



# THE ACTIVITY OF AQUEOUS EXTRACTS OF LEAVES AND ROOTS OF DANDELION ON CANCER CELL LINES

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## Abstract

Plants of the genus *Taraxacum officinale*, commonly known as dandelions, have a history of use in Native American, Chinese and Arabian traditional medicine. In the present study, aqueous extract of leaves and aqueous extract of roots were added to the cultured cancer cells (RD and MD cell line) in the various concentration (15.62, 31.25, 62.5, 125, 250 µg/ml) and incubated for three time (24, 48, 72h). The 3-(4, 5-dimethyl-2-thiazolyl)-2, 5-diphenyl-2-H-tetrazolium bromide (MTT) assay was used to investigate the cytotoxic effects of a dandelion extract on cancer cell lines.

The obtained results showed that dandelion extracts at all concentrations could significantly inhibit both RD and MD cell line in all time of the exposure.

**Key words:** Dandelion, cancer cell line, *Taraxacum officinale*

## Introduction

Cancer is the second reason of death worldwide. Conventional therapies for cancer include surgery, chemotherapy, radiation therapy, and immunotherapy which are used as a single or combinatorial therapy (Soltanian *et al.*, 2017). Today many secondary metabolic compounds of the plant “phytochemicals” have been identified that have anti-cancer properties, for example, inhibition of cell proliferation, and induction of apoptosis which finally reduce the risk of cancer (Amin *et al.*, 2009).

*Taraxacum officinale* known as dandelion is a member of the Asteraceae / Compositae family (Al-Kafaji *et al.*, 2016). it is a perennial weed that has been used for hundreds of years as a traditional medical remedy for several diseases (Gerbino *et al.*, 2018). dandelion is nowadays commercialized as a healthy food because of its has medical properties, including anti-rheumatic, anti-oxidant, anti-carcinogenic, anti-inflammatory, diuretic, laxative and hypoglycemic activities (Wirngo *et al.*, 2016). dandelion contains many useful phytochemicals such as, phenolic acids, flavonoids, terpenes and alkaloids (Han *et al.*, 2018). Over 30 phenolic compounds have been isolated from *Taraxacum officinale* (Gonzalez-Castejon

*et al.*, 2012). Oriental medicine has recognized the value of dandelion extract for the treatment of spleen, bladder, and liver ailments and for diseases such as gout and diarrhea (Martinez *et al.*, 2015).

In this study, our aim was to determine whether a dandelion extract possessed anti-cancer activity.

## Materials and methods

### Preparation of the extractions:-

*Taraxacum officinale* was collected from Wasit city, Iraq. According to (Harborne *et al.*, 1975) the leaves and roots were washed, dried and ground to get powder using a blender. Aqueous extraction of leaves and roots were prepared as follows: 50g of the dried plant parts were soaked in 250ml of distilled water for 72h at room temperature, The mixtures were filtered by filter paper, then dried by oven and stored at 4°C.

### Cell culture-

RD cell line and MD Anderson cell line was incubated after obtained in the incubator at 37°C provided with 5% CO<sub>2</sub>. The cell line culture was grown in RPMI -1640 with 10% fetal bovine serum.

### -MTT assay

To determine the toxicity of these extract, MTT assay

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were done according to ATCC protocol. RD and MD cells were trypsinized and seeded in 96-well plates, after 24 hours of seeding cells were treated for 24, 48 and 72 hours with different concentrations of aqueous extract of leaves and aqueous extract of roots of dandelion (250, 125, 62.5, 31.25, 15.62 µg/mL) against control (1% DMSO without any treatment). Determination of cell viability was done by MTT assay and using Elisa reader at 630nm wavelengths (Freshney, 2012).

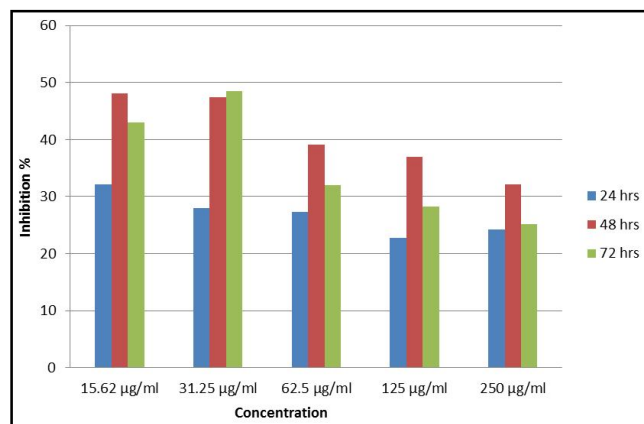


Fig. 1. A comparison of growth inhibition percentage of RD cell line, by aqueous extract of leaves of *Taraxacum officinale* during three periods of exposure.

**Table 1:** showed a comparison of growth inhibition percentage of RD cell line, by aqueous extract of leaves of *Taraxacum officinale* during three periods of exposure.

Conc. (µg/ml)	Inhibition%			LSD value
	24hrs	48hrs	72hrs	
15.62	32.075 ± 1.48	48.117 ± 2.73	42.941 ± 2.28	5.803 *
31.25	28.048 ± 1.07	47.368 ± 2.35	48.500 ± 2.76	6.522 *
62.5	27.272 ± 1.18	29.157 ± 1.30	32.034 ± 1.58	5.023 NS
125	22.807 ± 0.74	26.911 ± 1.35	28.319 ± 1.57	5.298 *
250	24.250 ± 1.08	22.143 ± 0.84	25.131 ± 1.44	3.677 NS
LSD value	5.493 *	6.411 *	5.885 *	----

\* (P<0.05).

**Table 2:** showed a comparison of growth inhibition percentage of RD cell line, by aqueous extract of roots of *T. officinale* during three periods of exposure.

RD cell line by aqueous extract of roots				
Conc. (µg/ml)	Inhibition%			LSD value
	24hrs	48hrs	72hrs	
15.62	25.384 ± 1.37	53.125 ± 2.57	24.320 ± 1.19	6.230 *
31.25	27.760 ± 1.06	55.555 ± 1.94	26.760 ± 1.30	6.094 *
62.5	29.689 ± 1.73	60.655 ± 2.63	25.530 ± 1.41	6.722 *
125	21.518 ± 0.79	41.598 ± 2.53	20.518 ± 0.89	6.409 *
250	28.834 ± 1.27	36.861 ± 1.56	23.465 ± 1.07	5.837 *
LSD value	4.973 *	6.037 *	5.722 *	----

\* (P<0.05).

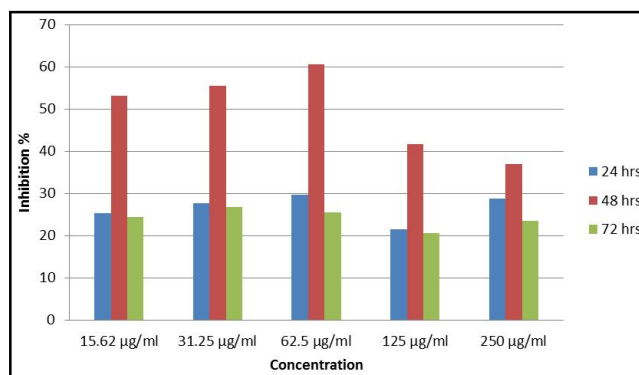


Fig. 2. A comparison of growth inhibition percentage of RD cell line, by aqueous extract of roots of *Taraxacum officinale* during three periods of exposure.

### Results

Cytotoxic effect of crude aqueous extract of leaves and crude aqueous extracts of roots on (RD), and (MD) cell lines: Two cell lines were used (RD and MD cell lines) at three times of exposure (24, 48 and 72 hours). Two fold dilution was made to get concentrations from 15.62 µg/ml to 250 µg/ml of crude aqueous extract of leaves and crude aqueous extracts of roots of the plant. In table 1 and Fig. 1 the results revealed significant cytotoxic effect of crude aqueous extract of leaves at levels (P < 0.05) for all concentrations on RD cell line.

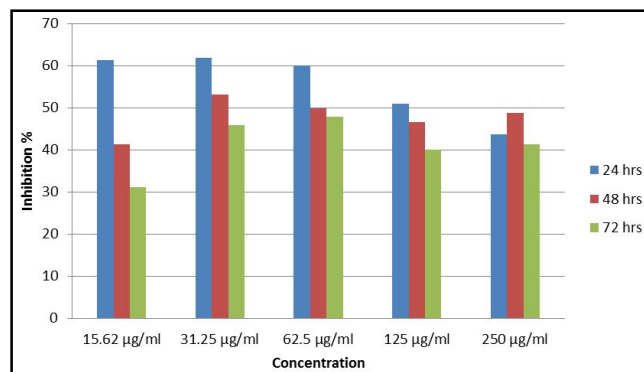
The aqueous extract of leaves had highest growth inhibition on RD cell line at the concentrations (31.25 µg/ml) for the period of 72 hrs. Table 2 and Fig. 2 shows the effect of the crude aqueous extract of roots on RD cell line in three periods of exposure. Crude aqueous extract of roots had highest inhibitory effect on growth of RD cell line at the concentration (62.5 µg/ml) for the periods of 48 hrs. The cytotoxic effect on RD cell line showed significant effect at levels (P < 0.05). In table 3 and Fig. 3 the results revealed significant cytotoxic effect of crude aqueous extract of leaves at levels (P < 0.05) for all concentrations on MD cell line. The aqueous extract of leaves had highest growth inhibition on MD cell line at the concentrations (15.62, 31.25, 62.5 µg/ml) for the period of 24 hrs. Table 4 and Fig. 4 shows the effect of the crude aqueous extract of roots on MD cell line. Crude aqueous extract of roots had highest inhibitory effect on growth of MD cell line at the concentration (31.25 µg/ml) for the periods of 72 hrs.

### Discussion

Our results showed that aqueous extracts

of leaves and roots of *Taraxacum officinale* have anticancer effects on cancer cell lines. In line with our findings previous studies have shown the *Taraxacum officinale* have anticancer effects (Sharma and Zafar, 2016). Dandelion has been well-known for its medicinal properties in different cultures. It has been described to treat different illnesses such as cirrhosis of the liver, inflammation, hepatitis, anemia, and cancer (Tahtamouni *et al.*, 2016).

The anticancer effects of *T. officinale* extracts



**Fig. 3.** A comparison of growth inhibition percentage of MD cell line, by aqueous extract of leaves of *Taraxacum officinale* during three periods of exposure.

**Table 3:** showed a comparison of growth inhibition percentage of MD cell line, by aqueous extract of leaves of *Taraxacum officinale* during three periods of exposure.

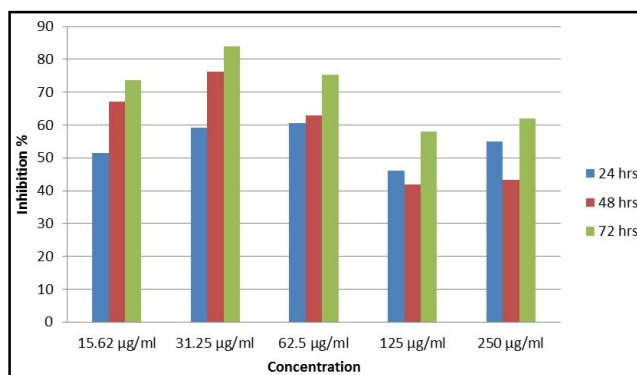
(MD cell line) aqueous extract of leaves				
Conc. (µg/ml)	Inhibition%			LSD value
	24hrs	48hrs	72hrs	
15.62	61.251 ± 2.59	41.401 ± 2.08	31.153 ± 1.26	6.544 *
31.25	61.835 ± 2.07	53.103 ± 2.51	45.769 ± 2.47	5.968 *
62.5	60.095 ± 2.38	49.842 ± 2.37	47.789 ± 2.61	6.483 *
125	50.901 ± 1.82	46.622 ± 2.71	39.981 ± 1.96	5.023 *
250	43.662 ± 1.35	48.744 ± 2.42	41.309 ± 2.07	5.471 *
LSD value	7.538 *	6.496 *	6.523 *	-----

\* (P<0.05).

**Table 4:** showed a comparison of growth inhibition percentage of MD cell line, by aqueous extract of roots of *Taraxacum officinale* during three periods of exposure.

aqueous extract of roots(MD cell line)				
Conc. (µg/ml)	Inhibition%			LSD value
	24hrs	48hrs	72hrs	
15.62	51.388 ± 2.58	67.246 ± 3.41	73.714 ± 3.63	6.502 *
31.25	59.209 ± 2.61	76.192 ± 4.16	83.930 ± 3.66	6.944 *
62.5	60.560 ± 2.85	62.934 ± 2.97	75.216 ± 4.07	5.895 *
125	46.017 ± 2.38	41.859 ± 2.36	57.931 ± 2.37	5.462 *
250	55.092 ± 2.74	43.241 ± 2.30	61.949 ± 2.77	6.571 *
LSD value	7.033 *	8.016 *	7.402 *	-----

\* (P<0.05).



**Fig. 4.** A comparison of growth inhibition percentage of MD cell line, by aqueous extract of roots of *Taraxacum officinale* during three periods of exposure.

comes from the antioxidant and antitumor components found in the extracts. *T. officinale* contains taraxerol, taraxasterol, saponins, sesquiterpenes, flavonoids and phenolic compounds (Ivanov *et al.*, 2018).

### Conclusions

These results suggest that the cytotoxic concentrations of aqueous extracts of *Taraxacum officinale* showed variation in values among cell lines according to cell types *in vitro*.

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