	2,4-Dihydroxy-2,5-dimethyl-3(2H)-furan-3-one	9.791	3.246642
10	2H-Pyran-2,6(3H)-dione	10.203	0.685775
11	Benzeneacetaldehyde	11.1	0.353436
12	Furaneol	11.538	1.171823
13	1-Methyl-5-fluorouracil	13.064	13.78326
14	5-Hydroxymethylfurfural	14.306	7.011776
15	2-Methoxy-4-vinylphenol	15.39	1.483055
16	Vanillin	16.616	0.200481
17	Ethanone, 1-(3-hydroxy-4-methoxyphenyl)-	17.72	0.183238

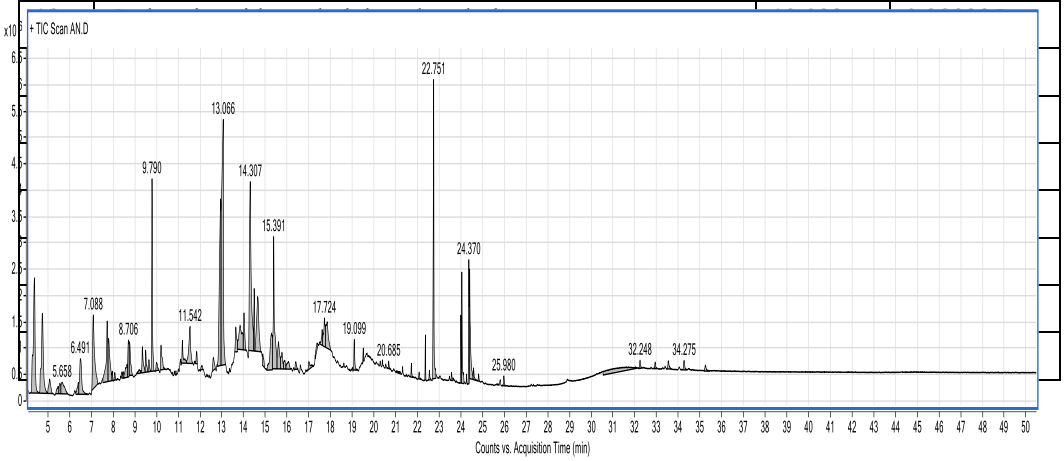

Figure (1) shows the values of the active chemical compounds in white onions that were detected by the GC-MS device.

Table (3) shows the percentages of active chemical compounds in red onions that were detected by the GC-MS device.

	Vessel Name	Detention Time,	Percentage %
1	Propane, 2-fluoro-2-methyl-	4.336	1.990679
2	Glycine, N-methyl-N-methoxycarbonyl-, nonyl ester	5.517	0.1556
3	3-Furaldehyde	6.474	1.198239
4	4-Cyclopentene-1,3-dione	7.706	0.984704
5	2-Chloroethyl methyl sulfide	9.208	0.613042

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6	2,4-Dihydroxy-2,5-dimethyl-3(2H)-furan-3-one	9.786	3.064244
7	Resorcinol	10.257	0.195428
8	Benzeneacetaldehyde	11.085	0.21941
9	Furaneol	11.517	1.518277
10	1-Methyl-5-fluorouracil	13.039	14.1598
11	5-Hydroxymethylfurfural	14.298	8.23239
12	Phenol, 5-ethenyl-2-methoxy-	15.391	1.028269
13	N-Ethyl-2-carbomethoxyazetidine	16.391	0.38737
14	Acetoisovanillone, trimethylacetate	17.719	3.123177
15	Carbamic acid, methylphenyl-, ethyl ester	19.091	0.313115
16	n-Hexadecanoic acid	22.751	4.80122
17	cis-7,cis-11-Hexadecadien-1-yl acetate	24.37	2.090424
18	Benzene, 1-bromo-4-iodo-	31.542	0.375626
19	Clionasterol acetate	33.551	0.188272
20	9,19-Cyclolanost-24-en-3-ol, (3.beta.)-	35.258	0.141628
			100.00

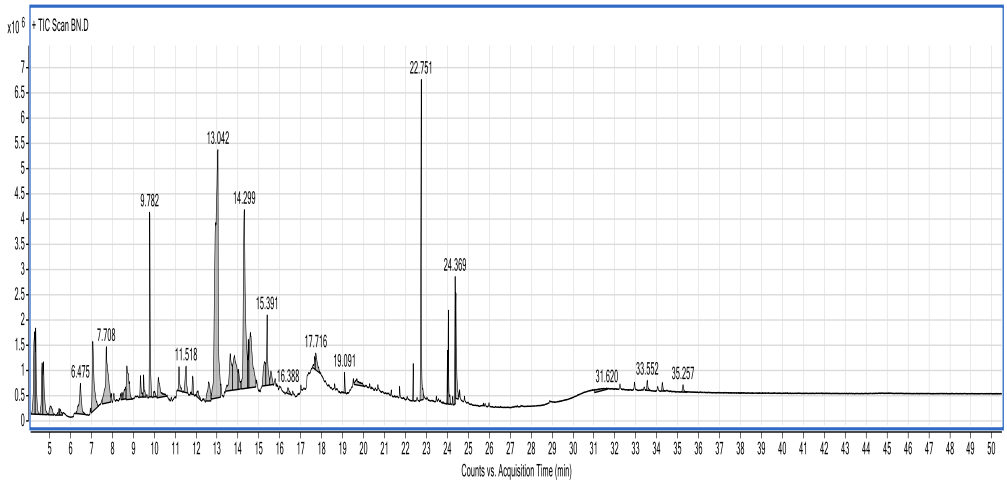

Figure (2) shows the values of the active chemical compounds in red onions that were detected by the GC-MS device.

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