

Article

Anti-Inflammatory Activity of *Calendula officinalis* L. Flower Extract

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Abstract: The use of calendula for its lenitive properties' dates to the XII century. This plant contains several bioactive compounds, including terpenoids, terpenes, carotenoids, flavonoids and polyunsaturated fatty acids. Calendula flower extract is used in soothing cosmetics, such as after-sun, sensitive skin and eye contour products. The anti-inflammatory properties of this ingredient were demonstrated in an animal model, but the mechanism of action is poorly understood. Therefore, our work explored the effect of a calendula flower extract on NO production, a pro-inflammatory radical produced by nitric oxide synthase (iNOS) and highly released by innate immune cells in inflammatory-related pathologies. NO production was evoked by the Toll-like receptor 4 agonist lipopolysaccharide (LPS) in macrophages, using concentrations that did not compromise cells viability. This ingredient exhibited a dose-dependent NO inhibition, reaching 50% at 147 $\mu\text{L}/\text{mL}$ without cytotoxicity. Together with previous literature, these results provide experimental evidence on the anti-inflammatory properties of calendula flower extract, as well as its usefulness in cosmetics with soothing properties and adjunctive skin care in the treatment of the diseases associated with dysregulation of the NO signaling cascade.

Keywords: calendula; anti-inflammatory; NO; skin care; iNOS; soothing cosmetics



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1. Introduction

Calendula officinalis L. (marigold) belongs to the Asteraceae/Compositae family, which is native to Central Europe and Mediterranean. Its flower oil is the main preparation used in cosmetic products, and contains several bioactive compounds, including terpenoids and terpenes (mainly bisabolol, faradiol, chamazulene, amidiol and esters), carotenoids (mainly with rubixanthin and lycopene structures), flavonoids, (mainly quercetin, isorhamnetin and kaempferol aglycones) and polyunsaturated fatty acids, (mainly calendic acid) [1–4]. *Calendula officinalis* L. has been used for medical purposes since the XII century. The plant is reported to present several biological activities namely angiogenic, vascular regeneration, analgesic, antimicrobial, antioxidant and immunomodulatory [5–8]. In cosmetic products, calendula is used in formulations for sensitive skin and soothing products (e.g., after-sun products) among a variety of presentations, including skin, eye, hair and bath products, with recognized safety for use in cosmetics [9].

Several Calendula preparations are available for incorporation in topical formulations directed towards wound healing and for soothing inflamed and damaged skin, like extracts, tinctures, and oils [9]. There are 14 INCI designations for *Calendula officinalis* L. preparations at the European directory of cosmetic ingredients, and within the same designation, it is

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Heinrich**

Anti Inflammatory Activity Of Flower Extract Of Calendula:

Phytopharmacy Sarah E. Edwards, Ines da Costa Rocha, Elizabeth M. Williamson, Michael Heinrich, 2015-02-17 Healthcare professionals including doctors pharmacists and nurses are often confronted with patients who use over the counter OTC herbal medicinal products and food supplements While taking responsibility for one's own health and treatment options is encouraged many patients use these products based on limited and sometimes inaccurate information from non scientific sources such as the popular press and internet There is a clear need to offer balanced well informed advice to patients yet a number of studies have shown that generally conventionally trained health practitioners consider their knowledge about herbal medicinal products and supplements to be weak Phytopharmacy fills this knowledge gap and is intended for use by the busy pharmacist nurse or doctor as well as the expert patient and students of pharmacy and herbal medicine It presents clear practical and concise monographs on over a hundred popular herbal medicines and plant based food supplements Information provided in each monograph includes Indications Summary and appraisal of clinical and pre clinical evidence Potential interactions Contraindications Possible adverse effects An overview of the current regulatory framework is also outlined notably the EU Traditional Herbal Medicinal Products Directive This stipulates that only licensed products or registered traditional herbal medicinal products THRs which have assured quality and safety can now legally be sold OTC Monographs are included of most of the major herbal ingredients found in THRs and also some plant based food supplements which while not strictly medicines may also have the potential to exert a physiological effect Edible Medicinal And Non-Medicinal Plants T. K. Lim, 2013-11-08 This book continues as volume 7 of a multi compendium on Edible Medicinal and Non Medicinal Plants It covers plant species with edible flowers from families Acanthaceae to Facaceae in a tabular form and seventy five selected species from Amaryllidaceae Apocynaceae Asclepiadaceae Asparagaceae Asteraceae Balsaminaceae Begoniaceae Bignoniaceae Brassicaceae Cactaceae Calophyllaceae Caprifoliaceae Caryophyllaceae Combretaceae Convolvulaceae Costaceae Doryanthaceae and Fabaceae in detail This work will be of significant interest to scientists medical practitioners pharmacologists ethnobotanists horticulturists food nutritionists botanists agriculturists conservationists lecturers students and the general public Topics covered include taxonomy common English and vernacular names origin and distribution agroecology edible plant parts and uses botany nutritive pharmacological properties medicinal uses nonedible uses and selected references *Novel Drug Targets With Traditional Herbal Medicines* Fatma Tuğçe Güragaç Dere, Mert İlhan, Tarun Belwal, 2022-09-29 This book collects information about the most popular ethnomedicinal plants which are common in Turkey and around the world It presents the ethnopharmacological records in vivo and in vitro studies side effects chemical compositions and clinical studies of these medicinal plants Its special focus is on the novel drug targets for disease and their possible mechanisms of action It covers botanical descriptions the status of the plants and food or drug interactions including precautions and warnings about the plants and the available market products It provides an

explanation of recorded and known plant administration dosages Also the gap between the traditional practice and scientific clinical evidences in the use of ethnomedicinal plant is acknowledged It is well known that traditional knowledge of the use of the medicinal plants in therapy is an important resource for the discovery of novel treatment options and drug targets The main purpose of this book is to draw attention to ethnomedicinal plant species Data on the therapeutic potentials of these medicinal plants can now be accessed from a single source It provides an important resource for future research opportunities for harnessing the full potential of these plants

Fundamentals of Herbal Medicine Kofi Busia,2016-11-10 This book consists of cutting edge materials drawn from diverse authoritative sources which are sequentially arranged into a multipurpose one stop shop user friendly text It is divided into four parts as follows part 1 historical overview of some indigenous medical systems an outline of the basic concepts of pharmacognosy ethnopharmacology common analytical methods for isolating and characterising phytochemicals and the different methods for evaluating the quality purity and biological and pharmacological activities of plant extracts part 2 phytochemistry and mode of action of major plant metabolites part 3 systems based phytotherapeutics discussion on how the dysfunction of the main systems of the human body can be treated with herbal remedies part 4 153 monographs of some medicinal plants commonly used around the world including 63 on African medicinal plants This book therefore demonstrates the scrupulous intellectual nature of herbalism depicting it as a scientific discipline in its own right

Herbs and Natural Supplements, Volume 2 Lesley Braun,Marc Cohen,2014-10-01 Herbs and Natural Supplements 4th Edition An evidence based guide is an authoritative evidence based reference This two volume resource is essential to the safe and effective use of herbal nutritional and food supplements The second volume provides current evidence based monographs on the 132 most popular herbs nutrients and food supplements Organised alphabetically each monograph includes daily intake main actions and indications adverse reactions contraindications and precautions safety in pregnancy and more Recommended by the Pharmacy Board of Australia as an evidence based reference works print that pharmacists are meant to have access to when dispensing Contributed content from naturopaths GPs pharmacists and herbalists Useful in a clinical setting as well as a reference book It provides up to date evidence on the latest research impacting on herbal and natural medicine by top leaders in Australia within the fields of Pharmacy Herbal Medicine and Natural Medicine

Herbs and Natural Supplements Inking Lesley Braun,Marc Cohen,2010-06-24 A must have health companion for herbalists naturopaths complementary medicine practitioners and students Herbs and Natural Supplements 3rd Edition An evidence based guide presents evidence based information on the 130 most popular herbs nutrients and food supplements used across Australia and New Zealand This exhaustive textbook is organised alphabetically by each herb or nutrient s common name Herbs and nutrients are then accompanied by critical information such as daily intake main actions and indications adverse reactions contraindications and precautions safety in pregnancy and more This new edition of Herbs and Natural Supplements has been expanded with new chapters on

pregnancy and wellness It also features 10 new monographs for Arginine Dunaliella Elde Goji Pelargonium Prebiotics Red Yeast Rice Rhodiola Shatavari and Taurine provides current evidence based information on herbal nutritional and food supplements used in Australia and New Zealand is user friendly and easily organised by easy to find A Z herbal monographs appendices offering important additional information for the safe use of herbal and nutritional supplements including a list of poison information centres associations manufacturers and more offers clear comprehensive tables including herb natural supplement drug interactions lists the pharmacological actions of all herbs and natural supplements a glossary of terms relevant to herbs and natural supplements two comprehensive new chapters Herbs and Natural Supplements in Pregnancy and Introduction to Wellness all chapters completely updated and expanded ten new monographs taking the total to 130 now also available as an eBook A code inside Herbs and Natural Supplements 3rd Edition An evidence based guide enables a full text download allowing you to browse and search electronically make notes and bookmarks in the electronic files and highlight material

Baumann's Cosmetic Dermatology, Third Edition Leslie S. Baumann, Evan A. Rieder, Mary D. Sun, 2022-06-21 A Doody's Core Title for 2023 2024 A concise well written and well illustrated overview of the topic of cosmetic dermatology that will prove useful to all physicians who care for cosmetic patients Archives of Facial Plastic Surgery reviewing the First Edition The bestselling resource on cosmetic dermatology updated to reflect the latest skin care procedures and treatments Baumann's Cosmetic Dermatology covers the entire gamut of dermatology with essential information about the anatomy and physiology of skin and skin conditions Comprehensive and engagingly written this updated text addresses the latest medications cosmeceuticals and procedures Grounded in an evidence based clinically relevant approach and featuring 400 full color images this is an indispensable resource for everyday practice Features Guidance on the efficacy of over the counter and prescription skin care products Step by step review of must know procedures NEW The latest drugs and topical agents including retinoids moisturizing agents antioxidants depigmenting agents vitamins and herbals NEW The newest laser treatments pulsed light techniques varicose veins and cosmeceuticals 400 full color photos and illustrations [Indian Science Abstracts](#), 2009-03 [Cosmeceuticals and Cosmetic Ingredients](#) Leslie S. Baumann, 2014-10-22 UNDERSTAND WHAT INGREDIENTS WORK FOR VARIOUS SKIN TYPES AND WHY WITH THE HELP OF THIS UNIQUE TEXT Cosmeceuticals and Cosmetic Ingredients helps skin care professionals understand topical drug delivery through cosmeceuticals the scientific basis of cosmetic ingredients and the challenges of using either in a skin care regimen The author addresses myths and misconceptions about specific ingredients and carefully details what each can and cannot do It provides an unbiased brand neutral approach along with detailed information and references to published evidence Cosmeceuticals and Cosmetic Ingredients is logically divided into ten sections Cleansing Agents Moisturizing Agents Barrier Repair Ingredients Skin Lightening Agents Antioxidants Vitamins Other Ingredients Coenzyme Q10 Ginger Honey etc Anti Inflammatory Agents Anti Acne Ingredients Anti Aging Ingredients **Reviews on Indian**

Medicinal Plants: Ca-Ce, 2007 *Herbal Companion to AHFS DI*. American Society of Health-System Pharmacists, 2000 Integrates conventional and alternative medicine providing evidence based medicine providing evidence based monographs of the most common herbal ingredients and nutritional supplements from various schools of healing and health promotion Back cover
PDR for Herbal Medicines, 2004 New Expanded Improved Comprehensive Building on its best selling predecessors the PDR for Herbal Medicines Third Edition has left no resource unturned to bring together the latest scientific data in the most comprehensive herbal reference compiled The third edition goes far beyond the original source adding a new section on Nutritional Supplements and new information aimed at greatly enhancing patient management by medical practitioners All monographs have been updated to include recent scientific findings on efficacy safety and potential interactions clinical trials including abstracts case reports and meta analysis results This new information has resulted in greatly expanded Effects Contraindications Precautions and Adverse Reactions and Dosage sections of each monograph

Natural Standard Herb & Supplement Reference Natural Standard (Firm), 2005 Provides detailed evidence based reviews for 98 herbs and dietary supplements Calendula Mindy Green, 1999-01-11 Probably no herb has as many healing benefits as calendula Unsurpassed in treating most skin problems from cuts and scrapes to surgical wounds from sunburn and insect bites to psoriasis and varicose veins calendula also works wonders in the digestive respiratory urinary immune and female reproductive systems CALENDULA is a volume in the Keats Good Herb Guide series **Herbal Medicines** Joanne Barnes, Linda A. Anderson, John David Phillipson, 2007 Written by experts in the fields of pharmacognosy phytochemistry phytopharmacy clinical herbal medicines phytopharmacovigilance and regulation of herbal medicinal products Herbal Medicines is an invaluable reference text for pharmacists and other healthcare professionals who require evidence based information on herbal medicines used for treatment and prevention of health problems In Vivo Potential
Anti-Inflammatory Activity of Extracts from Calendula Arvensis (CA) Flowers Abdulmalik Abdullah Abudunia, 2017 Calendula arvensis CA had been reported in traditional Moroccan medicine to exhibit its extensive use to treat pain and inflammation Therefore the objective of this study was to evaluate the anti inflammatory activity of CA flowers The methanol aqueous and hexane extracts ME AE and HE were investigated for inflammatory effects by using two methods namely carrageenan and experimental trauma induced hind paw edema in rats and using indomethacin 20 mg kg body weight as a standard drug The results demonstrated that Calendula Arvensis CA extracts had significant anti inflammatory activity where the HE at the doses of 300 and 500 mg kg pageso p *Mosby's Handbook of Herbs and Supplements and Their Therapeutic Uses* Steven Bratman, Andrea M. Girman, 2003 This pocket sized reference provides quick information on 145 herbs 20 supplements and 75 conditions Extremely thorough it offers reliable references and a unique system that rates the current knowledge of therapeutic efficacy for each herb or supplement used in a particular treatment Features an appendix on clinically tested brands **Natural Standard Herb & Supplement Handbook** Ethan M. Basch, Natural Standard (Firm), 2005 Provides key

facts on the safety efficacy and interactions of 91 commonly used herbs and dietary supplements **Herbal-Drug Interactions and Adverse Effects** Richard B. Philp,2004 Assists clinicians in quickly recognizing and avoiding potential adverse reactions and interactions that can occur between more than 150 of the most common herbal remedies and prescription over the counter medications This quick reference is organized alphabetically and includes drug interactions side effects and highlighted cautionary notes for each entry **Medication Safety in Pregnancy and Breastfeeding** Gideon Koren,2007-05-18 Fully understand the toxicological effects of prescription and OTC drugs on pregnant women and breastfed children Drawn from the internationally recognized MotherRisk program at the University of Toronto this authoritative resource is filled with evidence based information and guidance that puts the risks of maternal exposure to drugs into sharp focus The book s clear easy to follow two part organization conveniently reviews the toxicologic effects of all major drug classes then provides well researched systematic reviews of major topics that impact pharmacotherapy in pregnant and breastfeeding patients This complete guide is your best source of information and consequently your patients best defense against the possible ill effects of reproductive and developmental drug toxicities Features The most authoritative resource available on the maternal toxicology of prescription drugs Packed with evidence based systematic reviews of key maternal therapeutics and toxicology topics from leading peer reviewed journals Complete reviews of all major drug classes and widely used agents plus other herbal chemical and radiological therapies Cutting edge guidance from the world renown MotherRisk program Clear conversational tone and cohesive two part organization that facilitates your ability to quickly identify the risks associated with specific agents and communicate this crucial information to patients And much more

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