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Study of pharmacological effect of *Verbena officinalis* Linn: A review

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ABSTRACT

Verbena officinalis Linn, the common vervain or common verbena, is a perennial herb native to Europe. It grows up to a meter high, with an upright habitus. The lobed leaves are toothed, the delicate spikes hold mauve flowers. This plant prefers limey soils. The aim of this study was to overview its therapeutic effects than its nutritive and industrial effects. This review article was carried out by searching studies in PubMed, Medline, Web of Science, and Iran Medex databases. The initial search strategy identified about 128 references. In this study, 113 studies were accepted for further screening and met all our inclusion criteria [in English, full text, therapeutic effects of *Verbena officinalis* Linn and dated mainly from the year 1964 to 2015]. The search terms were “*Verbena officinalis* Linn.”, lemon balm, “therapeutic properties”, “pharmacological effects”. It is commonly used for ameliorative effect, anti-tumor, pharmacokinetic effect, antioxidant and antifungal activity, antiradical efficacy, analgesic activity, neuroprotective effects, anti-inflammatory activity, inflammatory, wound healing, anti-trypanosomacruzi activity, antinociceptive and antioxidant activities, antioxidant/anti-inflammatory, anti-rhinosinusitis, biological activity, anti-skin infection. *Verbena officinalis* Linn. Possess very therapeutic effects. Nevertheless, it is still required to carry out more studies on this plant to identify its other properties.

Keywords: *Verbena officinalis* Linn., Photochemistry, Therapeutic effects

INTRODUCTION

Verbena officinalis, the common vervain or common verbena [1], is a perennial herb native to Europe [2]. It grows up to a meter high, with an upright habitus. The lobed leaves are toothed, the delicate spikes hold mauve flowers. This plant prefers limey soils; it is occasionally grown as an ornamental plant but perhaps more often for the powerful properties some herbalists ascribe to it [3]. Propagation is by root cuttings or seed. It is widely naturalised outside its native range, for example in America. It is also known as simpler's joy or holy herb, or more ambiguously as "mosquito plant" or "wild hyssop". *Verbena officinalis* herb has been used in the traditional Austrian medicine internally (as tea or liqueur) for treatment of infections and fever [4, 5]. Medical use of Common Vervain is usually as herbal tea. *Verbena officinalis* L. is used in folk medicine for the treatment of inflammatory disorders [6, 7], skin burns, abrasions, and gastric diseases [8, 9].

Chemical compound

Chemical investigations of petroleum ether and chloroform extracts led to the isolation of β -sitosterol, ursolic acid, oleanolic acid, 3-epiursolic acid, 3-epioleanolic acid and minor triterpenoids of derivatives of ursolic acid and oleanolic acids. Chromatographic purification of the methanol extract yield two iridoidglucosides [verbenalin and

hastatoside), a phenylpropanoidglycoside[10, 11], verbascoside and β -sitosterol-D-glucoside. Hastatoside and verbenalin have sleep-promoting [soporific] properties [12-14]. It also contains a monoterpene alcohol called verbenol[15, 16]. four compounds were isolated and identified as apigenin, 4'-hydroxywogonin, verbenalin, and hastatoside. Aucubin has also been found as one the active constituents [17, 18].

Ameliorative effect

The clinical efficacy of *Verbena officinalis* Linn decoction for patients with chronic generalized gingivitis in a double-blind randomized controlled multicenter clinical trial was evaluated. At the beginning of the clinical trial, nonsignificant clinical differences were found following the statistical analyses of both GI (P = .981) and PI (P = .920) between the test and control groups. The tested *V. officinalis* L decoction demonstrated efficacy in reducing tested indices and thus has a promising ameliorative effect for treating patients with chronic generalized gingivitis [19].

Anti-tumor

The anti-tumor effects of *Verbena officinalis* extract on H22 tumor-bearing mice and its effect on immune function was investigated. The *Verbena officinalis* extract had anti-tumor effect, with the inhibition rate reaching 38.78%, it also increased the spleen index to a certain extent, in addition, the changes in DTA and HA were not obvious compared with the model group. The *Verbena officinalis* extract had *in vivo* anti-tumor effect, while causing no damage on the immune function. [3]

Antioxidant activity

A sensitive and specific assay for the determination of four bioactive compounds in *V. officinalis* L. was described. The proposed method would be sensitive enough and reliable for comprehensive quality control for clinical use and modernization of *V. officinalis* L.[20]

Pharmacokinetic effect

a simple, sensitive and validated LC-MS/MS method for simultaneous determination of luteolin, kaempferol, apigenin, quercetol and isorhamnetin in rat plasma after oral administration of *V. officinalis* L. extract was described and investigated on their pharmacokinetic studies as well, with a short run time of 5 min [21]

Antioxidant and antifungal activity

The scavenging activity against DPPH (1,1-diphenyl-2-picrylhydrazyl) radical and the antifungal effect against chloroform, ethyl acetate and 50% methanolic extracts of *Verbena officinalis* leaves were investigated. The results suggest that 50% methanolic extract and caffeoyl derivatives could potentially be considered as excellent and readily available sources of natural antifungal and antioxidant compounds. [22]

Antiradical efficacy

Extracts obtained with different solvents were evaluated for anti-inflammatory, gastroprotective and cicatrizing activities. The results obtained after oral administration of *V. officinalis* extracts are also in agreement with the antioxidant capacity evaluated *in vitro*, confirming the relationship between pharmacological activities and antiradical efficacy. (23]

Analgesic activity

The anti-inflammatory activity of *Verbena officinalis* 50% methanolic extract in *i.p.* and topical administration, the effects of several formulations were prepared and studied using carrageenan-induced edema and formalin testing. The analgesic activity of topical preparation with more than 2.5% w/w was observed in the early phase. This activity was observed in concentrations of more than 2% w/w in the late phase. The topical analgesic activity of the extract was less than the analgesic activity of methyl salicylate ointment [24].

Neuroprotective effects

Cytoprotective effects of this plant on cells of the central nervous system was examined. As *V. officinalis* has long been used for many years to be a folk medicine, our study may provide a lead for its potential to be a neuroprotective agent against neuronal loss in AD [25].

Anti-inflammatory activity

active fraction (s) of the plant *Verbena officinalis* Linn., chloroform and methanol extracts of aerial parts for anti-inflammatory activity using carrageenan paw oedema model was carried out. Chromatographic purification of the methanol extract yielded two iridoidglucosides, verbenalin and hastatoside, a phenylpropanoid glycoside, verbascoside and beta-sitosterol-D-glucoside.[26]

The anti-inflammatory activity of a 50% methanol extract of the leaves of *Verbena officinalis* L. was investigated on topical and oral administration. In the TPA-induced ear inflammation model, the extract showed a high reduction of edema, but in the carrageenin-induced rat paw edema the effect observed was less at the two doses employed. These results confirm the use of this plant in folk medicine as a topical anti-inflammatory, herbal drug [27].

Inflammatory effect

The effect of lemon verbena supplementation in pro- and anti- inflammatory serum biomarkers of patients with different clinical subtypes of multiple sclerosis was evaluated. Serum levels of C reactive protein and 8 cytokines/ inflammatory markers were studied. Secondary progressive MS- supplemented patients showed C reactive protein concentrations significantly lower compared to the placebo group [28]

The bioavailability and intestinal absorption of polyphenols derived from lemon verbena infusion was evaluated in both healthy and colitic rats. The results show that intestinal absorption and urinary excretion of lemon verbena flavone diglucuronides were not altered by colonic inflammation, but that urinary excretion of hydroxycinnamic acids derived from verbascoside was affected in a colitic situation. [29]

Wound healing

The effects of topical treatment with AP and PLX gels on wounds inflicted on SKH-1/CRL mice was evaluated. The degree of inflammation showed improvement with a tendency towards statistical significance in Groups I and II at 2 and 7 days. Anti-laminin staining was more intense in the group treated with PLX at the 2- and 7-day periods. Topical treatment with PLX gel improved the degree of reepithelialisation and inflammation, and favoured neo-vascularisation of the wounds at 2 and 7 days following surgery. [30]

Anti-Trypanosomacruzi activity

The in-vivo anti-Trypanosomacruzi activity of the essential oil in mice was determined. The essential oil produced a significant reduction of the parasitemia, 85.4% with the peak at a dose of 250 mg/ kg. It was also observed a reduction in the number of amastigotes and inflammatory infiltrates in the heart. The creatine kinase-MB plasma levels also decreased at dpi 28 as a result of such treatment. The essential oil of this plant has in vivo anti-Trypanosomacruzi effect in mice [31].

Antinociceptive effect

The antinociceptive and antioxidant activities in extracts of this species was examined. HF showed a non-dose dependent analgesic activity in the writhing test; its antinociceptive activity in the hot plate test was restricted to 500 mg kg (-1), which is the highest dose. The results of this study showed the potential of tissue culture on conservation and large scale multiplication and confirmed the traditional folk medicine use of *V.litoralis*[32].

Antioxidant/anti -inflammatory

the efficacy of an antioxidant/anti-inflammatory supplement containing standardized lemon verbena extract and fish oil omega-3 fatty acid in a human pilot trial as an alternative treatment for joint management was investigated. It reveals that supplementation with lemon verbena combined with omega-3 fatty acids may be considered for further investigation as a complementary and alternative treatment for improving joint status in subjects with joint discomfort [33].

Anti-rhinosinusitis

Olfactory function from oral treatment with an herbal drug was investigated. Considering that its benefit for the inflammatory component of sinusitis has been shown, the herbal drug may exhibit positive effects on olfactory function in a different setting, e.g., when applied without preceding administration of prednisolone, or when used in patients with certain degrees of rhinosinusitis. [34]

Antioxidant effect

The preventive effects of lemon verbena infusion consumption against mild-to-moderate dextran sulfate sodium (DSS)-induced colitis in rats was evaluated. It shows that the preventive consumption of lemon verbena infusion offered some antioxidative protection during experimental colitis by stimulating SOD activity and decreasing lipid peroxidation. [35]

The antioxidant activity (AA) of lemon verbena infusion (LVI) as well as the thermal stability of its AA was assessed. LVI is shown to be a source of bifunctional antioxidants, and thus *in vivo* studies of the antioxidant capacity of LVI would be useful to evaluate its potential as an ingredient in antioxidant drinks. [36]

The antioxidant capacity of *Lippiacitriodora* extracts on plasma and blood cell oxidative status was investigated. The antioxidant action exerted on GSH-reductase seems to be post-translational and mainly due to verbascoside, a phenylpropanoid that represents 10% (w/w) of extract content. It shows antioxidant properties that could play an important role in modulating GSH-reductase activity in lymphocytes and erythrocytes and protecting plasma from exercise oxidative damage [37].

Verbena and lemon verbena aqueous preparations were investigated for their content of constituents. These simple preparations especially that obtained from infusion of lemon verbena could be lyophilized to obtain a powder having interesting technological properties to be used as ingredients of cosmetics, food supplements and herbal medicinal products do to the many biological properties of verbascoside [38].

The effect of moderate antioxidant supplementation (lemon verbena extract) in healthy male was determined. Moderate antioxidant supplementation with lemon verbena extract protects neutrophils against oxidative damage, decreases the signs of muscular damage in chronic running exercise without blocking the cellular adaptation to exercise [39].

Biological activity

The interaction of verbascoside with phospholipid membranes has been studied by means of differential scanning calorimetry, fluorescence anisotropy and dynamic light scattering. The presence of verbascoside decreased the particle size in PG unilamellar vesicles through the increase of the phospholipid head group area. A localization of verbascoside filling the upper region of PG bilayers close to the phospholipid/water interface is proposed. These effects on membranes may help to understand the mechanism of the biological activity of verbascoside and other similar phenylpropanoid glycosides [40].

Anti-skin infection

Ethanol extract of Lemon verbena against *Staphylococcus aureus* skin infection were assessed in an *in vivo*, in animal model. The results indicate that the ointment prepared from ethanol extract of Lemon verbena is a proper medication to prevent the skin infection by *Staphylococcus aureus* in early phase [41].

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