Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas

Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)

ISSN 2760-4942 (Online) Volume 01, Issue 02, December 2025

https://eurekaoa.com/index.php/5

CURCUMA LONGA L. PEOPLE MEDICINE AND MODERN IN MEDICINE USAGE

Guyoxon Mominova,
Associate Professor , DSc Institute Biological
Chemistry Department Andijan State Medicine

Abstract

The article describes the botanical and morphological characteristics of Curcuma longa L. (turmeric), its phytochemical composition (curcuminoids, essential oils), pharmacological effects (anti -inflammatory , antioxidant, metabolic, neuroprotective, antimicrobial) , and clinical evidence seeing was published . The literature search covered the period 2000–2024 and selected systematic reviews, in vitro/in vivo experiments, and clinical trials. The results highlighted the modulation of NF-κB, COX-2, Nrf2 pathways by curcuminoids, bioavailability issues, and strategies to address them (piperine, phytosomes, nanoformulations). There is evidence of symptomatic relief in osteoarthritis, metabolic syndrome, and respiratory diseases, but evaluation is limited due to the diversity of doses, formulations, and designs. In conclusion, although the safety of turmeric is good, the need for standardization, increased bioavailability, and high-quality clinical trials is emphasized.

Keywords: Curcuma longa, curcumin, curcuminoids, anti-inflammatory, antioxidant, bioavailability, phytotherapy, osteoarthritis.

Introduction

Curcuma longa L. (Zingiberaceae family) is a rhizome plant widely used in food, dye and traditional medicine, and its bioactive components are mainly curcuminoids (curcumin, demethoxycurcumin and bisdemethoxycurcumin) and

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)
ISSN 2760-4942 (Online) Volume 01, Issue 02, December 2025

https://eurekaoa.com/index.php/5

essential oils rich in monoterpenes and sesquiterpenes. In the last two decades, the interest in turmeric has increased dramatically in the scientific community; the reasons for this are the increasing global burden of diseases associated with inflammation and oxidative stress and the need for multi-target natural molecules [1–3]. Curcumin is characterized by reducing the expression of the NF-κB signaling pathway, cyclooxygenase-2 (COX-2), lipoxygenases, iNOS, proinflammatory cytokines (TNF-α, IL-1β, IL-6), as well as enhancing antioxidant defenses by activating the Nrf2/ARE pathway [1,3,7]. However, the low solubility and poor oral bioavailability of curcumin remain major obstacles to its clinical application [4,6]. The aim of this review is to provide an integrated analysis of the botanical-pharmacognostic, phytochemical, pharmacological, and clinical evidence on curcumin and to discuss approaches to enhance bioavailability and standardization issues.

Materials and Methods

A literature search was conducted in PubMed, Scopus, and Google Scholar databases between 2000 and 2024 using the keywords “Curcuma longa”, “curcumin”, “curcuminoids”, “bioavailability”, “anti-inflammatory”, “clinical trial”, “osteoarthritis”, “metabolic syndrome”, and “pulmonary”. Selection criteria: (a) full-text articles in English; (b) reviews, systematic reviews, meta-analyses, in vitro/in vivo studies, and clinical trials; (c) studies addressing the pharmacodynamics, pharmacokinetics, safety, or clinical efficacy of turmeric/curcumin. Exclusion criteria: (a) analyses not directly related to the topic; (b) studies with unclear methodology or that did not meet quality criteria. The number of references per article was limited to 10. Key evidence was selected from large reviews and major clinical studies covering different aspects of the topic, rather than from widely repeated sources [1–10].

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
OPEN ACCESS JOURNALS

Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)

ISSN 2760-4942 (Online) Volume 01, Issue 02, December 2025

https://eurekaoa.com/index.php/5

Results

Botany and raw material quality: Curcuma longa is a tropical-climate plant, and the main medicinal part is the rhizome. It is recommended to evaluate the quality of raw materials by organoleptic, microscopic, chromatographic (HPLC) and essential oil content by gas chromatography-mass spectrometry [2]. The main markers are the ratios of curcumin (diarylheptanoid), demethoxycurcumin and bisdemethoxycurcumin, as well as the amount of sesquiterpenes such as ar-turmerone. There is a risk of adulteration (addition with synthetic dyes), and quality control protocols are important [2].

Phytochemical composition and molecular targets: Curcuminoids have a polyphenolic structure and modulate oxidative-initiated signaling pathways. Inhibition of the NF-κB pathway, reduction of COX-2 and iNOS expression, and effects on MAPK, JAK/STAT, and TLR pathways have been demonstrated [1,3]. Induction of endogenous antioxidants (HO-1, SOD, catalase) through Nrf2/ARE activation has been reported [7]. Essential oil components (ar-turmerone, zingiberone) may have synergistic antimicrobial and anti-inflammatory effects [2].

Pharmacokinetics and bioavailability: When taken orally, curcumin has low systemic concentrations due to low solubility, intestinal wall metabolism, and first-pass liver metabolism [4]. A 2007 review suggests that piperine can increase absorption by many fold, as can liposomes, micelles, and nanoparticles, as well as phytosome complexes (phospholipid binding) [4,6]. In clinical trials, phytosome complexes have been reported to improve tissue delivery and enhance symptomatic response, but the variability in formulations makes comparisons between drugs difficult [6].

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)
ISSN 2760-4942 (Online) Volume 01, Issue 02, December 2025

https://eurekaoa.com/index.php/5

Pharmacological effects:

- Anti-inflammatory: Curcumin inhibits NF-κB and COX-2, reduces TNF-α and IL-6 levels; trials have shown a reduction in joint pain and swelling markers [1,3,10].
- Antioxidant: Reduces oxidative stress through neutralization of reactive oxygen species and induction of antioxidant enzymes [7].
- Metabolic: Positive effects on glycemia and lipids in animal models; modest improvements in biomarkers associated with metabolic syndrome have been reported at the clinical level [7].
- Neuroprotective: Reduction of oxidation and neuroinflammation provides a theoretical basis for the pathogenesis of Alzheimer's disease; clinical evidence is currently limited [7].
- Antimicrobial and respiratory: In vitro antimicrobial effects and reduction of inflammation; there are current reviews on the prospects for use in chronic respiratory diseases [9].

Clinical evidence: A systematic review and meta-analysis have shown that curcumin/turmeric extracts may be as effective as placebo and, in some cases, nonsteroidal anti-inflammatory drugs in pain and functional outcomes in osteoarthritis, although the effect sizes are moderate and heterogeneous [10]. Many small, short-term trials have shown reductions in inflammatory biomarkers [3,6]. Safety is generally well tolerated, with GI discomfort being the most common; evidence for long-term use with high doses is limited [3,8]. In the pulmonary setting, it has been suggested that it may provide symptomatic benefit by targeting inflammation and reducing oxidative stress, but the number of clinical trials is relatively small [9].

Discussion

Turmeric, as a multi-targeted natural substance, modulates the inflammatory-oxidative axis, which offers theoretical and practical benefits across a spectrum

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)
ISSN 2760-4942 (Online) Volume 01, Issue 02, December 2025

https://eurekaoa.com/index.php/5

of chronic diseases (osteoarthritis, metabolic syndrome, respiratory diseases). However, there is still a lack of robust randomized, large-scale, standardized formulation-based clinical trials. The low bioavailability of curcumin limits its use in pharmacotherapy; although the multi-fold increased absorption with piperine and improved pharmacokinetics with phytosome/nanoformulations are noteworthy, differences between formulations do not allow direct comparison of results [4,6]. Therefore, clinical studies should clearly define the exact dosage (mg curcuminoid/kg), curcuminoid ratios, excipients (e.g. piperine), duration of administration, and safety monitoring.

Safety and interactions: Turmeric is generally well tolerated; the most common adverse effects are dyspepsia, flatulence, and mild diarrhea [8]. Caution is advised in patients with biliary obstruction, active peptic ulcer, and severe hepatobiliary disease. The risk of bleeding should be monitored when coadministered with anticoagulants and agents that affect platelets. There is insufficient evidence for use in pharmacological doses during pregnancy and lactation; it is considered safe in food amounts.

Quality and standardization: Cases of admixture of synthetic dyes in raw materials have been reported in various markets; HPLC/preventive control of marker compounds at pharmacopoeial levels is mandatory [2]. For comparability with clinical studies, the percentage of curcuminoids, extraction method, curcumin:demethoxycurcumin:bisdemethoxycurcumin ratios, and essential oil composition should be reported. If piperine or other absorption enhancing agents are used in the extract, this should be specifically stated [4,6].

The “precious” metaphor and scientific relativity: Aggarwal et al. have coined the phrase “Curcumin: The Indian Solid Gold” for curcumin [1]. While this metaphor has attracted interest from the scientific community, our view as authors is that this phrase has rhetorical power and may convey the multifaceted potential of the molecule; however, unless the clinical evidence is consistent and of high quality, the scientific basis for its “gold standard” status is insufficient. Therefore, strict

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)
ISSN 2760-4942 (Online) Volume 01, Issue 02, December 2025

https://eurekaoa.com/index.php/5

adherence to the requirements of the strong evidence pyramid defines the true place and limits of curcumin.

Context of practical clinical guidelines: Curcuminoids (standardized extract) at 500–1000 mg/day may be appropriate as an adjunct to standard therapy in patients with osteoarthritis, especially those who are intolerant to NSAIDs ; however, the composition of the drug, bioavailability technology, and drug interactions must be taken into account [3,10]. Moderately positive changes in markers such as lipid profiles and HS-CRP can be expected in metabolic syndrome; in this regard, a combination with diet and physical activity is more meaningful [7]. It is being studied as an anti-inflammatory adjunct in respiratory diseases, but clinical evidence is still limited [9].

Scientific gaps and research agenda: (1) RCTs with inter-formulation comparisons; (2) Dose-response relationships; (3) Biomarker-driven, mechanism-stratified designs; (4) Long-term safety, especially from the perspective of the hepatobiliary and hemostatic systems; (5) Effectiveness studies and pharmacoeconomics in real-world settings.

Conclusion

Turmeric and its major polyphenol curcumin are promising adjuncts in inflammatory and oxidative stress-related diseases through multiple mechanisms of action. Clinical evidence suggests symptomatic benefit in osteoarthritis and some metabolic markers, but is insufficient to make a recommendation as a full replacement for standard therapy due to heterogeneous design and bioavailability limitations. In the future, it is necessary to develop clear clinical recommendations based on standardized extracts, stable formulations that enhance bioavailability, and robust RCTs.

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)
ISSN 2760-4942 (Online) Volume 01, Issue 02, December 2025

https://eurekaoa.com/index.php/5

Limitations

- Due to the limited number of references, only the most frequently cited sources and those that serve to provide complete coverage of the topic were selected.
- The diversity of formulations introduces heterogeneity in the generalization of results.
- Due to the constantly updated clinical evidence base, some new studies may not have been covered.

Recommendations for Future Research

- Dose-escalation RCTs to determine clinical target doses of curcumin and duration of treatment.
- Head-to-head comparison of phytosome/nanoformulations and biomarker-based subpopulation analyses.
- Development of international standards and interlaboratory compatibility protocols for quality control and authentication.

References

1. Aggarwal BB, Gupta SC, Sung B. Curcumin: The Indian Solid Gold. In: Aggarwal BB, Surh Y.-J., Shishodia S., editors. The Molecular Targets and Therapeutic Uses of Curcumin in Health and Disease. New York: Springer; 2007. p. 1–75.
2. Ravindran PN, Babu KN, Sivaraman K., editors. Turmeric: The Genus Curcuma. Boca Raton (FL): CRC Press; 2007. 541 p.
3. Jurenka JS Anti-inflammatory properties of curcumin: a major constituent of Curcuma longa: a review of preclinical and clinical research. Altern Med Rev. Sandpoint (ID): Thorne Research; 2009;14(2):141–153.
4. Anand P., Kunnumakkara AB, Newman RA, Aggarwal BB Bioavailability of curcumin: problems and promises. Mol Pharm. Washington (DC): American Chemical Society; 2007;4(6):807–818.

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas

Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)

ISSN 2760-4942 (Online) Volume 01, Issue 02, December 2025

https://eurekaoa.com/index.php/5

5. Basnet P., Skalko-Basnet N. Curcumin: an anti-inflammatory molecule from a curry spice on the path to cancer treatment. Molecules. Basel (Switzerland): MDPI; 2011;16(6):4567–4598.
6. Gupta SC, Patchva S., Aggarwal BB Therapeutic roles of curcumin: lessons learned from clinical trials. AAPS J. New York: Springer; 2013;15(1):195–218.
7. Ghosh S., Banerjee S., Sil PC The beneficial role of curcumin on inflammation, diabetes and neurodegenerative diseases: A recent update. Food Chem Toxicol. Amsterdam: Elsevier; 2015;83:111–124.
8. Chainani-Wu N. Safety and anti-inflammatory activity of curcumin: a review. J Altern Complement Med. New Rochelle (NY): Mary Ann Liebert; 2003;9(1):161–168.
9. Lelli D., Sahebkar A., Johnston TP, Pedone C. Curcumin use in pulmonary diseases: state of the art and future perspectives. Pharmacol Res. Amsterdam: Elsevier; 2017;115:133–148.
10. Daily JW, Yang M., Park S. Efficacy of Turmeric Extracts and Curcumin for Alleviating the Symptoms of Joint Arthritis: A Systematic Review and Meta-Analysis. J Med Food. New Rochelle (NY): Mary Ann Liebert; 2016;19(8):717–729.