CHEMICAL ANALYSIS OF NEW RECORDED SPECIES *Acalypha australis* L. AT IRAQ

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ABSTRACT

This study was aimed to chemical analysis of new recorded species *Acalypha australis* L. Plant samples collected from cultivated gardens and fields as well as road sides. This plant is annual herbs or weed, with wiry stem and simple lanceolate green leaves, and unisexual flowers with special cordate bracts, male flower characterized by separated anther sacs, fruits schizocarpic with 2 or 3 mericarps, pollen grains are 3-4-zonocolporate with irregular granulated sculpturing. Extract revealed a variable gropes of an important bioactive compounds as benzuquinones and its derivatives 2,6-dimethoxy – 1,4- benzoquinones which has an important roles as antioxidants compounds, From anthraquinones group the plant has trihydroxyanthraquinones with various biological and environment effects, other antioxidant compounds found in plant as phenols group represented by brevifolin carboxylic acid, gallic acid and some of its derivatives as protocatechuic acid, flavonoids compounds as rutin and kaempferol, and terpenoid as loliolide compound. Chemical analysis elucidated another compounds as phytostroles (β-sitosterol and daucosterol), butanedioic acid, and niacin.

Keywords: biochemicals compounds, new record, *Euphorbiaceae*, phenolis, flavonoids, trepenoid

مجلة العلوم الزراعية العراقية -2023 :54(3):674-681 **الدبيسي**

التحليل الكيميائي للنوع المسجل حديثا .*Acalypha australis* L في العراق

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المستخلص

هدف الدراسة الحالية التحليل الكيميائي لمستخلص النوع المسجل جديدا .*Acalypha australis* L . وقد جمعت العينات من الحدائق والحقول المستزرعة وحافات الطرق. هذا النبات حولي ذو سيقان ضيقة وقاسية واوراق خضراء بسيطة ورمحية وازهار احادية الجنس ذو قنابات قلبية متميزة, تتميز الاهار الذكرية بكونها ذات متوك مفصولة االفصوص, الثمار منشقة ومكونه من 2–3 وحدات ثمرية, حبات اللقاح ذات فتحات انبات ثلاثية او رباعية مرتبة حول منطقة الاستواء ومكونة من اخاديد وثقوب وذات زخرفة حبيبية غير منتظمة. اظهر المستخلص اختلافات واسعة بمجاميع المركبات الفعالة الهامة, كمركبات benzuquinones ومشتقاتها كالمركب 2,6–dimethoxy – 1,4– benzoquinones ذو دور فعال كمضاد للاكسدة, وقد احتوى النبات من مجموعة انثراكينون على مركب tri–hydroxy–anthraquinones ذو الفعالية البايولوجية والبيئية المهمة, ومن المركبات المضادة للاكسدة الاخرى الموجودة في النبات مجموعة المركبات الفينولية المتمثلة brevifolin carboxylic acid وgallic acid وبعض مشتقاته كالمركب protocatechuic acid, مركبات الفلافونايد كمركب rutin وkaempferol والتربينات كمركب loliolide. اتضح من التحليل الكيميائي ايضا مركبات اخرى كالستيرولات النباتية (β–sitosterol and daucosterol) phytostroles و butanedioic acid وniacin.

الكلمات المفتاحية: مركبات كيميائية حياتية، تسجيل جديد، ام الحليب، فينولات، فلافينويد، تربينات.

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INTRODUCTION

Euphorbiaceae family is one of the Iraqi vascular families represented by six genera and more than 51 species distributed at a different districts (28), *Acalypha* L. is one of these genera represented globally by almost 450 species, found as a tree, shrubs, or annual herbs(35). While in Iraq has one cultivated species *Acalypha godseffiana* (28). Then later as a result from some environmental studies as a new species recorded for the genus, which is Asian copper leaf *Acalypha australis* L. distributed at cultivated field or gardens and roadsides. *Acalypha australis* is a wild annual herb distributed at east Asia, China, and Japan(16), and recorded lately as an invasive alien plant in each of Turkey (9), Azerbaijan(21), Italy and Ukraine (34) and then in Iraq. Large numbers of herbal plants consider as an important medicinal plants and this importance revels the ability to cure different disease and infections as a result of its content from various secondary metabolites or bioactive compounds (31), and the most important bioactive compounds for *Acalypha* are flavonoids, phenols, quinones, alkaloids and tannins, which are concentrated in different plants parts from root to flowers and consider as an important character in taxonomical process between different taxa.(38) *Acalypha* Spp are known as a good resources of an important bioactive compounds with a distinctive roll in the environment and curing disease reveals from several studies in different species all over the world (1,2,11,23,25) while in Iraq there is no study for genus's chemical constitutes. This study was aimed to determine the distinctive features and phytochemical compound in aerial parts of new recorded species *Acalypha australis* in Iraq.

MATERIALS AND METHODS

Plant collection : Plant collected from the central garden of the Department of Biology at the College of Science, University of Baghdad. Some fresh material prepared for morphological study, other samples dried at room temperature for a week to use in extraction.

Morphological study

Different collected samples studied to determine the morphological features of species plant parts, its dimensions and color by using compound and dissecting microscopes, and scanning electron microscope for pollens morphology study.(3,4)/

Plant extraction

fifty grams of dry plant powder subjected to a thimble of soxhlet apparatus with 500 ml of ethanol solvent for 8 hours.(20)

Analysis with GC-MS

Plant extract compounds were analyzed by using GC-MS technique, by Shimadzu GC-MS-QP 2010 system and HP 5MS column, using helium gas as a carrier, and 40C° for 1 minute, and 280C° for 5 minute and then the chemical compared with data of National Institute Standard and Technology (NIST).

RESULTS AND DISCUSSION

Morphological description: Annual wild herbs grown at garden and cultivated field with light brownish root; stem wiry erect and branching from the base, green in color and semi-angular in cross sections (15-95 cm.); leaves simple petiolated with (3-4 cm.) petiole, arranged spirally alternated with pair of lanceolated stipules, leaves blades lanceolate with acute apexes, tunicate to rounded bases, and crenate margins. (6-8x1.5-2 cm.); flowers unisexual arranged axillary inflorescences with cordate bracts, some of them are male verticillata inflorescence consist of long peduncle and male flowers, which are formed by forth perianth leaves and eight stamens, each of them consist of short filament and separated bi-lobed anther which is represented the most distinctive features of the genus (12,16), other inflorescence are hermaphrodite in nature composed of sessile female flowers and verticillata male inflorescence, the female flowers covered by three perianth leaves and one pistil with tri-bi –lobed ovary and tri-branched style with hairy stigma; fruits yellow to light brown schizocarpic capsule of three mericarps each of them has obovoid black seed; plant part indumentum represented by a-glandular simple pointed white hairs, pollen grains are monad 3,4-zonocolprate, spherical, small in size (15.6 µm), appeared semi-triangular in polar view and semicircular in equatorial view, pollen sculpture is described as irregular finely granulated according to (32,33)

Chemicals analysis

GC-Ms analysis of *Acalypha australis* areal parts reveals numbers of an important biochemicals with valuable roles in disease heeling or preventing (Table1), in general the chemical analysis of plant extracts showed the presence of phenols, flavonoides, phytosteroles, quinones, anthraquinones, tannins, and alkaloids and this results coincide with (9,40) studies results. One of *Acalypha australis* biochemical groups is quinones, benzuquinones and its derivatives as 2,6-dimethoxy – 1,4- benzoquinones which have an important roles as antioxidants compounds (22) Fig.1. From anthraquinones group the plant has trihydroxyanthraquinones (Fig 2) which is known as emodin that reported to has antioxidant activity (41), laxative (39), antitumor (37), liver function improvers (42), and other biological and environmental effects (19). Moreover the taxonomic important as a result of its occurrence in *Acalypha australis* and *Acalypha brachystachya* only.(27,40) In addition to quinones and its derivatives the phenolic compounds play an important roles in various biological and environmental activities, phenols screening for *Acalypha australis* showed the presence of brevifolin carboxylic acid, gallic acid and some of its derivatives as protocatechuic acid (Fig:3,4,5) and that's reported previously by Wang *etal.*(40) for the species and by others (7,24,26) for another Acalypha species. Both of gallic acid and brevifolin carboxylic acid preformed an excellent roles as antioxidant and antibacterial activities as mentioned (16). Another valuable plant extracts compound is flavonoids compounds (Fig: 6,7) as rutin and kaempferol which were reported for *Acalypha australis* and other species by other researcher (10,17,24,26,40). Rutin preformed a fascinating pharmacological effects as antioxidant, cyto - protective, anticancer, cardioprotectine, and neroprotective activities as reported by others (13). Moreover kaempferol has antioxidant and anticancer roles represent as preserving viability of normal cell and preventing the growth of cancer cell as reported in Chen & Chen study (6).

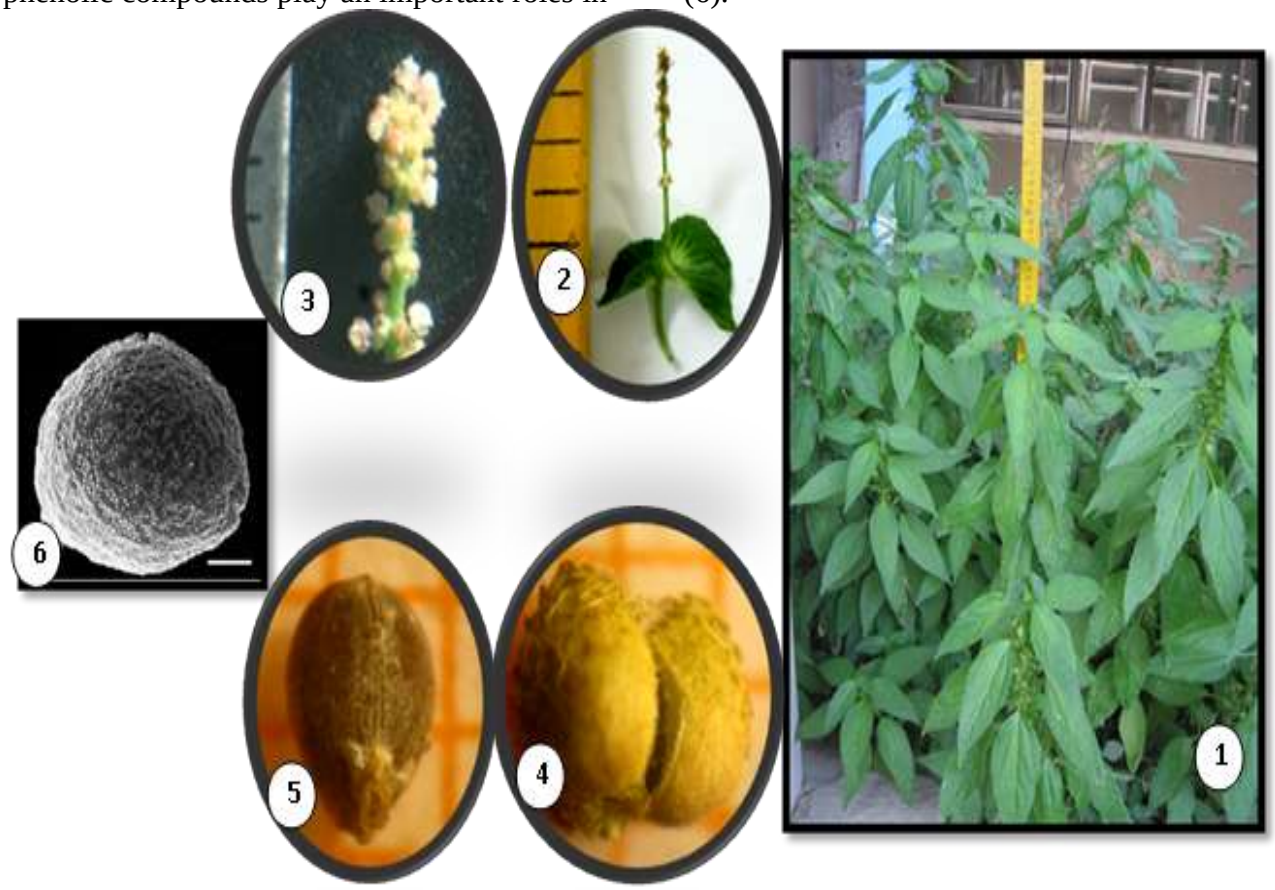

Fig 1. *Acalypha australis* in field, 2: inflorescence with bract, 3:male inflorescence, 4:fruit, 5: seed, 6: pollen grains. scale bar=1µm

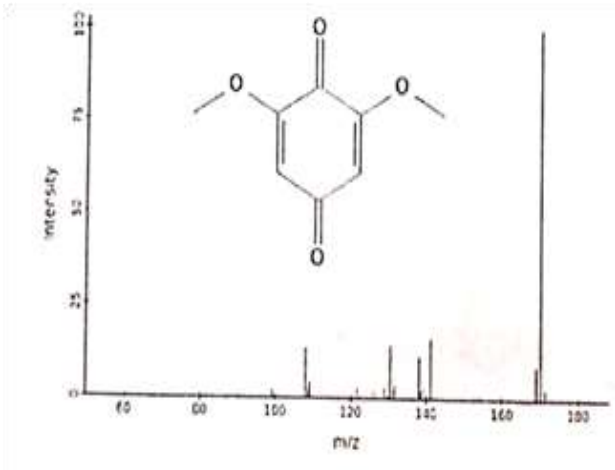

Fig 1. 2,6-dimethoxy – 1,4- benzoquinone

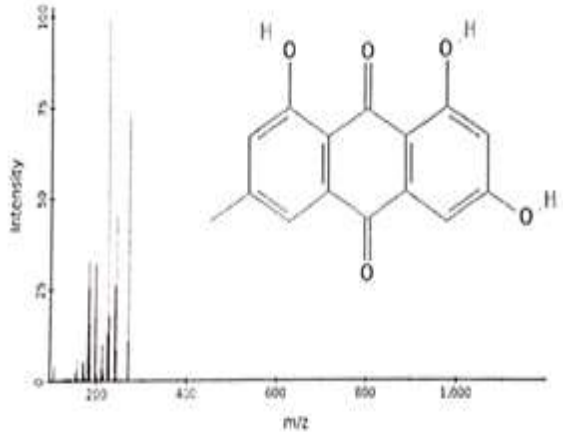

Fig 2. Trihydroxyanthraquinones

Phytosteroles screening for Acalypha australis extract showed the presence of β-sitosterol and daucosterol (Fig: 8,9) which are reported for the species previously by (8,40), and for other species of Acalypha by others (5,17), β-sitosterol consider as an important bioactive compound has a role in anti-inflammatory, ant-cancer, anti-oxidant activities and improvement of immunological and nervous systems (30), while both of sitosterol and daucosterol have a distinctive effect in lung cancer in human as recorded (29). Other phytochemical compound detected from *Acalypha australis* extract is loliolide which belong to terpenoids compound (Fig: 10) with biological important as anti-cancer, anti-bacterial, anti-fungle, and antioxidant (14), as well as some organic acids as butanedioic acid (Fig12) with an importance's as antimicrobial active compounds (18) and niacin (Fig 11) which is reported to improved cardiovascular health (36)

So, chemical study can significantly contributed to taxonomy study.

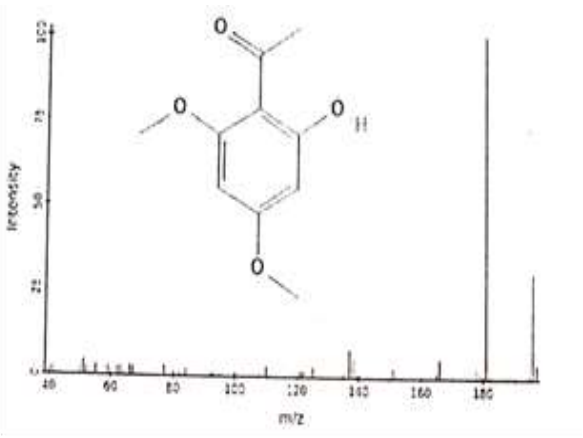

Fig 3. Brevifolin carboxylic acid

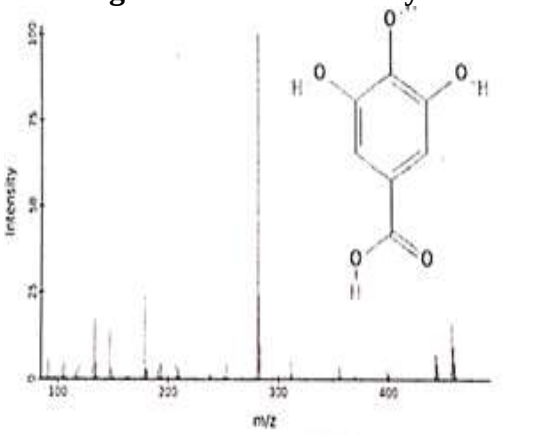

Fig 4. 3,4,5-trihydroxybenzoic acid

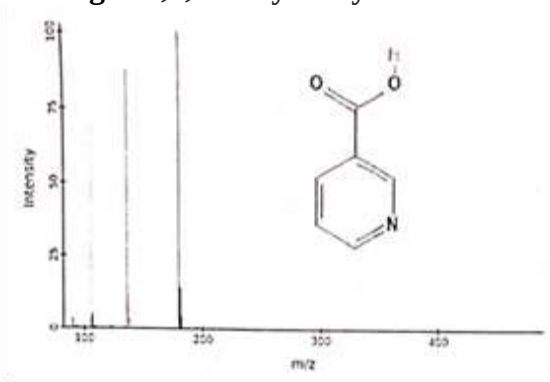

Fig 5. 3,4, -dihydroxybenzoic acid

Table1. bioactive compounds of *Acalypha australis* extract comparing with other species

No.	Chemical compound	synonyms	Molecular weight	Molecular formula	Occurrences In *Acalypha* species
1	2,6-dimethoxy – 1,4-benzoquinones	2,6-dimethoxycyclohexa-2,5- diene- 1,4-dione	168.15 g/mol	$C_8H_8O_4$	*A. australis*
2	Trihydroxyanthraquinones	emodin	270.24 g/mol	$C_{15}H_{10}O_5$	*A. australis* *A. brachystachya*
3	Brevifolin carboxylic acid	Xanthoxylin 2'-Hydroxy-4',6'-dimethoxyacetophenone	196.2 g/mol	$C_{10}H_{12}O_4$	*A. australis*
4	3,4,5-trihydroxybenzoic acid	Gallic acid	170.12 g/mol	$C_7H_6O_5$	*A. australis* *A. hispida* *A. wilkesiana*
5	3,4, -dihydroxybenzoic acid	Protocatechuic acid	154.12 g/mol	$C_7H_6O_4$	*A. australis*
6	Rutin	3-rutinoside Quercetin Vitamin p	610.5 g/mol	$C_{27}H_{30}O_{16}$	*A. australis* *A. alnifolia*
7	Kaempferol	tetrahydroxyflavon	286.24 g/mol	$C_{15}H_{10}O_6$	*A. australis* *A. hispida* *A.wikesiana*
8	β- sitosterol	Cupreol Azuprostat	414.7 g/mol	$C_{29}H_{50}O$	*A. australis* *A. phleoides* *A.wikesiana*
9	Daucossterol	Steroid saponin	576.8 g/mol	$C_{35}H_{60}O_6$	*A. australis*
10	Loliolide	Benzofuran 6-hydroxy-4,4,7*a*-trimethyl-6,7-dihydro-5*H*-1-benzofuran-2-one	196.24 g/mol	$C_{11}H_{16}O_3$	*A. australis*
11	Niacin	Nicotinic acid	123.11 g/mol	$C_6H_5NO_2$	*A. australis*
12	Butanedioic acid	Amber acid Succinic acid	118.09 g/mol	$C_4H_6O_4$	*A. australis*

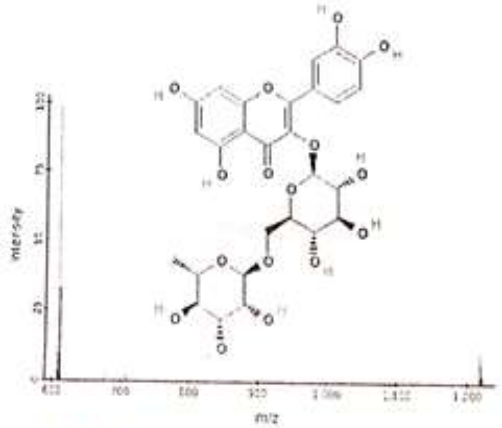

Fig 6. Rutin

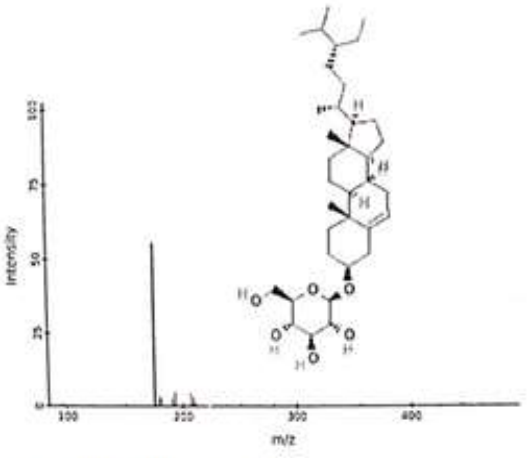

Fig 9. Daucossterol

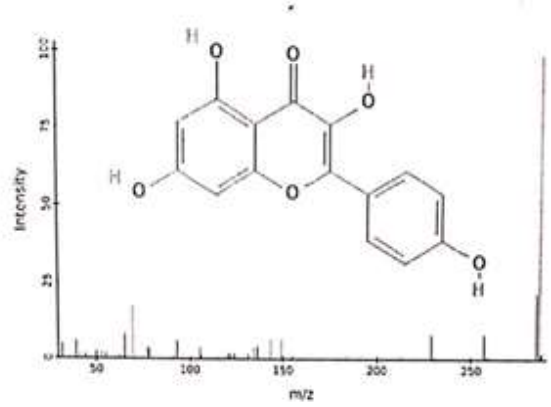

Fig 7. Kaempferol

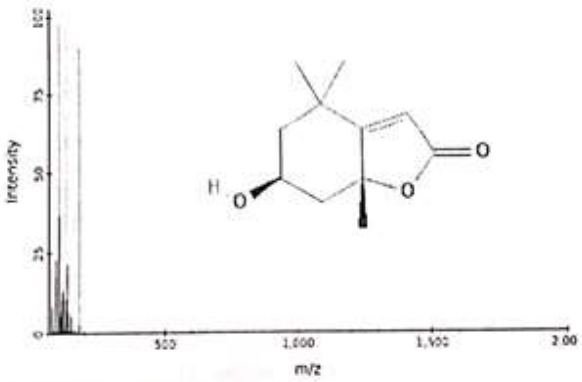

Fig 10. Loliolide

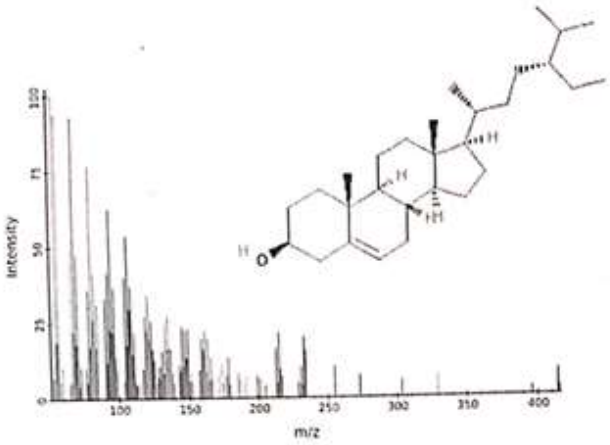

Fig 8. β- sitosterol

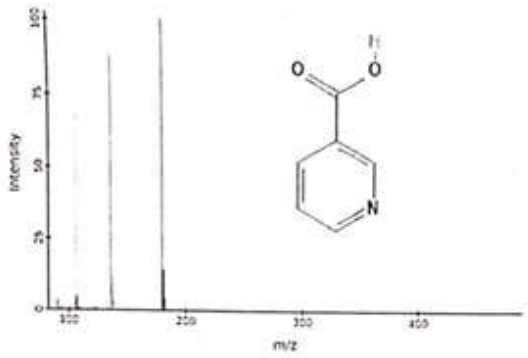

Fig 11. Niacin

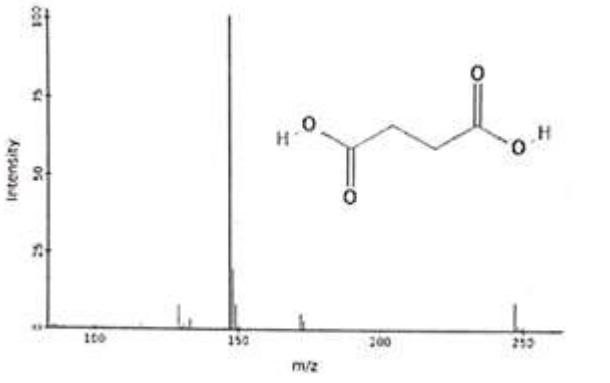

Fig 12. Butanedioic acid

CONCLUSION

New record species for genus *Acalypha* in Iraq is reported with an important bioactive molecules, its chemical screening revealed the presence of phenols, tannins, flavonoids, sterols, quinones, and other organic compound.

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