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The role of medicinal plants in the treatment of diseases: A systematic review of *Calendula officinalis*

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ABSTRACT

Calendula ,native to southwestern Asia, western Europe, Macaronesia, and the Mediterranean, is an annual and perennial herbaceous plants belongs to family Asteraceae . The aim of this study is to overview its pharmacological effects. This review article was carried out by searching studies in PubMed, Medline, Web of Science, and IranMedex databases up to 2016.totally, of 119 found articles, 40 articles were included. The search terms were "Calendula officinalis", "therapeutic", "pharmacological", "herbal therapy". Various studies have shown that Calendula officinalis possess anti-Pancreatitis properties, anti-Diabetic Properties, Anti-fungal Properties, Cytotoxic activity, anti-Tendon Properties, anti-Colitis Properties. Calendula is widely used for therapeutic and purposes that trigger its significant value. Various combinations and numerous medicinal properties of its extract, essential oils, its stems and leaves demand further and more studies about the other useful and unknown properties of this multipurpose plant.

Keywords: *Calendula officinalis*, therapeutic, pharmacological, herbal therapy

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INTRODUCTION

Herbal medicine is confirmed to be effective in the treatment of many diseases [1-10].

Calendula ,native to southwestern Asia, western Europe, Macaronesia, and the Mediterranean, is anannual and perennial herbaceous plants belongs to family Asteraceae[11-14] . The most commonly cultivated and used member of the genus is the pot marigold [Calendula officinalis]. Popular herbal and cosmetic products named 'calendula' invariably derive from C. officinalis [15].

Calendula species have been used traditionally as culinary and medicinal herbs. The petals are edible and can be used fresh in salads or dried and used to color cheese or as a replacement for saffron. A yellow dye has been extracted from the flowers [16-18]. Calendula ointments are skin products used to treat minor cuts, burns, and skin irritation [19-21]. Calendula oil is still used medicinally. The oil of C. officinalis is used as an anti-inflammatory, an antitumor agent, and a remedy for healing wounds [22-25].

Plant pharmacological studies have suggested that Calendula extracts have antiviral, antigenotoxic, and anti-inflammatory properties in vitro [26-29]. In herbalism, Calendula in suspension or in tincture is used topically for treating acne, reducing inflammation, controlling bleeding, and soothing irritated tissue. Limited evidence

indicates Calendula cream or ointment is effective in treating radiation dermatitis. Topical application of C. officinalis ointment has helped to prevent dermatitis and pain; thus reducing the incidence rate of skipped radiation treatments in randomized trials [30].

Calendula has been used traditionally for abdominal cramps and constipation [31]. In experiments with rabbit jejunum, the aqueous-ethanol extract of C. officinalis flowers was shown to have both spasmolytic and spasmogenic effects, thus providing a scientific rationale for this traditional use [31]. An aqueous extract of C. officinalis obtained by a novel extraction method has demonstrated antitumor [cytotoxic] activity and immunomodulatory properties [lymphocyte activation] in vitro, as well as antitumor activity in mice [32]. Calendula plants are known to cause allergic reactions, and should be avoided during pregnancy

The flowers of C. officinalis contain flavonol glycosides, triterpene, oligoglycosides, oleanane-type triterpene glycosides, saponins, and a sesquiterpene glucoside.

Anti-Pancreatitis
The effect of ethanol extract (95%) of Calendula officinalis flowers in l-arginine induced acute necrotizing pancreatitis in rats was investigated. The beneficial effect of COE may be attributed to its antioxidant, antinitrosative and antifibrotic actions. Hence, the study concludes that COE promotes spontaneous repair and regeneration of the pancreas [33].

Anti-Diabetic
The clinical benefits of using Calendula officinalis hydroglycolic extract in the treatment of DFUs was evaluated. No adverse events were observed during treatment. The study findings suggest C. officinalis extract is safe and has a beneficial effect on DFU healing. Randomized, controlled studies using C. officinalis hydroglycolic extract are warranted to confirm its safety and establish its clinical efficacy and effectiveness for the topical treatment of DFUs [34].

Anti-obesity
biosynthesis inhibitory, hyaluronic acid production activities, anti-obesity using lipase inhibition and adipocyte differentiation as well as evaluation of the protective effect against hydrogen peroxide induced neurotoxicity in neuro-2A cells was carried out. The results showed that, compound CS2 has a melanin biosynthesis stimulatory activity; however, compound CS1 has a potent stimulatory effect for the production of hyaluronic acid on normal human dermal fibroblast from adult (NHDF-Ad). Both compounds did not show any inhibitory effect on both lipase and adipocyte differentiation. Compound CS2 could protect neuro-2A cells and increased cell viability against H2 O2 [35].

Anti-fungal
The effect of mycorrhizal fungi and heavy metals stress and Cd pot marigold (Calendula officinalis L.), was examined. Results indicated that with increasing soil Pb and Cd concentration, growth and yield of pot marigold was reduced significantly; Cd had greater negative impacts than Pb. However, mycorrhizal fungi alleviated these impacts by improving plant growth and yield [36].

The effect of hydroalcoholic extract of CO on passive avoidance learning (PAL) and memory in streptozotocin (STZ)-induced diabetic male rats was examined. Results showed that CO extract can improve PAL and memory impairments in STZ-diabetic rats. This improvement may be due to its antioxidant, anticholinergic activities or its power to reduce hyperglycemia [37].

Cytotoxic activity
The CH2Cl2 extract from the flowers of C. officinalis by MTT and LDH assays in human epithelial gastric cells AGS was assessed. The conformational preferences of viridiflorolfucoside were established and a previously assigned stereochemistry was revised. The compounds 1a, 2a and 3f showed comparably high cytotoxicity in the MTT assays, whereas the effect on LDH release was lower [38].

Tendon
The effects of *C. officinalis* on the initial phase of Achilles tendon healing was analyzed. Immunocytochemistry analysis for chondroitin-6-sulfate showed no difference between the C and Cal groups. It was concluded that the

topical application of C. officinalis after tendon transection increases the concentrations of collagen and non-collagenous proteins, as well as the collagen organization in the initial phase of healing [39].

Anti-Colitis

Healing effects of Calendula officinalis hydroalcoholic extract in experimentally induced UC in rat was evaluated. Results indicate that oral and enema forms of hydroalcoholic extract of C. officinalis can be offered as are potential therapeutic agents for UC induced in rats [40].

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