Tarassacum officinale

ardanatura

Often dismissed as a mere weed to be uprooted, dandelion is actually a plant found all over the world and has been used for centuries as a natural remedy in various cultures, as confirmed by recent ethnobotanical studies.

Its simplicity conceals a rich world of stories, traditions, and remarkable properties that promote overall well-being. Derived from the Greek words *Taraxos* (disorder) and *Akos* (remedy), *Taraxacum officinale* continues to be studied today for its detoxifying, anti-inflammatory, and anti-lipogenic properties.

The different parts of the plant – roots, leaves, and flowers – contain a wide range of phytochemicals, including flavonoids, phenolic acids, sesquiterpene lactones, triterpenes, and polysaccharides (particularly inulin).

There are various sources around the world that document the traditional uses of dandelion, and some of them clearly mention its use as a remedy for skin disorders as well.

Vernacular name	Country	Traditional use
Löwenzahn	Germany	Remedy for gout, diarrhea, blisters, spleen, and liver disorders
Blowballs	USA	Useful for kidney disorders, dyspepsia, heartburn, "blood purification", mild laxative, treatment for arthritis, rheumatism, eczema, and other skin ailments
Diente de león	Mexico	Treatment for diabetes mellitus and bacterial infections
Cırtlık	Turckey	Laxative, diuretic, anti-diabetic
蒲公英 C	China	Remedy for upper respiratory infections, bronchitis, or pneumonia
Yanrin	Nigeria	Remedy for kidney dysfunction, diabetes, anti-inflammatory agent
Dudhal or Kanphul	India	Hepatic stimulant, diuretic, remedy for liver disorders and chronic skin diseases
هايدنهلا	Arabic countries	Remedy for liver and spleen disorders

ARDA NATURA PROPOSAL

- 009169 ACQUA DI TARASSACO PE - Aqua, Taraxacum officinale Rhizome/Root Extract
- 006743 E.GLICERICO TARASSACO U.A. - Glycerin, Aqua, Taraxacum officinale Rhizome/Root Extract
- 003398 E.G. TARASSACO 1:2 PE - Propylene Glycol, Aqua, Taraxacum officinale Rhizome/Root Extract

COSMETIC EFFICACY*

- [x] ANTIOXYDANT
- [x] RADICAL SCAVENGING
- [x] ANTIMICROBIAL
- [x] ANTI-INFLAMMATORY
- [x] ANTILIPOGENIC

*claim derived and synthesized, see bibliography

NUTRACEUTICAL EFFICACY

- [x] DIGESTIVE FUNCTION
- [x] LIVER FUNCTION
- [x] REGULARITY OF INTESTINAL TRANSIT
- [x] PURIFYING FUNCTIONS OF THE ORGANISM
- [x] DRAINAGE OF BODY FLUIDS

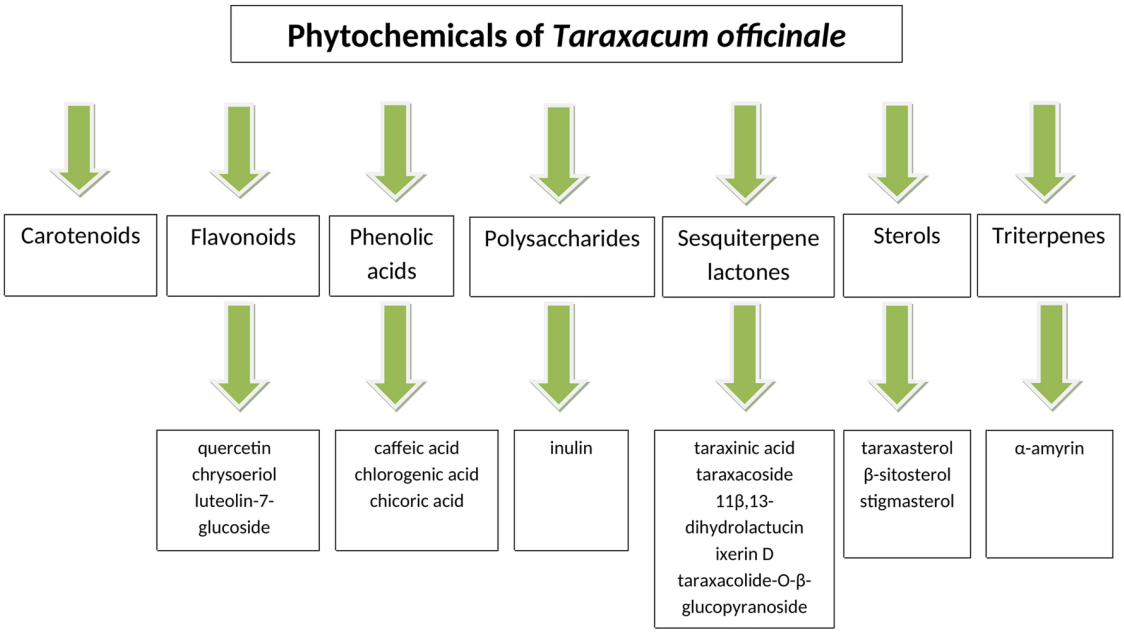
Dandelion

Etymology

Taraxacum officinale – the name *Taraxacum* derives from the fusion of two Greek words: "taraxos" meaning disorder and "akos" meaning remedy. The use of the adjective *officinale* indicates a plant known for its medicinal properties. In fact, its roots and flower heads are mainly used for medicinal purposes (Grieve 1931; Rasool and Sharma 2014; Stewart-Wade et al. 2002), while the young leaves are also consumed in salads and beverages for their nutritional value. [1]
The plant is also commonly known by other names such as "dandelion", referring to the tooth-like shape of its leaves, or "blowball" due to the fluffy sphere containing its seeds.

Description, distribution and habitat

Several literature sources have shown that the leaves of *Taraxacum officinale* are rich in fiber, minerals, vitamins, and essential fatty acids (Escudero et al. 2003).
Its main phytochemical constituents include: carotenoids; flavonoids (e.g., quercetin, chrysoeriol, luteolin-7-glucoside); phenolic acids (e.g., caffeic acid, chlorogenic acid, chicoric acid); polysaccharides (e.g., inulin); sesquiterpene lactones (e.g., taraxinic acid, taraxacoside, 11β,13-dihydrolactucin, ixerin D, taraxacolide-O-β-glucopyranoside); sterols (e.g., taraxasterol, β-sitosterol, stigmasterol); triterpenes (e.g., α-amyrin) (Amin Mir et al. 2013; Singh et al. 2008).
[2]



[1]

There are over 2500 known species of *Taraxacum*, such as *T. officinale, T. mongolicum, T. platycarpum, T. laevigatum, T. kok-saghyz*, with *T. officinale* being the most widely studied.
The first scientific classification of dandelion was made by Linnaeus in 1753 under the name *Leontodon taraxacum*. Later, Wiggers (1746–1811) described the genus *Taraxacum*, and Georg Heinrich Weber established the current classification in 1780.

Many botanists believe dandelion originated in Greece or possibly the northern Himalayas and spread through temperate regions, reaching Europe and Asia Minor.
Fossil records of dandelion have been found in Europe dating back to glacial and interglacial periods. It is believed to have spread to the Americas after the Pleistocene via Beringia (the land bridge that connected Alaska and Siberia during Pleistocene glaciations).
Later introductions to North America remain debated. Some hypotheses suggest it arrived on the east coast with the Vikings around 1000 AD, with the Mayflower, or by later settlers who brought it as a garden or medicinal plant. The first recorded observation of dandelion in North America was in New England in 1672.
Native American tribes such as the Cree, Digger, Apache, and Mohican quickly became aware of its medicinal properties and used it as a herbal remedy. Multiple introductions from various sources are likely.
Dandelion blooms almost year-round. It begins growing in autumn and can be found in parks, pastures, lawns, fields, gardens, wild areas, riverbanks, wastelands, and roadsides, at altitudes ranging from sea level to two thousand meters.
Due to its abundance, farmers often regard it as a bothersome weed.

Biological Activity from Scientific Literature

- Antimicrobial Activity

Numerous studies have investigated the antimicrobial activity of different parts of the dandelion plant (flower heads, leaves, roots) using various solvents. The findings are summarized below:

- **Ethanol and water extracts (leaves):** Effective against *Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa,* and *Staphylococcus aureus*. Activity was concentration-dependent; ethanol extracts were more effective. *E. coli* was the most sensitive.
- **Water-soluble polysaccharides (sprouts):** Strong antibacterial effect at 100 mg/mL on *E. coli, Bacillus subtilis,* and *Staphylococcus aureus*.
- **Ethyl acetate extract (leaves):** Effective against *Aeromonas hydrophila, Salmonella typhi, Staphylococcus aureus, Bacillus cereus,* and *E. coli*. *B. cereus* was the most sensitive.
- **Hydroalcoholic extracts (leaves):** Good antimicrobial efficacy against *Staphylococcus aureus, E. coli,* and *Salmonella abony*. Less effective against *S. aureus*.
- **Methanol, chloroform, and distilled water extracts (leaves):** Methanol and chloroform were the most effective. Water extract showed no activity.
- **Crude methanol hydrophobic and dialyzed extracts (roots):** Strongest activity against *Staphylococcus aureus*, including methicillin-resistant strains, and *Bacillus cereus*. Fractionation enhanced activity.
- **Dichloromethane, ethyl acetate, methanol, and water extracts (stems, roots, flowers):** Methanol showed highest dose-dependent antibacterial activity.
- **n-Hexane-soluble compounds (aerial parts):** Negligible or no activity against various pathogens, including *Candida albicans* and *Aspergillus niger*.
- **Hexane extract (leaves):** Highly effective against *Staphylococcus aureus*, moderately effective against *E. coli* and *Klebsiella pneumoniae*.
- **Ethanol extract (leaves):** High activity against oral pathogens, especially cariogenic strains such as *Enterococcus faecalis* and *Streptococcus salivarius*.

Among plant parts, root extracts showed the greatest antimicrobial activity, followed by stems and then flowers.

- Antioxidant activity

Aerobic mammals use oxygen to sustain normal physiological functions. Up to 2% of the oxygen consumed is converted into reactive oxygen species (ROS). These ROS are oxygen-derived molecules with unpaired electrons, making them unstable and highly reactive. ROS include hydroxyl radicals, superoxide radicals, peroxyl radicals, and singlet oxygen.

Natural plant extracts have been widely studied for their antioxidant potential. The most common antioxidants found in fruits include ascorbic acid, carotenoids, and polyphenolic substances. The quality of natural antioxidants depends not only on the type of plant, its geographical origin, weather conditions, and harvest/storage times, but also on the extraction method and solvent used, as shown in the following studies

No.	Active constituents / preparations	Parts of plant	Study design	Results
1	Water and ethyl acetate fractions derived from ethanol extract	Flowers from local areas within British Columbia and Nova Scotia. (Naturally Nova Scotia, Dartmouth, NS), Canada, during early summer	In vitro	Both fractions exhibited free radical scavenging activities in a stable 2,2-diphenyl-1-picrylhydrazyl radical model and reduced the breakage of supercoiled DNA strand induced by both non-site-specific and site- specific hydroxyl radical Oxidation of structured phosphatidylcholine liposome induced by peroxyl radical was reduced in the presence of both fractions Ethyl acetate fraction had greater affinity to scavenge peroxyl radical than water fraction, as measured by the formation of conjugated diene At low concentration, pro-oxidant activity of both fractions was observed in Cu2+-induced structured liposome and low-density lipoprotein oxidation models, thus indicating that the reducing power of the flower extract had resulted in generation of reactive cuprous ion At high concentrations the ethyl acetate fraction did not promote oxidation in the presence of Cu2+, suggesting that the free radical scavenging activity of this fraction was sufficient to minimize the potential oxidative mechanism attributed to the metal ion reducing activity associated with pro-oxidant activity
2	Ethanol extract	Flowers collected from a certified dandelion farm (Naturally Nova Scotia, Dartmouth, NS) during early summer	In vitro	The extract possessed marked antioxidant activity in both biological and chemical models The efficacy of extract in inhibiting both reactive oxygen species and nitric oxide were attributed to its phenolic content
3	Ethanol extract	Leaves and roots	In vitro	The extract of leaves exhibited a strong free radical scavenging activity than other parts and synthetic antioxidant At ascorbate peroxidase activity, the root had a greater antioxidant enzyme compare to the dandelion leaves The catalase and superoxide dismutase followed higher enzyme activity in root than other parts
4	Ethanol extract and various solvent fractions	Leaves and roots from Kyungnam, South Korea	In vitro	The ethyl acetate fraction of leaves exhibited antioxidant activity, and free-radical-scavenging effects
5	Methanol extract	Leaves and roots collected in Konya province in Turkey	In vitro	Antioxidant capacity values of leaves and roots were determined as 14.67 and 20.58 %, respectively
6	Ethanol extract	Fruit obtained from Brazil during the winter and early spring	In vivo (Male Wistar rats)	Extract had antioxidant activity and protected brain slices against sodium nitroprusside-induced cellular death. Possible mechanisms of action include its scavenger activities against reactive oxygen

				species and reactive nitrogen species, which are attributed to the presence of phenolic compounds in the extract
7	Water extract	Roots, stems and flowers collected from Kupwara region of Kashmir	Two in vitro models (FRAP and DPPH methods)	Dandelion has significant radical scavenging activity
8	Ethyl acetate extract	Leaves obtained from Arbil city, North of Iraq	In vitro (ferric thiocyanat e method)	Extract caused 44% lipid peroxidation in inhibition of linoleic acid emulsion
9	Purified flavonoids	Whole plant collected in September 2012 from Linyi City of Shandong Province, China	In vitro (scavengi ng capacity of ABTS or DPPH, β- carotene bleaching, and FTC test)	The ultrasonic extraction is an effective method for dandelion extraction and the purified flavonoids exhibited strong antioxidant activities
10	Hexane, methylene chloride, ethyl acetate, butanol and water fraction of methanol extract	Leaves collected on Dongguk University campus, Gyeongju, 780-714, South Korea	In vitro	The ethyl acetate and butanol fractions showed high antioxidant activities in all the assays Methylene chloride and water fractions demonstrated moderate activity, whereas the hexane fraction had relatively lower activity
11	Eleven sequentially derived crude and dialysed extracts	Roots were collected from Irish Organic Herbs Ltd. (Drumshambo, Co. Leitrim, Ireland)	In vitro	The ethyl acetate fraction demonstrated the strongest antioxidant activity, which was further linked to the phenolic content of the extract, particularly chlorogenic acid
12	Ethyl acetate extract	Roots were purchased from Irish Organic Herbs Ltd. (Drumshanbo, Co. Leitrim, Ireland)	In vitro	1,5-dicaffeoylquinic acid (chlorogenic acid derivative) is a major contributor to the antioxidant efficacy of dandelion root
13	Ethanol extract	Aerial part (leaves) was collected from Plovdiv Bulgaria	In vitro	The leaves are rich source of polyphenols possess high antioxidant properties The high yield of cichoric acid make this plant valuable source of commercial production
14	Water extract	Stems and leaves were collected in Accra, Ghana in September 2012.	In vitro	The extract possesses antioxidant activity
15	Methanol extract	Flowers, leaves, stems and roots	In vitro	Roots had a significant antioxidant potential with the largest capacity of inhibition of 2,2-diphenyl-1- picrylhydrazyl solution
16	Ethanol extract and n-hexane ethyl acetate and n-butanol fractions	Aerial parts (leaves) of a wild growing population of dandelion in Plovdiv region, Bulgaria were randomly collected during different vegetative stages	In vitro (1,1- diphenyl- 2- picrylhydr azyl method)	The unpolar fraction exhibited promising antioxidant activity
17	Methanol extract separated into five preparations (A-E) differing in chemical content	Roots was collected in September2016 from a natural source (south-eastern Poland)	In vitro	Roots are a safe and valuable source of different class natural compounds possessing antioxidant activities

18	Ethanol extract and ethyl acetate, n-butanol, and aqueous fraction	Aerial parts of purchased at Kyungdong Folk Medicine Market, Seoul, Korea in March 2004	In vivo (Male ICR mice) and in vitro (RAW264 .7 cell line)	Ethanol extract showed a scavenging activity in the 1,1- diphenyl-2-picrylhydrazyl assay and a diminishing effect on intracellular reactive oxygen species level In the carrageenan-induced air pouch model, extract inhibited production of exudate, and diminished nitric oxide and leukocyte levels in the exudate It also possessed an inhibitory effect on acetic acid- induced vascular permeability and caused a dose- dependent inhibition on acetic acid-induced abdominal writhing
19	Water extract	Commercial capsules of root powder purchased from Arkopharma® (Cedex, France), leaves and roots supplied by Soria Natural Laboratory (Soria, Spain)	In vitro	The extracts showed effective antioxidant activity correlating with total flavonoid and polyphenol contents
20	Ethanol and water extracts	The taproots of several randomly chosen dandelion plants were gathered from territory of South Bulgaria- Plovdiv (Plovdiv region), Parvomay (Krushevo village) and Chirpan (Stara Zagora region) during 13-20 April 2013	In vitro	The extracts showed the high antioxidant activity for both the 2,2-diphenyl-1-picrylhydrazyl and the ferric reducing ability of plasma assays
21	Ethanol extract	Leaves obtained from the campus of Cruz Alta University (Cruz Alta, RS, Brazil)	In vitro	Extract demonstrated antioxidant activity, as well as scavenger activity against 2,2-diphenyl-1-picrylhydrazyl and nitric oxide radicals
22	Acetone and Triton X- 100 extracts	Leaves and flowers collected from a natural habitat (Rzeszów, south-west Poland, 50020N 21530E) in May 2016	In vitro	All extracts showed good anti-radical properties, especially for leaves, in comparison to the flower samples
23	Ethanol extract	Leaves, flowers and roots harvested from a natural location close to Szczecin	In vitro	The antioxidant activity of dandelion depended on the type of raw material used, as well as the type of solvent and extraction time. The highest 2,2-diphenyl-1-picrylhydrazyl activity was found for dried flower extracts prepared in 70% ethanol for 30 min With FRAP method, the highest reduction capacity was observed for dried leaves extracts in 40% ethanol for 30 min
24	Methanol extract	Flowers, leaves, roots, and stalks	In vitro	The antioxidant activity of the methanol extracts from all the plant parts dose- dependently increased 1,1-diphenyl-2-picryl hydrazyl radical free radical scavenging activity was highest in flower extracts, and followed by leaf, root, and stalk extracts
25	Water extract	Leaves and roots	In vitro	The folium extract proved to be more effective as hydrogen-donor, reducing agent and hydrogen peroxide scavenger compared to radix extract
26	Home prepared dandelion beverage boiling for 1, 3 or 5 min. The beverages were extracted using organic solvents of increasing polarity	Dried dandelion	In vitro	All preparations had an overall good antioxidant profile. Regarding the chosen solvents, mid polarity solvents were more likely to give better results in all tests conducted, which can be indicative of the compounds extracted in each fraction Samples prepared under 3 min boiling presented significant interaction with 2,2-diphenyl-1- picrylhydrazyl and strong lipoxygenase and lipid peroxidation inhibition

27	Ethanol extract	Leaves and roots collected from its natural habitat around the Walter Sisulu campus in April 2014	In vitro and in vivo	Compared to roots, leaves possessed higher free radical scavenging activity and total antioxidant capacities and both extracts showed no toxicity Leaves and roots elevated total antioxidant capacities and reduced malondialdehyde acid levels in targets organs

- ANTINFIAMMATORIA

Inflammation is a complex pathophysiological process mediated by numerous signaling molecules generated by leukocytes, macrophages, and mast cells. It is a tissue response to injury, characterized by increased blood flow to the area, resulting in heat, redness, swelling, and pain.

Macrophages play a key role in inflammation by releasing inflammatory mediators such as nitric oxide (NO), prostaglandin E2 (PGE2), and pro-inflammatory cytokines including TNF-α, IL-1β, and IL-6.

Several studies have reported the anti-inflammatory effects of dandelion, summarized below (see table for detailed results).

The mechanism underlying the anti-inflammatory activity of dandelion may involve the reduction of NO production (via inhibition of NO synthesis), and decreased expression of COX-2 and PGE2, particularly attributed to luteolin and luteolin-7-O-glucoside.

No.	Active constituents / preparations	Parts of plant	Study design	Results
1	Ethanol extract and ethyl acetate, n- butanol and aqueous fractions	Aerial parts	In vivo (Male ICR mice and male Sprague-Dawley rats)	Dandelion had anti-inflammatory activity through inhibition of nitric oxide production and cyclooxygenase-2 expression and/or its anti- oxidative activity
2	Water extract	Whole plant	In vitro (Primary cultures of rat astrocytes)	Dandelion may inhibit tumor necrosis factor-α production by inhibiting Interleukin-1 production and it has an anti-inflammatory activity in the central nervous system
3	Ethanol extract, ethyl acetate and water fractions	Flowers	In vitro (Mouse macrophage cell line RAW264.7)	The inhibitory effects were attributed to the suppression of both inducible nitric oxide synthase and cyclooxygenase-2 protein expression, and not reduced enzymatic activity Similar suppression for both inducible enzymes was found with the presence of extract, specifically, the ethyl acetate fraction of extract which contained 10% luteolin and luteolin-7-O-glucoside
4	Methanol extract and chloroform, ethyl acetate, n- butanol, and distilled water fractions	Leaves	In vitro (Mouse macrophage cell line RAW 264.7)	The anti-inflammatory effects are probably due to down-regulation of nitric oxide, prostaglandin E2, and pro-inflammatory cytokines and reduced expressions of inducible nitric oxide synthase and cyclooxygenase-2 via inactivation of the mitogen- activated protein kinase signal pathway
5	Ethanol extract	Leaves	In vivo (Male Noguchi strain guinea- pigs)	Extract possessed anti-cholinergic and reduced neutrophil, eosinophil and basophil counts in ovalbumin-sensitized guinea-pigs
6	Methanol and water extract	Leaves	In vitro (Lipopolysaccharide-stimulated RAW 264.7 cells)	Both extracts inhibited oxidative stress and inflammatory responses through elevated de novo synthesis of anti-oxidative enzymes and suppression of inducible nitric oxide synthase expression by nuclear factor-κB inactivation

7	Methanol extract	Roots	In vitro	Chemical examination of the extract of the showed that 14-O-~-D-glucosyl-l1,13-dihydro-taraxianciicd and 14-0-0-D-glucosyl-taraxinic acid are responsible for inhibitory effect on the formation of leukotriene B4 from activated human neutrophils
8	Polysaccharides from dandelion (TOP 1 and 2)		In vitro (RAW 264.7 cells)	TOPs treatment inhibited phosphorylation of inflammatory transcription factor, nuclear factor- κB, and its upstream signaling molecule, PI3K/Akt Heme oxygenase-1was potently induced by TOPs treatment, which was in accordance with the nuclear translocation of nuclear factor-erythroid 2 p45-related factor 2 TOPs treatment phosphorylated PI3K/Akt with slight activation of c-Jun NH2-terminal kinase TOPs-mediated heme oxygenase-1 induction protected macrophage cells from oxidative stress- induced cell death, which was confirmed by SnPP and CoPP (Heme oxygenase-1 inhibitor and inducer, respectively) TOPs potently inhibited Nuclear Factor Kappa B- mediated inflammation and accelerated nuclear factor-erythroid 2 p45-related factor 2-mediated anti-oxidative potential through the modulation of PI3K/Akt pathway, which would contribute to their promising strategy for novel anti-inflammatory and anti-oxidative agents
9	Dichloromethane, ethyl acetate, methanol and water extracts	Roots, stems and flowers	In vitro (human red blood cells suspension Fresh whole)	The percentage stabilization (The inhibition of hypotonicity induced membrane lysis) of stem water extract was found to be highest, followed by methanol extract of stem The root and flower extracts also follow the same trend as the stem extracts as per their percentage stabilization against inflammation The percentage of stabilization was found concentration dependent in all the plant extracts, i.e., percentage of stabilization increases with the increase in the concentration of plant extracts The polar solvents potentially showed more stabilization potential against inflammation as compared to the non-polar solvents
10	Water extract	Leaves	In vitro (Rat mammary microvascular endothelial cells (RMMVECs) and in vivo (adult female BALB/c mice)	Endothelium may use as a possible target of dandelion for anti-inflammation activity
11	Ethanol extract	Leaves	In vivo (Male Noguchi strain guinea- pigs)	A significant dose-dependent reduction in anti- histaminic activity on isolated guinea-pig ileum Histopathological lesions such as perivascular oedema, hypertrophy of smooth muscles, infiltration of eosinophils and basophils were reduced in the lungs of extract treated group compared to ovalbumin-sensitized controls
12	Methanol extracts	Whole plant	In vitro (Human umbilical vein endothelial cells)	The extract dramatically inhibited lipopolysaccharides-induced endothelial cell- monocyte interactions by reducing vascular cell adhesion molecule-1 and monocyte chemoattractant protein-1, and pro-inflammatory cytokine expression The extract suppressed the lipopolysaccharides - induced nuclear translocation of nuclear factor-κB, whereas it did not affect mitogen-activated protein kinase activation

[2]

ANTILIPOGENIC ACTIVITY

A 2015 study demonstrates the antilipogenic effects of dandelion extracts on adipocytes, as well as their antioxidant activity.

Free radicals play a dual and ambivalent role in the body: at low/moderate concentrations, free radicals or reactive oxygen species (ROS) are involved in normal physiological functions such as cell signaling. However, excessive ROS production or a decrease in antioxidant levels leads to a condition known as oxidative stress. Increased oxidative stress is implicated in the pathogenesis of several chronic diseases associated with aging.

The rise of oxidative stress in accumulated fat has been linked to metabolic syndrome, suggesting that modulation of the redox state of adipose tissue is a therapeutic target for preventing dyslipidemia and obesity.

Growing evidence suggests that phytochemicals found in natural plant extracts exert anti-obesity effects by inhibiting preadipocyte differentiation, attenuating adipose tissue growth, inducing apoptosis, and promoting lipolysis in mature adipocytes.

Table 1

Effect of dandelion extracts on cell viability, intracellular triglyceride (TG) content, and cholesterol content in mature 3T3-L1 adipocytes.

- Cell viability of 3T3-L1 mature adipocytes after 48 hours of treatment with dandelion extracts at the indicated concentrations (µg/mL). Results are expressed as % viability compared to untreated control adipocytes (100%).
- Intracellular triglyceride content in mature 3T3-L1 adipocytes after 48 hours of treatment with dandelion extracts (µg/mL) and positive control cells. Results expressed as mg TG/mg protein.
- Cholesterol content in mature adipocytes treated for 48 h with extracts (µg/mL). Cholesterol content was analyzed and quantified using high-performance liquid chromatography (HPLC). Results are expressed as percentage of cholesterol (mg/ml) relative to differentiated positive control cells (100%).
  Results are reported as mean ± SEM of three independent experiments. Differences between treated and untreated control cells (positive control) were considered significant at $p < 0.05$.

Treatment adipocytes	Cell viability (% ofthe control)	Triglycerides (mg TGs/mg protein)	Cholesterol (% of the control)
Untreated Adipocytes	100.0 ± 0.4	0.229 ± 0.005	100.0 ± 0.49
Crude powdered root (µg/mL)			
400	92.80 ± 0.6	0,179 ± 0.001	87.109 ± 0.285
500	90.80 ± 0.7	0.178 ± 0.003	79.456 ± 0.564
600	81.90 ± 0.7	0.176 ± 0.004	74.724 ± 0.323
Root extract (µg/mL)			
400	92.8 ± 0.6	0.220 ± 0.005	73.548 ± 0.963

500	96.7 ± 0.2	0.228 ± 0.002	68.521 ± 0.778
600	97.0 ± 0.5	0.239 ± 0.002	60.729 ± 0.486
Leaves extract (µg/mL)			
400	105.5 ± 0.5	0.168 ± 0.001	88.921 ± 0.838
500	107.1 ± 0.5	0.165 ± 0.001	88.128 ± 0.779
600	109.6 ± 0.2	0.150 ± 0.004	87.164 ± 0.874

Table 2
Antioxidant activity of Taraxacum officinale extracts determined using the Ferric Reducing Antioxidant Power (FRAP) and DPPH assays.
Results are expressed as TEAC (Trolox Equivalent Antioxidant Capacity) in µmol Trolox®/g of dry weight extract (DWE) and as EC50 (µg/mL). Data are mean ± SEM of four independent experiments.

Extracts	FRAP	DPPH
	TEAC (µmoles Trolox®/g)	EC50 (µg/mL)
Leaves extract	302.3 ± 26.3	1.9 ± 0.1
Root extract	124.5 ± 14.8	12.6 ± 1.3
Crude powdered root	25.2 ± 4.1	65.0 ± 0.4

The study shows that although both antioxidant and antilipogenic activities were observed in mature adipocytes, these two effects are not necessarily linked.
The results indicate that the leaf extract, with the highest phenolic content, also exhibited the strongest antioxidant activity. Moreover, root extract demonstrated greater antioxidant efficacy than crude powdered root extract.
Regarding lipid accumulation, results suggest that the extract's effect could be attributed to mechanisms that may not necessarily involve antioxidant responses. In fact, supplementation of mature 3T3-L1 adipocytes with powdered root extract (which has moderate antioxidant capacity) significantly reduced intracellular triglycerides and total cholesterol levels. It also appeared to reduce the size/volume and number of mature adipocytes, along with dose-dependent cell viability reduction.
In conclusion, dandelion extracts appear to inhibit lipid accumulation during adipocyte differentiation and exert diverse effects on the expression of related genes. These extracts also normalize cholesterol and triglyceride levels in mature 3T3-L1 adipocytes, thereby improving lipid profiles. [3]

BIBLIOGRAFIA

[1] Di Napoli, A., Zucchetti, P. A comprehensive review of the benefits of Taraxacum officinale on human health. Bull Natl Res Cent 45, 110 (2021). https://doi.org/10.1186/s42269-021-00567-1

[2] Kania-Dobrowolska M, Baraniak J. Dandelion (Taraxacum officinale L.) as a Source of Biologically Active Compounds Supporting the Therapy of Co-Existing Diseases in Metabolic Syndrome. Foods. 2022 Sep 15;11(18):2858. doi: 10.3390/foods11182858. PMID: 36140985; PMCID: PMC9498421.

[3] García-Carrasco B, Fernandez-Dacosta R, Dávalos A, Ordovás JM, Rodriguez-Casado A. In vitro Hypolipidemic and Antioxidant Effects of Leaf and Root Extracts of Taraxacum Officinale. Med Sci (Basel). 2015 Jun 11;3(2):38-54. doi: 10.3390/medsci3020038. PMID: 29083390; PMCID: PMC5635758.
Le immagini sono state create con l'aiuto dell'intelligenza artificiale.