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Curcumin: A Multifaceted Natural Compound with Promising Therapeutic Potential

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ABSTRACT-

Curcumin, the principal bioactive compound of *Curcuma longa*, has been widely recognized for its therapeutic properties. Recent trends in phototherapy emphasize the use of polyherbal formulations, wherein curcumin is co-administered with other medicinal plant extracts to enhance efficacy, reduce toxicity, and target multiple pathways. This review summarizes current knowledge on curcumin-based polyherbal combinations, focusing on their pharmacological synergy in treating inflammatory, metabolic, infectious, and neurodegenerative diseases. Mechanistic insights and clinical relevance are also discussed, highlighting the promise and challenges of polyherbal strategies. It exhibits antifungal, antimicrobial, antioxidant, renal and hepatoprotective activities. This review is an attempt to explore the various pharmacological properties of curcumin.

Keywords: Curcumin, turmeric, polyphenol, *Curcuma longa*

INTRODUCTION.

Turmeric, also known as curcuma longa is a herbaceous perennial plant that belongs to family Zingiberaceae. Traditionally, it has been used in holistic and folk medicine for the treatment of many ailments like gynecological, gastric, hepatic disorders, infectious diseases, and blood disorders [1]. It is widely cultivated in the tropic areas of Asia and to a lesser extent in Africa. In India, it is commonly known as haldi. India is the primary exporter; turmeric is also cultivated in Bangladesh, China, Indonesia, islands of the Caribbean, and South America [2].

The rhizomes of the plant are oblong, ovate, pyriform, often short branched [3]. The most active component of turmeric is curcumin, which makes up to 2–5 % of the spice.

Curcumin, a prominent bioactive compound from *Curcuma longa* (turmeric), plays a vital role in polyherbal formulations due to its broad therapeutic potential and ability to synergize with other plant-based compounds. In traditional systems of medicine such as Ayurveda and Traditional Chinese Medicine (TCM), polyherbalism—where multiple herbs are combined to enhance therapeutic efficacy and minimize toxicity—has long been practiced. Curcumin, when used in such formulations, often acts as a central therapeutic agent that complements and amplifies the effects of accompanying herbs. One of the most well-known combinations is with piperine, an alkaloid from *Piper nigrum* (black pepper), which significantly enhances curcumin's bioavailability by inhibiting hepatic and intestinal glucuronidation. This combination has shown improved outcomes in managing inflammatory conditions, metabolic disorders, and even cancer. Additionally, curcumin is frequently used with herbs like *Zingiber officinale* (ginger), *Withania somnifera* (ashwagandha), *Azadirachta indica* (neem), and *Ocimum sanctum* (tulsi), where it contributes to a multifaceted pharmacological profile including anti-inflammatory, antioxidant, antimicrobial, and neuroprotective effects. These combinations target multiple signaling pathways such as NF-κB, MAPK, and PI3K/Akt, providing a more comprehensive approach to complex diseases like diabetes, arthritis, neurodegeneration, and cancer. Furthermore, polyherbal formulations with curcumin are known to offer better patient tolerance, reduced side effects, and enhanced therapeutic outcomes. Despite these advantages, the clinical application of such combinations is still limited by challenges like formulation standardization, variability in herbal extract quality, and a lack of large-scale clinical trials. Nonetheless, curcumin continues to be a cornerstone in the development of polyherbal therapeutics, representing a bridge between traditional knowledge and modern pharmacological innovation.

Description of the plant	Dimensions
Plant type	herbaceous perennial
Length	60-90 cm far above the ground with a short stem
Flowers	Yellow in colour and 10-15 cm in length and dense spikes (appears at end of spring) [6]
Rhizomes	Yellowish brown, tough and segmented surface. Internally, the rhizome is yellowish-brown and matured one is dull orange looks bright yellow (powdered) [6]
Rhizomes Size	2.5-7.0 cm (in length) and 2.5 cm (in diameter) with small tuber branching off [6]
Temperature	20 – 30 ºC [7]

Turmeric has been used since primeval times to add flavor and color to various food preparations. [3, 4]. Along with it is the one of the prime constituent of the various species such as curry powder. In the western era it is prominently used in sauces, mustard blends and pickles. Turmeric has also been used widely for beautifying and health maintenance helps in building immunity. In cosmetic industry it is widely used in form of ointment to enhance appearance and removes acnes and blemishes due to its antiseptic property. In India it is widely used in traditional functions like marriage [5].

Organoleptic Properties

Chemical Constituents of Turmeric:-

Constituents	Polyphenolic curcuminoids, curcumin, demethoxycurcumin (about 12%), and bisdemethoxycurcumin [8 9]
	Protein (6.3%)
	fat (5.1%),
	minerals (3.5%),
	carbohydrates (69.4%)
	moisture (13.1%) [10]
Solubility (curcumin)	Insoluble in water and soluble in etanol alkalis, ketone, acetic acid and chloroform [11]
Essentials oils (rhizomes) (Steam distillation)	**sesquisterpenes** as ar-turmerone (61%), curlone (12.47%), ar-curcumene (6.11%), zingiberene (2.97%), α-sesquiphellandrene (2.81%) **Aromatic compounds** ethyl-4-isobutylbenzene (2.61%), α-bisabolene (1.48%), benzene (1.47%), benzaldehyde (1.44%), 1,2,3,5-tetramethyl-benzene (1.42%), 4-methyl-carbanilonitrile (1.09%), silane (0.84%) and phenol (3.45%)[12] , d-α-phellandrene (1%), d-sabinene (0.6), cineol (1%), borneol (0.5%) [13], β-caryophyllene (0.2%), β-farnesene (0.2%), β-curcumene (2.5%), β-sesquiphellandrene (2.4%), β-bisabolol (0.3%), ar- turmerol (0.9%), α-atlantone and traces of α-phellandrene, p-cymene, limonene, 1.8-cineole, camphor, β-elemene, and germacrone [14].

Curcumin

Bioavailability of Curcumin

Bioavailability of curcumin is primarily dependent on its metabolism within the body, especially in intestine and liver. It is available in lesser amount when taken orally due to less absoption in small intestine. [20].

In order to enhance the bioavailability, curcumin should be taken with piperine. [21], [22]. It later on inhibits glucouronidation of curcumin which bypasses Phase II metabolism which prevent its conversion to polar water soluble forms. [20]

Safety of Turmeric

As per FDA, curcuma is recognized as a food additive [23]. In the dose identification trial the single oral dosage of upto 12 gm was

found safe. [23].

In phase I trial in Taiwan, for three months curcumin supplementation up to 8 g/day was well tolerated in patients with precancerous conditions or noninvasive cancer [24]. In UK another clinical trial showed curcumin supplementation (0.45 to 3.6 g/day) for four months was well tolerated by people with advanced colon and rectal cancer, though two participants experienced diarrhea and nausea [25] In several participants, rise in serum alkaline phosphatase and lactate dehydrogenase were observed, but it was not clear whether these increases were linked to curcumin supplementation or cancer progression [21]. In an open-label phase II trial, 7 out of 17 patients experienced severe abdominal pain with advanced pancreatic cancer with curcumin (8 g/day) along with anticancer drug (gemcitabine) leading to the treatment being discontinued in five patients though curcumin dose was reduced to 4 g/day in two patients [26].

Drug Interactions

Curcumin has been found to inhibit platelet aggregation *in vitro* [27] [28] signifying potential for supplements to raise the risk of bleeding in people taking anticoagulant or antiplatelet medications, e.g. aspirin, clopidogrel, dalteparin, enoxaparin, heparin, ticlopidine, and warfarin. In cultured breast cancer cells, curcumin repressed apoptosis induced by the chemotherapeutic agents (1 to 10 μM) such as camptothecin, mechlorethamine, and doxorubicin [29].

Curcuminoids may interfere with the activity of efflux drug transporters of the ATP- binding cassette family, together with P-glycoprotein, multidrug resistance protein (MRP), and breast cancer-resistant protein (BCRP), which function as ATP-dependent efflux pumps [30] [31] . The activity of phase I biotransformation enzymes like cytochrome P450 (CYP) 3A4 (CYP3A4) was also affected by curcumin [32].

Some curcumin supplements also contain piperine to increase its bioavailability. Piperine may interfere with efflux drug transporters and phase I cytochrome P450 enzymes and increase the bioavailability and slow the elimination of a number of drugs, including phenytoin, propranolol, theophylline and carbamazepine [33] [34] [35].

Curcumin in Obesity, Insulin resistance and Diabetes

Curcumin has been widely studied as a treatment of obesity and related metabolic disorders [36]. It in a dose of 5 μM showed down regulation of TNF-alpha; production in various tissues [37]. Curcumin mimicked most of anti-diabetic drugs by activating PPARγ in hepatic stellate cells at a concentration of 10–50 μM [37]. Interruption in leptin signaling by reducing the phosphorylation levels of leptin receptor (Ob-R) and downstream targets was observed with curcumin (5–30 μM)[38] and it increased the expression of adiponectin, which negatively regulates obesity when supplied as dietary curcumin in obese mice [39]. Administration of curcumin improves lipid metabolism to support healthier total cholesterol and HDL to LDL ratios associated with obesity[40, 41].

Anti-inflammatory Activity

Inhibition of NF-κB activation and translocation induced by IL-1β and the consequent expression of NF-κB induced pro-inflammatory genes, COX-2 and VEGF was shown by curcumin at a concentration of 50 μM [42]. In human tendon cells, curcumin (5μM) was shown to modulate inflammation [43] by the inhibition of COX-2 through its effect on NF-κB. Curcumin (30 mg/kg body weight/day, daily) for 2 weeks in rats attenuates the ability of macrophages to generate reactive oxygen species and decreases the secretion of the lysosomal enzymes [44]. The effective anti-inflammatory property of it is likely to exert chemopreventive effects on carcinogenesis giving a complex inter-relationship between inflammation and tumorigenesis . The oil-free aqueous extract (COFAE) of *C. longa* showed significant effects against acute and chronic inflammation. [45]

Anti-catabolic/anabolic Effects

The potency of curcumin against inflammation has been revealed by its ability to inhibit NF-κB activation, thus producing anti-catabolic effects. Curcumin (50 μM) produced anti-catabolic effect by the inhibition of NF-κB activation. [46]

Effect on Cell Survival and Anti-apoptotic Potency

Curcumin suppressed the apoptotic features induced by IL-1β. It also stimulates antiapoptotic factors (Bcl-2, Bcl-xL and TRAF1) and inhibits pro-apoptotic factors [42]. Curcumin is shown to induce apoptosis inmutated cells such as melanoma [47], [48] and to facilitate apoptosis by chemotherapies in drug-resistant cells improving drug efficacy [49].

Curcumin and Immune Function

Proliferation of B-lymphocyte mediated immune function is effected by curcumin. It blocks Epstein-Barr virus-induced immortalization of human B cells [50].

Ulcerative Colitis

A significant amelioration of diarrhea, improved colonic architecture, and significant reduction of neutrophil infiltration and lipid peroxidation in colonic tissue was observed with curcumin at a dose of 50 mg/kg for 10 days prior to induction of colitis with 1,4,6-trinitrobenzene sulphonic acid [51].

Pancreatitis

Decreased inflammation was found with curcumin by significant reduction in activation of NF- κB and AP-1 as well as inhibiting mRNA induction of IL-6, TNF-α, and iNOS in the pancreas. Curcumin's inhibitory effect on inflammation results in improvement in disease severity as measured by histology, serum amylase, pancreatic trypsin, and neutrophil infiltration in both cerulein- and ethanol-induced pancreatitis [52].

Cancer Chemoprevention

Curcumin modulates transcription factors controlling phase I and II detoxification of carcinogens [53], free radical-activated transcription factors, decreases response to proinflammatory cytokines, and arachidonic acid metabolic pathways; and scavenges free radicals [37,54,55]. Curcumin decreases frequency and size of tumors and induces apoptosis via suppression of NF-κB and AP- 1 in promotion and progression stages of carcinogenesis [56,57]. Curcumin's effects in patients with colorectal cancer at doses of 450, 1,800, or 3,600 mg daily for seven days was investigated in clinical trial [58]. Phase I clinical trial with cancer predisposition taking curcumin orally for 3 months showed little toxicity and revealed histological improvement of precancerous lesions in 7 out of 25 patients [59].

Anti-oxidant Effect

Various reports have verified that curcumin is also a pro-oxidant agent able to increase the cellular levels of reactive oxygen species (ROS) [60, 61,62]. At 25, 50, and 100 μM, curcumin produced a considerable (dose and time-dependent) rise in the cellular levels of ROS[63]. Chemotherapeutic properties of curcumin may be mediated, by an increase in the cellular levels of ROS [64,65].

Alzheimer 's disease

Curcumin plays an important role in neuroprotective and cognitive-enhancing properties that may delay or prevent neurodegenerative diseases, including Alzheimer's disease (AD). It inhibited fibril formation and extension, as well as destabilize pre-formed fibrils in a dose- dependent manner, at concentrations about 0·1–1·0 μM [66]. In a dose-dependent manner curcumin inhibit the formation of small Aβ aggregates (Aβ oligomers) [67,68]. There is a marked amyloid clearance effect, with 30 % plaque size reduction and slowed plaque development, in animals getting curcumin (intravenous tail injections) for seven days [69]. It also stimulates proliferation of embryonic neural progenitor cells and neurogenesis in the adult hippocampus, representing other potential beneficial effects on neuroplasticity[70]. Chronically curcumin (200 and 400 mg/kg) improved spatial learning and memory in a dose dependent manner [71].

Curcumin Effects on Lipid Metabolism

Curcumin has hypocholesterolaemic effect, based on its hepatic gene expression [72, 73,74]. It also lowers the cholesterol levels by suppression of Niemann Pick C1-like (responsible for the uptake of cholesterol through vesicular endocytosis within the intestine) 1 protein [75].

Stress Response Modulating Effects of Curcuminoids

Turmeric could be functionally a metformin-like desensitizer taking part in stress triggered thermoregulatory and other physiological responses, and that it could be a better option for prevention and cure of co-morbid psychopathologies accompanying environmental stress[76].

Cardiovascular Diseases

Curcumin mediates its effects against cardiovascular diseases through different mechanisms like oxidative stress, inflammation and cell death [77], [78], [79, 80]. Post-treatment of curcumin have an effects against myocardial ischemia and reperfusion by the activation of JAK2/STAT3 pathway, which reflected by the withdrawal of the curcumin-induced down-regulation of Caspase3 and up- regulation of Bcl2 [81]. In heart failure therapy by the GATA4/p300 transcriptional signal pathway curcumin plays a critical role in the cardiomyocyte hypertrophy [82].

Allergy, Asthma and Bronchitis

Curcumin showed reduction in allergic response in murine model of allergy [82]. It could be utilized in alternate anti-asthmatic therapy, plays a vital role in scavenging nitric oxide (NO) and prevent the bronchial inflammation in asthmatic patients [83].

Chronic Kidney Diseases

Treatment with curcumin has been shown to decrease macrophage infiltration in chronic renal failure rats and block transactivation of NF-κB, representing that its anti-inflammatory property may be responsible for alleviating disease [83]. It could also inhibit p300 and NF-κB actions and decrease oxidative stress through down-regulation of vasoactive factors (endothelial nitric oxide synthase and enothelin-1), transforming growth factor-β and extracellular matrix proteins in the kidneys [16].

Skin Diseases

Curcumin suppresses the levels of PKC δ that cause ECM excessive accumulation and fibrosis *in vivo* and *in vitro* [84]. Curcumin may have beneficial effect in the treatment of scleroderma, it could protect rats against lung fibrosis induced by a large number of agents [85].

Liver Diseases

Curcumin improve hepatic steatosis and block fatty liver disease progression by inhibiting fatty acids synthesis and biosynthesis of unsaturated fatty acids such as stearic, oleic and linoleic acids [84]. It can improve mitochondrial activity, facilitate β oxidation and decrease lipogenesis [86, 87]. It inhibit liver damage in steatohepatitis via reducing the cytosolic and nuclear translocation [88], [89].

Antimicrobial Activity

Turmeric was shown to inhibit the growth of *Helicobacter pylori*, linked with the development of gastric and colon cancers [90]. Curcuma has been shown to act as a preservative by retarding microbial growth [91]. Spice inhibited hepatitis B virus replication in liver cells by raising the level of p53 protein [92]. Turmeric exhibits antifungal activity against different strains of fungus [93], [94]. This spice can also inhibit the production of aflatoxin [95].

Insecticidal and Larvicidal Activity

Curcuma possesses insecticidal activity against the red flour beetle (*Tribolium castaneum*) and maize weevil (*Sitophilus zeamais*) [96]. Turmeric extract confirmed larvicidal activity against the dengue vector *Aedes aegypti* [97]. It exhibits toxicity against red spider mites as well [98].

Radioprotector

Turmeric offers protective effect against damage by radiation. Study revealed the effect of an aqueous extract on the sensitivity of *E. coli*, *Bacillus megaterium*, and *B. pumilus* spores to γ radiation [99]. The spice also showed reduction in the degradation of plasmid pUC18 DNA induced by radiation [99]. In another study, it protect against X-ray-induced DNA damage of *E. coli* cells 100.

Antidepressant Activity

The antidepressant activities of turmeric extract are mediated through regulations of the neurochemical and neuroendocrine systems [101]. In different study, the antidepressant activity was mediated through monoamine oxidase A inhibition in the mouse brain [101].

Antiaging Activity

A reduction in skin elasticity and in skin thickness (chronic UVB exposure) was observed by the extract (at 300 or 1000 mg/kg, twice daily. It also prevented the formation of wrinkles and melanin as well as increase in the diameter and length of skin blood vessels. Inhibition in MMP- 2 expression by turmeric was proposed to contribute to the prevention of UVB-induced skin aging in mice [102].

Wound Healing

Turmeric in a polyherbal preparation has been shown to increase the cellular proliferation and collagen synthesis at wound sites in normal rats [103]. The formulation also increased the DNA, total protein, hydroxyproline, and hexosamine contents at the wound site [103]. The efficacy of a fresh turmeric paste to heal wounds has also been verified in rabbit model [104].

Turmeric in Urinary Disorders

As oral drugs, effective to prevent the formation of urinary calculi [6].

Dyspepsia and Gastric Ulcer

As effective as ranitidine, haldi was found to protect the gastric mucosal layer. Ethanol extract (oral) is believed to inhibit gastric acid, gastric juice secretion, and ulcer formation [105]. Pre- treatment with extract reduced the intensity of ulceration. Hypothermic-restraint stress reduction of gastric wall mucus was inhibited by turmeric extract treatment and reduced the severity of lesions caused by various necrotizing agents [106].

Anticoagulant Activity

Curcumin has found to possess anticoagulant activity by inhibiting collagen and adrenaline- induced platelet aggregation *in vitro* as well as *in vivo* in rat thoracic aorta [107].

Antifertility Activity

Grag [108] reported antifertility activity about 100 % in rats when fed orally (petroleum ether and aqueous extracts). Again Garg *et al*. [108] also reported that implantation is totally repressed by these extracts. It is also found to inhibit 5*a*-reductase, which changes testosterone to 5*a*- dihydrotestosterone, inhibiting the enlargement of flank organs in hamster. It also inhibits human sperm motility, and it is a sign of possible for the progress of a novel intra-vaginal contraceptive 109.

Analgesic Action

The powdered rhizome is beneficial in the treatment of sprain and inflammation. Turmeric paste mixed with little lime and saltpeter and applied hot is a popular application to sprains [110].

Anthelmintic Activity

Turmeric is said to be *Krimihara* (anthelmintic) and *Krimighn*a (destroyer of worms) in prehistoric lexicons. The juice has anti-helmintic property on internal use. In rural areas of Nepal, turmeric powder or paste boiled in water with a little common salt is taken as an anti- helminthic [110]

Turmeric in Ophthalmic Care

It inhibited deoxyribonucleic acid (DNA) damage, can reduce the opacity on eye lens, produced by wood smoke condensate and thus, prevent loss of vision[111] . Efficacy of curcumin in the management of chronic anterior uveitis (CAU) was proved clinically [112].

Oral Health

Anti-inflammatory and antimicrobial properties of curcumin suggests that it could be beneficial in the treatment of certain diseases of the oral cavity. e.g. topical application of curcumin gel reduced gingival bleeding and periodontal bacteria after conventional periodontal therapy (scaling and root planing) [113],[114], [115]. A mouthwash containing curcumin was also effective as chlorhexidine in

reducing inflammation in individuals who underwent periodontal therapy for gingivitis. [116]

Novel Polyherbal Formulations Involving Curcumin: A Modern Approach to Synergistic Herbal Therapy

Polyherbalism, the practice of combining multiple medicinal herbs into a single formulation, has long been a cornerstone of traditional medicine systems such as Ayurveda, Siddha, and Traditional Chinese Medicine (TCM). The rationale behind this approach lies in the concept of synergy—where the therapeutic effects of individual herbs are enhanced, side effects minimized, and multiple disease targets are addressed simultaneously. In recent years, curcumin, the principal bioactive component of *Curcuma longa* (turmeric), has emerged as a central molecule in several novel polyherbal formulations due to its multifaceted pharmacological properties, including anti-inflammatory, antioxidant, antimicrobial, and anticancer effects. However, curcumin's clinical utility is often limited by its poor bioavailability, which has spurred interest in combining it with other phytochemicals and delivery systems to enhance its absorption and efficacy.

One of the most well-established and widely researched combinations is that of curcumin with piperine, an alkaloid extracted from *Piper nigrum* (black pepper). Piperine enhances curcumin's bioavailability by inhibiting hepatic and intestinal glucuronidation. When combined with other herbs such as *Zingiber officinale* (ginger), the formulation becomes a powerful anti-inflammatory and metabolic regulator, suitable for the treatment of arthritis, obesity, and type 2 diabetes. Ginger adds additional anti-nausea and thermogenic properties, complementing curcumin's antioxidant and anti-inflammatory actions.

In the field of neurodegenerative diseases and cognitive support, polyherbal blends of curcumin with *Withania somnifera* (ashwagandha) and *Bacopa monnieri* (brahmi) have garnered attention. Ashwagandha provides adaptogenic and neuroprotective effects, while brahmi enhances memory and learning capabilities. Together with curcumin, these herbs modulate neurotransmitter levels, reduce oxidative stress in neuronal tissue, and downregulate neuroinflammatory pathways such as NF-κB and IL-6, offering a promising approach for managing Alzheimer's disease, Parkinson's disease, and age-related cognitive decline.

Another promising category of polyherbal formulations targets the immune system and infectious diseases. Combinations including curcumin, *Azadirachta indica* (neem), *Ocimum sanctum* (tulsi), and *Tinospora cordifolia* (guduchi) exhibit strong immunomodulatory and antimicrobial properties. These herbs synergize to regulate cytokine production, enhance natural killer (NK) cell activity, and inhibit microbial proliferation, making them suitable in the management of respiratory infections, post-viral fatigue, and even as adjuncts in viral diseases such as hepatitis or dengue.

Hepatoprotective formulations have also been developed using curcumin in combination with *Phyllanthus niruri* and *Andrographis paniculata*. These herbs are traditionally used to treat liver disorders, and when combined with curcumin, offer enhanced protection against oxidative damage, hepatic fibrosis, and viral load. Such formulations are being investigated for use in conditions like non-alcoholic fatty liver disease (NAFLD), hepatitis B and C, and drug-induced liver injury.

Cardiometabolic health is another domain where curcumin-based polyherbal formulations are proving beneficial. A notable combination includes curcumin, *Commiphora mukul* (guggul), and *Trigonella foenum-graecum* (fenugreek). Guggul contributes lipid-lowering effects, while fenugreek improves glucose metabolism and insulin sensitivity. When formulated with curcumin, this blend addresses the complex interplay of inflammation, dyslipidemia, and insulin resistance that characterizes metabolic syndrome and cardiovascular disease.

In dermatological applications, curcumin is increasingly formulated with herbs like *Aloe vera* and *Crocus sativus* (saffron) for its skin-healing and antimicrobial properties. These formulations are used in topical gels, creams, and transdermal patches to treat acne, eczema, pigmentation, and wounds. Curcumin's antiseptic properties, combined with aloe vera's moisturizing effect and saffron's complexion-enhancing action, create a holistic remedy for various skin ailments.

Emerging technologies are now enabling the development of nano-polyherbal systems, where curcumin and companion herbs are co-loaded into nano-carriers such as liposomes, solid lipid nanoparticles (SLNs), and polymeric micelles. For example, nanoformulations combining curcumin with ashwagandha and brahmi have shown enhanced penetration across the blood-brain barrier and increased neuroprotective efficacy in preclinical models. These advancements promise higher therapeutic efficacy at lower doses with fewer side effects.

Another noteworthy formulation targets gastrointestinal health by combining curcumin with *Triphala*—a blend of *Emblica officinalis* (amalaki), *Terminalia chebula* (haritaki), and *Terminalia bellirica* (bibhitaki)—and *Haridra* (a different term for turmeric in classical texts). This blend aids in digestion, reduces gut inflammation, and supports gut microbiota balance, offering potential relief in conditions like inflammatory bowel disease (IBD), irritable bowel syndrome (IBS), and colitis.

Despite the promising therapeutic potential of these novel polyherbal formulations, several challenges remain. Standardization of herbal extracts, variability in phytochemical content, lack of regulatory guidelines, and limited large-scale clinical trials hinder their widespread acceptance in mainstream medicine. However, ongoing research supported by modern analytical techniques, clinical validation, and advanced delivery platforms is steadily overcoming these obstacles.

Conclusion:

Novel polyherbal formulations incorporating curcumin represent a dynamic fusion of traditional wisdom and modern scientific innovation. These combinations hold immense potential in the treatment of chronic and complex diseases by offering multi-targeted, safer, and more effective therapeutic options. As scientific validation progresses and regulatory pathways become more accommodating, these formulations are poised to play a significant role in the future of integrative and personalized medicine.

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