INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD)
© 2026 IJNRD | Volume 11, Issue 6, June 2026 | ISSN: 2456-4184 | IJNRD.ORG

"A Review on Therapeutic Potential Of Helianthus annus Seeds"

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Abstract:

Helianthus annuus (sunflower) seeds possess significant therapeutic, nutritional, environmental, and industrial value owing to their rich composition of bioactive compounds. The seeds contain polyunsaturated fatty acids, tocopherols, phenolic acids, flavonoids, proteins, vitamins, and essential minerals, which collectively contribute to their potent antioxidant, anti-inflammatory, cardioprotective, antihyperlipidemic, and immunomodulatory activities. Numerous pharmacological studies highlight the seeds' relevance in managing oxidative stress, inflammation, gastrointestinal disorders, hypertension, and microbial infections. Sunflower-derived extracts demonstrate notable wound-healing, analgesic, antidiarrheal, and anti-ulcer effects, supported by both in vivo and in vitro findings. Beyond therapeutic potential, sunflower plants exhibit exceptional phytoremediation capacity, effectively accumulating toxic metals and organic pollutants, making them highly valuable in environmental restoration. Industrially, sunflower oil and biomass serve as cost-effective raw materials for food, cosmetic, and manufacturing applications, with high-oleic varieties enhancing oxidative stability for broader use. Despite these advantages, variability in chemical composition across cultivars, limited clinical validation, and insufficient standardization pose challenges for pharmaceutical development.

Introduction:

Helianthus annuus (sunflower) seeds are increasingly recognized not only as an important agricultural commodity but also as a potent source of bioactive compounds with significant therapeutic potential. Sunflower seeds contain a wide spectrum of nutritionally and pharmacologically relevant constituents, including polyunsaturated fatty acids, tocopherols (vitamin E), phytosterols, phenolic acids, flavonoids, proteins, and essential minerals. These components collectively contribute to a variety of biological activities such as antioxidant, anti-inflammatory, cardioprotective, antihyperlipidemic, antimicrobial, immunomodulatory, and potential anticancer effects. (1)

The global burden of oxidative stress related and metabolic diseases has intensified interest in natural products capable of mitigating chronic inflammation, improving cellular defense, and modulating metabolic pathways. Preclinical studies highlight that sunflower seed oils and phenolic-rich extracts exhibit strong radical-scavenging activity, modulate inflammatory mediators, improve lipid profiles, and support hepatic and cardiovascular function. Furthermore, the phenolic compounds distributed within oilseeds sunflower seeds included play a key role in regulating oxidative processes and may enhance therapeutic outcomes when incorporated into functional foods or for nutraceutical preparations. (2)

Fig no. 1 Helianthus Annus

Fig no.2 Helianthus Annus Seed

History of Helianthus: The history of the sunflower (Helianthus annuus L.) traces back thousands of years to its origin in eastern North America, where it was domesticated by Native American communities. Archaeological findings indicate that sunflower domestication began around 4225 B.C., during which the plant served multiple purposes, including food consumption, oil extraction for uses such as sunscreen and hair decoration, medicinal treatments such as diuretic and anti-inflammatory applications, and ceremonial ornamentation. Early domestication was largely driven by mass selection, as Native American farmers intentionally replanted seeds from plants with the largest seed size. This practice significantly contributed to the development of the cultivated sunflower known today, likely arising from mass selection of the wild species H. annuus, which possesses smaller seeds and a branched stem. Sunflower was introduced into Europe in 1510, where it initially gained popularity as an ornamental plant. For more than two centuries, it was cultivated primarily for decorative purposes, not for oil. The transition toward sunflower as a major oilseed crop occurred after its introduction to Russia, where significant breeding efforts led to substantial improvements in oil yield and agronomic performance. Domestication brought about considerable phenotypic changes, typical of domestication syndrome, including increased apical dominance, larger seed size, reduced seed dormancy, loss of natural seed dispersal, and loss of self-incompatibility. These changes distinguish domesticated sunflower from its wild relatives, which typically exhibit highly branched growth and multiple small flowering heads. Over time, the combination of selection and genetic drift reduced the diversity of cultivated sunflower, with modern varieties retaining only 50–67% of the diversity found in wild populations. Despite this reduction, sunflower has evolved into a globally important oilseed crop with a rich domestication history shaped by human selection and modern breeding strategies. (3)

Materials and Methods: -

Materials: -

The experiment used a set of ten sunflower (Helianthus annuus L.) hybrids representing both advanced breeding lines and established commercial cultivars. Five oil-type test hybrids DA-VD20-06, DA-VD20-10, ADASUN21, DA-VD20-13, and DA-VD20-21 were obtained from the Eastern Mediterranean Agricultural Research Institute in Adana, Türkiye. These candidate hybrids were selected for evaluation based on their improved breeding characteristics and potential adaptability across diverse agro-ecological zones. Additionally, five commercial control hybrids sourced from private seed companies (Bosfora, LG-5580, Tunca, P64-LL62, and P64-LL134) were included to provide a comparative performance standard. (4)

Methods

Field trials were conducted across three locations during the 2015 growing season to capture the effects of varying geographic and climatic conditions. One trial was in Kesan (Takira Province) in the Thrace region of Northwest Türkiye, where sunflower acreage is historically extensive. The other two trial sites Dogankent and Ceyhan were situated in the Çukurova Delta (Eastern Mediterranean region), which is characterized by fertile soils and favorable temperatures for sunflower production.

A Randomized Complete Block Design (RCBD) with four replications was used at each site. Sowing occurred in March 2015 at the Doğankent and Ceyhan locations and in April 2015 at the Keşan site. Each plot consisted of two rows (1.40 m × 6.80 m) with a total harvested area of 9.52 m². Seeds were sown with 0.70 m interrow and 0.30 m intrarow spacing. Soil preparation included ploughing at appropriate moisture levels, followed by disking to achieve a suitable seedbed. Fertilization consisted of 500 kg ha^{-1} of basal NPK (20-20-0), supplemented with 100 kg ha^{-1} nitrogen and 100 kg ha^{-1} phosphorus (P_2O_5). Potassium fertilizer was not applied due to naturally high soil potassium levels. Standard agronomic practices thinning, hand hoeing, and mechanical hoeing were performed as needed. To minimize bird damage, mature flower heads were covered with cotton bags. Harvesting was conducted in July at the Eastern Mediterranean sites and in August at the Thrace site once physiological maturity (R-6) was reached and seed moisture declined. (4)

Measurements: -

Table Diameter (cm): -

At the R-6 physiological maturity stage, table diameter was measured from five randomly selected plants per plot. The diameter of each capitulum was recorded and averaged for each genotype to assess the head size and potential seed-bearing capacity.

Plant Height (cm): -

Plant height was measured from the soil surface to the base of the capitulum. Five randomly selected plants in each plot were evaluated, and mean values were calculated. This parameter helps assess biomass production and suitability for mechanical harvest.

Thousand Grain Weight (g): -

Thousand grain weight was determined by counting and weighing 100 seeds from each plot, repeated four times. The mean weight was multiplied by 10 to obtain the standard TGW. This trait reflects seed density and contributes directly to seed yield.

Seed Yield (kg): -

Seed yield was assessed by harvesting each plot, adjusting seed moisture to 10% using a John Dickey moisture meter, and converting the plot yield to kg ha^{-1}. This parameter was used to determine the productivity of each hybrid under different environmental conditions.

Results and Discussion: -

Statistically significant differences in seed yields (kg ha^{1}) among genotypes were observed in Adana/Dogankent & Edirne/Kesan locations but not in Adana/Ceyhan location (Table 1).

In Adana/Ceyhan location, seed yields were between 3205-4467kg.InAdana/Dogankent location, seed yields were highest at Genotype no 1, 2, 3, 4, 5, 7(control variety LG-5580) and 8 (control variety Tunca) (between 4362-5208 kg) and lowest at Genotype no 6, 9 and 10(between 3257-4502 kg) (Table I). In Edirne/Kesan location, seed yields were highest at Genotype no 1, 2, 3, 4, 5, 6(control variety Bosfora) and 10 (control variety P64-LL134) (between 2887-3393kg ha') and lowest at Genotype no 7, 8 and 9 (between 2262-2768 kg).

Seed yields for average of three locations were between 3198-4148 kg (Table 1). For all genotypes, seed yields were highest in Adana/ Dogankent location, medium in Adana/Ceyhan location and lowest in Edirne/Kesan location. Genotype no 1, 2, 3, 4 and 5 were yielded well in Adana/ Dogankent and Adana/Ceyhan locations but among these 5 genotypes, genotype no 4 was the lowest yielding of all genotypes in Adana/Ceyhan location. Due to this result, genotype no 1, 2, 3 and 4 were found superior in terms of yield in the trials (Table 1). [(4)]

Genotype no.	Genotype name	Seed yields (kg) in tested location			Average seed yields (kg)
		Adana /Ceyhan	Adana/ Dogankent	Edirne/ Kesan	
1	DA-VD20-06	3957	4926	3393	4092
2	DA-VD2010	3712	4826	3125	3900
3	ADASUN21	3934	5207	3304	4148
4	DA-VD2013	4033	4362	2946	3780
5	DA-VD2021	3205	5064	3095	3788

6	Bosfora	3379	3257	2956	3198
7	LG-5580	3703	4732	2768	3734
8	Tunca	4186	5014	2262	3820
9	P64-LL62	3531	3765	2708	3335
10	P64-LL134	4467	4502	2887	3952
Average		3811	4502	2944	3752
Standard error		118.0	144.8	246.3	169.7
CV (%)		19.76	16.9	5.4	14.02

Table 1. Seed Yields (kg) of sunflower genotypes tested in 2020

Potential Use of Sunflower Seeds in Environmental Industry :-

Sunflower (Helianthus annuus L.) has emerged as a highly effective crop in the environmental industry due to its remarkable capacity for phytoremediation, particularly in the removal of heavy metals and organic pollutants from contaminated ecosystems. Evidence from field and laboratory studies demonstrates its ability to accumulate toxic metals such as uranium (U), cesium (Cs), strontium (Sr), thorium (Th), and radionuclides from industrial and nuclear contaminated sites. At a wastewater site in Ashtabula, Ohio, four-week-old sunflower plants removed more than 95% of uranium from contaminated water within 24 hours, primarily through rhizofiltration, where plant roots absorb and concentrate pollutants from aqueous environments. (7) Sunflower was also used in a U.S. Department of Energy (DOE) pilot project to clean uranium-contaminated water and in remediation efforts following contamination near the Chernobyl nuclear plant. In these cases, Cs tended to accumulate in the roots, while Sr preferentially moved into the shoots, illustrating sunflower's capacity for selective uptake and partitioning of pollutants. (5)

Beyond radionuclides, sunflower is also effective in the remediation of organic contaminants, including trichloroethylene (TCE), polycyclic aromatic hydrocarbons (PAHs), TNT, BTEX compounds, and polychlorinated biphenyls (PCBs). Mixed plantings with sunflower, timothy grass, and red clover have been shown to accelerate the degradation of herbicides such as 2,4,5-trichlorophenoxyacetic acid (2,4,5-T).(8) Sunflower's suitability for environmental applications is supported by its low cost, ability to operate as a solar-driven system, strong public and governmental support, and potential for large scale ecological restoration.(6)Overall, sunflower stands out as a promising Phyto technological tool for cleaning contaminated soils and water, offering a sustainable, green technology for environmental rehabilitation.(7)

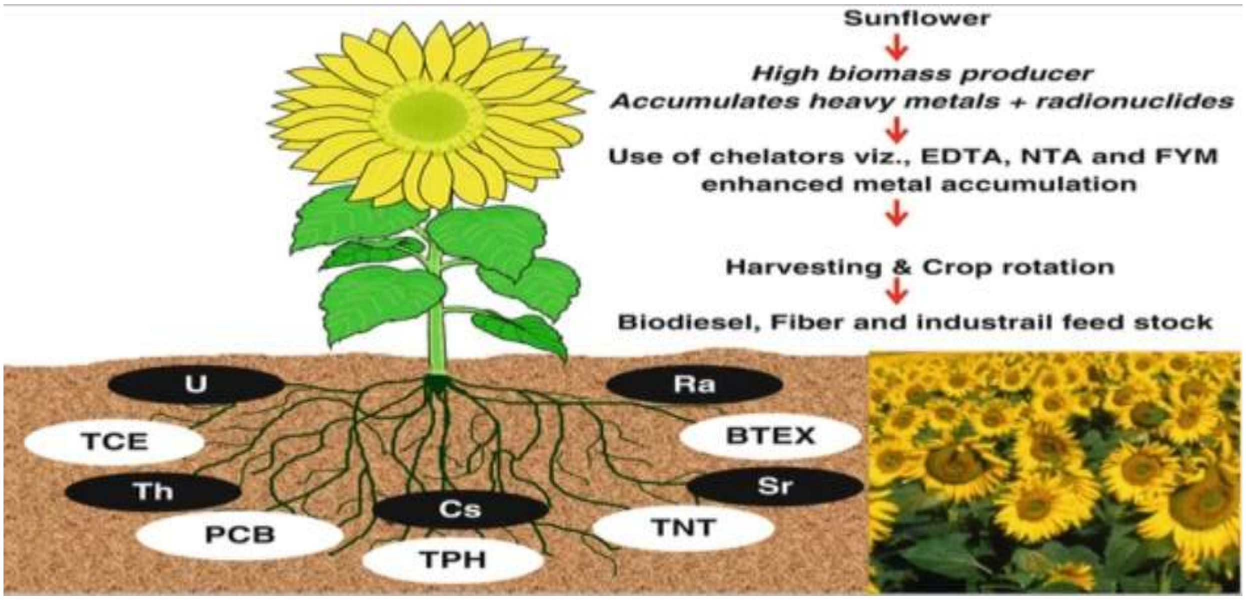

Fig 3. Sunflower as a potential environmental crop for phytotechnology's to clean-up inorganic and organic contaminants and pollutants

Industrial Value: - Sunflower as a source of cheap and safe raw material

Sunflower (Helianthus annuus L.) has gained considerable industrial importance due to its versatility, safety, and cost-effectiveness as a raw material. Unlike animal derived residues, which may contain infectious agents or contaminants during handling and processing, sunflower biomass and oil are plant-based materials regarded as inherently safer alternatives for a wide range of industrial applications. [9] This safety aspect significantly increases its desirability in industries seeking hygienic, reliable, and sustainable ingredients.

Sunflower oil is extensively utilized not only in foods but also as a raw material for manufacturing industrial products such as soaps, varnishes, lubricants, paints, surfactants, and polymer precursors. Its diverse fatty acid composition, particularly its high content of polyunsaturated fatty acids (PUFAs), adds functional advantages that support various chemical transformations essential for industrial processing. [10] The presence of PUFAs also helps reduce low density lipoprotein (LDL) cholesterol, which initially positioned sunflower oil as a health-promoting edible oil; however, the same properties influence its industrial behavior by reducing oxidative stability under high temperature operations such as deep frying or thermal processing.

A key limitation of traditional sunflower oil in industrial contexts is its proneness to oxidation and rancidity due to its high linoleic acid content. Thermal degradation of PUFAs generates free radicals and volatile compounds that negatively affect both industrial product stability and food quality. To overcome these challenges, modern breeding and genetic modification

techniques have produced high oleic and high stearic sunflower lines. High oleic (approximately 80%) hybrids contain elevated levels of monounsaturated fatty acids, which exhibit superior oxidative stability, making the oil suitable for repeated heating, deep frying, and industrial thermo-processing [9]. Similarly, high stearic (up to 35%) lines provide a more saturated profile ideal for margarine, shortening, specialty fats, and non-edible industrial formulations requiring firmness and heat resistance.

Additionally, improvements in sunflower oil composition reduce the dependence on partially hydrogenated oils, which can generate trans-fatty acids linked to cardiovascular risks. This makes sunflower derived oils more attractive for industries committed to safer and trans-fat free formulations. The increased oxidative stability of improved sunflower oil also enhances its usability in the production of long-lasting paints, resins, linoleum, coatings, and biodegradable industrial materials. These applications align with global priorities for sustainable and eco-friendly raw materials.

Beyond oil, sunflower biomass including hulls, stalks, meal, and press cake also serves as economical raw material for manufacturing fibers, biofuels, pellets, adhesives, and organic fertilizers. Sunflower meal, rich in protein, is employed in animal feed formulations. Hulls are widely used in combustion and bioenergy production due to their calorific value. The plant's entire structure is thus efficiently exploitable, minimizing agricultural waste and promoting a circular industrial economy. [9]

Pharmacological Activities: -

Anti-Inflammatory and Analgesic Effects of Helianthus annuus: -

Sunflower (Helianthus annuus) possesses a wide spectrum of anti-inflammatory and analgesic properties attributed to its diverse secondary metabolites, including diterpenes, phenolic compounds, and bioactive acids. Helianthosides isolated from the n-butanol-soluble fraction of sunflower methanol extracts demonstrated strong anti-inflammatory activity in mice subjected to 12-O-tetradecanoylphorbol-13-acetate (TPA) induced inflammation. All isolated compounds exhibited marked activity, with ID50 values ranging from 65 to 262 nmol per ear, indicating potent topical anti-inflammatory effects. [10]

Further investigations into sunflower diterpene acids specifically grandiflorolic, kaurenoic, and trachylobanoic acids revealed significant anti-inflammatory action against lipopolysaccharide (LPS)-stimulated RAW 264.7 macrophages. These compounds suppressed nitric oxide (NO) production, prostaglandin E2 (PGE2) synthesis, and tumor necrosis factor-α (TNF-α) levels in a concentration-dependent manner. Additionally, they inhibited inducible nitric oxide synthase (NOS-2) and cyclooxygenase-2 (COX-2) expression, both key mediators in inflammatory signaling pathways. In vivo, the same diterpenoids efficiently reduced TPA-induced mouse ear edema and suppressed myeloperoxidase (MPO) activity, indicating reduced leukocyte infiltration. [10]

Sunflower leaves also demonstrated notable anti-inflammatory potential in rat models. Ethanol extracts at doses of 0.5, 2, and 4 g/kg significantly inhibited paw edema induced by egg albumin. Their effect was comparable to or better than 10 mg/kg of oral indomethacin, a standard nonsteroidal anti-inflammatory drug. Treatment also increased thermal pain tolerance, suggesting an additional analgesic effect. [10]

The methanol extract of sunflower seeds displayed strong analgesic activity in acetic-acid-induced writhing and hot plate tests in mice. At doses of 100 and 200 mg/kg, the extract reduced writhing responses by 50.35% and 57.85%, respectively. In the hot-plate model, it significantly increased latency time after 60 minutes, with both doses outperforming aspirin. [10] These findings confirm that sunflower seeds contain potent analgesic phytochemicals capable of modulating nociceptive pathways.

Antioxidant Effects of Helianthus annuus

The seeds of Helianthus annuus possess notable pharmacological antioxidant activity attributed to their rich composition of phenolic acids, flavonoids, tocopherols, and essential fatty acids. These phytochemicals collectively enhance the scavenging of reactive oxygen species (ROS), thereby reducing oxidative stress and protecting cellular components from damage. Experimental studies have shown that sunflower seed extracts exhibit strong free-radical-quenching capacity, particularly against DPPH and ABTS radicals, demonstrating their potent reducing ability and lipid peroxidation inhibiting properties. [17] Furthermore, bioactive constituents such as chlorogenic acid and vitamin E stimulate endogenous antioxidant enzymes, including superoxide dismutase, catalase, and glutathione peroxidase, which contribute to improved redox balance and mitochondrial stability. [18]

The antioxidant action of sunflower seeds is also linked to their capacity to modulate inflammatory pathways, as oxidative stress and inflammation are closely interconnected. By lowering oxidative burden, sunflower seed extracts help attenuate inflammatory mediators and prevent cellular dysfunction. These findings highlight the therapeutic potential of H. annuus seeds in preventing oxidative-stress–related disorders, such as cardiovascular diseases, neurodegenerative conditions, and metabolic syndrome. Therefore, sunflower seeds represent a promising natural antioxidant source with broad pharmacological relevance [18].

Anti-Ulcer Effects

Helianthus annuus seeds demonstrate noteworthy anti-ulcer potential due to their rich composition of flavonoids, tocopherols, polysaccharides, and essential fatty acids, which collectively support gastric protection. These bioactive constituents enhance mucosal defense mechanisms by stimulating mucus secretion, increasing bicarbonate levels, and maintaining the integrity of the epithelial barrier. Experimental findings show that sunflower seed extracts reduce ulcer formation by suppressing oxidative stress, a major contributor to gastric mucosal injury. [19] The antioxidant components mitigate lipid peroxidation and neutralize free radicals that damage stomach tissues. Additionally, anti-inflammatory compounds present in the seeds inhibit the release of histamine, cytokines, and other ulcerogenic mediators, thereby limiting inflammation-driven erosion of the gastric lining. [20] Through these combined effects, sunflower seeds offer promising natural protection against chemically and stress induced ulcers.

Antidiarrheal Effects

The antidiarrheal actions of Helianthus annuus have been confirmed through castor-oil-induced diarrhea models in mice. Administration of ethanolic leaf extracts at 250–500 mg/kg significantly reduced the frequency of loose stools and slowed intestinal motility. These effects were accompanied by a marked decline in gastrointestinal transit time, demonstrating that the extract acts through both antimotility and antisecretory pathways. By moderating irritation in the intestinal mucosa and suppressing excessive fluid release, the plant extract effectively limits diarrhea severity. The overall reduction in fecal output highlights the value of sunflower leaves as a natural agent capable of controlling acute secretory diarrhea. [10]

Central Nervous System Effects

The methanolic seed extract of Helianthus annuus also influences multiple central nervous system functions. When administered to mice, doses of 100–200 mg/kg improved behavioral performance, including enhanced movement coordination, increased grip strength, heightened spontaneous activity, and improved sensory reflexes such as the pinna and pain response. Moreover, the extract demonstrated notable anxiolytic behavior in both light dark box and elevated plus maze models by increasing exploration of illuminated or open spaces. In antidepressant evaluations using the tail suspension test, the sunflower seed extract significantly decreased immobility time, reflecting mood elevating properties comparable to standard agents such as imipramine and diazepam. These findings suggest that sunflower seeds possess compounds capable of modulating anxiety, mood, and overall neurobehavioral activity. (10)

Antihypertensive Effects: -

Recent research highlights the antihypertensive potential of bioactive peptides derived from Helianthus annuus, particularly those generated during protein hydrolysis. Sunflower seed proteins especially the globulin fraction produce peptides capable of inhibiting angiotensin-converting enzyme (ACE), a central regulator of blood pressure control. During digestion, sunflower proteins are hydrolyzed by pepsin and pancreatin, releasing multiple peptides with varying ACE-inhibitory strengths. Studies show that ACE inhibitory activity increases as hydrolysis progresses, with early peptic hydrolysis producing peptides of moderate activity, while pancreatin hydrolysis maximizes inhibitory potential through the formation of smaller, more active peptide fragments. (11)

Once isolated and sequenced, several sunflower peptides have been shown to effectively block ACE activity in vitro, suggesting their potential use as natural antihypertensive agents. One characterized peptide, exhibiting homology to sunflower seed 11S globulin, demonstrated substantial inhibition of ACE, indicating that storage proteins in the seed are excellent precursors for antihypertensive peptide production. By reducing ACE activity, sunflower-derived peptides can help decrease angiotensin II formation, relax vascular resistance, and ultimately lower systemic blood pressure. Thus, sunflower seeds possess functional value as dietary components capable of supporting cardiovascular health through peptide-mediated blood pressure regulation. (11)

Wound-Healing Effects: -

Helianthus annuus also exhibits noteworthy wound-healing properties, largely due to its high content of linoleic acid an essential fatty acid critical for maintaining skin integrity. Sunflower oil has been investigated in both animal and clinical settings, demonstrating accelerated tissue repair and improved wound appearance. Application of sunflower seed oil in young lambs enhanced the healing process, with treated wound areas showing greater than 300% reduction in size compared to untreated controls after three days. This rapid improvement is attributed to the oil's ability to restore the cutaneous barrier, regulate trans epidermal water loss, and promote epidermal differentiation. (11)

Linoleic and arachidonic acids in sunflower oil additionally serve as precursors for prostaglandins involved in inflammation resolution and tissue regeneration. Clinical studies also report benefits in human infants: topical application of sunflower oil to preterm newborns significantly improved skin condition, reducing dryness, promoting barrier repair, and lowering the incidence of nosocomial infections. These findings suggest that sunflower oil not only supports structural repair but also enhances microbial defense by strengthening the skin's natural barrier. Collectively, the evidence underscores sunflower oil as a safe, effective, and economical therapeutic option for wound management and skin protection. (11)

Cosmetic Uses of Helianthus annuus (Sunflower): -

Sunflower (Helianthus annuus) is widely utilized in cosmetic formulations due to its rich content of essential fatty acids, antioxidants, vitamins, and bioactive plant compounds that support skin and hair health. Sunflower oil, seeds, petals, and leaf extracts each play distinct roles in modern skincare and personal-care products. (12)

1. Sunflower Oil

Sunflower oil serves as a versatile cosmetic ingredient because of its high concentration of linoleic acid and vitamin E. As a moisturizer, it strengthens the skin barrier and prevents moisture loss, making it effective in lotions, creams, and hydrating serums. Its lightweight texture allows deep penetration without leaving a greasy feel, making it suitable for both dry and combination skin. (12)

In anti-aging products, the natural tocopherols in sunflower oil protect skin cells from oxidative stress, reducing the formation of wrinkles and enhancing overall skin elasticity. The oil's antioxidant capacity slows collagen breakdown and promotes a smoother skin surface.

As a cleanser, sunflower oil effectively dissolves impurities, makeup, and excess sebum. It is commonly used in cleansing oils and micellar formulations due to its non-comedogenic nature and ability to lift dirt without stripping natural oils.

For hair care, sunflower oil conditions the hair shaft, improves shine, and nourishes the scalp. It is essential fatty acids help maintain hair softness and reduce breakage.

2. Uses of Sunflower Oil for Skin

As a facial moisturizer, sunflower oil helps maintain hydration, soothes irritation, and supports a radiant complexion. Its gentle profile makes it ideal for sensitive or acne-prone skin.

As a makeup remover, sunflower oil breaks down waterproof cosmetics while preserving the skin's natural moisture barrier, leaving the face cleansed and soft.

3. Sunflower Seeds

Crushed sunflower seeds serve as natural exfoliants in scrubs and body polishes. Their mild abrasive effect removes dead skin cells and enhances skin smoothness. In hair products, ground sunflower seeds can be used as a hair treatment to strengthen strands and enhance overall scalp nutrition.

4. Sunflower Petals

Sunflower petals are incorporated into infused oils, providing a gentle floral scent and mild antioxidant benefits. In face masks, petal extracts soothe the skin, add softness, and improve brightness due to their natural phytochemicals.

5. Sunflower Leaf Extract

Sunflower leaf extract acts as a soothing agent, offering anti-inflammatory and calming effects. It is incorporated into creams, toners, and gels designed to reduce redness, irritation, and environmental stress. [12]

Home Made Remedies of Helianthus Annuus

1. Sunflower Oil Moisturizer Ingredients

a. 2 tablespoons of sunflower oil
b. 1 tablespoon of coconut oil (optional, for added moisture)
c. A few drops of essential oil (like lavender or tea tree, optional)

Instructions: - Mix sunflower oil with coconut oil (if using) in a clean container. Add a few drops of essential oil if desired. Apply a small amount to your face or body and massage gently.

Benefits: Sunflower oil is rich in fatty acids and vitamin E, which help moisturize. [12]

2. Sunflower Seed Face Scrub Ingredients

a. 2 tablespoons of finely ground sunflower seeds
b. 1 tablespoon of honey
c. 1 tablespoon of yogurt

Instructions

1. Mix the ground sunflower seeds with honey and yogurt to form a paste.
2. Gently massage the paste onto your face in circular motions.
3. Rinse off with warm water.

Benefits: The sunflower seeds provide gentle exfoliation, while honey and yogurt offer moisturizing and soothing properties.

3. Sunflower Oil Hair Mask Ingredients

a. 3 tablespoons of sunflower oil
b. 1 tablespoon of honey
c. 1 tablespoon of aloe vera gel

Instructions

1. Combine sunflower oil, honey, and aloe vera gel in a bowl.
2. Apply the mixture to your hair, focusing on the ends.
3. Leave it on for 30 minutes to an hour, then wash out with shampoo and conditioner.

Benefits: This hair mask helps to nourish and hydrate the hair, making it softer and shinier. [12]

4. Sunflower Oil Lip Balm

Ingredients

a. 2 tablespoons of sunflower oil
b. 1 tablespoon of beeswax
c. 1 tablespoon of beeswax
d. 1 tablespoon of shea butter
e. A few drops of your favorite essential oil (optional)

Instructions

1. Melt the beeswax and shea butter together in a double boiler.
2. Stir in the sunflower oil and essential oil if using.
3. Pour the mixture into lip balm containers and let it cool.

Benefits: Provides hydration and protection for the lips.

5. Sunflower Seed Eye Treatment

Ingredients

a. tablespoon of sunflower seed oil
b. 1 tablespoon of aloe vera gel

Instructions

1. Mix the sunflower seed oil and aloe vera gel.
2. Gently apply under your eyes, avoiding direct contact with the eves.
3. Leave it on for 10-15 minutes, then gently wipe off with a damp cloth.

Benefits:

This mixture can help reduce dryness and soothe the delicate to the skin around the eyes. (12)

Chemical and nutrients component of sunflower seeds

In recent times, the awareness by nutritionists, dietetics, food chemists on balance dietary intake to prevent health related problems such as obesity, cardiovascular, and neurological diseases have led to high demand for vegetable oil such as sun foil, as a major ingredient in the human diet with characteristic flavors and textures. The physical and chemical composition of edible oils depends primarily on the biological origin, and they contain dietary fiber, minerals, vitamins (vitamin E), and antimicrobial and antioxidant agents. Over time, the consumption of foods with high saturated fatty acids content can affect certain organs in the human body, causing obesity, cancer, and diabetes. The functional properties of foods can be improved by biological and chemical processes. Lipids from plant origin are considered healthier and more beneficial than fats from animal sources due to their high polyunsaturated fatty acids that are essential in organ functioning, improve health, and reduce the incidence of life-threatening ailments such as cardiovascular diseases. Therefore, oils from oilseeds crops (soybean, sunflower, olive, and rapeseed) are found as major sources of edible oils in the global world market for human consumption with high Ω-3 and Ω-6 fatty acid contents as well as other biological components. (13) The fatty acids profiles of sun foil can be classified as low-oleic acid, medium-oleic acid, and high-oleic acid. Most of the oilseed crops contain polyphenols as endogenous antioxidants that prevent lipid oxidation. Natural antioxidants from the bioactive components of foods and the predominant phenolic compound in sunflower seeds are chlorogenic acid. (13)The chemical constituents of sunflower seeds contained flavonoids which include heliannone, quercetin, kaempferol, luteolin, apigenin; phenolic acids such as caffeic acid, chlorogenic acid, caffeoylquinic acid, gallic acid, protocatechuic, coumaric, ferulic acid, and sinapic acids and fatty acids (lauric, palmitic, oleic, linoleic, stearic, linolenic, and heneicosanoic). The most widely occurring substitution patterns for flavones are 5,7,4-trioxygenation (apigenin type) and 5,7,3,4-tetraoxygenation (luteolin type) while flavanols include 3,5,7,4-tetraoxygenation (kaempferol type) and 3,5,7,3,4-pentaoxygenation (quercetin type). Some plants contain natural antioxidants which help in scavenging free radicals against toxic molecules, reducing the risk of chronic diseases, and cellular damage. Natural antioxidants from plants could be categorized as enzymes (catalase, glutathione dehydrogenase, and guaiacol peroxidase), peptides (reduced glutathione), carotenoids, and phenolic compounds (tocopherols, flavonoids, and phenolic acids). (13)

Sunflower seeds (Helianthus annuus) possess a rich chemical composition that contributes to their nutritional and functional value. One of the major components is oil, which constitutes 40%–50% of the seed. This oil is dominated by polyunsaturated fatty acids, especially linoleic acid (omega-6), and moderate amounts of oleic acid (omega-9). These fatty acids support cardiovascular health and help maintain healthy lipid profiles [13]. Sunflower oil also contains significant levels of tocopherols, with α-tocopherol (vitamin E) being the most abundant, offering strong antioxidant protection against oxidative damage.

Micronutrient content in sunflower seeds is substantial, including essential minerals such as magnesium, selenium, zinc, copper, phosphorus, and manganese. These minerals serve as cofactors for enzymatic reactions, support bone structure, and contribute to antioxidant defense mechanisms. In addition, the seeds contain B-complex vitamins (B1, B2, B3, B6, and folate), which are necessary for energy metabolism and neural function.

Sunflower seeds also contain diverse phytochemicals, including phytosterols, chlorogenic acid, caffeic acid, phenolic compounds, and flavonoids. These bioactive molecules have been associated with anti-inflammatory, antioxidant, and cholesterol-lowering effects. Phytosterols, in particular, reduce cholesterol absorption, contributing to improved cardiovascular health. [14]

Challenges and Future Perspectives

Although Helianthus annuus seeds contain valuable bioactive compounds with antioxidant, anti-inflammatory, and cardioprotective effects, several challenges still restrict their full therapeutic application. A major limitation is the insufficient characterization of bioactive components across different cultivars. The chemical composition of sunflower seeds varies widely depending on genotype, agroecological conditions, and post-harvest processing, making it difficult to establish uniform therapeutic standards. [15] This lack of biochemical consistency hinders the development of standardized formulations suitable for pharmaceutical use.

Another challenge is the limited pharmacokinetic and toxicological data. Although sunflower seed extracts demonstrate promising biological effects in experimental models, there is a scarcity of controlled clinical trials confirming their efficacy and safety in humans. Issues such as optimal dosing, potential drug interactions, and long-term toxicity remain largely unexplored. Additionally, anti-nutritional factors such as tannins and certain phenolic compounds can reduce bioavailability, further complicating therapeutic evaluation.

Despite these challenges, future perspectives for sunflower seed research remain highly promising. Advances in metabolomics, proteomics, and molecular breeding could allow the identification of high value varieties with elevated concentrations of therapeutic compounds. Furthermore, the application of nanotechnology, including nanoencapsulation of sunflower bio actives, may significantly enhance stability and bioavailability, allowing more effective delivery in medical formulations. Emerging green extraction techniques such as microwave-assisted extraction may also improve yield and purity of sunflower-derived compounds.

Expanding interdisciplinary collaboration between plant scientists, pharmacologists, and food technologists will be essential to translate laboratory findings into real therapeutic products. With systematic clinical validation, improved extraction technologies, and enhanced cultivar selection, Helianthus annuus seeds hold strong potential for future development as functional ingredients in nutraceutical and pharmaceutical industries. [16]

Conclusion

The therapeutic potential of Helianthus annuus (sunflower) seeds continues to attract significant scientific interest due to their diverse bioactive compounds and broad pharmacological activities. Rich in polyunsaturated fatty acids, tocopherols, phenolic acids, and essential minerals, sunflower seeds demonstrate antioxidative, anti-inflammatory, cardioprotective, and immunomodulatory effects that make them promising candidates for preventive and therapeutic applications. Current evidence suggests that their lipid-rich profile supports cardiovascular health, while their phenolic constituents exhibit strong free-radical scavenging properties, contributing to reduced oxidative stress and improved metabolic function. Additionally, emerging research highlights the potential of sunflower seed extracts in managing conditions such as hyperlipidemia, chronic inflammation, and microbial infections.

However, despite encouraging findings, gaps remain regarding clinical validation, optimal dosage, long term safety, and the molecular mechanisms underlying their therapeutic actions. Future interdisciplinary research, including clinical trials and advanced phytochemical analyses, is essential to translate experimental outcomes into standardized therapeutic applications.

References: -

1. Guo, S., et al. (2017). A review of phytochemistry, metabolite changes, and biological activities of sunflower (Helianthus annuus).
2. Zhang, Y., et al. (2022). Composition distribution of phenolic compounds in oilseeds and their implications. Frontiers.
3. Radanović, A., Miladinović, D., Cvejić, S., Jocković, M., & Jocić, S. (2018). Sunflower genetics from ancestors to modern hybrids—A review. Genes, 9(10), 528. https://doi.org/10.3390/genes9100528
4. Çil, A., Çil, A. N., Şahin, V., & Yaşar, Y. (2023). Sunflower (Helianthus annuus L.) advanced breeding materials in field trials in different geographical regions of Turkey. MAS Journal of Applied Sciences,8(2), 384–390. https://doi.org/10.5281/zenodo.8051748
5. Dushenkov, V., Kapulnik, Y. (2002). Phytoremediation of toxic metals and radionuclides by sunflowers.
6. Dushenkov, V., et al. (1997a). Rhizofiltration of uranium-contaminated water.
7. Dushenkov, V., et al. (1997b). Field application of sunflower for uranium removal.
8. Prasad, M. N. V. (2007). Sunflower (Helianthus annuus L.): A potential crop for environmental industry. Helia, 30(46), 167–174. https://doi.org/10.2298/HEL0746167P
9. Rauf, S., Ortiz, R., Shehzad, M., Haider, W., & Ahmed, I. (2020). The exploitation of sunflower (Helianthus annuus L.) seed and other parts for human nutrition, medicine and the industry. HELIA, 43(73), 167–184. https://doi.org/10.1515/helia-2020-0019.
10. Al-Snafi, A. E. (2018). The pharmacological effects of Helianthus annuus – A review. Indo American Journal of Pharmaceutical Sciences, 5(3), 1745–1756.
11. Guo, S., Ge, Y., & Na Jom, K. (2017). A review of phytochemistry, metabolite changes, and medicinal uses of the common sunflower seed and sprouts (Helianthus annuus L.). Chemistry Central Journal, 11(95), 1–10.

12.Tyagi, A., Prajapati, R., Parmar, N., Shah, K., Bhavisi, P., Vable, K., & Tyagi, A. (2024). Helianthus annuus (Sunflower): The magnificent plant – A review. European Journal of Biomedical and Pharmaceutical Sciences, 11(12)

13.Adeleke, B. S., & Babalola, O. O. (2020). Oilseed crop sunflower (Helianthus annuus) as a source of food: Nutritional and health benefits. Food Science & Nutrition, 8(9), 4666–4684. https://doi.org/10.1002/fsn3.1783

14.Nicolle, C., Cardinault, N., Gueux, E., Jaffrélo, L., Rock, E., Mazur, A., & Rémésy, C. (2004). Health effect of vegetable-based diet: Lettuce consumption improves HDL cholesterol concentrations and antioxidant status in rats. Journal of Nutrition, 134(8), 2179–2183.

15.Gökdoğan, A., Açik, L., & Ülger, P. (2015). Assessment of bioactive compounds in sunflower seeds and their potential health benefits. Journal of Food Biochemistry, 39(4), 471–479.

16.Paucar-Menacho, L. M., Amaya, D. B., & Alvarez, A. M. (2018). Bioactive components in oilseeds and their therapeutic properties: A review. Food Reviews International, 34(7), 610–630.

17.Ghafoor, K., Özcan, M. M., & Al-Juhaimi, F. (2018). Antioxidant properties of sunflower seeds. Journal of Food Biochemistry, 42(2), e12455.

18.Nadeem, M., & Imran, M. (2016). Nutritional and therapeutic potential of sunflower seeds. Journal of Medicinal Food, 19(3), 205–214.

19.Ivanova, D., Gerova, D., Chervenkov, T., & Yankova, T. (2019). Polyphenols and gastrointestinal protective properties of plant seeds. Phytotherapy Research, 33(4), 1012–1020.

20.Kostas, E., Dimitriou, A., & Papageorgiou, V. (2020). Gastroprotective potential of edible seed extracts. Journal of Ethnopharmacology, 259, 112935.

21.https://www.gardenia.net/plant/helianthus-annuus.

22.https://www.picxy.com/photo/209604