

The Inhibitory Action of *Capparis spinosa* Leaves Against the Tumor and Leishmania

Nidal M.S. Al-Janabi^{1*}, Mohammad M. F. Al-Halbosiy² and Samah. R. H. Al-Badri³

¹Department of Food Science, Agriculture College, Baghdad University, Iraq

²Medical and Molecular Biotechnology Department / Biotechnology Research Center, Al-Nahrain University, Iraq

³Ministry of Agriculture, Iraq

*Corresponding Author: nidhalspring@yahoo.com

Abstract

The leaves of the *Capparis spinosa* were collected from the eastern Radwaniya/Baghdad during the months April, May, June, July, September, and September. The leaves were extracted by water and alcohol.

The effectiveness of anti-tumor and anti-leishmania for the water and alcohol extracts of al-Qabar leaf samples for May and September, which were characterized by the highest percentage of active compounds for the rest of the tested months, was evaluated by adopting the results of a previous study for the same researchers or chemical composition and leaf content of active compounds. The concentrations of 250, 500, 1000 mg.L⁻¹ were evaluated for anti-tumor efficacy. The anti-leishmania efficacy was tested at 250, 500 and 1000 mg L⁻¹. The sample of the alcohol extract for May collected complex showed the highest anti-tumor activity at 63.5% at 500 mg.L⁻¹ and the highest efficacy of the samples of alcohol extract for September was 56.1% at the concentration of 250 mg.L⁻¹, while the water extract for the May sample did not show any effectiveness even at the highest concentration 1000 mg L⁻¹, but the September collected sample was effective at 49.3%. In the case of the inhibitory efficacy of leishmania, the alcohol extract of the May sample did not show any inhibitory activity at the lowest concentration. The effectiveness of 41.3% was observed at 500 mg.L⁻¹, but decreased to 14.8% at the highest concentration of 1000 mg L⁻¹. Of the same month at the lowest concentration of 37.8% and decreased effectiveness there was an increase in the anti-leishmania effect of the September extract of the sample with increased concentration. There was an increase in its effectiveness at the lowest concentration of a user and then reached 8 and 37% at the concentration of 500 and 1000 mg.L⁻¹ with the same percentage, and the water extract for the September sample did not show any efficacy at the minimum and highest concentrations, except the concentration of 500 mg.L⁻¹, which reached 11%.

[DOI: [10.22401/ANJS.00.2.08](https://doi.org/10.22401/ANJS.00.2.08)]

Keywords: *Capparis spinosa*, Anti-tumor, anti-leishmania.

Introduction

Capparis spinosa is a major cultivar of *Capparis* [11]. Known in Iraq as Shafallah and Kabar in Basra, kifri in Kurdistan [4].

Previous studies have indicated the presence of active compounds in *C. spinosa* such as alkaloids, lipids, flavonoids and clocosinols [5]. They have a number of biological agents such as antifungal, antifungal and liver toxicity [15].

There have been numerous studies on the original habitat of the plant. Some pointed out that the island of Capri, off the coast of Naples, derived from the name of the plant, while other studies indicate that the plant

origin dates back more than 7500 years before the date by finding the plant seeds in the so-called In Iraq, and other studies have suggested that the original inhabitants of the plant are Mediterranean countries [16].

The vast majority of herbaceous plants used in conventional medical treatments are obtained from the wild rather than cultivated by *C. spinosa*, which is one of the most highly valuable medicinal and medicinal plants in a different system of medicines. Greece and China [3].

Cancer is the second most common disease after heart disease and is a leading cause of death worldwide. It has been found

that some nutrients and some non-food compounds have the direct effect of preventing some chronic diseases such as obesity, heart disease and cancer. In one way or another with the type of food intake, if 80-90% of cancers are due to environmental factors, 35% of these factors are due to the quality of the food intake [14]. Recent studies have shown that phytochemicals exert anticancer effects by altering various activities (Kinases Tyrosine) Receptor in the expression of genes responsible for cell proliferation and apoptosis [11].

The genus *C.spinosa* has received a lot of publicity recently, because it is the source of the most active biologically active ingredients, which has a wide range of biological properties, has attracted the attention of the routine as a food component, and the results of clinical studies indicated its potential role in the anti-carcinogenic effect [19].

Al-Daraji M. N. in [1] concluded that the raw water extract of *C.spinosa* leaves had an effect on the growth of hep-2 and hepatocellular carcinoma cells in a low concentration of 125 µg/mL. Hep-2 0.340 cell density %, Hela 0.6545%, and the highest inhibitory effect of the extract at 1000 µg/mL.

Selenium is found at a high concentration in the plant, compared to its concentration in other plants, which is associated with the prevention of certain forms of cancer [18].

Leishmania is a genus of single-cell parasites involving more than thirty species that prey on vertebrates, primarily on mammals, and leishmaniasis can be caused by 20 different species of leishmaniasis and has a wide range of clinical symptoms ranging from ulcers to self-healing. The skin of cutaneous leishmaniasis (CL) to the nasopharyngeal larynx (mucosal mucous leishmaniasis) and diffuse visceral leishmaniasis (VL) is known as leishmaniasis. These parasites are transmitted by female bites of the sand fly *Phlebotomuspapatasi* (Scopoli) [7].

The World Health Organization (WHO) has reported that there are approximately 12 million cases of leishmaniasis worldwide, with 2 million new cases of self-healing lesions of leishmaniasis and half a million

new cases of visceral diffuse leishmaniasis in one year [7].

Jacobson, R.L.; Schlein, Y. in [10] note that *C.spinosa* is a control of leishmaniasis, which helps to control major leishmaniasis, and has introduced several medicinal activities of the aquatic extracts of elder plants, including the control of leishmaniasis [10].

Extracts of different parts of *C.spinosa* have been found to have a biological activity against a large number of pathogens, Anti-leishmania and anti-allergic activities [17].

Materials and Methods

Extraction:

Samples collected: The May and September samples were collected and extracted according to [20].

Antitumor activity:

Antitumor efficacy of aqueous and alcohol extract of leaves for May and September was evaluated against the L20B cell line derived from murine fibroblast. The 3-(4,5-dimethylthiazal-z-yl)-2,5-diphenyl-terazolium (MTT), in which the vitality of the cells is measured in a chromatic manner according to [8]. Briefly, add 100 µl of L20B per hole with 10^6 cells / ml) was cultured in 96-well tissue culture plate. Different concentrations of the leaf extract were prepared (500,250 and 1000 mg / mL) by dissolving it with water, taking 100 µl of concentrations was added to each well and placed in the incubator 37 °C for 24 hours. After the end of the incubation,

10 microliters of MTT dye was added at a concentration of 5 mg/ml to each well and incubated at 37 °C for 4 hours. Finally add 50 µl of Dimethylsulfoxide (DMSO) solution to each well and leave for 10 min. L20B cells with the whole medium without the extraction solution as a positive comparison. The whole medium without cells and the extraction solution is a blank solution, whereas the absorbance was measured at 620 nanometers per well and using the Elisa Enzyme Linked Immunosorbent Assay technique. The percentage of vitality and inhibition of living cells was calculated as follows:

Inhibition% = $\frac{\text{Optical density for positive comparison} - \text{Optical density of the model}}{\text{Optical density for positive comparison}} \times 100$.

Antileishmanial activity:

The effect of anti-leishmania on the water and alcohol extract of the leaves of the al-Kabir plant for May and September was estimated against the promastigote forms of *L.tropica*. The MTT test is a chromatic test of cell vitality as described by [13], (100 μ l) of the promastigote form cells in a single well (10^6 cells/ml) seeding in 96-well tissue culture plate. The different concentrations of the extraction solution (500, 250 and 1000) mg/ml, which were prepared from the solubility of 3 g of the extract of leaves of dried fruit plant in 3 ml of water, was added on the well plate. Then, Plate was incubated at 26 °C for 24 hours and after the incubation period, 10 μ l of dye MTT at 5 mg/mL concentration was added per well and incubated at 26 °C for 4 hours. Finally, 50 μ l of DMSO was added to each well and incubated for 10 min. The promastigote forms cultured in a complete medium without extract. The whole medium without the promastigote forms and the macromolecule extract was used as blank. The absorbance was measured at 620 nanometers per well and Elisa (Enzyme Linked Immunosorbent Assay). The percentage of vitality and inhibition of living cells was calculated as follows:

Inhibition% = $\frac{\text{Optical density for positive comparison} - \text{Optical density of the model}}{\text{Optical density for positive comparison}} \times 100$.

Results and discussion

Antitumor efficacy:

Table (1) shows the percentage of inhibition of cancer cells derived from fibroblast cell-2 (cell murine fibroblast) cells using water and alcohol extracts of the leaves of the large plant for May and September.

The highest percentage of inhibition was due to the alcoholic extract for May at a concentration of 500 mg/ml which was

63.5%. The water extract for the same month did not show any inhibitory activity at the tested concentrations.

It is also noted that the percentage of inhibition of water and alcohol extracts of the leaves of the *Al-Kabir* plant for May was less than the water and alcohol extracts for September, except for the alcohol extract for May at a concentration of 500 and 1000 mg/ml. Inhibition of water extracts for September (38.7, 45.1 and 49.3)% concentration (250, 500 and 1000 mg / ml), and for alcoholic extracts for the same month (56.1, 44.2 and 33.4%) at the same concentration respectively. In May, water extracts were (5.5, 16.28 and 0%) respectively, and 50.9%, 63.5, 52.29% respectively for alcoholic extracts with the same concentrations.

We conclude that the alcoholic extracts of the months of May and September were more effective than the water extracts for the two months mentioned. The effectiveness of anti-cancer extracts of the leaves of the plant of watercress and alcoholic water because it contains a number of active compounds. The sex of *C.spinosa* much of the publicity recently, because it is the source of most important components biological activity such as routine, which possesses a wide range of biological properties, and the results of clinical studies indicated its potential role in an anti-carcinogenic protective effect [19]. Both routine and isothiocyanate showed anticancer effects [6].

Table (1)
Percentage of inhibition of cancer cells with water and alcohol extracts of leaves of Al-Kabir plant for May and September

Concentration Mg L^{-1}	Percentage of inhibition %			
	The month of May		The month of September	
	Alcoholic Extract	Water extract	Alcoholic Extract	Water extract
250	5.5	5.5	56.1	38.7
500	16.28	16.28	44.2	45.1
1000	0	0	33.4	49.3

It may be due to the effect of the plant in the prevention of cancer to the presence of the element of selenium in which the concentration of high compared to its concentration in other plants and this element is related to the prevention of some forms of cancer [18]. The roots and leaves in the plant may have some antagonism [2]. Isothiocyanates (ITCc) has been paying great attention over the past years especially because of their strong anti-cancer properties that have been shown in the models both in the laboratory and *in vivo* models [9].

Anti-leishmanial activity:

Table (2) shows the percentages of inhibition of *L.tropica* in water and alcohol extracts of the leaves of *Al-Kabir* plant for

May and September. The alcohol extract for May showed the highest inhibitory activity of 41.3% at 500 mg/ml followed by the water and alcohol extract of May. The percentage of inhibitors for the water extract for the month of May was 37.8% with a concentration of 250 mg/ml and 37% for the September extract of 1000 mg/ml and 36.9% for the May water extract at a concentration of 500 mg/ml. May and September at concentrate 1000 mg/ml for aqueous extract did not show him the effectiveness of inhibitory against *Leishmania* when the highest laboratory concentration, while the minimum concentration also did not show the effectiveness of inhibition of both extracts at September and at alcoholic extract at May.

Table (2)
Percentage of inhibition of leishmania (Baghdad bean) using water and alcohol extracts of leaves of al-Kabir plant for May and September

Concentration Mg L^{-1}	Percentage of inhibition %			
	The month of May		The month of September	
	Alcoholic Extract	Water extract	Alcoholic Extract	Water extract
250	0	37.8	0	0
500	41.3	36.9	8	11
1000	14.8	0	37	0

This is confirmed by [12], where *C.spinosa* showed antifungal activity and leishmania and leukaemia because it contains cadabicine, betasitosterylglucoside-6'-octadecanoate (1) and 3-methyl-2-butenyl-beta-glucoside. In addition, extracts of the leaves of the large plant contain lacanin, which prevents the availability of sugars to

parasites of *Leishmania*, leading to their aggregation [10].

Conclusions

Demonstration of the Prophecy of Antitumoractivity and Anti-leishmanial activity the water and alcohol extracts of the May and September samples. The highest

Antitumor activity form of alcohol extracts of the May 63.5% of the Concentration 500 mg / ml and 56.1% of the September samples of the Concentration 250 mg. ml⁻¹. The alcohol extracts highest Anti-leishmanial activity form the May 41.3% of the Concentration 500 mg ml⁻¹.

References

- [1] Al-Daraji, M. N. J.A., "Study of the inhibitory effect of the capar, *Capparisspinosa* L. aqueous crude leaf extract on the HEP-2 and HELA cancer cell line", Iraqi Journal of Desert Studies, 2(1): 67-73, 2010.
- [2] Arena, A.; Bisignano, G. and *et al.*, "Antivieal and immunomodulatory effect of a lyophilized extract of *Capparisspinosa* L. buds", Phytother Res, 22: 313-317, 2008.
- [3] Azaizeh, H.; Fulder, S.; Khalil, K. and Said, O. "Ethnomedicinal knowledge of local Arab practitioners in the Middle East Region", Fitoterapia, 74: 98-108, 2003.
- [4] Blakeiock, R. A. and Townsend, C. C., *Caapparidaceae.*, "Ministry of Agriculture and Agrarian Reform, Baghdad", Iraq. in C. C. Townsend and E. Guest, eds., Flora of Iraq, 4, (1):139-145, 1980.
- [5] Brevard, H.; Brambilla, M.; Chaintreau, A. and Marion, J.P., "Occurrence of elemental sulphur in capers (*Capparisspinosa* L.) and first investigation of the flavour profile", Flavour Fragrance J. 7: 313-321, 1992.
- [6] Cao, Y.L.; Li, X. and *et al.*, "*Capparisspinosa* protects against oxidative stress in systemic sclerosis demal fibroblasts". Arch Dermatol Res, 302(5): 349-355, (2010).
- [7] Davis, A. J.; Kedzierskil, L., "Recent advances in antileishmanial drug development", Curr Opin Investig Drugs 6: 163-169, 2005.
- [8] Freshney, R. I., "Culture of Animal Cell", 6th Edition. Wily-Liss, New York, 2010.
- [9] Halkier, B. A. and Gershenzon, J., "Biology and Biochemistry of Glucosinolates, in Annual Review of Plant Biology", (57): 303-33, 2006.
- [10] Jacobson, R.L.; Schlein, Y., "Lectins and toxins in the plant diet of *Phlebotomuspapatasi* (Diptera: Psychodidae) can kill *Leishmania major* promastigotes in the sandfly and in culture", Annals of Tropical Medicine and Parasitology, 93 : 351-356, 1999.
- [11] Kan, Y. and Arslan, N., "Konya' dagoğalparakyetisenkapari (*Capparisspinosa* Desf. var. *canescens* (coss.) Heywood) 'de bazıfenolojikvemorfolojiközelliklerüzerin ebirarastırma. Bitkiselilaçmaddeleritoplantısı, Bildiriler" 29-31 Mayıs. Eskisehir, 144-148 (In Turkish), 2002.
- [12] Khanfar, M. A.; Sabri, S. S.; Zarga, M. H. and Zeller, K.P., "The chemical constituents of *Capparisspinosa* of Jordanian origin", Nat Prod Res., 17:9-14, 2003.
- [13] Mahmoudv, H.; Ezzatkah, F., Sharififar, F. and *et al.*, "Antileishmanial and cytotoxic effects of essential oil and methanolic extract of *Myrtuscommunis*" L. Korean J. Parasitol. 53(1), 21-27, 2015.
- [14] Manjinder, K; Reinuka, M.; Rajesh, A. and Chapla, A., "Grape Seed Extract Induces Cell Cycle Arrest and Apoptosis in Human Colon Carcinoma Cells Nutr Cancer" 60(1): 2-11, 2008.
- [15] Mouna, M.; Khadija, E.; Anass, E.; Abdallah, A.; Jamal, J. E.; Fouad, S.; Norddine, H. and Abdallah, B. "*Capparisspinosa* L. promotes anti-inflammatory response in vitro through the control of cytokine gene expression in human peripheral blood mononuclear cells", 2016.
- [16] Romeo, V.; Ziino, M. and Giuffrid, A. D., "Flavour profile of capers (*Capparisspinosa* L.) from the Eolian Archipelago by HS-SPME/GCMS", Food Chem. 101: 1272-1278, 2007.
- [17] Tesoriere, L.; Butera, D. and *et al.*, "Bioactive components of caper (*Capparisspinosa* L. from Sicily and antioxidant effects in a red meat simulated gastric digestion", Jagric Food Chem 55(21): 8465-8471, 2007.

- [18] Tlili, N.; Munne-Bosch, S.; Nasri, N.; Saadaoui, E.; Khaldi, A. and Triki, S. J. "Food Lipids", 16: 452-464, 2009.
- [19] Webster, R. P.; Gawde, M. D. and Bhattacharya, R. K., "Protective effect of rutin, a flavonol glycoside, on the carcinogen-induced DNA damage and repair enzymes in rats", *Cancer Letters*. 109, 185-191, 1996.
- [20] Zhou, X.; Peng, J.; Fan, G. and Wu, Y., "Isolation and purification of flavonoid glycosides from *Trollius ledebouri* using high-speed countercurrent Chromatography by stepwise increasing the flow-rate of the mobile phase", *Journal of Chromatography A*, (1092): 216-221, 2000.