



## Traditional Chinese Herbal, “Dandelion” and Its Applications on Skin-Care

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### Abstract

Dandelion (*Taraxacum officinale*) belongs to the *Asteraceae* or sunflower family. Its leaves, stems, and roots have been used in traditional Chinese herbal for a long time because dandelion has a wide range of pharmacological properties including anti-microbial, anti-viral, anti-inflammatory, and anti-infectious as well as anti-oxidation especially in the dandelion root extract which is the most medicinal value. A clinical study of dandelion extracts on skin acne and a simple preparation method of the dandelion extract would be discussed since the dandelion extract has low toxicity on the skin, even is non-toxic based on the British Herbal Pharmacopoeia recommendation.

**Keywords:** Dandelion; Traditional chinese herbal; Skin-care

### Introduction

Dandelion (*Taraxacum officinale*) is a common meadow herb that belongs to the *Asteraceae* or sunflower family usually with a yellow flower. Its leaves, stems, and roots are often used in traditional Chinese medicine for different kinds of medical purposes. Yin and Yang are the theory in traditional Chinese medicine used to de-

scribe relative opposite qualities or manifestations of “*Qi*”. “*Qi*” is the vital energy managed by Yin and Yang. The property of dandelion is cold in nature, and it is expelled excess heat in the body. Its category of dandelion is “clearing heat and relieving toxicity” for the treatment of anti-microbial, anti-viral, anti-inflammatory, anti-infectious, and anti-oxidation conditions.

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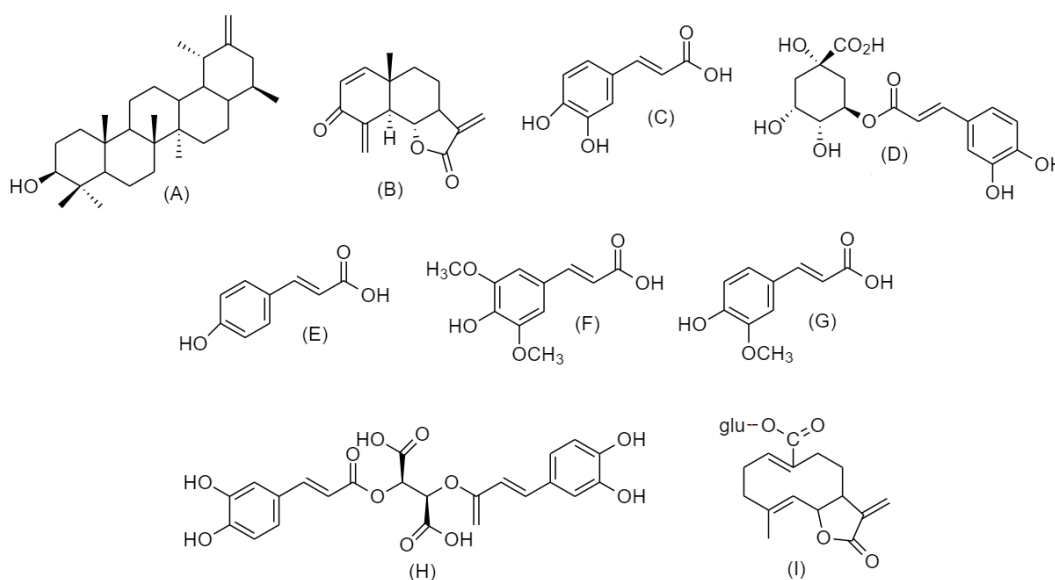


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It replenishes and regulates “*Qi*” in the movement of blood to eliminate infectious toxins from the body [1]. This mini-review summarizes the pharmacological properties originating from traditional Chinese medicine knowledge, western biology experiments, and describes the clinical results obtained from dandelion extracts to decide whether it can develop in skincare or not, also describes a clinical study of dandelion extracts on skin acne and a simple preparation method of dandelion extracts as well as its applications.

## Pharmacological properties

The dandelion root extract has the most medicinal value in traditional Chinese medicine. It consists of bioactive components such as taraxasterol (TS), sesquiterpene lactones, caffeic acid, chlorogenic acid, p-coumaric acid, sinapic acid, ferulic acid, cichoric acid, and taraxinic acid- $\beta$ -D-glucopyranoside (Figure 1.) [2]. These components are non-toxic and contributed to the (a) anti-viral, (b) anti-inflammatory, and (c) anti-oxidation properties [3].



**Figure 1.** Chemical structure of (A) taraxasterol (TS), (B) sesquiterpene lactones, (C) caffeic acid, (D) chlorogenic acid, (E) p-coumaric acid, (F) sinapic acid, (G) ferulic acid, (H) cichoric acid, and (I) taraxinic acid- $\beta$ -D-glucopyranoside.

(a) He W, et al. reported the dandelion root extract prevented virus infection because of the inhibition of viral polymerase activity and the reduction of the virus nucleoprotein (NP) RNA level. It inhibited the viral growth in Madin-Darby Canine Kidney (MDCK) or A549 adenocarcinomic human alveolar basal epithe-

lial cells that contributed to the anti-viral effect [4]. Previously, Ovadie P, et al. identified the dandelion root extract could selective induction of apoptosis through activation of caspase-8 in human leukemia cells. The non-cancerous peripheral blood mononuclear cells (PBMCs) were not significantly affected relating to the

function of anti-viral [5].

(b) Apart from the anti-viral activity, Seo SW et al. discovered the dandelion root extract protected against cholecystokinin-induced acute pancreatitis in rats. It increased the pancreatic levels of HSP60 and HSP72 but decreased the secretion of IL-6 and TNF-alpha. That was effective to protect the octapeptide cholecystokinin (CCK) for preventing pancreas inflammation [6]. Meanwhile, Koo HN et al. reported the dandelion root extract fight against women's diseases such as breast and uterus cancers. It decreased the number of viability in human hepatoma cells (Hep G2), significantly increased the production of tumor necrosis factor (TNF)-alpha, and interleukin (IL)-1alpha, also induced apoptosis and reduced the cytotoxicity of human hepatoma cells (Hep G2) contributed to the anti-inflammatory of breast or uterus cancers [7].

(c) Besides, Choi UK et al. identified the dandelion root extract has an antioxidant effect on cholesterol-fed rabbits. It changed the plasma antioxidant enzyme activities, lipid profiles in cholesterol-fed rabbits and enhanced the level of oxygen free radicals in lipid peroxidation. The dandelion root extract prevented oxidative stress to atherosclerosis and decreased the atherogenic index [8]. These antioxidant activities were regarding the scavenging free radicals in the presence of phenolic acid content derived from the dandelion such as sinapic acid and cichoric acid. The highest antioxidant activities were the richest in polyphenols and cichoric acid, while the least active species were less rich in polyphenols [9]. Another research from Xie P et al. discovered that 50% ethanol-water

of dandelion root extract had an antioxidant effect on skincare. It inhibited the activity of tyrosinase by the interaction on Van der Waals' force and Hydrogen bonding between the tyrosinase residues and phenolic acid molecules in dandelion root extract. These also blocked and exhibited a strong reducing power against the ultraviolet (UV) light. Thus, dandelion root extract was suitable for the prevention of skin corrosion, cytotoxicity, and intensive allergy [10].

### **Dandelion extracts and its clinical study on the skincare**

According to Yang Y et al. found that dandelion leaf and flower extracts helped to absorb Ultraviolet B (UVB) irradiation. It acted as a protective agent against UVB damage and H<sub>2</sub>O<sub>2</sub>-induced cellular senescence in human dermal fibroblasts (HDFs) by suppressing reactive oxygen species (ROS) generation and matrix metalloproteinase (MMP) activities. When the concentration of dandelion extract (30, 100, and 300 µg/mL) was added either into HDFs for 30 min before UVB irradiation or added promptly after irradiation, both dandelion leaf and flower extracts were effective protected UVB irradiation-inhibited cell viability. However, dandelion root extract had a less significant on UVB-induced cell death when added into HDFs 30 min before UVB irradiation [11].

In early 2005, Hu C et al. reported the dandelion flower extract suppressed both superoxide and hydroxyl radicals by the phenolic content. The peroxy-radical-induced intracellular oxidation was inhibited by the addition of dandelion flower extract over a range of concentrations (31.3,

62.5, 125, 250, and 500 µg/mL). When the concentration of dandelion flower extract was 100 µg/mL, it had a strong antioxidant effect on the free radicals scavenging nearly 90%. The higher the concentration of dandelion flower extract, its inhibition proportionally increased by suppressing nitric oxide production stimulated with lipopolysaccharides (LPS) [12].

Meanwhile, Chatterjee SJ et al identified the dandelion root extract specifically and effectively induced apoptosis in human melanoma skin cells without inducing toxicity in noncancerous cells. The plasma membrane of A375 human melanoma skin cells would be dead within 48 h after 2.5 µg/mL dandelion root extract was added. It induced apoptosis activates caspase-8 in A375 by the generation of ROS and the natural compounds in dandelion root extract would also be directly targeted mitochondria for confirmation of the apoptosis process [13].

Furthermore, Jeon HJ et al indicated the dandelion had anti-angiogenic, acute anti-inflammatory, and anti-nociceptive activities. When the concentration of dandelion was 1.0 mg/mL, it possessed the greatest inhibitory activity on *in vitro* NO production in the stimulated mammalian cells. It also had the highest free radicals scavenging and reduced the activity of ROS level in LPS-activated macrophages when the concentration of dandelion was 100 mg/kg. These findings provided the pharmacological properties of the dandelion in therapeutic efficacy to treat and combat warts, eczema, acne-prone skin as well as other skin disorders in folk medicine [14,15].

Acne is a common skin disease for young people, which has small, red spots appear on the

face and neck. There was a cosmetic formula containing dandelion developed by Guangzhou Caishi Cosmetics Co., Ltd for inhibiting skin acne. Its acne ointment from plant extraction liquids included *Phellodendri Cortex*, *Matricariae chamomillae Flos*, *Hamamelidis Mollis Radix*, *globolus eucalyptus*, *Menthae Herba*, *Lonicerae Flos*, *Taraxaci Herba (dandelion)*, *Isatidis Radix*, and green tea.

This acne ointment was carried the human trial in 30 examples, 13 males and 17 females aged from 15 to 30 years old and the average age were around 23.03. It was continuously used for two weeks and an effective rate reached 93%. The skin acne had improved and the red spot disappeared slowly. Acne ointment was also non-toxic and non-stimulated on the skin. The skin irritation/corrosion test methods were conducted according to the Ministry of Public Health's "cosmetics health standard", 2007 version [16].

### **A simple preparation method of dandelion extracts**

Nowadays, dandelion root extract could prepare within several simple steps [17]:

- (1) Add around one cup of dried dandelion herbs or dandelion whole plant to half a quart jar;
- (2) Fill the jar with boiling water;
- (3) Stand the mixture for 3-4 days;
- (4) Filter the mixture and add it to a dark glass bottle for ready use. Nevertheless, this dandelion root extract has some side-effects including cannot be taking in bleeding disorders, eczema, and ragweed allergy [18].

Dandelion has low toxicity for the alkaloids constituents. However, some bioactive components

such as taraxinic acid- $\beta$ -D-glucopyranoside and sesquiterpene lactone might cause allergic contact dermatitis and reactions in sensitive individuals. As mentioned above, dandelion root extract is non-toxic to normal human cells but toxic to the human melanoma skin cells. Based on the British Herbal Pharmacopoeia recommendation, the dosage of dandelion extract is 1-2 teaspoons per day [19].

## Conclusion

All of the above information demonstrates that dandelion extract is a possible candidate applied for skincare. It has anti-viral, anti-inflammatory, and anti-oxidation properties which contributed to the anti-aging, stimulate the production of collagen, and calm inflammation, prevent the damage from free radicals and help to the skin detoxification. Dandelion is a single herb in the previous investigation. In the future aspect, dandelion would try multiple herb formulations to enhance its properties or develop into a nano-system to get better bioavailability such as its solubility and absorptivity on the skin using the lesser concentration. However, much more work needs to be done for supporting the nano-system of dandelion including the study of dandelion nano-system on anti-viral, anti-inflammatory, and anti-oxidation activities, as well as its safety evaluation in human clinical trials.

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## Author contributions

All authors contributed to the concept, drafting

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## Conflict of interest

The authors declare no conflict of interest.

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## Ethical statement

This research did not require ethical approval as it does not involve any human or animal experiments.

## Data availability

Not applicable.

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