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CHEMICAL ANALYSIS OF COMMON DANDELION (TARAXACUM OFFICINALE)

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Annotation

The article analyzes the correlation between the chemical composition of various morphological parts of the Taraxacum officinale (dandelion) plant and their pharmacological effects. It is scientifically substantiated that the presence of flavonoids, phenolic acids, polysaccharides (inulin), sesquiterpene lactones, as well as vitamins and minerals, determines its antioxidant, anti-inflammatory, hepatoprotective, diuretic, and antidiabetic properties. Furthermore, the chemical composition of the roots, leaves, and flowers is characterized by quantitative indicators.

How to Cite

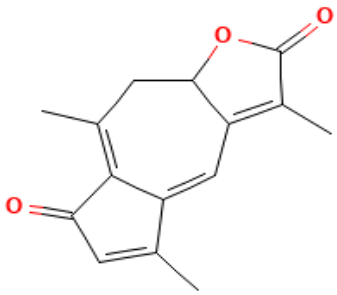
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Taraxacum officinale (dandelion) is a perennial plant belonging to the Asteraceae family. Its roots, leaves, and flowers are widely used as medicinal raw materials. Organic substances accumulate in high concentrations particularly in the root part.

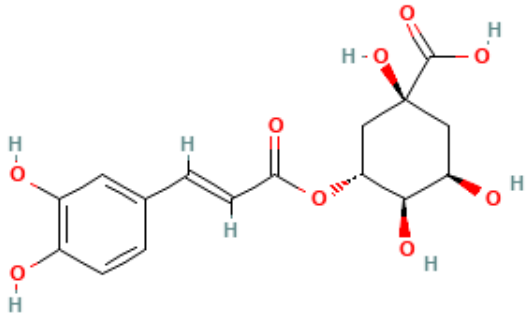
Dandelion contains organic compounds belonging to various classes:

Sesquiterpene Lactones (Taraxacin).

Taraxacin is a sesquiterpenoid with a C_{15} carbon skeleton containing a lactone ring. This substance provides a bitter taste and stimulates bile secretion. Its structure consists of several carbon rings and carbonyl (C=O) groups.



Taraxacin



Chlorogenic acid

2. Flavonoids (Luteolin, Quercetin).

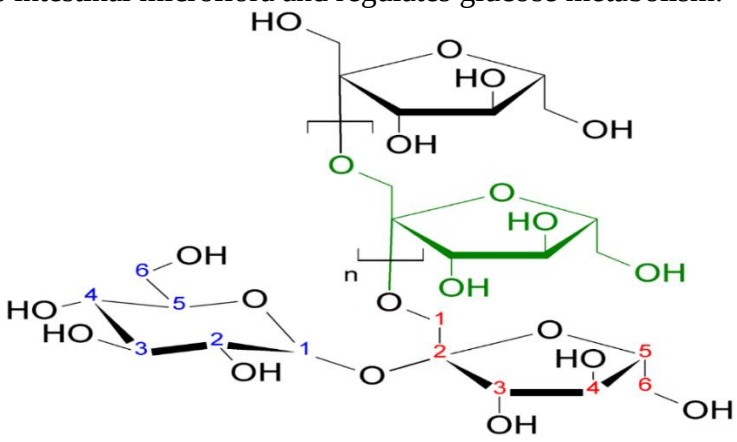
Flavonoids are polyphenolic compounds with aromatic rings that possess antioxidant properties. Their molecules contain phenolic (–OH) groups, which play a crucial role in neutralizing free radicals.

3. Phenolic Acids (Chlorogenic, Caffeine acid).

These substances are organic acids featuring a benzene ring, exhibiting antioxidant and anti-inflammatory effects. They protect liver cells from oxidative stress.

4. Inulin (polysaccharide).

Inulin is a high-molecular-weight carbohydrate composed of fructose units, possessing prebiotic properties. From the perspective of organic chemistry, it consists of a fructose chain linked via glycosidic bonds. Inulin normalizes intestinal microflora and regulates glucose metabolism.



Inulin

5. Vitamins and other compounds.

Vitamin C (ascorbic acid) is a powerful reducing agent involved in redox reactions. Carotenoids are pigments with an isoprenoid structure.

6. Tannins and alkaloids.

Tannins and alkaloids are vital biologically active components in the Taraxacum officinale plant. Tannins occur in relatively high amounts and determine the plant's antioxidant, antimicrobial, and anti-inflammatory properties. Although alkaloids are present in small quantities, they act as essential components that enhance biological activity and influence metabolic processes.

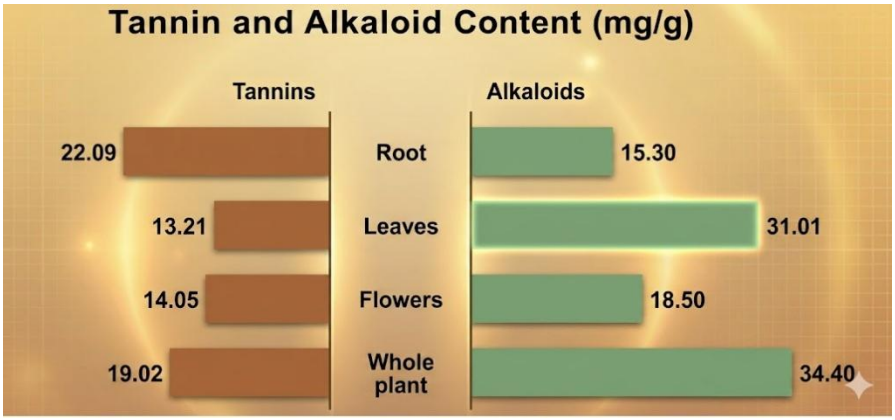


Figure 1. Total content of tannins and alkaloids by plant parts

Tannins and alkaloids in dandelion, along with other bioactive substances, play an essential role in defining the medicinal properties of the plant.

Chemical Composition and Biological Activity of Dandelion Root. The dandelion root is considered the most significant medicinal part of the plant. It accumulates a high amount of the polysaccharide inulin, with its content reaching up to 30–40%. Additionally, the root contains 10–20% simple sugars, 1–3% phenolic acids (chlorogenic and caffeine acids), sesquiterpene lactones, triterpenes, and phytosterols.



Figure 2. Chemical composition of different parts of the dandelion plant.

Phenolic acids exert antioxidant and hepatoprotective effects. Sesquiterpene lactones enhance bile secretion and improve digestive processes.

Chemical Composition and Pharmacological Properties of the Leaves. Dandelion leaves are rich in flavonoids and phenolic compounds. The flavonoid content in the leaves is 1–2%, while caffeoylquinic acids range around 2–5%.

Additionally, the leaves contain high levels of vitamins (A, C, K) and minerals, particularly potassium (300–400 mg/100 g). These constituent components provide the leaves with the following properties:

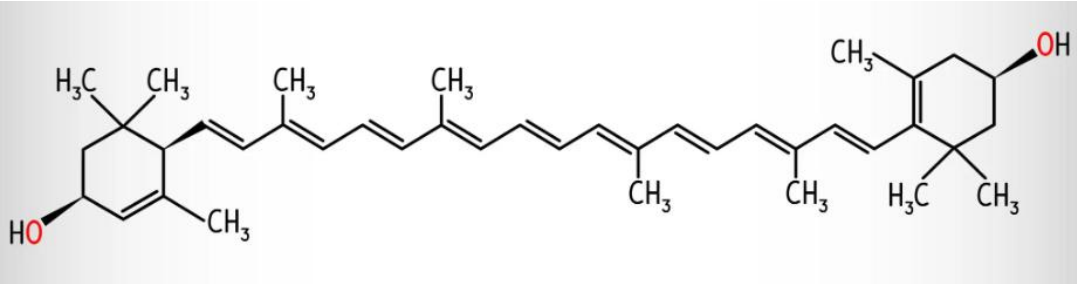
diuretic effect (due to potassium and flavonoids);

anti-inflammatory effect;

antioxidant activity;

improvement of digestion (due to bitter substances).

Chemical composition and biological significance of the flowers. Dandelion flowers are rich in flavonoids (1–3%), carotenoids (lutein, β-carotene), and phenolic acids. These compounds possess potent antioxidant properties and protect cells from oxidative stress.



Lutein

Carotenoids support the function of the immune system and accelerate skin regeneration. For this reason, dandelion flowers are also utilized in dermatological and cosmetological products.

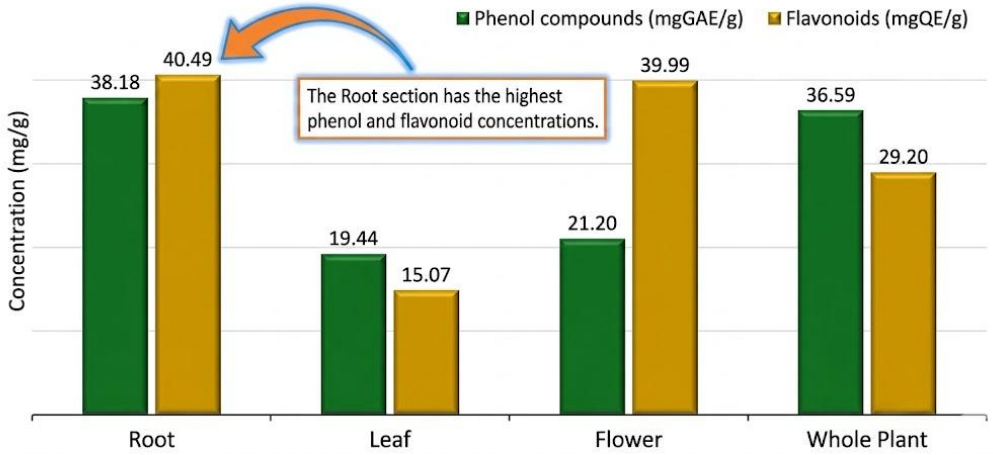


Figure 3. Total content of phenols and flavonoids by plant parts.

The biological activity of the compounds in dandelion depends on their chemical structure:

* *Phenolic groups* → antioxidant effect.
* *Lactone rings* → bitter taste and choleretic effect.
* *Polysaccharide chains* → metabolic and prebiotic effect.

These structural characteristics facilitate the interaction of these substances with biological membranes.

Taraxacin stimulates bile secretion, while flavonoids protect hepatocytes from free radicals. Phenolic compounds modulate liver enzyme activity. Consequently, the dandelion plant is regarded as a natural hepatoprotector.

Conclusion. The organic compounds present in *Taraxacum officinale* (sesquiterpene lactones, flavonoids, phenolic acids, and polysaccharides) ensure its high biological activity. Based on their chemical structure, these substances exert a complex positive effect on the liver and biliary system. Therefore, dandelion is an essential medicinal plant that warrants study at the intersection of organic chemistry and pharmacology.

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