REVIEW ARTICLE

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Review Article on Phytochemical Constituents and Biological Activity of *Cornulaca monacantha*.

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Abstract

Amaranthaceae is a family of flowering plants. It is often containing isoflavonoids. In phytochemical research, various methylene dioxyflavonols, saponins, triterpenoids, ecdysteroids, and specific carbohydrates have been found in the roots. There are around 165 genera and 2,040 species in it. The flowering plant species *Cornulaca monacantha* is now a member of the Amaranthaceae family and belongs to the genus *Cornulaca* (formerly Chenopodiaceae). It is a type of desert plant that can be found throughout the Middle East and the Sahara; the southern limit of its distribution is thought to mark the edge of the desert. *C. monacantha* is an annual herb with thorny leaves that are highly ramified from the base and turn yellow when dried. It has been recognized as an important medicinal plant with different use. The plant is used to cure liver issues including jaundice. It is also regarded as a superior camel pasture, particularly for its impact on milk production. Few studies have been conducted on the chemical composition of C. monacantha, hence little is known about its phytochemical content, including derivatives of quercetin and luteolin, thirteen triterpenoid saponins, four gallotannin analogues, including monacanthin A and monacanthin B. In Arabic it is known as *had* and *djouri*, and the Tuareg people call it *tahara*. It was first described in 1813 by the French botanist Alire Raffeneau Delile.

Keywords: *Cornulaca monacantha;* botanist; herb; isoflavonoids.

1. Introduction

C. monacantha Del. is an annual herb growing wild in Egypt, in Arabic known as “Had" and is commonly known as "*had* and *djouri*" **(Mhiri et al., 2020)**. The current systematic classification of *C. monacantha* is listed in Table 1. Preliminary phytochemical screening of *C. monacantha* revealed the presence of alkaloids, coumarin, triterpenoid, saponins, flavonoids, polyphenolic compounds and tannins **(Dgahra *et al.*, 2018).** Decoction of the leaves is used in folk medicine for treatment of jaundice, also considered as an excellent pasture for camels, especially for its effect on milk production as well as its beneficial purgative effect. It has spiny leaves which used to treat scabies **(Mhiri *et al.*, 2020)**.

Species Profile Geography and Distribution

C. monacantha is native to North Africa, Arabia, the Middle East, Iran and Baluchistan. It is a desert plant and grows in arid conditions on sandy and stony ground. In Egypt, along the Mediterranean coast, and in the western desert near oases it grows on sand dunes and in sandy depressions but not saline locations **(Boulos *et al.*, 1992)**.

Figure 1: A photo of *C. monacantha* distribution

Division	Angiospermae
Class	Magnoliopsida
Superorder	Caryophyllanae
Order	Caryophyllales
Family	Amaranthaceae
Genus	*Cornulca*
Species	*monacantha*

Table 1: The systemic classification of *C. monacantha*

2. Chemical constituents reported from *C. monacantha*:

2. 1. Triterpene Acid compounds:

From the *C. monacantha* isolated triterpene acid, the first compound was Manevalic acid and the other compound was azizic acid **(Dawidar *et al.*, 1979)**, are listed in Table 2.

2. 2. Flavonoids:

Previous investigation improved the presence of Flavonoids as luteolin-8-O-glucoside-3'-O-rutinoside, quercetin-3-O-rutinoside and quercetin-3-O-galactoside **(Kandil *et al.*, 2001)**. isoflavones also were isolated as, 3-(2-hydroxyphenyl)-5,7-dimethoxy-6-(methoxymethyl)-4*H*-1-benzopyran-4-one and 7-hydroxy-3-(4-hydroxyphenyl)-5-methoxy-6-(methoxymethyl)-4H-1-benzopyran-4-one were **(Mhiri *et al.*, 2020)**, are listed in Table 2.

2. 3. Alkaloids:

From the fresh aerial parts of *C. monacantha*, N-*cis* feruloyltyramine, and N-*trans*-feruloyltyramine were isolated **(Mhiri *et al.*, 2020)**, are listed in Table 2.

2. 4. Tannins:

C. monacantha gave galloyltannin analogs which were identified as monacanthin A and monacanthin B. they are characterized by protoctechuoyl moiety at C-6 are **(Kandil *et al.*, 2001)**, are listed in Table 2.

3. Biological activities reported from *C. monacantha*:

3.1 Anti-oxidant activities:

The aqueous extract of *C. monacantha* had an anti-oxidant activity when compared with standard compound (Ascorbic acid) **(Dgahra *et al.*, 2018)**.

3.2 Cytotoxicity activities:

The test for Cytotoxicity evaluation is done at different fractions from *C. monacantha* at concentrations ranging from 0.0 - 500 µg/ml and using two mammalian cancer cell which were obtained from VACSERA Tissue Culture Unit**(Ashour *et al*., 2019)**. The result showed that, ethyl acetate fraction was the most Cytotoxicity.

3.3 Antimicrobiala ctivities:

The most active antimicrobial activity was ethyl acetate fraction where it 13, 15, 10, 13, and 12 mm inhibition zones against *C. albicans*, *S. aureus*, *B. subtilis*, *P. vulgaris* and *E. coli* respectively, but the acetone fraction of *C. monacantha* has the mild effect of antimicrobial activity, it showed only inhibition zones against S. aureus and E. coli.The antimicrobial activity of *C. monacantha* fractions were determined using well diffusion method **(Ashour *et al*., 2019)**.

3.4 Antidiabetic activities:

From all *C. monacantha* fraction, ethyl acetate fraction was the best antidiabetic activity. The test for Antidiabetic evaluation of *C. monacantha* was carried out *In-vitro* by using both α-amylase and α-glucosidase inhibitory assays **(Ogundajo *et al*., 2017)**

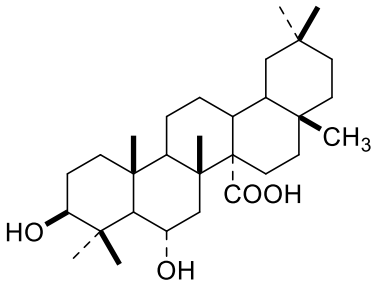
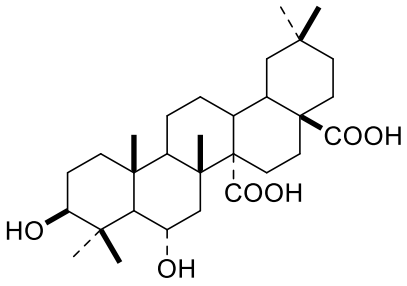
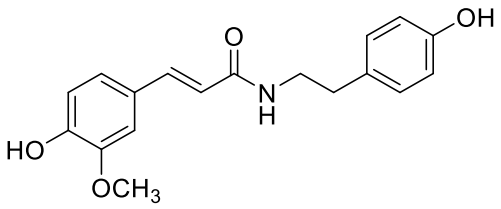
3.5 Anti-arthritic activities:

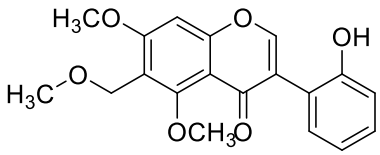
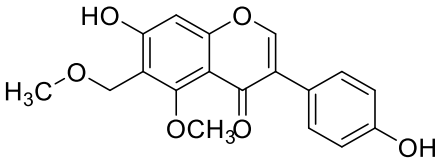
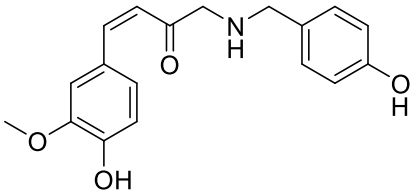
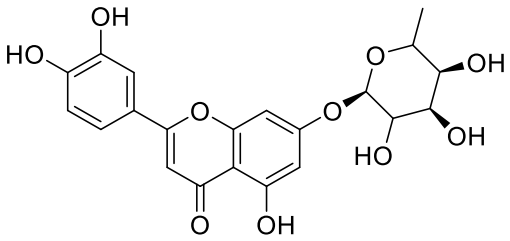
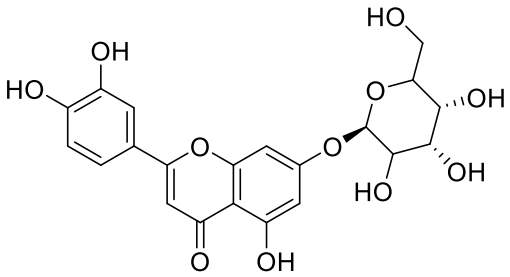
The ethyl acetate fraction of *C. monacantha* was the most active fraction evaluation of anti-arthritic effect fractions on inhibition of protein denaturation was conducted using bovine serum albumin (BSA) procedure **(Uttra *et al*., 2017)**,The experiment were evaluated *in-vitro* using protein denaturation (bovine serum albumin) method at 0 –1000 µg/ml concentrations.

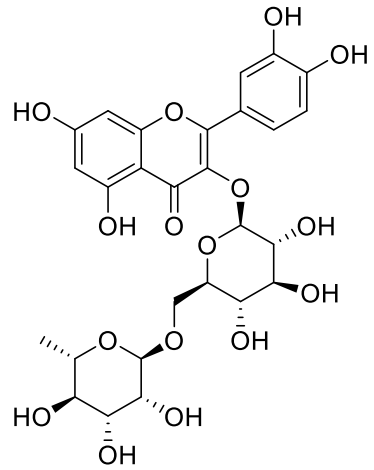
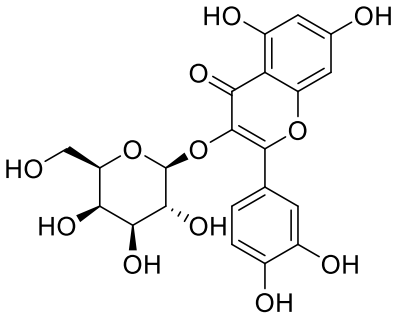
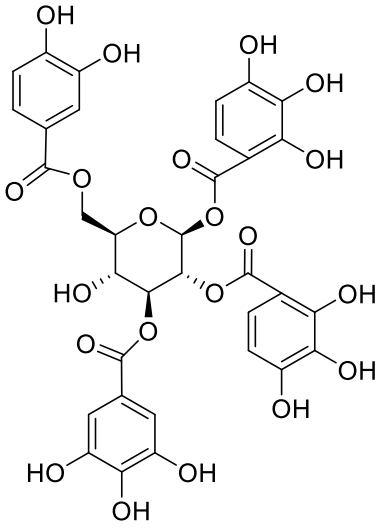
3.6 Hepatoprotective activities:

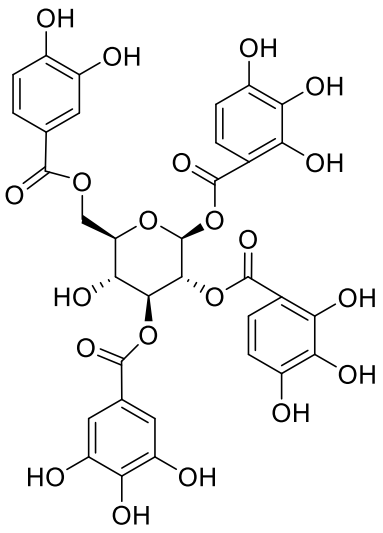
The ethyl acetate fraction of *C. monacantha* are more valuable than the other fractions in hepatoprotective because it has a hepatoprotective protection of 24.6% compared to 20.5%, 10.9% and 13.7% for the acetone, saponins and ether fractions, respectively **(Joshi *et al*., 2015)**. The evaluation of hepatoprotective activity of different *C. monacantha* sub- fractions were carried out using HepG-2 cell line at Non cytotoxic conc. 30 µg/ml. where the percentages of hepatoprotection were 20.5 %, 10.9%, 13.7% and 24.6 % for acetone, saponin, ether and ethyl acetate fractions respectively; while the IC_{50} (µg/ml) of reference substance (silymarin) was 87% **(Thirunavukkarasu *et al*., 2014)**

Table 2: Examples of some compounds isolated from *C. monacantha* of family Amaranthaceae.

Structure	Name	Plant	Reference
	**Manevalic acid**	***C. monacantha***	**(Dawidar *et al*., 1979)**
	**Azizic acid**	***C. monacantha***	**(Dawidar *et al*., 1979)**
	***N-trans*-feruloyltyramine**	***C. monacantha***	**(Mhiri *et al*., 2020)**

	**3-(2-hydroxyphenyl)-5,7-dimethoxy-6-(methoxymethyl)-4*H*-1-benzopyran-4-one**	***C. monacantha***	**(Mhiri *et al*., 2020)**
	**7-hydroxy-3-(4-hydroxyphenyl)-5-methoxy-6-(methoxymethyl)-4*H*-1-benzopyran-4-one**	***C. monacantha***	**(Mhiri *et al*., 2020)**
	***N-cis* feruloyltyramine**	***C. monacantha***	**(Mhiri *et al*., 2020)**
	**Luteolin-7-O-rhamnoside**	***C. monacantha***	**(Kandil *et al*., 2001)**
	**luteolin-7-O-glucoside**	***C. monacantha***	**(Kandil *et al*., 2001)**

	**Quercetin-3-O-rutinoside**	***C. monacantha***	**(Kandil *et al*., 2001)**
	**Quercetin-3-O-galactoside**	***C. monacantha***	**(Kandil *et al*., 2001)**
	**Monacanthin A**	***C. monacantha***	**(Kandil *et al*., 2001)**

	**Monacanthin B**	***C. monacantha***	**(Kandil *et al*., 2001)**

4. Conclusion:

C. monacantha are growing all over the world. It is used in folk medicine for treatment of different disease. Here we just report a brief review for the chemical constituent and biological activity of the plant.

5. Conflict of interest:

The authors report no declaration of conflict of interest.

References:

Ashour, M. A. J. J. o. A. B. 2019. Comparative chemical and biological investigations of three Saudi Astragalus species. Journal of Applied Biology Biotechnology, 7, 5-1.

Boulos, L. J. K. b. 1992. Notes on *Agathophora* (Fenzl) Bunge and *Cornulaca* Del. Studies in the Chenopodiaceae of Arabia 5. journal of plant taxonomy, 46, 283-287.

DAWIDAR, A., REISCH, J., AMER, M. J. C., Bulletin, P. 1979. Structure of manevalic and azizic acids, two new triterpenes from *Cornulaca monacantha* Del. Chemical Pharmaceutical Bulletin, 27, 2938-2942.

DJAHRA, A. B., BENKADDOUR, M., BENKHERARA, S., OUALABI, K., GHANIA, A., JDIDI, K. 2018. Evaluation of total phenolic contents and antioxidant potentials of ten medicinal plants from Algerian Sahara. Biological and Agricultural, 1, 28-36 Joshi, B. C., Prakash, A., Kalia, A. N. J. T. r. 2015. Hepatoprotective potential of antioxidant potent fraction from Urtica dioica Linn.whole plant in CCl4 challenged rats. Toxicology reports., 2, 1101-1110.

Kandil, F. E., Grace, M. H. J. P. 2001. Polyphenols from *Cornulaca monacantha*. Phytochemistry., 58, 611-613.

Mhiri, R., Koubaa, I., Chawech, R., Auberon, F., Allouche, N., Michel, T. J. C. 2020. New Isoflavones with Antioxidant Activity Isolated from Cornulaca monacantha. Chemistry Biodiversity, 17, e2000758.

Ogundajo, A., Ashafa, A. T. J. P. m. 2017. Phytochemical Compositions and In vitro Assessments of Antioxidant and Antidiabetic Potentials of Fractions from Ehretia cymosa Thonn. Pharmacognosy magazine, 13, S470.

Thirunavukkarasu, P., Asha, S., Ramanathan, T., Balasubramanian, T., Shanmogapriya, R., Renugadevi, G. J. P. c. j. 2014. In vitro Hepatoprotective activity of isolated fractions of Cressa cretica. Pharmaceutical chemistry journal, 48, 121-126.

Uttra, A. M., Hasan, U. H. J. B. c., medicine, a. 2017. Anti-arthritic activity of aqueous-methanolic extract and various fractions of Berberis orthobotrys Bien ex Aitch. BMC complement alternative medicine, 17, 1-16.

Zheng, H.-c., Lu, Y., Chen, D.-f. J. B., Letters, M. C. 2018. Anticomplement compounds from Polygonum chinense. Bioorganic Medicinal Chemistry Letters, 28, 1495-1500.