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***Helianthus annuus*: A systematic review of Pharmacological activity**

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ABSTRACT

Helianthus annuus, indigenous to Europe, possess an erect rough-hairy stem, reaching typical heights of 3 meters the common sunflower, is a large annual forb of the genus *Helianthus* grown as a crop for its edible oil and edible fruits seeds. The aim of this study is to overview its Pharmacological activity. This review article was carried out by searching studies in PubMed, Medline, , Web of Science, and IranMedex databases up to 2016. totally, of 78 found articles, 40 articles (42 in vitro and 5 animal studies) were included. The search terms were “*Helianthus annuus*. ”, “therapeutic”, “pharmacological”, “Various studies have shown that *Helianthus annuus*. Process Salinity and sodicity stresses properties, Salinization stress properties, Anti-diabetes properties, Antioxidant properties , Herbicide properties ,Myocardial infarction properties, Allergy properties ,Skin barrier function ,Fatty acid patterns properties , Dermatitis properties. *Helianthus annuus* is shown to have lots of therapeutic activities causing its importance. Various combinations and numerous medicinal properties of this plant need further and more studies about the other useful and unknown properties of this multipurpose plant.

Keywords: *Helianthus annuus*, therapeutic, pharmacological, traditional medicine

INTRODUCTION

It is proved that herbal medicine is effective in the treatment of many diseases [1-10]. *Helianthus annuus*, indigenous to Europe, possess an erect rough-hairy stem, reaching typical heights of 3 metres the common sunflower, is a large annual forb of the genus *Helianthus* grown as a crop for its edible oil and edible fruits (sunflower seeds) [11-16]. This sunflower species is also used as bird food, as livestock forage, and in some industrial applications. Wild *Helianthus annuus* is a widely branched annual plant with many flower heads. The domestic sunflower, however, often possesses only a single large in florescence (flower head) atop an unbranched stem. The name sunflower may derive from the flower's head's shape, which resembles the sun, or from the false impression that the blooming plant appears to slowly turn its flower towards the sun as the latter moves across the sky on a daily basis [17].

Sunflower leaves are broad, coarsely toothed, rough and mostly alternate. What is often called the "flower" of the sunflower is actually a "flower head" or pseudanthium of numerous small individual five-petaled flowers ("florets"). The outer flowers, which resemble petals, are called ray flowers [18]. Each "petal" consists of a ligule composed of fused petals of an asymmetrical ray flower. They are sexually sterile and may be yellow, red, orange, or other colors. The flowers in the center of the head are called disk flowers. These mature into fruit (sunflower "seeds"). The disk flowers are arranged spirally [19, 20]. Generally, each floret is oriented toward the next by approximately the golden angle, 137.5°, producing a pattern of interconnecting spirals, where the number of left spirals and the number of

right spirals are successive Fibonacci numbers. Typically, there are 34 spirals in one direction and 55 in the other; however, in a very large sunflower head there could be 89 in one direction and 144 in the other. This pattern produces the most efficient packing of seeds mathematically possible within the flower head. Sunflower oil, extracted from the seeds, is used for cooking, as a carrier oil and to produce margarine and biodiesel, as it is cheaper than olive oil. A range of sunflower varieties exist with differing fatty acid compositions; some 'high oleic' types contain a higher level of monounsaturated fats in their oil than even olive oil [21, 22].

Traditionally, several Native American groups planted sunflowers on the north edges of their gardens as a "fourth sister" to the better known three sisters combination of corn, beans, and squash. Annual species are often planted for their allelopathic properties

Sunflowers can be used in phytoremediation to extract toxic ingredients from soil, such as lead, arsenic and uranium, and used in rhizofiltration to neutralize radionuclides and other toxic ingredients and harmful bacteria from water [23-27].

Salinity and sodicity stresses

The effects of NaCl and Na₂CO₃ salinity in two concentrations on the growth, lipoxygenase (LOX) activity, membrane integrity, total lipids, yield parameters and fatty acids (FAs) composition of seeds of sunflower cultivar Sakha 53 was distinguished. Plant growth, LOX activity and malondialdehyde (MDA) content were reduced by salts stresses. On the contrary, salinity and alkalinity stress induced stimulatory effects on membrane permeability, leakage of UV-metabolites from leaves and total lipids of sunflower shoots and roots (28)

Salinization stress

The adaptability of plant under salt stress to crude oil pollution of soil and improvement measures, a pot experiment of *Helianthus annuus* seedlings was explored. The results showed that, with the increase of soil crude oil concentration, the relative growth rate (RGR) of plant height, RGR of aboveground biomass and root N: P ratios of *H. annuus* seedlings decreased significantly, while the activity of SOD and CAT increased at first and then decreased significantly [29].

Anti-diabetes

Inulin accumulation and degree of polymerization (DP) of the treated cells in the same medium were investigated after treatment with six types of elicitors. Among the six types of elicitors, the descending order of inulin content is MeJA > Ag > SA > KJT > Tv > YE. For the purpose of lower DP inulin and application to prebiotic food, three elicitors, including KJT, YE and Ag, can be used for the elicitation [30].

Antioxidant

The efficiency of butylated hydroxyl anisole (BHA) as an antioxidant in sunflower oil was evaluated. The ultrasonic results obtained have shown reduction in thermal degradation and improvement in oxidation stability of antioxidant loaded oil in comparison to base oil. Hence, it can be recommended that sunflower oil with 200 ppm BHA can be used for frying without adverse effect on physical properties. The ultrasonic velocity can be used for assessment of stability of frying oil [31].

Herbicide

The supercritical fluid extraction (SFE) with CO₂ of bioactive substances from *Helianthus annuus* L. var. Arianna was studied. The result showed high activity in the wheat coleoptile bioassay, in Petri dish phytotoxicity bioassays, and in the hydroponic culture of tomato seeds. Metabolites have been tested in the etiolated wheat coleoptile bioassay with good results in a noteworthy effect on germination. The most active compounds were also tested on tomato seeds, heliannuol A [30] and leptocarpin [45] being the most active, with values similar to those of the commercial herbicide [32].

Myocardial infarction

The protective effect of oil *Helianthus annuus* (Sunflower) on myocardial infarction induced by epinephrine in New Zealand rabbits was Determined. *Helianthus annuus* oil at doses of 20 mg/kg has protective effect on myocardial infarction induced by epinephrine in New Zealand rabbits [33].

Allergy

It is hypothesized that household exposure to allergenic proteins via an impaired skin barrier, such as atopic dermatitis, may contribute to the development of IgE sensitization. It suggested that homes which are intentionally peanut-safe may provide an environment whereby infants with impaired skin barrier are at increased risk of allergy to alternative "butter" products being used, via cutaneous exposure to these products preceding oral introduction to the child [34].

Case of a 40-year-old male patient, admitted to hospital due to shortness of breath and urticaria, both of which appeared shortly after the patient ingested sunflower seeds. laryngological examination revealed swelling of the pharynx with retention of saliva and swelling of the mouth and tongue. We suspected that hypersensitivity to sunflower LTP and defens in-like proteins, both cross-reactive with mugwort pollen allergens, were the main cause of the patient's anaphylactic reaction (35).

New seed-specific allergens associated with severe symptoms in patients allergic to this edible vegetable was examined. Two novel allergens determined from tomato seeds that belong to the nonspecific lipid transfer protein family classes 1 and 2, respectively. This is the first work associating IgE reactivity to these proteins with severe symptoms of certain tomato-allergic patients. Therefore, they are optimal candidates for clarifying the diagnosis of the tomato allergy [36].

Skin barrier function

The effect of sunflower seed oil (SSO) on skin barrier development in low-birth-weight premature infants was investigated. The result showed that SSO application may retard postnatal skin barrier maturation in preterm infants [37].

The effect of olive oil and sunflower seed oil on the biophysical properties of the skin was evaluated. The use of olive oil for the treatment of dry skin and infant massage should therefore be discouraged. These findings challenge the unfounded belief that all natural oils are beneficial for the skin and highlight the need for further research [38].

Topical therapy with skin barrier-enhancing products may be an effective strategy for improving neonatal outcomes, particularly among preterm was examined. Given the low cost and technologic simplicity of the intervention and the effect size observed in this study, a clinical trial with increased numbers of subjects is indicated to evaluate the potential of topical therapy to reduce infections and save newborn lives in developing countries [25].

Fatty acid patterns

In order to prevent the development of essential fatty acid deficiency, 19 premature babies and term infants needing parenteral nutrition were studied during 14 days. Although Intralipid administration is often controversial or contraindicated in premature infants (hypoxia, septicemia, acidemia), it appears necessary to prevent plasmatic deficiency in C18:2. The latter cannot be prevented by topical application of sunflower seed oil, not even in very low birthweight infants [39].

Dermatitis

Sunflower seeds for the presence of SLs and to assess the prevalence of sunflower sensitization in Compositae-allergic individuals was analyzed. The concentration of SLs on the sunflower seeds is considered high enough to elicit dermatitis in sensitive persons, and it seems appropriate to warn Compositae-allergic subjects against handling sunflower seeds [40].

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