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A Review study of Ethnopharmacology, Phytochemistry, and Anti-inflammatory, antioxidant, and anti-microbial effect of Artemisia absinthium

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ABSTRACT

Introduction*: Artemisia absinthium or wormwood is a species of Artemisia, native to temperate regions of Eurasia and Northern Africa and widely naturalized in Canada and the northern United States. It is grown as an ornamental plant and is used as an ingredient in the spirit absinthe as well as some other alcoholic drinks. The aim of this study is to review Ethnopharmacology, Phytochemistry, and Anti-inflammatory, antioxidant and anti-microbial effect of Artemisia absinthium.*

Methods*: This review article was carried out by searching studies in PubMed, Medline, Web of Science, and IranMedex databases up to 2016.Totally, of 83 found articles, 56 articles were included. The search terms were "Artemisia absinthium", "wormwood", "therapeutic", "pharmacological",*

Result*: Various studies have shown that Artemisia absinthium Possess Mostly Anti-inflammatory, antioxidant and anti-microbial effect. Besides, its Essential oil is an encouraging candidate for compounds activation against Leishmania. The anti-neuroinflammatory and neuroprotective mechanism of Artemisia absinthium L., was shown to be due to caruifolin D, a major anti-inflammatory component, which might be developed as a drug candidate for neuro-inflammation-related diseases.*

Conclusion*: Anti-inflammatory activity of Artemisia absinthium L., was due to caruifolin D, a major constituent, which might be developed as a drug candidate for neuro-inflammation-related diseases. While these findings sound promising and worthwhile for further investigation, the well-defined profile of adverse properties of wormwood demands a more cautious interpretation of these result.*

Keywords: *Wormwood, Artemisia Absinthium, "Anti-Inflammatory, Antioxidant, Anti-Microbial Effect*

INTRODUCTION

The history of herbal remedies in the treatment of many diseases dated back to ancient times [1-24]. *Artemisia absinthium* or wormwood is a species of *Artemisia*, native to temperate regions of Eurasia and Northern Africa and widely naturalized in Canada and the northern United States [25, 26]. It is grown as an ornamental plant and is used as an ingredient in the spirit absinthe as well as some other alcoholic drinks. *Artemisia absinthium* is an herbaceous, perennial plant with fibrous roots[27]. The stems are straight, growing to 0.8–1.2 meters tall, grooved, branched, and silvery-green. The leaves are spirally arranged, greenish-grey above and white below, covered with silky silvery-white trichomes, and bearing minute oil-producing glands; the basal leaves are up to 25 cm long, bipinnate to tripinnate with long petioles, with the cauline leaves (those on the stem) smaller, 5–10 cm long, less divided, and with short petioles; the uppermost leaves can be both simple and sessile (without a petiole)[28]. Its flowers are pale yellow, tubular, and clustered in spherical bent-down heads (capitula), which are in turn clustered in leafy and branched panicles [29]. Flowering is from early summer to early autumn; pollination is anemophilous. The fruit is a small achene; seed dispersal is by gravity [30].

It grows naturally on uncultivated, arid ground, on rocky slopes, and at the edge of footpaths and fields. Today, the medicinal use of wormwood (Artemisia absinthium) is enjoying a resurgence of popularity [31].

It is an ingredient in the spirit absinthe, and is utilized for flavoring in some other spirits and wines, including bitters, vermouth and pelinkovac. In the middle Ages, it was utilized to spice mead, and in Morocco it is utilized as tea. *It* is believed to stimulate the appetite and relieve indigestion [32].

It has antimicrobial [33,34], acaricidal [35], anthelmintic [27],neuroprotective[28], larvicidal[36], antioxidant [37], antifungal effect [38], hepatoprotective activities [39].

Chemical compound

The main components of *Artemisia absinthium* were caryophyllene oxide, p-cymene, 1, 8-cineole and (Z)-lanceol acetate [40]. The major constituent of wormwood oil is thujone [41]. High levels of thujanol and thujyl acetate, myrcene, camphor and 1, 8-cineole were also determined in wormwood essential oils [35]. Thujones, transsabinyl acetate, cis-clnysanthenyl acetate and cisepoxyocimene are the most common constituents in wonnwood essential oils [34]. The main chemical components of wormseed oil are a-thujone, b-thujone, sabinene, myrcene, trans-sabinol, trans- sabinyl acetate, linalyl acetate and geranyl propionate [34].

RESULT

Antioxidant effect

In an animal study, A. absinthium ethanolic extracts were evaluated for their chemical composition, antioxidant activity and protective efficacy against H2O2-induced oxidative stress in cell line. Extracts of both herbs demonstrated a damage antioxidant property and cytoprotective effect against oxidative damage in fibroblast-like cells [42].

In an animal research, the methanol extract of Artemisia absinthium Linn. Was assessed for its in vitro free-radical scavenging effects, and in vivo antioxidant activity. The findings indicated that A. absinthium possess potent antioxidant properties, and may be utilized as a protective agent against disorders associated with oxidative stress [43].

the antioxidant potential and radical-scavenging capacities of the extracts was utilized to evaluate the ferric-reducing antioxidant power, 2,2'-diphenyl-1-picrylhydrazyl radical scavenging, total phenolic contents assay, total flavonoid contents and metal-chelating property assays, and the lipid peroxidation value in linoleic acid emulsion systems. The findings indicated that both the plants have potential free radical-scavenging property and the ability to prevent lipid peroxidation and radical chain reactions [44].

The callus cultures were investigated for their growth kinetics, total phenolic content, and antioxidant activity on weekly basis for a period of 49 days. The findings displayed a positive correlation of total phenolic content and DPPH radical scavenging property in most of the callus cultures of A. absinthium L [45].

Response surface methodology was utilized to optimize experimental conditions for ultrasonic-assisted extraction of phenolic compounds from Artemisia absinthium. The result illustrated the suitability of response surface methodology in optimizing the ultrasound-assisted extraction of phenolic compounds from A. absinthium [46].

The differential efficacy of light on biomass accumulation and secondary metabolites production in cell suspension cultures of Artemisia absinthium L was investigated. a positive correlation among maximum levels of antioxidant activity (63.8%), total phenolic production (42.96 mg/l) and total secondary metabolites (6.79 mg/g DW) was displayed by light-grown suspension cultures [47].

The accumulation of biomass and antioxidant secondary metabolites in response to different carbohydrate sources (sucrose, maltose, fructose and glucose) and sucrose concentrations (1, 3, 5, 7 and 9 %) was investigated. sucrose-treated cultures displayed positive correlation of antioxidant property with total phenolic and total flavonoids production. This work describes the stimulatory role of disaccharides and sucrose feeding strategy for higher accumulation of phenolic and flavonoids, which could be potentially scaled up to bioreactor level for the bulk production of these metabolites in suspension cultures of A. absinthium [48].

Anti-inflammatory effects

The anti-neuroinflammatory effects of natural sesquiterpene dimer caruifolin D from Artemisia absinthium L. was evaluated. Anti-inflammatory mechanism in this study indicated that caruifolin D considerably suppressed the production of intracellular reactive oxygen species. The findings displayed the anti-neuroinflammatory and neuroprotective mechanism of Artemisia absinthium L., and also suggested that caruifolin D was a major anti-inflammatory component from Artemisia absinthium L., which might be developed as a drug candidate for neuro-inflammation-related diseases[49].

In an animal study, the anti-snake venom activities of Artemisia absinthium L. in comparison with carrageenan-induced acute inflammation was investigated. The result showed for the first time the toxicity and inflammatory actions and cytotoxic actions of crude M. xanthine venom as well as prevention of venom-induced inflammation through methanolic extract of A. absinthium [50].

The effectiveness of Artemisia absinthium L. in complex remedy of inflammatory periodontal disease was assessed. Microcirculation in periodontal tissues was also assessed by means of laser Doppler flowmetry. It was found out that complex treatment involving Artemisia absinthium L. improves microcirculation in periodontal tissues and reduces inflammation [51].

Antimicrobial effect

In an in vitro study, antimicrobial efficacy of ethanol extract of Simarouba glauca, Melaleuca leucadendron and Artemisia absinthium were assessed. Cytotoxicity was assessed against human MRC-5 cells. Only M. leucadendron extract illustrated selective activity against microorganisms tested. Although S. glauca exhibited strong property against all protozoa, it must be considered non-specific [33].

The antimicrobial properties of essential oil composition of the leaves of A. absinthium is investigated. The oil displayed antimicrobial activity against bacteria and fungi validate the traditional use of the plant as an antiseptic [52].

In an in human research, the efficacy of ethanol extract from Artemisia absinthium (Asteraceae) against Leishmania major L. was investigated. It was concluded that there might be one or more chemical constituents within the herbal extract of wormwood which at high concentration controlled cell division and affected the relevant property within the only one giant mitochondrion in this flagellate parasite. At low doses, however, it displayed the opposite effect of leading to mitotic cell divisions [53].

Antileishmanial effect

In an animal study, anti-leishmanial effects, and cytotoxicity of the EO from Artemisia absinthium L was investigated. In conclusion, in human study and in vivo findings demonstrated EO from A. absinthium is a encouraging candidate for compounds activation against Leishmania [54].

Essential oils of Artemisia absinthium L. and Echinops kebericho Mesfin were investigated. Weak hemolytic effect was observed for both oils, showing a slightly decreased selectivity index (SI 0.8-19.2) against the THP-1 cell line. Among the two oils tested, E. kebericho exerted strong anti-leishmanial activity that was even higher than that of amphotericin B with significant cytotoxicity. This research demonstrated the potent application of both oils as source of new agents for the remedy of leishmaniasis [55].

Antileishmanial effect of Essential oils of Artemisia absinthium L. and Tanacetum vulgare L. were tested. All three extracts of A. absinthium and of T. vulgare were lethal to the spider mite but to variable degrees. Chromatographic analysis indicated differences in composition between the more toxic DSD oil of A. absinthium and the other two extracts of this plant, indicating that a sesquiterpene (C15H24) compound present in the DSD oil and absent in the other two may enhance the toxicity of the DSD oil [35].

Hepatoprotective activity

In vivo hepatoprotective property of the aqueous extract of Artemisia absinthium L. was assessed. The results of this study strongly indicate the protective effect of AEAA against acute liver injury which may be attributed to its antioxidative and/or immunomodulatory activity, and thereby scientifically support its traditional usage [39].

Neuroprotective effect

Research has shown that the concentrations of thujone present in absinthe were not sufficient to exceed these thresholds, and the marketing of wormwood-flavored alcoholic beverages has ultimately been reinstated.

The declining fears of absinthium may have led to a revival of the medical uses of wormwood, evidenced by several experimental reports, e.g. on the treatment of Crohn's disease.

Most recently in this journal, neuroprotective properties of wormwood were detected in rats, and the plant was suggested to be possibly beneficial in the remedy of strokes. While these findings sound promising and worthwhile for further investigation, the well-defined profile of adverse properties of wormwood demands a more cautious interpretation of these results.

It remained unclear in the studies, for example, if the threshold dose for thujone (e.g. as set by the European Medicines Agency) would be exceeded during therapeutic usage. its application in humans should be preceded by a thorough and careful risk-benefit analysis [28].

The potential protective effects of Artemisia absinthium on cerebral oxidative stress and damage as well as behavioral disturbances induced by cerebral ischemia and reperfusion injury in rats was investigated. The findings suggested that Artemisia absinthium is neuroprotective and may prove to be useful adjunct in the treatment of stroke [56].

CONCLUSION

Anti-inflammatory activity of Artemisia absinthium L., was due to caruifolin D, a major constituent, which might be developed as a drug candidate for neuro-inflammation-related diseases. While these findings sound promising and worthwhile for further investigation, the well-defined profile of adverse properties of wormwood demands a more cautious interpretation of these result.

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