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REVIEW ARTICLE

Kiwifruit (*Actinidia* spp.): Bioactive Compounds, Therapeutic Potential, and Pharmaceutical Applications – A Comprehensive Review

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Abstract

Kiwifruit (*Actinidia* spp.) is an emerging phytopharmaceutical resource due to its rich nutritional profile and diverse bioactive compounds, including Vitamin C, polyphenols, flavonoids, carotenoids, dietary fiber, actinidin, and essential minerals. These constituents contribute to a wide range of biological activities, such as antioxidant, anti-inflammatory, antimicrobial, cardioprotective, gastroprotective, antidiabetic, immunomodulatory, neuroprotective, and anticancer effects. This review summarizes the botanical characteristics, phytochemical composition, therapeutic potential, and pharmaceutical applications of kiwifruit, with emphasis on its role in disease prevention and health promotion. It also highlights the utilization of kiwifruit-derived bioactive compounds, peel, seeds, and seed oil in nutraceutical, cosmeceutical, and pharmaceutical formulations. Despite promising experimental and clinical evidence, further studies on standardization, bioavailability, safety, and large-scale clinical validation are needed. Overall, *Actinidia* spp. represents a valuable natural source for the development of innovative phytopharmaceuticals and functional health products.

Key words: Bioactive compounds, kiwifruit, pharmaceutical applications, phytopharmaceuticals, therapeutic potential

INTRODUCTION

Kiwifruit, commonly known as the Chinese gooseberry, is the edible berry of woody vines belonging to the *Actinidia* genus in the family *Actinidiaceae*. The fruit is distinguished by its edible seeds, luscious flesh, and thin peel. Green (*Actinidia deliciosa*), gold (*Actinidia chinensis*), red, and purple kiwifruits (*Actinidia melanandra* and *Actinidia arguta var. purpurea*) are commercially significant species that vary in their sensory qualities and nutritional makeup.[1] Kiwifruit has garnered significant interest as a functional food and a viable phytopharmaceutical resource due to its remarkable nutritional profile and abundance of bioactive compounds. It is an excellent source of Vitamin C, dietary fiber, minerals, organic acids, and a variety of phytochemicals that promote digestive health, immunity, metabolism, and general health. Its unique flavor, appealing look, and pleasing texture have all contributed to its increased commercial value and worldwide appeal.[2]

The increasing recognition of nutrition in disease prevention has stimulated interest in functional foods containing biologically active compounds that provide health benefits beyond basic nutrition. Due to its high levels of Vitamin C, dietary fiber, potassium, folate, carotenoids,

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phenolic compounds, and other phytochemicals that support normal physiological functions and lower the risk of chronic diseases, kiwifruit is considered one of the most nutrient-dense fruits.[3,4] Numerous bioactive compounds found in various plant parts, such as polyphenols, flavonoids, carotenoids, triterpenoids, polysaccharides, amino acids, vitamins, and organic acids, have been identified by phytochemical studies. These substances have a variety of pharmacological properties, such as immunomodulatory, antioxidant, anti-inflammatory, antibacterial, antidiabetic, anticancer, and cardioprotective actions.[5]

Oxidative stress is recognized as a major contributor to several chronic disorders, including cardiovascular diseases, diabetes, neurodegenerative disorders, and cancer. The rich antioxidant composition of kiwifruit, particularly its Vitamin C, phenolic compounds, carotenoids, and polyphenols, effectively scavenges free radicals and protects cells from oxidative damage, thereby enhancing its therapeutic significance.[2,5]

The increasing scientific interest in medicinal plants has emphasized the significance of phytopharmaceuticals, which are plant-based products that are standardized and backed by evidence from pharmacological, phytochemical, and toxicological studies. The various bioactive components found in *Actinidia* plants have shown promising therapeutic effects against inflammation, infections, metabolic issues, and cancer, making kiwifruit a favorable option for pharmaceutical research.[5] Consuming kiwifruit regularly has been linked to enhanced immune system function, gut health, and decreased oxidative stress, mainly attributed to the combined impact of its dietary fiber, antioxidants, and other plant chemicals.[6,7] In addition, recent genetic research has unveiled significant genetic variation among *Actinidia* species and pinpointed genes related to fruit quality, accumulation of plant chemicals, and resilience to stress, opening up novel possibilities for enhancing crops and medical uses.[8]

BOTANICAL PROFILE AND TAXONOMIC SIGNIFICANCE OF KIWIFRUIT

The genus *Actinidia* Lindl., belonging to the family Actinidiaceae, comprises approximately 54 species of deciduous woody climbing vines that are predominantly distributed in East Asia, with China recognized as the primary center of origin and diversity. Besides its horticultural importance, *Actinidia* species are valued for their rich phytochemical composition, including polyphenols, flavonoids, terpenoids, polysaccharides, alkaloids, carotenoids, vitamins, and other bioactive compounds. These phytochemicals exhibit diverse biological activities, such as antioxidant, anti-inflammatory, antimicrobial, anticancer, antidiabetic, neuroprotective, and cardioprotective properties, highlighting the potential of kiwifruit as an important phytopharmaceutical resource.[9-11]

Taxonomy and classification

The genus *Actinidia* belongs to the family Actinidiaceae under the order Ericales. The taxonomy of the genus is considered complex due to its extensive interspecific diversity, morphological variation, and differences in ploidy levels. Conventionally, species classification was primarily based on morphological characteristics such as leaf pubescence, flower morphology, fruit shape, and vegetative traits. However, advances in molecular markers, phylogenetic studies, and whole-genome sequencing have greatly improved species identification, taxonomic resolution, and the understanding of evolutionary relationships within the genus.[12] The taxonomic classification of the genus Actinidia is summarized in Table 1.

The genus *Actinidia*, which has about 50 species with significant morphological and ploidy variety, is a member of the family Actinidiaceae under the order Ericales.[13] Although physical traits have historically been the basis for species categorization, more recent molecular and genomic research has enhanced species identification and elucidated evolutionary connections within the genus.[14] These developments have improved breeding initiatives, germplasm conservation, and the use of *Actinidia* spp. for phytopharmaceutical and horticultural purposes.

Origin, evolution, and domestication

China is widely recognized as the center of origin, evolution, and domestication of *Actinidia* spp., particularly in the hilly and temperate forest regions of southwestern China. Due to their long history of medicinal use, *Actinidia* species have traditionally been used in Chinese medicine to treat gastrointestinal disorders, inflammation, rheumatism, and several other ailments.[5] The global cultivation of kiwifruit began after seeds were introduced from China to New Zealand during the early twentieth century, where the commercially important cultivar "Hayward" was subsequently developed and widely cultivated. Evolutionary studies indicate that polyploidization, hybridization, and environmental adaptation have played key roles in the diversification of *Actinidia* spp.[13,14] Furthermore, recent genomic studies have provided deeper insights into the domestication history of kiwifruit and identified genetic factors associated with fruit quality, pigmentation, and stress tolerance.[12]

Morphological characteristics

Actinidia spp. is perennial, deciduous, woody climbing vines with twining stems and rapid vegetative growth. Most

Table 1: Taxonomic classification of *Actinidia* spp.

Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Ericales
Family	Actinidiaceae
Genus	*Actinidia* Lindl.

species are dioecious, requiring separate male and female plants for successful pollination and fruit production. Their root systems are generally shallow and fibrous, making them sensitive to environmental conditions, particularly soil moisture. The leaves are simple, alternate, and petiolate, exhibiting considerable variation in shape and pubescence among species. The flowers are typically fragrant, white to cream-colored, and insect-pollinated. Male flowers possess numerous fertile stamens, whereas female flowers contain well-developed pistils with sterile stamens. Following successful pollination, fleshy berries develop.

Kiwifruit exhibits considerable diversity in fruit size, shape, flesh color, and skin texture. Depending on the species and cultivar, the flesh may be green, yellow, or red. The fruits are rich in vitamin C, dietary fibre, flavonoids, carotenoids, phenolic acids, and the proteolytic enzyme actinidin, all of which contribute to their nutritional and therapeutic value. Variations in phytochemical composition among *Actinidia* spp. influence their biological activities and medicinal potential.[9,11]

Major commercial and medicinally relevant species

A. deliciosa

A. deliciosa is the most widely cultivated species globally and features the popular cultivar "Hayward." The fruits possess green flesh and brown hairy skin, abundant in Vitamin C, polyphenols, dietary fiber, and actinidin. This species has been extensively studied for its antioxidant, digestive, and anti-inflammatory properties.[3]

A. chinensis

A. chinensis Planch. (Chinese kiwifruit) is originally from China and has been cultivated in several countries including New Zealand, the United States, Greece, Italy, Chile, France, Japan, and Korea. It provides a rich source of triterpenoids, polyphenols, Vitamin C, carbohydrates, amino acids, and minerals.[5]

A. arguta

A. arguta (hardy kiwi or mini kiwi) is a cold-hardy kiwifruit species native to East Asia, valued for its edible smooth skin and high nutritional quality. It possesses high antioxidant capacity due to its abundance of Vitamin C, polyphenols, flavonoids, carotenoids, and dietary fiber.[15] *A. arguta* is a prospective functional food and phytopharmaceutical resource because of its many bioactive components, which include antioxidant, anti-inflammatory, antidiabetic, anticancer, and antibacterial properties.[16]

Actinidia eriantha

Actinidia eriantha Benth. is a medicinally significant wild kiwifruit species indigenous to China, recognized for its elevated Vitamin C concentration and rich array of bioactive components, including triterpenoids, polysaccharides, flavonoids, and phenolics. Historically, its roots have been employed to treat various cancer and inflammatory conditions. Scientific studies have confirmed its anticancer, anti-angiogenic, antioxidant, and immunomodulatory activities, while recent breeding programs have developed early-maturing cultivars with improved fruit quality, highlighting its potential for both pharmaceutical and commercial applications.[17-19]

PHYTOCHEMICAL COMPOSITION OF KIWIFRUIT

The nutritional value of kiwifruit is attributed to its diverse composition of essential nutrients and health-promoting bioactive constituents. Although green- and gold-fleshed kiwifruit cultivars share several nutritional characteristics, they may differ in their respective nutrient profiles and compositional attributes. The major nutritional constituents of these two cultivars are comparatively presented in Table 2.

BIOLOGICAL AND PHARMACOLOGICAL ACTIVITIES OF KIWIFRUIT BIOACTIVE COMPOUNDS

Antioxidant activity

Due to its high concentration of bioactive compounds such as polyphenols, flavonoids, phenolic acids, Vitamin C, and tocopherols, kiwifruit (*Actinidia* spp.) exhibits potent antioxidant activity. 2,2-diphenyl-1-picrylhydrazyl, 2,2'-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid, ferric reducing antioxidant power, and cupric reducing antioxidant capacity antioxidant assays have demonstrated that kiwifruit effectively scavenges free radicals.[25,26] The fruit's polyphenol and ascorbic acid contents have a strong correlation with its antioxidant potential; cultivars with higher concentrations of these compounds exhibit greater antioxidant activity.[26] Furthermore, kiwifruit's antioxidant potential is greatly enhanced by phytochemicals such as chlorogenic acid, quercetin, caffeic acid, and tocopherols, help reduce oxidative stress, and protect against chronic diseases linked to free radical damage.[27,28]

Table 2: Comparative nutritional profile of green (*Actinidia deliciosa*) and gold (*Actinidia chinensis*) kiwifruit (per 100 g fresh weight)

Component	Unit	*Actinida deliciosa* (green)	*Actinidia chinensis* (gold)	References
Proximate				
Water	g	82	81	[20]
Total carbohydrates	g	14.6	14.23	[20]
Total Sugars	g	9.0	12.3	[3]
Sucrose	g	0.15	0.05	[21]
Glucose	g	4.11	5.2	[21]
Fructose	g	4.35	5.68	[21]
Maltose	g	0.19	0.05	[21]
Citric acid	mg	490–1290	460–517	[21]
Malic acid	mg	80–260	214	[21]
Quinic acid	mg	540–1320	1310–1354	[21]
Total protein	g	1.22	1.14	[20]
Fat	g	0.52	0.28	[22]
Dietary fiber	g	3.0	1.4	[22]
Total lipid	g	0.61	0.47	[22]
Vitamins				
Vitamin A	µg	87	23	[23]
Vitamin B1 (Thiamine)	mg	0.027	0.024	[24]
Vitamin B2(Riboflavin)	mg	0.025	0.074	[23]
Vitamin B3 (Niacin)	mg	0.341	0.28	[24]
Vitamin B5 (Pantothenic acid)	mg	0.183	0.5	[24]
Vitamin B6 (pyridoxine)	mg	0.63	0.079	[23]
Vitamin B9 (Folate)	µg	25	31	[22]
Vitamin B12	mg	0	0.08	[22]
Vitamin C	mg	92.7	161.3	[3]
α-Tocopherol	mg	1.46	1.49	[23]
ϒ-Tocopherol	mg	0.03	0.01	[24]
δ-Tocopherol	mg	0.0	0.01	[24]
Vitamin K	µg	40.3	5.5	[24]
Minerals				
Phosphorus	mg	34	25	[22]
Potassium	mg	312	315	[22]
Calcium	mg	34	20	[24]
Magnesium	mg	17	12	[3]
Iron	mg	0.31	0.21	[22]
Manganese	mg	0.098	0.05	[22]
Copper	mg	0.13	0.147	[24]
Zinc	mg	0.14	0.08	[3]
Sodium	mg	3	3	[3]
Selenium	µg	0.2	0.04	[22]
Amino acids				
Tryptophan	g	0.015	0.044	[24]
Threonine	g	0.047	0.042	[24]

(Contd...)

Table 2: *(Continued)*

Component	Unit	*Actinida deliciosa* (green)	*Actinidia chinensis* (gold)	References
Isoleucine	g	0.051	0.037	[24]
Glutamic acid	g	0.184	0.129	[24]
Glycine	g	0.060	0.046	[24]
Proline	g	0.044	0.028	[24]
Serine	g	0.053	0.040	[24]
Leucine	g	0.066	0.056	[24]
Methionine	g	0.024	0.016	[24]
Cystine	g	0.031	0.025	[24]
Phenylalanine	g	0.044	0.030	[24]
Tyrosine	g	0.034	0.023	[24]
Valine	g	0.057	0.046	[24]
Arginine	g	0.081	0.109	[24]
Histidine	g	0.027	0.020	[24]
Alanine	g	0.053	0.040	[24]
Aspartic acid	g	0.126	0.119	[24]
Others				
(Glycemic index) GI		39.3	48.5	[24]
Lutein/Zeaxanthin	μg	112	114	[24]

Anti-inflammatory activity

Kiwifruit exhibits significant anti-inflammatory activity due to its rich content of polyphenols, flavonoids, procyanidins, and carotenoids. These bioactive compounds modulate inflammatory mediators and cytokines such as interleukin (IL)-1β, tumor necrosis factor-alpha, and IL-6, thereby reducing inflammatory responses.[29,30] Polyphenol-rich extracts, particularly from red-fleshed kiwifruit, have shown strong anti-inflammatory effects, while animal studies have confirmed their ability to alleviate inflammatory responses.[31,32]

Antimicrobial activity

Kiwifruit exhibits broad-spectrum antimicrobial activity due to its rich amount of polyphenols, flavonoids, and organic acids. Kiwifruit extracts, particularly those derived from the peel, have shown inhibitory effects against several Gram-positive and Gram-negative bacteria, including *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas aeruginosa*, as well as various fungal species.[33,34] Disruption of the microbial cell membrane, enzyme inhibition, and interference with bacterial biofilms are the primary mechanisms of the antimicrobial effect. These findings demonstrate the potential of kiwifruit bioactive compounds as natural antimicrobial agents for food preservation and oral healthcare applications.[35,36]

Anticancer activity

Active compounds from the *Actinidia* family, specifically ascorbic acid, polyphenols, and flavonoids, have chemopreventive and anticancer properties due to their capability to scavenge free radicals, reduce oxidative DNA damage, and inhibit proliferation of several human cancer cell lines such as oral squamous cell carcinoma, gastric, lung, colon (HCT116), and hepatic cells.[37,38] Polyphenols and peel extracts generals exhibit better antiproliferative properties than those derived from the flesh, whereas green-synthesized zinc oxide nanoparticles from kiwi peels also exhibit dose- and time-dependent cytotoxicity toward colon cancer cells.[33,39] Furthermore, clinical studies also suggest that regular consumption enhances DNA repair mechanisms and reduction in H_2O_2-induced strand breaks in lymphocytes along with improvement in gastrointestinal motility.[37]

Cardioprotective activity

The cardioprotective properties of *Actinidia* spp. come mainly from their high levels of Vitamin C, Vitamin E, polyphenols, potassium, and dietary fiber. Regular consumption has been linked to lower platelet aggregation, reduced triglyceride levels and slight reductions in blood pressure, thereby supporting cardiovascular health.[40,41] These benefits are attributed to antioxidant, antiplatelet, and ACE-inhibitory activities that help lower oxidative stress and improve

vascular function.[42] Overall, adding kiwifruit to the daily diet can help prevent cardiovascular diseases and maintain heart health.[43,44]

Gastrointestinal activity

Kiwifruit is widely recognized for its beneficial effects on gastrointestinal health because it contains numerous bioactive compounds, oligosaccharides, fiber, and a key proteolytic enzyme called actinidin. Kiwifruit promotes digestion through the retention of bulk and water in the stool, which leads to increased intestinal motility. Actinidin also relieves that the difficulties people have digesting protein. Several clinical trials have demonstrated positive changes in constipation and irritable bowel syndrome that is characterized primarily by constipation.[3,45] Kiwifruit has been shown to positively modulate the gut microbiota and improves gastrointestinal comfort.[46,47]

Antidiabetic activity

The low glycemic index, high dietary fiber, and richness in bioactive polyphenols make kiwifruit a potential functional food for diabetes prevention. These components delay carbohydrate absorption, reduce postprandial glucose excursions, and improve insulin sensitivity. Both human and animal studies have demonstrated reductions in blood glucose level, oxidative stress, and diabetes complications after consuming kiwifruit or its extracts.[48-50]

Immunomodulatory activity

Due to its high content of Vitamin C, polyphenols, carotenoids, and flavonoids, kiwifruit has significant immunomodulatory effects. These bioactive compounds stimulate lymphocyte proliferation, immunoglobulin production, cytokine secretion, and help counteract oxidative stress. Regular consumption may enhance immune function and promote immune homeostasis.[51-53]

Neuroprotective activity

The neuroprotective effects of kiwifruit are attributable to its high concentration of antioxidants, phenolic compounds, flavonoids, and Vitamin C, which protect neuronal cells from oxidative stress, apoptosis, and amyloid-β neurotoxicity. Furthermore, acetylcholinesterase inhibitory activity and enhancement of cognitive function has been reported with potential against neurodegenerative diseases like Alzheimer's disease.[54-56]

Dermatological and cosmeceutical benefits

Kiwifruit has garnered significant interest in dermatological and cosmeceutical uses due to its substantial content of Vitamin C, polyphenols, flavonoids, and actinidin. These components support the production of collagen, enhance skin hydration, guard against oxidative and ultraviolet-induced damage, and lessen obvious indications of aging skin.

THERAPEUTIC POTENTIAL OF KIWIFRUIT IN HUMAN HEALTH

Kiwifruit (*Actinidia* spp.) is widely recognized as a functional food with significant therapeutic potential due to its exceptional nutritional composition and abundance of bioactive compounds, including Vitamin C, Vitamin E, folate, dietary fiber, potassium, carotenoids, polyphenols, flavonoids, and the proteolytic enzyme actinidin. These bioactive constituents act synergistically to exert antioxidant, anti-inflammatory, immunomodulatory, cardioprotective,

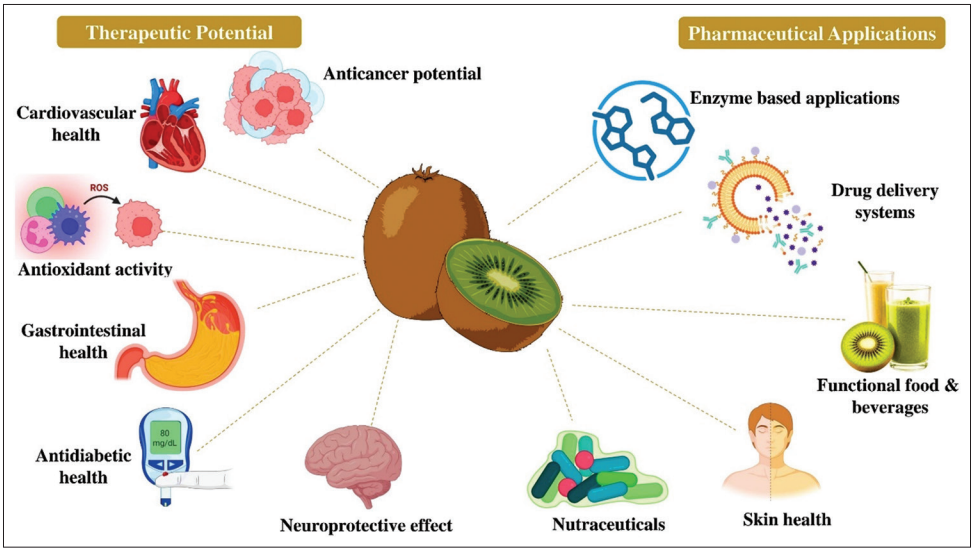


Figure 1: Therapeutic potential and pharmaceutical applications of kiwifruit (*Actinidia* spp.)

gastroprotective, antidiabetic, and anticancer mechanisms. Regular consumption of kiwifruit has been associated with improved gastrointestinal function, enhanced immune responses, better cardiovascular and metabolic health, and reduced oxidative stress and inflammation, thereby contributing to the prevention and management of several chronic non-communicable diseases.[6,3,23,20] The therapeutic potential and pharmaceutical applications of kiwifruit are summarized in Figure 1.

KIWIFRUIT SEED OIL (KSO): PHARMACEUTICAL AND COSMETIC APPLICATIONS

KSO, extracted from the seeds of *Actinidia* spp. is a valuable source of α-linolenic acid, linoleic acid, tocopherols, phytosterols, and phenolic compounds. These bioactive constituents exhibit antioxidant, anti-inflammatory, moisturizing, and skin-conditioning properties, making KSO a promising ingredient for pharmaceutical, nutraceutical, and cosmetic applications.[57,58]

Safety profile of kiwifruit bioactive compounds

The bioactive components derived from kiwifruit possess a favorable safety profile because they are naturally present in edible fruits with a long history of safe human consumption. Rich in omega-3 fatty acids, tocopherols, and antioxidants, KSO demonstrates significant biological activity with low adverse effects at the appropriate doses. In addition, the safety of commercial products should be ensured through standardized extraction, purification, and quality control procedures to minimize contamination and batch-to-batch variation.[57,59]

Allergenicity and hypersensitivity

Although kiwifruit is widely recognized as a nutritious fruit, it is also considered a food allergen that can cause different types of allergic responses, including oral allergy syndrome and even anaphylactic shock. The allergens contained in kiwifruit are actinidin, thaumatin-like protein, and kiwellin. Hence, the presence of residual proteins in unrefined seed oil may pose a risk for individuals with kiwifruit allergy.[60,61]

Toxicological evaluation

The existing scientific information suggests that KSO demonstrates a favorable toxicological profile, as its major constituents are generally regarded as non-toxic. It has been demonstrated to have an antioxidant effect and provides protection against DNA damage with no genotoxic impact on cells. Nevertheless, comprehensive toxicological and clinical evaluations are required before its widespread pharmaceutical application.[3,57,62]

Drug-bioactive interactions

Kiwifruit bioactive compounds, such as polyphenols, Vitamin C, and omega-3 fatty acids, may influence the absorption, metabolism, and therapeutic activity of certain drugs. Kiwifruit has been shown to reduce platelet aggregation and might interact with anticoagulant and antiplatelet drugs. Therefore, caution is advised when combining concentrated kiwifruit-derived products with cardiovascular or antidiabetic therapies, although limited clinical evidence supports this recommendation.[3,40,63]

Regulatory status of kiwifruit-derived products

Kiwifruit-derived products are increasingly incorporated in food, cosmetic, nutraceutical, and pharmaceutical products because of their bioactive properties. Regulatory agencies require evidence of safety, purity, quality, and accurate labeling, with particular attention to allergen declaration and contaminant control. Standardized quality specifications and harmonized regulations are essential for supporting the safe commercialization of kiwifruit-derived products worldwide.[58]

LIMITATIONS AND CHALLENGES

Although kiwifruit (*Actinidia* spp.) possesses significant phytopharmaceutical potential, several limitations restrict its clinical and commercial application. The phytochemical composition varies among species, cultivars, geographical regions, cultivation practices, and postharvest conditions, resulting in variations in bioactive composition and therapeutic efficacy. Furthermore, most evidence supporting its pharmacological activities is derived from *in vitro* and preclinical studies, whereas well-designed human clinical trials remain limited. The instability and low bioavailability of certain bioactive compounds, together with the absence of standardized extraction methods, quality control protocols, and dosage guidelines, remain major challenges. In addition, the allergenic nature of actinidin in susceptible individuals may limit its therapeutic use. Addressing these challenges through standardized processing, advanced formulation approaches, and well-designed clinical studies is essential for the successful clinical translation of kiwifruit-derived bioactives into pharmaceutical applications.

FUTURE PERSPECTIVES AND RESEARCH DIRECTIONS

Future research should focus on conducting well-designed human clinical trials to validate the therapeutic efficacy and safety of kiwifruit-derived bioactive compounds. Standardization of extraction techniques, quality control measures, and dosage formulations is essential to ensure

consistency and reproducibility. In addition, advances in nanotechnology, targeted drug delivery systems, and metabolomics-based approaches may enhance the bioavailability and pharmaceutical potential of kiwifruit bioactives. Exploring underutilized *Actinidia* species and integrating omics technologies with sustainable cultivation practices could further support the development of novel kiwifruit-based phytopharmaceuticals and functional health products.

CONCLUSION

Kiwifruit (*Actinidia* spp.) has emerged as a promising phytopharmaceutical resource due to its rich composition of Vitamin C, polyphenols, flavonoids, carotenoids, dietary fiber, actinidin, and other bioactive compounds that exhibit antioxidant, anti-inflammatory, antimicrobial, cardioprotective, gastroprotective, immunomodulatory, and anticancer activities.[3,22] In addition to its nutritional and therapeutic value, recent studies have highlighted the pharmaceutical potential of kiwifruit peel, seeds, and other by-products as sustainable sources of bioactive ingredients for nutraceutical, functional food, and cosmeceutical applications. Although further clinical validation, standardization, and large-scale human studies are required, the available scientific evidence supports *Actinidia* spp. as a valuable natural resource for the development of innovative phytopharmaceuticals and evidence-based healthcare products. Continued research integrating phytochemistry, pharmacology, biotechnology, and clinical sciences will further strengthen the therapeutic applications and commercial utilization of kiwifruit in modern healthcare.

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