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Review Article

HELIANTHUS ANNUUS (ASTERACEA) : A REVIEW

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Abstract
The present review article is an effort to compile all the phytochemical and pharmacological activities of the plant *Helianthus annuus* (Asteracea). *Helianthus annuus* is an important oilseed crop around the world. Besides this, it has been utilized as medicines for thousands of years and now there is a growing demand for plant based medicines, health products, pharmaceuticals and cosmetics. *Helianthus annuus* is a widely growing plant which is used traditionally as anti-inflammatory, antimalarial, anti-asthmatic, anti-oxidant, anti-tumour and antimicrobial agent. Several phytoconstituents have been isolated and identified from different parts of the plant belonging to the category of alkaloids, glycosides, flavanols, tannins, saponins, sterols and terpenoids. A review of plant description, pytochemical constituents present and their pharmacological activities are given in the present article.

Keywords: - Helianthus annuus, Asteracea, phytochemical constituents, pharmacological activities.

Introduction
Plants are the main source of treatment not only in developing countries, but also in developed countries where modern medicines are predominantly used**. [1]** The traditional medicines usually derived from medicinal plant, mineral and organic matter, but the herbal drugs are prepared from medicinal plants only**.[2]** The use of plants as a source of medicines has been inherited and is an important component of the health care system in India. In the Indian system of medicines, most practitioners formulate and dispense their own recipes; hence this requires proper documentation and research. In Western countries the use of herbal medicines is steadily growing**.[3]** Public, academic as well government interest in plant based medicines is growing exponentially due to the increased incidence of the adverse drug reactions and economic burden of the modern system of medicine**.[4]** Efficacy testing of the traditional and new herbal products in experimental screening method is important to establish the active component and appropriate extract of the plant**.[5]** To be accepted as viable alternative to modern medicine, the same vigorous method of scientific and clinical validation must be applied to prove the safety and effectiveness of a therapeutic product.**[6]** The sunflower that most people refer to is *Helianthus annuus*, meaning annual sunflower**.[7]** Sunflower (*Helianthus annuus* ; Asteraceae) is cultivated primarily for its seeds, which yield the world's second most important source of edible oil.**[8]** The seed oil, shoots, and herb tincture have been employed for anti-inflammatory, antipyretic , astringent, cathartic, diuretic, emollient, expectorant, stimulant, vermifuge, and vulnerary purposes. Prior to the use of the seeds as a food, other parts of the plant, notably the petioles and young flowers, were used as savory delicacies**.[9]** The use of yellow petals as colouring agents gives its new prospective in cosmetic industry**.[10]**

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TAXONOMICAL CLASSIFICATION:

Kingdom:	Plantae
Division:	Angiospermae
Subdivision:	Eudicots
Class:	Asterids
Order:	Asterales
Family:	Asteraceae
Subfamily:	Helianthoideae

Tribe: Heliantheae
Genus: Helianthus
Species: annuus

BOTANICAL DESCRIPTION: -

Helianthus annuus is a coarse, stout and erect annual plant, up to 1-3 meters high. Stems are straight, rarely branched. Leaves are opposite at the lower part of the stem, alternate above, ovate, rough, hairy, with toothed margins, long-stalked, 10-25 cm long. Flower heads are solitary or in clusters, up to 40 cm across; disk flowers are yellow to brown, with tubular, 5-limbed corolla. Ray flowers are yellow and spreading. The involucral bracts are ovate or oblong. *Helianthus annuus* produces grayish-green or black seeds encased in tear-dropped shaped gray or black shells that oftentimes feature black and white stripe Seeds encased in tear-dropped shaped gray or black shells that oftentimes feature black and white stripes. They are grayish-green or black in colour**[11-13].**

Heliotropism: A common misconception is that *Helianthus annuus* flowers track the sun**.[14]** In fact, mature flower heads typically face east and do not moves. The leaves and buds of young of *Helianthus annuus* do exhibit heliotropism (sun turning). Their orientation changes from east to west during the course of a day**. [15]** The movements become a circadian response and when plants are rotated 180 degrees, the old response pattern is still followed for a few days, with leaf orientation changing from west to east instead**.[16]** The leaf and flower head bud phototropism occurs while the leaf petioles and stems are still actively growing, but once mature, the movements stop. These movements involve the petioles bending or twisting during the day then unbending or untwisting at night**. [17]**

SYNONYMS:

The plant is known by various names in different languages:

English: Sunflower
Hindi: Surya Mukhi
Kannada: HSuryakanthi
Marathi: Suryaphul
Tamil: Suriyakanthi
Bengali: Surja Mukhi

TRADITIONAL USES:

Helianthus annuus was used as food in Mexico and had reputed medicinal value in soothing chest pains Crushed stems juice is used for the speedy recovery of wounds, with no case of infection**.** Whole plant is used in different ways by different civilizations of the world. *The Cherokee* used an infusion of sunflower leaves to treat disease of the kidneys. *The Dakota* used an infusion of sunflowers for treating chest pains and pulmonary troubles. *The Gros Ventres, Rees*, and *Mandan* used sunflowers ceremonially; oil from the seeds were used to lubricate the face and body. *The Gros Ventres, Mandan, Rees*, and *Hidatsa* used sunflower seeds as a stimulant, to alleviate fatigue. *The Hopi* used the sunflower plant as dermatological aid. *The Navajo* ate sunflower seeds to stimulate the appetite. *The Navaho-Kayenta* used the plant as a disinfectant to prevent prenatal infections. *The Paiute* used a decoction of sunflower root to alleviate rheumatism**. [18].** Apart from this, tea made from the leaves is astringent, diuretic and expectorant, used in the treatment of high fevers. For asthma, the infusion of the leaves are used. The crushed leaves are used as a poultice on sores, swellings, snakebites and spider bites. In Brazil, leaves used as lieu of quinine substitute for *Datura stramonium* for treatment of asthma. A tea made from the flowers is used in the treatment of malaria and lung ailments. Boiled flower heads were once used by *Amerindians* for pulmonary affections. Tincture of flowers and leaves mixed with balsamics used for bronchiectasis. The seeds are febrifuge, nutritive and stomachic. The seed is also considered to be diuretic and expectorant. It has been used with success in the treatment of many pulmonary complaints. An infusion of the brown seeds is used for whooping cough. In China, seeds are used for dysentery. Tincture prepared from seeds, rectified with wine, used for fevers, an Infusion of roots used for diabetes. A decoction of the roots has been used as a warm wash on rheumatic aches and pains. A tea from decocted roots is used for diabetes. The boiled bark and flowers used for fevers. Tincture of bark and flowers employed for intermittent fevers resistant to quinine**. [12].**

PHYTOCHEMISTRY: -

Plant contains an oleic acid and triacyl glycerol, alkaloids, glycosides, saponins, cardiac glycosides, tannins, fixed oils, phenolics. Oil contains 44-72% linoleic acid. Leaves contain a glucoside, C11H19N2. Flowers contain quercimeritrin, C21H20O12, a monoglucoside of quercetin; anthocyanin; and abundant amount of cholin and betain. Seeds are an excellent source of vitamin E. They are also a very good source of vitamin B1. In addition, seeds are a good source of manganese, magnesium, copper, selenium, phosphorus, vitamin B5 and folate.

Table 1. Phytochemicals reported in Helianthus annuus:

Part used	Reported chemical constituent	Reference
Leaves	Sesquiterpene Lactones (Heliangolides)	**[19]**
Leaves	Monoterpenes,(α-pinene, Sabinene)	**[20],[21]**
Leaves	Diterpenes (Helikauranoside)	**[22]**
Flower petals	Triterpenes(Two new oleanane-type triterpene glycosides, helianthosides)	**[23]**
Seeds	Fatty acids(palmitic acid, linoleic acid, α-linoleic acid, stearidonic acid,linolenic acid)	**[24],[25]**
Seeds	Tocopherols	**[26]**
Whole plant	Flavonoids	**[27] [29]**
Seed	Tannins	**[28]**
Leaves , stems, roots.	Alkaloids.	**[29]**
leaves, stems and roots	Phenols.	**[29]**
Flower petals.	Saponins	**[30]**
Seeds	Polyphenols(chlorogenic acid, caffeic acid, quinic acid)	**[31], [32]**

PHARMACOLOGY:--

Anti-inflammatory activity:

Six triterpene glycosides, helianthoside 1 , helianthoside 2, helianthoside 3 , helianthoside 4 , helianthoside 5 ,and helianthoside B, were isolated from an n-Butanol-soluble fraction of a methanol extract of the ligulate flower petals of sunflower. The methanol (MeOH) extracts of the ligulate and tubular flower petals of sunflower possess marked anti-inflammatory activities on 12-O-tetradecanoylphorbol-13-acetate (TPA)-induced ear edema in mice. All of the triterpene glycosides tested showed potent inhibitory effects, with ID_{50} (50% inhibitory dose) values of 65-262 nmol/ear, and are more potently inhibitory than indomethacin (ID_{50} 838 nmol/ear). Among them, compound 6 exhibited a strong inhibitory effect that was almost the same order of potency as that of hydrocortisone (ID_{50} 83 nmol/ear).**[22]**

Antitumor activity:

There is inhibition of tumor promotion in two stage carcinogenesis initiated by 7,12-dimethylbenz[a]anthracene (DMBA) and 12-O-tetradecanoylphorbol-13-acetate (TPA), a well-known promoter, in a mouse skin model. Thus, *Helianthus annuus* may have anti-tumor-promoting activity in this animal model**.[33]** Also, Twenty-four terpenoids and lipid and six free triterpene triols , derived from their fatty acid esters by alkaline hydrolysis, are evaluated with respect to their inhibitory effects on the induction of Epstein−Barr virus early antigen (EBV-EA) induced by the tumours promoter, 12-O-tetradecanoylphorbol-13-acetate (TPA), in Raji cells, which is known to be a primary screening test for antitumor promoters. Among the 30 compounds tested, 21 compounds possessing a di- or a polycyclic ring system in the molecule showed potent inhibitory effects on EBV-EA induction. **[34]** Furthermore, when the rats were administered mutagens (NDEA and z-AFF) to induce the prehepatocarcinoma's nodes. If before administration of mutagens, 5~6g/d of the seeds of herb are given, the number of nodes were decreased. It indicated that the herb has a certain preventive effect against carcinogenesis**. [35]**

Hypolipidaemic effect:

Enzymatically extract of the protein fraction (PF) from H*elianthus annuus* seeds is extracted and its dietary effect on the growth, plasma and tissue lipid profiles, plasma protein content, erythrocyte membrane lipid profile and organ weights of rats is investigated. Extraction of dehulled sunflower seeds in an aqueous medium in the presence of the enzyme pectinase at 50 ± 1 °C and pH 4.5 yielded a protein fraction with low residual chlorogenic acid and fibre contents. Rats fed the sunflower seed protein fraction showed a similar body weight gain and food efficiency ratio as rats fed casein. However, the different dietary proteins had different effects on plasma total cholesterol and triglyceride contents. The rats fed the sunflower seed protein fraction showed a significant decrease in plasma cholesterol ($p < 0.02$) and triglyceride ($p < 0.02$) concentrations compared to the casein-fed rats. The Protein fraction fed rats also exhibited a significant difference in erythrocyte membrane phospholipids and phosphatidylcholine/phosphatidylethanolamine ratio. Rats fed the different dietary proteins did not show much variation in plasma protein content, liver and brain lipids and organ weights. These results demonstrate the hypolipidemic action of the sunflower seed protein fraction**. [36]**

Antioxidant activity:

The antioxidant capacity of the striped sunflower seed cotyledon extracts, obtained by sequential extraction with different polarities of solvents, was evaluated by three different in vitro methods: ferric reducing/antioxidant power (FRAP), 2.2-diphenyl-1-picrylhydrazyl radical (DPPH) and oxygen radical absorbance capacity (ORAC) assays. In the three methods, the aqueous extract at 30 µg/ml showed a higher antioxidant capacity value (FRAP, 45.27 µmol; DPPH, 50.18%; ORAC, 1.5 Trolox equivalents) than the ethanolic extract (FRAP, 32.17 µmol; DPPH, 15.21%;ORAC, 0.50 Trolox equivalents). When compared with the synthetic antioxidant butylated hydroxyl toluene, the antioxidant capacity of the aqueous extract varied from 45% to 66%, according to the used method. The high antioxidant capacity observed for the aqueous extract of the studied sunflower seed suggests that the intake of this seed may prevent in vivo oxidative reactions**. [37]**

Antiaesthamatic activity:

Ovalbumin-induced mice were orally administered the aqueous extract of Helianthus annuus seeds, and their lungs were assessed by hematoxylin and eosin staining. Moreover, the expression levels of IL-4/IL-13 cytokines and IgE were determined. Extract induced a decrease in CD4+ cell number, IL-4/IL-13 expression, and IgE secretion levels in the lungs. This suggest that the HAS extract has considerable potential in reducing the asthma-like symptoms induced by a mouse ovalbumin challenge model**. [38]**

Antimicrobial activity:

The ethanolic extract *Helianthus annuu*s leaves contain a germacranolide with an α-methylene-γ-lactone moiety, the heliangolide niveusin B and its ethoxy derivative. They shows the inhibition of microbes in Avena coleoptile tests and antimicrobial tests**. [39]** The new sesquiterpene lactone, a germacranolide, annuithrin, shows inhibition of microbes in straight growth tests, antibacterial tests and inhibition of DNA-/RNA-synthesis in cells of the ascitic form of Ehrlich carcinoma**. [40]** Also,a 16-kDa protein was isolated from *Helianthus annuus* flowers by its ability to inhibit the germination of fungal spores**.[41]**

Other uses:

Whether chronic use of these oils will effectively block thrombosis at sites of vascular injury, inhibit pathologic platelet vascular interactions associated with atherosclerosis, or reduce the incidence of acute vascular occlusion in the coronary or cerebral circulation is uncertain. Linoleic acid is needed for normal immune response, and essential fatty acid (EFA) deficiency impairs B and T cell-mediated responses. SBO and SFO can provide adequate linoleic acid for maintenance of the immune response. **[41**] Photons from the sun are stored in the DNA of the sunflower, making its seed resonate with the photons in human cells. This resonance is good for mind as well as body, and makes sunflowers one of the top foods for fighting depression. The substantial content of the amino acid, tryptophan, enhances serotonin production and thus improves mood**.[42]**

CONCLUSION: There are 400 different tribal and other various ethnic groups in India that constitute about 7.5% of India's population. Most of the societies have discovered solution for treatment of disease to almost all their needs and their problems from the natural resources around them.**[43]** Hence in recent years, ethno medicinal studies received much attention as this brings to light the numerous little known and unknown medicinal virtues especially of plant origin which needs evaluation on modern scientific lines such as phytochemical analysis, pharmacological screening and clinical trials. **[44-47]**

Helianthus annuuss possesses various pharmacological activities as discussed in present paper. However, it is imperative that more clinical and pharmacological studies should be conducted to investigate the unexploited potential of this plant.

REFERENCES:

1. Kamboj VP, Herbal medicine, Current science, 2000; 78(1):35-39.

2. Sath SD and Sharma B, Medicinal Plants in India, Indian J Med Res, 2004; 120(1): 9-11.

3. Bent S, Commonly used herbal medicines in the United States- A review, Am. J. Med, 2004; 116(7): 478-85.

4. Dubey NK, Kumar R, Tripathi P, Global promotion of herbal medicine: India's opportunity, Current science, 2004; 86(1): 37-41.

5. Chakravarty BK, Herbal medicines, Safety and Efficacy Guidelines, The Regulatory affairs Journal, 1993; 4(1): 699-701.

6. Pal SK and Shukla Y, Herbal Medicines: Current status and the further Asian Pacific, Journal of Cancer Prevention, 2003; 4(4): 281-8.

7. www.Growing-Snflowers.com

8. Carter JF. Sunflower Science and Technology. 1st edition.

American Society of Agronomy; Madison; 1978.
9. Duke JA. Handbook of Medicinal Herbs. 2nd edition. CRC Press; Boca Raton; 2002.
10. Kapoor VP, Herbal cosmetic for skin and hair care, Natural Product Radiance, 2005; 4(4):306-314.
11. http://www.stuartxchange.org/News.html
12. Heiser CB. The sunflower. 1st edition. Oklahoma Press; 1976.
13. Schilling EE and Heiser CB, Infrageneric Classification of Helianthus (Compositae), Taxon, 1981; 30(2):393-403.
14.http://plantsinmotion.bio.indiana.edu/plantmotion/movements/tropism/solartrack/solartrack.html
15. Shella GSG, Langa ARG and Salea, PJM, Quantitative measures of leaf orientation and heliotropic response in sunflower, bean, pepper and cucumber, Agricultural Meteorology, 1974; 13 (1): 25–37.
16.Häder Donat-Peter, Lebert Michael, Photomovement, Ist edition, Elsevier; Amsterderm; 2001.
17. Brian James Atwell, Paul E. Kriedemann, Colin GN. Plants in action-adaptation in nature, performance in cultivation. 1st edition. Australia. Malbourne; 1999
18. Moerman Daniel E. Medicinal plants of native America. 1st edition. Museum of Anthropology; University of Michigan; 1986.
19. Francisco AM *et al*., Ecological biochemistry: Potential allelopathic sesquiterpene lactones from sunflower leaves, Phytochemistry, 1996; 43(6): 1205-1215.
20. L Ceccarinia *et al*, Essential oil composition of *Helianthus annuus* L. leaves and heads of two cultivated hybrids "Carlos" and "Florom 350", Industrial Crops and Products, 2004; 19(1): 13-17
21. Verma Sheetal and Singh SP, Current and future status of herbal medicines,Veterinary World ,2008; 1(11): 347-350.
22. Francisco A. Macías *et al*, Helikauranoside A, a New Bioactive Diterpene, J Chem Ecol 2008; 34(1):65–69.
23. Ukiya M *et al*., Triterpene glycosides from the flower petals of sunflower (*Helianthus annuus*) and their anti-inflammatory activity, Journal of Natural Products. 2007 ;70(5):813-816.
24. Peiretti PG and Meineri G, Ealuation of chemical composition, nutritive value and fatty acid content of sunflower(*Helianthus annuus* L.) during their growth cycle, Journal of Animal and Veterinary Sciences, 2010; 9(1): 112-117.
25. Qasim Ali, Muhammad Ashraf and Farooq Anwar, Physico-chemical attributes of seed oil from drought stressed sunflower (*Helianthus annuus* L.) plants, International journal of Fats and Oils (Grasas Y Aceites)2009; 60 (5): 475-481.
26. Gotora AA *et al*., Determination of tocopherols and phytosterols in sunflower seeds by NIR spectrometry, Eur. J. Lipid Sci. Technol, 2007; 109(1):525–530.
27. Bohm, Bruce A, Stuessy, Tod F. Flavonoids of the Sunflower Family (Asteraceae), 1st edition. Springer; Austria; 2001.
28. Catherine NK *et al*., Antioxidant and Antidiabetic Properties of Condensed Tannins in Acetonic Extract of Selected Raw and Processed Indigenous Food Ingredients from Kenya, Journal of Food Science, 2011; 76(4):560-567.
29. Javed Kamal, Quantification of alkaloids, phenols and flavonoids in sunflower (Helianthus annuus L.), African Journal of Biotechnology, 2001; 10(16): 3149-3151.
30. Chirva V, Ya Chirva, Cheban PL, Lazur'evskii GV, The Saponins Of Sunflower, Chemistry of Natural Compounds, 1968; 4(2): 140
31. Kenneth LM, Cecil Randolph Smith, Iuan A. Wolff, Phenolic and sugar components of Armavireo variety sunflower (Helianthus annuus) seed meal, J. Agric. Food Chem., 1970; 18 (1): 27–32.
32. Sripad G, Prakash V, Rao MS, Extractability of polyphenols of sunflower seed in various solvents, Journal of Bioscience,1982; 4(2): 145-152.
33.Akihisa T, Yasukawa K, Potentially cancer chemopreventive and anti-inflammatory terpenoids from natural sources, Studies in Natural Products Chemistry, 2003; 29(1):43-87.
35. Motohiko Ukiya *et al*., Isolation, Structural Elucidation, and Inhibitory Effects of Terpenoid and Lipid Constituents from Sunflower Pollen on Epstein−Barr Virus Early Antigen Induced by Tumor Promoter, TPA, Journal of Agriculture and Food Chemistry, 2003; 51 (10): 2949–2957.
36.http://www.fzrm.com/anticancer%20herbs/Dosage_of_anticancer_herbal/Helianthus_annuns_L.ht
37.Sen. M and Bhattacharyya DK, Hypolipidemic effect of enzymatically extracted sunflower seed protein fraction, Journal of the Science of Food and Agriculture,2001; 81(3): 347–352.
38. Giada, Maria, Mancini Filho, Antioxidant capacity of the striped sunflower (*Helianthus annuus* L.) seed extracts evaluated by three in vitro methods, International Journal of

Food Sciences and Nutrition, 2008; 60(5) : 395-401.

39. Spring Otmar, Alberta Klaus, Hagera Achim , Three biologically active heliangolides from *Helianthus annuus*, Phytochemistry, 1982; 21(10): 2551-2553.

40. Spring Otmar, Alberta Klaus, Gradmannb Waltraud, Annuithrin, a new biologically active germacranolide from *Helianthus annuus*, Phytochemistry, 1981; 20(8): 1883-1885.

41. Giudici Ana Marcela, Regente Mariana Clelia, Canal Laura, A potent antifungal protein from *Helianthus annuus* flowers is a trypsin inhibitor, Plant Physiology and Biochemistry 2000; 38(11): 881-888.

42. Jin-Chul Heo *et al*., Aqueous extract of the *Helianthus annuus* seed alleviates asthmatic symptoms in vivo, International Journal of Molecular Medicine, 2008; 21(1):56-61.

43. Meydani SN, Food use and health effects of soybean and sunflower oils, Journal of American college of nutrition,1991; 10(5):406-428.

44. www.naturalnews.com

45. Basu R and Mukherjee PK, Plants used for lac culture by the tribals of purulia in West Bengal, Ethnobotany, 1999; 11(1-2), 119-121.

46. Atique A, Iqbal M and Bhouse AKM, Ethnobotanical study of cluster figure, Fitoterapia, 1985; 56(4):236-240.

47. Jha V, Modern Scientific Interpretations of Ethnobotanics references in beliefs, custom and philosophical thoughts in Mithila (North Bihar) India, Ethno botany: 1999; 11(1-2): 138-144.

48. Mali RG, Hundiwale JC, Gavit RS, Patil DA and Patil KS, Herbal abortifacients used in North Maharashtra, Natural Product Radiance, 2006; 5(4): 315-318.

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