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Phamacognosy of Traditional Medicinal Plants with Anti-Inflammatory Effect

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Abstract: *Plants represent the main source of molecules for the development of new drugs, which intensifies the interest of transnational industries in searching for substances obtained from plant sources, especially since the vast majority of species have not yet been studied chemically or biologically, particularly concerning anti-inflammatory action. Anti- inflammatory drugs can interfere in the pathophysiological process of inflammation, to minimize tissue damage and pro- vide greater comfort to the patient. Therefore, it is important to note that due to the existence of a large number of species available for research, the successful development of new naturally occurring anti-inflammatory drugs depends mainly on a multidisciplinary effort to find new molecules. Although many r regard, the majority presented the subject from a limited regional perspective Thus, the current article presents highlights from the published literatureon a plant as a source of anti-inflammatory agents.*

Keywords: Plants

I. INTRODUCTION

Inflammation is a defense response of our body to hazardous stimuli such as allergens and/or injury to the tissues; on the other hand, uncontrolled inflammatory response is the main cause of a vast continuum of disorders including allergies, cardiovascular dysfunctions, metabolic syndrome, cancer, and autoimmune diseases imposing a huge economic bur- den on individuals and consequently on the society . There are various medicines for controlling and suppressing inflammatory crisis; steroids, nonsteroidalanti-inflammatory drugs, and immunosuppressant are the practical examples of these medications which are associated with adverse effects while in practice our goal is to apply minimum effective dose by the highest efficacy with the least adverse effects. Thus, we need to apply natural anti-inflammatory factors within medication therapy to achieve immunosuppressant are the practical examples of these medications which are associated with adverse effects while in practice our goal is to apply minimum effective dose by the highest efficacy with the least adverse effects. Thus, we need to apply natural anti-inflammatory factors within medication therapy to achieve in- creased pharmacological response and the lowest degree of unwanted side effects . Herbal medicines are promoting subjects in medicine and, of course, we have to increase our knowledge about them. Complementary, alternative, and traditional medicines are the pivotal source of herbal medication guidance, but surely modern medicine must prove these guidelines through scientific methods before using them in practice In this review, wehave endeavored to evidence of their anti-inflammatory effects.Inflammation is the launutie system's response to harmfustimul, such as pathogens, damaged cris, toxic compounds, ar irradiation and acts by removing injurious stimuli and initiating the healing pencv [1] In other words "inflammation is the mayor and complex reaction of the body against infection upon tissue injury" The role of inflammation as a healing restorative process, as well as its aggressive role is also more widely record today But in some conditions appears to be no resolution and a the state of inflation in that may be the bầu of the individual Such conditions include the inflammatory disorders rheumamid arthritis, esteoarthritis, inflammatory bowel diseases, retinitis, multiple sclernses, peeriasts and atherosclerosis. To overcome this problem different kind fe and effect antiinflamatory agents are available, including aspirin and other tendal anti-inflammatoris.

Many more drugs under development. So these agents which are heal to reduce the inflammatory response are called anti-inflammatory agent (2) it mainly characterized by the redness, swollen joints and joint pain, les stiffness and loss of joint function

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II. METHODS

In this study, all the data were gathered from search engines as follows: PubMed, Science Direct, and Google Scholar. We have used these keywords “anti-inflammatory”, “plant”, “herb”, and “herbal medicine” for searching in these databases. All the references which were used to publish this review article were written in English and from the standpoint of the time interval, they belonged to 1980 to the present. The entire articles relating to our goal were collected and classified based on the level of evidence, where systematic reviews and randomized control trials (RCT) have possessed the highest values. Open-label, cohort, case-control, case series, preclinical, in vivo, ex vivo, and in vitro studies have less importance than the first two, respectively. It is obvious that each subject that we have found which has higher valuable studies, such as RCT in association with that, has received high priority for mentioning in this literature.In this study, all the data were gathered from search engines as follows: PubMed, ScienceDirect, and Google Scholar.We have used these keywords “anti-inflammatory”, “plant”, “herb”, and “herbal medicine” for searching in these databases.All the references which were used to publish this review article were written in English and from the standpoint of the time interval, they belonged to 1980 to the present. The entire articles relating to our goal

Curcuma longa

Curcuma longa (common name is Turmeric in English, زردچوبه in Persian, cúrcuma in Spanish, in Hindi, and الصفراء عقدة in Arabic) is an Indian indigenous plant [3]. The most important secondary metabolite of C. longa is curcumin, which is responsible for anti-inflammatory effect of this plant [4].

Fig 1 Curcuma Longa

Many clinical trials have been done for proving the anti-inflammatory effect of curcumin. Their results suggest that curcumin can be effective in improving inflammation of rheumatoid arthritis (RA) and reducing clinical manifestation of RA, such as joint swelling and morning stiffness in comparison with phenylbutazone which is used as a positive control [5]. Also, curcumin was tested in patients with anterior uveitis; after 2 weeks, exhaustive remission occurred [6]. The effectiveness of curcumin in patients with dyspepsia and/or gastric ulcer was proved by another clinical trial. In this study, subjects experienced remission after 12 weeks (maximum) [7]. Curcumin is beneficial in irritable bowel syndrome (IBS) treatment [8] and also works as a reducing agent to delayed graft rejection (DGR) after kidney transplant surgery [9]. Curcumin likewise has a beneficial effect in inhibition of inflammatory bowel disease (IBD) and reduction in sedimentation rate in patients who suffered from IBD [10]. It is also proven to be beneficial in maintaining amelioration of ulcerative colitis [11] and psoriasis (by the selective prohibition of phosphorylase kinase)

Zingiber officinale

Zingiber officinale (common name is ginger in English, لی‌زنجب in Persian, in Hindi, and الزنجبيل in Arabic) is a native plant from south-east Asia Oral administration of Z. officinale extract has shown different and inconsistent effects, depending on the quantity of consumption. Although administration of squeezed ginger extract to mice one time or twice has elevated the tumor necrosis factor-α (TNF-α) in peritoneal cells, long-term consumption of the extract has increased the serum corticosterone level and has reduced proinflammatory markersZ. officinale was also tested in type

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2 diabetic patients with low-grade inflammation; after 2 months of treatment, serum level of TNF-α and high-sensitivity C-reactive protein (hs-CRP) were decreased definitely In patients with osteoarthritis, ginger had not only efficacy in pain improvement identical to Diclofenac 100 mg but also no side effects Ginger extract has been compared to Ibuprofen and Indomethacin in OA patients; the results have exerted improving function of Ibuprofen, Indomethacin, and ginger extract equally in pain score Ginger powder has had ameliorative effect in musculoskeletal and rheumatism patients through inhibiting cyclooxygenase and lipoxygenase pathway in synovial fluid.

Fig 2 Zingiber officinale

Rosmarinus officinalis

Rosmarinus officinalis (common name is Rosemary in English, یرزمار in Persian, Romero in Spanish, in Hindi, and روزماري in Arabic) is native in the Mediterranean area .

In an open-label trial, the effects of rosemary extract have been assessed in patients with osteoarthritis (OA), rheumatoid arthritis (RA), and fibromyalgia during 4 weeks; hs-CRP (an index for inflammation presence) was decreased noticeably in patients who had demonstrated augmentation in this index; by the way, reduction in inflammation related to pain score was observed during the treatment but remission has not occurred in fibromyalgia scores. There is evidence that confirms anti-inflammatory potential of R. officinalis in molecular scope; according to this, rosmarinic acid could disturb complement system activation easily by inhibiting C3b attachment; the dose required for making this effect is very low (34 M). Furthermore, rosemary's extract has shown gastroprotective action against gastric ulcer, even better than Omeprazole; this advantage is because of inhibition activity of rosemary in neutrophils infiltration and reduction in proinflammatory mediators: TNF-α and IL-1. Nevertheless, in another preclinical study on rats, high dose of rosemary extract (500 mg/kg) has reduced testosterone and spermatogenesis that led to infertility.. This plant has had topical anti-inflammatory in wound healing in mice Carnosic acid in R. officinalis has interacted with CYP3A4 and CYP2B6 substrate and likewise has had toxicity in human hepatocyte with EC50 value identical to Tamoxifen.

Fig 3 Rosmarinus officinalis

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Borago officinalis

Borago officinalis (common name is Borage in English, گاوزبـــان گـل in Persian, Borraja in Spanish, and الثـــورحمحم لســان in Arabic) is a member of Boraginaceae family and is native in European area and north of Africa. This plant is a rich source of gamma linoleic acid (GLA), which contains 25% of GLA, by elevating prostaglandin-E (PGE) level that leads to cyclic adenosine monophosphate (cAMP) augmentation; GLA could count as a strong suppressor of TNF-α. The mechanism mentioned above can clarify the anti-inflammatory effect of borage oil in rheumatoid arthritis (RA) [28]. Regarding this pathway, borage has contraindication during pregnancy because of the miscarriage risk . Antirheumatoid arthritis's potential of borage seed oil was assessed in 2 RCT as follows: in the first study, 1.4 g/day borage seed oil has been compared with placebo in RA patients; 36.8% amelioration occurred in the treatment group at the end of 6-month therapy. In the second study, 2.8 g/day of borage seed oil was taken by patients during 6 months; at the end of treatment, the amelioration percent of RA manifestation was noticeable: 64% in the treatment group compared with 21% in the control group .. Likewise, the anti-inflammatory effect of borage oil was tested in patients with atopic dermatitis. 12 clinical trials were performed to evaluate the effectiveness of this herb in ameliorating in atopic dermatitis. 5 of those have proved the anti-inflammatory effect and 2 of those have recorded improving in some patients, although in the rest 5 trials there has not been any observation for remission.

Fig 3 Borago officinalis

Oenothera biennis (Evening Primrose)

Oenothera biennis (common name is evening primrose in English, ىمغرب گـل in Persian, Onagri in Spanish, in Hindi, and زهرة الربيع المســـائية in Arabic) is a member of Onagraceae family which is native in Central America.GLA, linear aliphatic alcohols (e.g., Tetracosanol), and phenolic compound (ferulic acid) are the active components of evening primrose oil which have had protective roles against proinflammatory markers . This oil has sterols such as β-Sitosterol and Campesterol that have had modulator effect on nitric oxide (NO), TNF-α, IL-1β, and thromboxane B2 (TXB2) leading to suppressing COX-2 gene expression; because of these reasons, the primrose oil has a greater anti-inflammatory effect than borage oil .

Fig 4 Oenothera biennis

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The effectiveness of evening primrose oil with hemp seed oil has been clinically assessed in multiple sclerosis (MS) patients. Patients with MS (a chronic inflammatory disorder) have randomly taken hemp seed/evening primrose oil and placebo. Significant reduction in IFN- and IL-17 has occurred in the treatment group. The relapse rate of the disease has been also alleviated in the treatment group; this study has shown the immunomodulatory impression of these oils and their components . In an RCT on RA, researchers have recorded subjective improvement and reduction in using NSAIDs without any improvement in clinical measurements . Likewise, patients have demonstrated remission in morning stiffness with no clinical changes in articular index or pain [36]. And no significant amelioration in target therapy group was the main outcome of a clinical trial on 18 patients with RA after 12 weeks .

Harpagophytum procumbens (Devil's Claw)

Fig 5 Harpagophytum procumbens

H. procumbens (common name is Devil's claw in English, طاناىش پنجـــه in Persian, Garra del Diablo in Spanish, and الشـــيطان مخلـب in Arabic) is a member of Pedaliaceae family . Among its abundant metabolites, Harpagoside has been substantiated as an anti-inflammatory component .Root's extract of Devil's claw has been claimed to possess inhibition potential of NO, inflammatory cytokines (IL-6, IL-1β, and TNF-α), and PGE2, as well as prevention of arachidonic acid metabolism and eicosanoid biosynthesis, leading to COX-2 inhibition and reducing inflammation . In another preclinical study, devil's claw has shown no efficacy in improving carrageenan-induced edema in the hind foot of the rat . Over an RCT, the effectiveness of Devil's claw in osteoarthritis remission has been assessed. At the end of treatment period, anti-inflammatory effects of H. procumbens have been observed .In contrast, in a pilot study which has been carried out on patients who have suffered from arthritic disease (RA and psoriatic arthropathy), researchers have not observed any remission or subjective and objective improvement with 410 mg TDS of H. procumbens's liquid extract after 12 weeks . Gastrointestinal upset is the main side effect of this plant which leads to contraindication in patients with gastric or duodenal ulcers, gallstone, and diabetes.

Mechanisms of anti-inflammatory action of the medicinal plants mentioned in this review paper HerbInhibition ofTNF-αCOX-2 iNOSNF-κBPGE2NOLOXComplement IFN-γ

It should be noted that the word "natural anti-inflammatory" refers to natural compounds, lifestyle, exercise, and sleep and eating habits. There are numerous studies on natural compounds and herbal medicines issues but those outcomes are various and inconsistent; sometimes, the method of evoking extract has direct impact on the chemical constituents and it must be considered because the pharmacological effect of each medicinal herb is the result of plenty of metabolites combination and their synergistic effects; perhaps, it is one of the reasons of paradoxical results. In another aspect, considering side effects, contraindication, and pregnancy properties of plants is an important issue, which requires great caution on the part of the practitioner, but almost there is no reliable evidence about these. Further evidence-based studies and meta-analyses perhaps could create more clear vision and approach for the health professionals.

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