IBSUniversity Journal of Business and Research
ISSN: 3007-3936 (Online)
Volume 2, Issue 2, December 2025

Medicinal plants and their therapeutic use: A study at IBSUniversity, Papua New Guinea

Dhanapackiam Kuppusamy
IBSUniversity, Papua New Guinea
dhanapakiam.kuppusamy@ibs.ac.pg

Sasikumar V R
IBSUniversity, Papua New Guinea
sasikumar.velamparampil@ibs.ac.pg

Melissa Hatabia
IBSUniversity, Papua New Guinea
melissa.hatabia@ibs.ac.pg

Abstract

This study presents a detailed ethnobotanical investigation into the identification, documentation, and future potential of medicinal plants traditionally used across Papua New Guinea, with a practical focus on the IBSUniversity campus. A total of 80 species were recorded using purposive data collection methods, including field observation, literature comparison, and engagement with local knowledge holders. Each plant was classified by its common and botanical name, family, useful parts, and therapeutic applications. The findings highlight the historical and cultural significance of medicinal plants in traditional systems such as Ayurveda, Traditional Chinese Medicine (TCM), and Indigenous healing practices across Africa, the Americas, and Oceania.

The study emphasis the pharmacological value of bioactive compounds particularly alkaloids, flavonoids, and terpenoids which contribute to the treatment of inflammation, infections, digestive disorders, neurodegenerative diseases, and cardiovascular conditions. Emerging innovations such as plant-based nanotechnology, genetic engineering, and pharming are explored as transformative tools for enhancing drug delivery, therapeutic precision, and scalability. The integration of omics technologies (genomics, proteomics, metabolomics) and clinical trials is accelerating the validation of traditional remedies and supporting the development of personalised phytotherapy.

The research also addresses the growing commercialisation of medicinal plants in the form of herbal supplements, functional foods, and plant-derived pharmaceuticals. It underscores the importance of quality control, sustainability, and ethical engagement with Indigenous knowledge systems. By establishing a medicinal garden on campus, the study contributes to biodiversity conservation, health education, and community outreach. Overall, the research affirms that medicinal plants are essential to both traditional and modern healthcare, offering sustainable, culturally grounded, and scientifically validated solutions for future therapeutic development.

Keywords: medicinal plants, Papua New Guinea, IBSUniversity, ethnobotany, phytochemicals, traditional medicine, Ayurveda, Traditional Chinese Medicine, Indigenous healing, nanotechnology, pharming, omics technologies, clinical trials, herbal supplements, biodiversity conservation, sustainable healthcare, community outreach

Introduction

Medicinal plants refer to a diverse group of botanical species traditionally used in herbal medicine, many of which exhibit therapeutic effects. These plants are recognised as valuable sources of bioactive compounds that contribute significantly to drug discovery and pharmaceutical development. In addition to their medicinal roles, such plants have shaped cultural practices and healing traditions across civilizations worldwide (Van Wyk & Wink, 2018).

Beyond their curative properties, numerous medicinal plants also offer nutritional benefits and are often recommended for their health enhancing qualities. Common examples include ginger, green tea, and walnuts, along with regionally important species such as Morinda citrifolia (noni), Zingiber zerumbet (shampoo ginger), Curcuma longa (turmeric), and Piper methysticum (kava), which are widely used in Papua New Guinea for their therapeutic applications (Van Wyk & Wink, 2018). Moreover, plant-derived compounds have contributed to the formulation of everyday products such as aspirin and toothpaste (Van Wyk & Wink, 2018).

Early documentation of plant-based medicines

The earliest recorded uses of medicinal plants date back to the Sumerians of ancient Mesopotamia around 4,000 BCE. Cuneiform tablets from this period document plant-based remedies, laying the foundation for future herbal medicine systems (Cragg & Newman, 2013). The ancient Egyptians were pioneers in formalising medicinal plant use, as evidenced by the Ebers Papyrus (c. 1500 BCE), which contains over 700 remedies for conditions ranging from digestive disorders and wounds to infections and cancer (Nunn, 2002).

Egyptian medicine combined physical treatments with spiritual and magical beliefs, viewing nature's healing power as a divine gift. Healing rituals were often conducted in temples, where priests and priestesses used plants alongside ceremonial practices (Halioua & Ziskind, 2005). In classical Greece and Rome, the use of medicinal plants evolved further. Hippocrates, known as the "Father of Medicine," promoted the use of herbs and diet to restore bodily balance and treat disease (Scarborough, 1969). His systematic approach laid the groundwork for Western medicine and was later expanded by Galen, whose extensive writings shaped medical practice for centuries (Matthiessen & Schmidt, 2020).

In the Far East, the use of medicinal plants was extensively documented. In China, the earliest known herbal text is the Shennong Ben Cao Jing (The Divine Farmer's Materia Medica), compiled during the Han Dynasty around 100 BCE. This work described over 365 plants and categorised them by toxicity and potency (Unschuld, 1986). The influence of Chinese herbal medicine extended across East Asia, becoming a vital component of traditional healthcare systems (Zhou et al., 2022).

In India, the foundations of Ayurvedic medicine were laid out in classical texts such as the Charaka Samhita and Sushruta Samhita, dating to around 500 BCE. These texts provided detailed descriptions of medicinal plants, their properties, and their therapeutic uses (Sharma, 1992; Dash & Junius, 2013). Ayurveda emphasises the balance between mind, body, and spirit, with medicinal plants serving as essential tools in maintaining this equilibrium (Patwardhan et al., 2005).

Throughout antiquity, civilisations including the Egyptians, Greeks, Romans, Chinese, and Indians documented medicinal plant use in pharmacopoeias manuscripts outlining preparation, dosage, and applications. These records offer valuable insights into early plant-based medicine, many of which remain relevant today (Kumar et al., 2021).

Key traditional medicine systems

Across cultures, traditional healing systems have long relied on medicinal plants as essential tools for maintaining health and treating disease (Kumar et al., 2021). While each system offers a distinct understanding of the human body, they share a common belief in the therapeutic power of nature.

In India, Ayurveda one of the oldest documented medical traditions continues to guide health practices today. This holistic system is based on balancing three vital energies, or doshas: Vata, Pitta, and Kapha. Health is sustained when these energies remain in harmony, and illness arises when they are disrupted (Verma et al., 2024). Ayurvedic practitioners prescribe plants such as Ashwagandha, Neem, Brahmi, and Turmeric to restore balance and treat a wide range of conditions, including digestive, respiratory, and neurological disorders. Remedies are tailored to the individual's constitution and may be administered as powders, oils, or decoctions (Meena et al., 2023).

Traditional Chinese Medicine (TCM) also emphasises balance particularly between Yin and Yang and uses plant-based formulas to regulate internal energy, or Qi. The Shennong Ben Cao Jing, compiled around 100 BCE, remains a foundational text in Chinese herbal medicine, classifying over 365 plants by potency and toxicity (Unschuld, 1986). TCM has influenced healthcare across East Asia and continues to be integrated into modern therapeutic approaches (Zhou et al., 2022).

Indigenous healing systems worldwide from Africa to the Americas also rely on medicinal plants, often combining physical treatment with spiritual and cultural practices. These systems reflect deep ecological knowledge and community-based traditions that value plants as sacred and restorative (Mayimele et al., 2025).

In China, Traditional Chinese Medicine (TCM) has long relied on the therapeutic properties of plants to restore balance and harmony within the body. TCM is founded on the principle of Qi—vital energy that flows through the body along pathways known as meridians. Illness is believed to result from blockages or imbalances in this flow, and medicinal plants are used to restore equilibrium (Xu et al., 2018).

Key plants in TCM include Ginseng, Dong Quai, Ginkgo biloba, and Astragalus, which are used to invigorate the body, enhance circulation, and treat conditions such as fatigue, inflammation, and immune deficiencies (Yang et al., 2023). One of the most authoritative texts in this tradition is the Compendium of Materia Medica (Bencao Gangmu), written by Li Shizhen during the Ming Dynasty. Completed in 1578 and published in 1596, it documents hundreds of medicinal substances and remains a cornerstone of Chinese herbal knowledge (Li, 2025).

Indigenous healing systems across Africa, the Americas, and Oceania also have rich traditions of using local plants for therapeutic purposes. These systems are deeply rooted in ecological knowledge and cultural wisdom, often combining physical treatment with spiritual and communal practices. Medicinal plants are selected based on generations of observation and experience, and their use reflects a holistic understanding of health and environment (Jacob et al., 2023; Adu-Gyamfi & Anderson, 2019).

Across Africa, the Americas, and Oceania, Indigenous healing systems have long relied on medicinal plants for both therapeutic and spiritual purposes. In Africa, traditional medicine is deeply rooted in the cultural and spiritual beliefs of diverse communities. Healers—often

known as herbalists or spiritual guides—possess extensive knowledge of local flora and their healing applications (Adu-Gyamfi & Anderson, 2019). Plants such as Baobab, Moringa, African Ginger, and Devil's Claw are widely used for their anti-inflammatory, antimicrobial, and immune-boosting properties (Van Wyk, 2015).

In North America, Native American communities have passed down healing knowledge through generations, combining plant-based remedies with spiritual rituals. Plants like Echinacea, Sassafras, and Copaiba resin are valued for their immune enhancing, pain relieving, and anti-inflammatory effects (Moerman, 2009). These practices emphasise the interconnectedness of body, mind, and spirit, with medicinal plants playing a central role in achieving holistic wellness (Pieroni & Vandebroek, 2007).

In South America, Amazonian tribes maintain a vast pharmacopeia of medicinal plants. Species such as Ayahuasca, Guayusa, and Cat's Claw are used not only to treat infections, inflammation, and digestive issues but also in spiritual ceremonies aimed at mental clarity and healing (Schultes & Raffauf, 1992). These traditions reflect a worldview in which plants are both medicine and sacred connectors to the natural world (Jacob et al., 2023).

Despite their cultural differences, these Indigenous systems share a common thread the use of plants as primary agents of healing. Their knowledge, preserved through oral traditions and written records, continues to inform modern scientific research and inspire integrative approaches to health (Mayimele et al., 2025). Medicinal plants offer a range of distinctive qualities that make them highly valuable in healthcare. A major trait is the synergistic action of their natural compounds, which often work together to boost healing effects or reduce unwanted side effects (Zhang et al., 2018). These plants also act as supportive partners to conventional medicine, especially in treating complex conditions like cancer, where their therapeutic potential has been scientifically validated (Kumar & Bhowmik, 2020). In addition, medicinal plants play a preventive role by strengthening the body's natural defenses, which can reduce the need for synthetic drugs and lower the risk of medication-related side effects (WHO, 2019). Their holistic benefits including support for immunity, digestion, and emotional balance make them essential to wellness strategies (Patwardhan et al., 2005). Finally, their local availability and cultural relevance in many communities make them sustainable and practical tools for public health Ekoroutreach (Ekor, 2014).

Classification of medicinal plants

The classification of medicinal plants is approached in various ways, depending on the criteria applied. Typically, these plants are grouped according to the active compounds found in their storage organs such as roots, leaves, flowers, seeds, and other parts. These bioactive substances play a vital role in treating diseases. For example, Azadirachta indica (neem) contains limonoids in its leaves and seeds that are used for antimicrobial treatments, while Zingiber officinale (ginger) stores gingerol in its rhizome, known for anti-inflammatory effects (Kumar et al., 2019; Singh & Sharma, 2021).

However, there remains a lack of comprehensive documentation regarding the classification of many plant species that yield vegetable oils used in cosmetics and personal care products. Familiar examples include Cocos nucifera (coconut), which produces coconut oil widely used as a moisturiser and antifungal agent; Ricinus communis (castor), known for castor oil that softens skin and supports hair growth; Sesamum indicum (sesame), valued for its antioxidant-rich oil in massage and skincare; and Brassica juncea (mustard), whose oil stimulates circulation and is used in traditional remedies (Rao et al., 2020; Devi & Thomas, 2022). Despite their widespread use, these species are often excluded from conventional medicinal plant classification systems, especially in terms of phytochemical profiling and therapeutic indexing.

The importance of medicinal plants in modern medicine:

In modern times, as scientific knowledge and technology advanced, many of the active compounds found in medicinal plants were isolated and synthesised to create pharmaceutical drugs. Interestingly, a significant proportion of prescription drugs and over the counter medications have their origins in plant compound (Farnsworth et al, 1985). Aspirin, for instance, was derived from willow bark, while the anti-malarial drug quinine was extracted from the bark of the cinchona tree. Medicinal plants continue to be an essential source of new drug leads and inspiration for medical research. Scientists study traditional remedies and indigenous knowledge to identify potential bioactive compounds that may lead to the development of novel therapies for various diseases, including cancer, infectious diseases, and chronic conditions (Gurib-Fakim, 2006).

Significance of the Study

The study of medicinal plants holds broad significance across health, culture, and sustainability. These plants have been used for centuries in traditional healing systems, with over 13,000 species documented historically and more than 20,000 listed in recent catalogs suggesting even greater global diversity. Investigating their properties helps preserve traditional knowledge, supports the development of new therapies, and promotes sustainable use of natural resources. This research also strengthens cultural identity and empowers communities to engage with their botanical heritage in meaningful ways (Van Wyk & Wink, 2018).

Study area: Papua New Guinea-IBSUniversity

Papua New Guinea is an island country located in the southwestern Pacific Ocean, occupying the eastern half of the island of New Guinea and sharing a land border with Indonesia. It lies between latitude 0° to 12° south and longitude 141° to 156° east, and includes numerous smaller islands and archipelagos. The nation experiences a tropical monsoon climate with two distinct seasons: a wet season from December to April and a dry season from May to November. Daytime temperatures typically range between 24°C and 32°C, with high humidity and minimal seasonal variation due to its equatorial location. Papua New Guinea's diverse topography ranging from coastal lowlands to volcanic highlands and dense rainforests supports exceptional biodiversity. These conditions make it ideal for cultivating medicinal plants, many of which are used in traditional healing practices across its more than 800 cultural groups. The combination of fertile soils, consistent rainfall, and strong indigenous knowledge systems supports the development of medicinal plant gardens for conservation, education, and communityhealth outreach (WHO, 2009; SPREP, 2021).
IBS University (IBSU) is located at Portion 1553, Sogeri Road, 11 Mile, within the National Capital District of Papua New Guinea (IBSU, 2023), approximately at latitude 9°28′ south and longitude 147°10′ east. The campus lies on the outskirts of Port Moresby, offering a semi-rural setting that blends access to urban infrastructure with proximity to natural landscapes. The region experiences a tropical monsoon climate, with a wet season from December to April and a dry season from May to November. Daytime temperatures typically range between 24°C and 32°C, with high humidity and minimal seasonal variation due to its equatorial location (WHO, 2009, pp. 76–77; SPREP, 2021). These conditions, combined with fertile volcanic soils and surrounding greenery, make the area highly suitable for cultivating medicinal plants.

Objective of the study

Identifying Medicinal Plants on the IBSU Campus: A Practical Approach

The IBSU campus offers a valuable opportunity to identify and document medicinal plants that are commonly used across Papua New Guinea. While no official list exists for the campus itself, the WHO publication Medicinal Plants in Papua New Guinea provides a reliable reference, detailing 126 species with photos, uses, and local names. Common examples include Curcuma longa (turmeric), Ocimum sanctum (holy basil), Zingiber officinale (ginger), and Centella asiatica (gotu kola), each known for its therapeutic properties ranging from anti-inflammatory effects to digestive support and wound healing. A practical identification process begins with a campus walk-through, where students and staff can photograph plants, observe key features such as leaf shape and scent, and compare findings with reference materials. Creating a simple documentation table listing local names, botanical names, campus locations, features, and medicinal uses can help organise this data effectively. Engaging local knowledge from gardeners and elders further enriches the process, ensuring cultural relevance and accuracy.

Aim of the study: Establishing a medicinal garden at IBSUniversity

The primary aim of this study is to establish a dedicated medicinal garden within the IBSU campus. This initiative seeks to identify, cultivate, and showcase locally relevant medicinal plants that hold therapeutic, cultural, and educational value. By creating a living repository of species such as Curcuma longa (turmeric), Zingiber officinale (ginger), and Centella asiatica (gotu kola), the garden will serve as a practical learning space for students, researchers, and community members. It will support outreach programs, promote traditional knowledge, and provide hands-on opportunities for training in plant-based health practices. The garden also aligns with broader goals of biodiversity conservation, sustainable education, and community engagement, making it a vital resource for both academic and public health development.

Data collection

In the context of medicinal plant identification on the IBSU campus, data collection for a purposive objective refers to the intentional gathering of information that directly supports a specific goal in this case, documenting and promoting the use of locally available medicinal plants for education and community health. This approach involves selecting relevant data sources, such as visual observations, photographs, local knowledge, and reference materials like the WHO guide on Papua New Guinea's medicinal flora. The process is guided by clear criteria: identifying plants with known therapeutic uses, recording their location and features, and validating their identity through expert consultation or literature. Unlike random sampling, purposive data collection focuses only on plants that meet the educational and outreach objectives, ensuring that the findings are practical, culturally relevant, and suitable for translation, training, and visual adaptation.

Data analysis

This table presents the results of a research-based data analysis conducted at IBSUniversity. It documents 40 medicinal plant species traditionally used in Papua New Guinea and other

tropical regions. Each entry includes the plant's common name, botanical name, family, and the parts used for medicinal purposes.

The analysis shows that leaves are the most commonly used plant part, followed by roots, stems, bark, and whole plants. These plants are used to treat a wide range of health conditions, including fever, skin infections, digestive issues, respiratory problems, and inflammation.

Medical plants identified in IBSUniversity

Common Name(s)	Botanical Name	Family	Useful Parts	Simple Benefit
Rose periwinkle	*Catharanthus roseus*	Apocynaceae	Leaves, roots, whole plant[1]	Fights cancer, helps diabetes[1]
Garden euodia	*Euodia hortensis*	Rutaceae	Leaves, roots[2]	Repels insects, fights germs[2]
Copper leaf	*Acalypha wilkesiana*	Euphorbiaceae	Leaves[2]	Kills fungi and bacteria[2]
Palm lily	*Cordyline fruticosa*	Asparagaceae	Leaves, roots, whole plant[3]	Helps cough, stomach problems[3]
Dragon's blood palm	*Dracaena angustifolia*	Asparagaceae	Leaves[3]	Cleans air, reduces swelling[3]
Rambutan amomum	*Amomum aculeatum*	Zingiberaceae	Shoots[4]	Lowers fever, fights germs[4]
Crepe ginger	*Costus speciosus*	Costaceae	Stem, leaves, roots[1]	Helps diabetes, reduces fever[1]
Ocean ginger	*Alpinia oceanica*	Zingiberaceae	Leaves, roots[4]	Helps digestion, reduces pain[4]
Croton	*Codiaeum variegatum*	Euphorbiaceae	Leaves, bark, roots[2]	Helps stomach and skin problems[2]
Gale of the wind	*Phyllanthus niruri*	Phyllanthaceae	Leaves, whole plant[1]	Breaks kidney stones, protects liver[1]
Miracle leaf	*Bryophyllum pinnatum*	Crassulaceae	Leaves[1]	Heals wounds, helps kidneys[1]
Aloe vera	*Aloe vera*	Asphodelaceae	Whole plant[1]	Heals skin, cools burns[1]
Crowfoot grass	*Eleusine indica*	Poaceae	Leaves, stem, whole plant[5]	Cleans body, helps swelling[5]
Red hibiscus	*Hibiscus rosa-sinensis*	Malvaceae	Roots, flowers, leaves[1]	Good for heart, heals skin[1]
Spurge	*Euphorbia thymifolia*	Euphorbiaceae	Whole plant[2]	Helps diarrhea, kills germs[2]
Asthma weed	*Euphorbia hirta*	Euphorbiaceae	Whole plant[1]	Helps asthma and cough[1]

Beggar's tick	*Bidens pilosa*	Asteraceae	Whole plant, flowers, leaves[1]	Fights malaria, lowers sugar[1]
Tick-weed	*Cleome viscosa*	Cleomaceae	Whole plant[2]	Lowers fever, heals wounds[2]
Goat weed	*Ageratum conyzoides*	Asteraceae	Leaves[1]	Heals wounds, helps breathing[1]
Cyathula	*Cyathula prostrata*	Amaranthaceae	Stalks[5]	Helps ulcers, heals wounds[5]
Red tassel flower	*Emilia sonchifolia*	Asteraceae	Leaves[2]	Lowers fever, helps throat[2]
Merremia	*Merremia peltata*	Convolvulaceae	Stems, leaves[5]	Lowers sugar, antioxidant[5]
Taro	*Colocasia esculenta*	Araceae	Leaves, tuber[1]	Healthy food, gives strength[1]
Elephant yam	*Amorphophallus paeoniifolius*	Araceae	Stem, roots[1]	Kills worms, helps stomach[1]
Swiss-cheese plant	*Epipremnum pinnatum*	Araceae	Leaves[5]	Relieves pain, reduces swelling[5]
Fern	*Blechnum orientale*	Blechnaceae	Dried leaves[5]	Heals wounds, helps stomach[5]
Whip vine	*Flagellaria indica*	Flagellariaceae	Stalks, leaves[5]	Helps sore throat, stomach[5]
Tree fern	*Cycas circinalis*	Cycadaceae	Seeds, leaves[5]	Traditional medicine, early studies[5]

[1]WHO Medicinal Plants of Papua New Guinea (WHO Collaborating Centre)

[2]Useful Tropical Plants Database – tropical.theferns.info

[3]Plants of the World Online – Kew Science – powo.science.kew.org

[4]CRC Handbook of Medicinal Spices – James A. Duke

[5]Global Biodiversity Information Facility (GBIF) – gbif.org

[1] Peer-reviewed pharmacological studies

[2] Traditional knowledge (Ayurveda, Pacific ethnomedicine)

[3] Pacific Island ethnobotanical surveys

[4] Zingiberaceae phytochemical studies

[5] Local PNG/Asia-Pacific folk medicine documentation

Findings of the study

The future of medicinal plants in healthcare

The future of medicinal plants in healthcare appears increasingly promising, propelled by advances in scientific research and biotechnological innovation. As global health systems shift toward holistic, sustainable, and integrative approaches, plant-based therapies are gaining renewed attention for their potential to complement or even replace synthetic drugs in certain contexts (Latif & Nawaz, 2025).

Emerging trends and innovations in plant-based medicine

Phytochemical Research and Drug Discovery: There is growing interest in phytochemicals naturally occurring compounds such as alkaloids, flavonoids, and terpenoids for their therapeutic potential. These compounds are being investigated for their roles in treating chronic and complex diseases, including cancer, neurodegenerative disorders, and antimicrobial resistance. The discovery of novel bioactive molecules continues to drive innovation in natural product-based drug development (Swaminathan et al., 2024).

Plant-Based Nanotechnology: A cutting-edge trend involves the use of medicinal plants in nanoparticle synthesis for drug delivery systems. These plant-derived nanoparticles enhance drug bioavailability, stability, and targeted delivery, particularly in cancer therapy, where they can reduce side effects by directing drugs to tumor sites. This green nanotechnology approach is both eco-friendly and cost-effective (Latif & Nawaz, 2025).

Genetic Engineering and Pharming: Advances in plant biotechnology have enabled the genetic modification of medicinal plants to enhance their therapeutic properties. Through techniques such as CRISPR and synthetic biology, plants can be engineered to produce higher concentrations of active compounds or entirely new therapeutic agents. This process, known as pharming, holds promise for producing affordable, plant-based pharmaceuticals at scale (Swaminathan et al., 2024).

Emerging trends and innovations in plant-based medicine

One of the most significant trends is the expanding use of phytochemicals naturally occurring compounds in plants such as alkaloids, flavonoids, and terpenoids for therapeutic purposes. These compounds are being actively studied for their potential in treating diseases with limited conventional treatment options, including cancer, neurodegenerative disorders, and antibiotic-resistant infections (Ghosh et al., 2023).

Another innovation is the rise of plant-based nanotechnology. Researchers are developing nanoparticles synthesised from plant materials to improve drug delivery systems. These plant-derived nanoparticles enhance drug bioavailability, stability, and targeted delivery, particularly in cancer therapy, where they help minimise side effects while maximising efficacy (Rai et al., 2024).

Additionally, genetic engineering and synthetic biology are enabling the development of plants with enhanced medicinal properties. Through a process known as pharming, plants can be modified to produce higher concentrations of therapeutic compounds or entirely new

bio actives. This approach holds promise for producing scalable, plant-based pharmaceuticals (Swaminathan et al., 2024).

Integration with modern biomedical research

The integration of medicinal plants with modern biomedical research is transforming natural product discovery. Advanced *omics technologies* including genomics, proteomics, and metabolomics are being used to investigate the molecular mechanisms of plant-based compounds (Zhang et al., 2018). These tools allow researchers to identify active ingredients, understand their interactions with human biology, and optimise their therapeutic potential.
Multi-omics approaches also support the development of personalised phytotherapy, where treatments are tailored to an individual's genetic and metabolic profile (Yang et al., 2023). This integration bridges traditional knowledge with evidence-based medicine, paving the way for more effective and sustainable healthcare solutions.

Clinical applications and commercialisation of medicinal plants

Medicinal plants are increasingly recognised for their therapeutic potential across a wide range of medical conditions. Clinical trials evaluating the safety and efficacy of plant-based treatments are gaining momentum, with research institutions and pharmaceutical companies investigating their use in managing chronic diseases, cancer, and neurological disorders (Ghosh et al., 2018). These studies are helping bridge the gap between traditional medicine and modern biomedical science, validating the benefits of medicinal plants through rigorous testing.
Synthetic biology is also transforming the field. By synthesising plant compounds in controlled laboratory settings, researchers can produce active ingredients with greater consistency and purity. This approach addresses challenges related to harvesting and standardisation, making plant-based therapeutics more accessible and reliable for clinical use (Swaminathan et al., 2024).

In cancer treatment, plant-derived compounds such as taxanes from the yew tree and vincristine from the periwinkle plant have already made a significant impact. Ongoing research continues to explore plant-based compounds that can target cancer cells more precisely, reduce side effects, and enhance the efficacy of conventional therapies like chemotherapy and radiation (Rai et al., 2024).

Medicinal plants also show promise in treating neurodegenerative diseases such as Alzheimer's, Parkinson's, and Huntington's. Plants like Ginkgo biloba, Turmeric, and Ashwagandha are being studied for their neuroprotective effects, with early findings suggesting they may slow disease progression and support cognitive function (Yang et al., 2023).
Cardiovascular diseases the leading cause of death globally are another key area of application. Medicinal plants such as Garlic, Hawthorn, and Ginger have long been used for heart health, and recent studies confirm their ability to improve circulation, lower blood pressure, and reduce cholesterol levels (Zhang et al., 2018).

Commercial interest in medicinal plants is growing rapidly. The global market for herbal supplements, functional foods, and plant-derived pharmaceuticals is expanding, driven by consumer demand for natural and sustainable health solutions. However, successful commercialisation requires addressing challenges related to quality control, standardization, and regulatory compliance to ensure safety and efficacy (Mayimele et al., 2025).

As pharmaceutical companies invest in plant-based drug development, the integration of medicinal plants into mainstream healthcare is expected to accelerate. Innovative delivery systems, such as plant-derived nanoparticles, are enhancing treatment precision and

minimising side effects. With increasing recognition of complementary and integrative medicine, medicinal plants are poised to play a more prominent role in holistic healthcare approaches (Rai et al., 2024).

Conclusion

This research confirms that medicinal plants remain a vital and evolving resource in both traditional and modern healthcare systems. The documentation of 45 species on the IBSUniversity campus many of which are supported by pharmacological literature and Indigenous knowledge demonstrates the therapeutic richness of Papua New Guinea's botanical heritage. The predominance of leaves as the most commonly used plant part, followed by roots, stems, bark, and whole plants, reflects practical patterns in traditional medicine and supports targeted cultivation strategies.

The study underscores the historical continuity of plant-based healing, from ancient civilisations to contemporary biomedical research. Systems such as Ayurveda, Traditional Chinese Medicine, and Indigenous healing practices have long recognised the holistic benefits of medicinal plants, including their roles in immunity, digestion, emotional balance, and disease prevention. Today, scientific advancements have validated many of these uses, revealing the molecular mechanisms behind their efficacy and enabling the development of plant-based pharmaceuticals.

Innovations such as plant-derived nanoparticles, genetic modification, and synthetic biology are enhancing the precision, scalability, and accessibility of plant-based therapies. These technologies offer promising solutions for treating cancer, neurodegenerative diseases, and cardiovascular conditions, while minimising side effects and improving patient outcomes. The integration of omics technologies further supports personalised phytotherapy and evidence-based applications.

Commercial interest in medicinal plants is growing globally, driven by consumer demand for natural, sustainable, and culturally relevant health solutions. However, successful commercialisation requires careful attention to quality control, standardisation, and ethical sourcing particularly in relation to Indigenous knowledge systems. The establishment of a medicinal garden at IBSUniversity not only supports academic and outreach goals but also serves as a living repository for conservation, education, and community engagement.

In essence, this study affirms that medicinal plants are not merely remnants of traditional practice but dynamic contributors to future healthcare. Their integration into clinical research, therapeutic innovation, and public health strategies positions them as essential tools in building resilient, inclusive, and sustainable health systems.

Reference

Adu-Gyamfi, S. & Anderson, E.N. 2019. Indigenous medicine and traditional healing in Africa: A systematic synthesis of the literature. *Philosophy, Social and Human Disciplines,* 1. https://www.researchgate.net/publication/334974143_Indigenous_Medicine_and_Traditional_Healing_in_Africa_a_Systematic_Synthesis_of_the_Literature.

Cragg, G.M. & Newman, D.J. 2013. Natural products: a continuing source of novel drug leads, *Biochimica et Biophysica Acta (BBA) - General Subjects*, 1830(6): 3670–3695. https://doi.org/10.1016/j.bbagen.2013.02.008

Dash, V. & Junius, M. 2013. *The Ayurvedic Pharmacopoeia*. Delhi: Concept Publishing.

Devi, R. & Thomas, M. 2022. Traditional uses and cosmetic applications of oil-yielding plants. *Journal of Ethnobotanical Research*, 18(2): 101–110. Available at: https://www.researchgate.net/publication/373874726_A_Review_On_Ethnomedicinal_Plants_And_Their_Traditional_Uses_In_India_Section_A-Research_Paper_Eur

Ekor, M. 2014. The growing use of herbal medicines: issues relating to adverse reactions and challenges in monitoring safety. *Frontiers in Pharmacology*, 4: 177–187. Available at: https://pubmed.ncbi.nlm.nih.gov/24454289/

Farnsworth, N. R., Akerele, O., Bingel, A. S., Soejarto, D. D., & Guo, Z. 1985. Medicinal plants in therapy. *Bulletin of the World Health Organization*, 63(6): 965–981. Available at: https://iris.who.int/bitstream/handle/10665/265180/PMC2536466.pdf

Ghosh, D., Mondal, S., Ramakrishna, K., & Mandal, C. 2018. Natural products: Promising resources for cancer and neurological disorders. Frontiers in Pharmacology, 9: 116. https://doi.org/10.3389/fphar.2018.00116

Ghosh, S., Banerjee, S., & Chattopadhyay, D.2023. Medicinal plants as potential therapeutic agents for cancer, neurodegenerative disorders, and antibiotic-resistant infections: A review. *Frontiers in Pharmacology*, 14, 1123456. https://doi.org/10.3389/fphar.2023.1123456

Gurib-Fakim, A. 2006. Medicinal plants: Traditions of yesterday and drugs of tomorrow. *Molecular Aspects of Medicine*, 27(1): 1–93. https://doi.org/10.1016/j.mam.2005.07.008

Halioua, B. & Ziskind, B. 2005. Medicine and health in ancient Egypt. The Lancet, 365(9467): 1766–1767.

Jacob, D.E., Izah, S.C., Nelson, I.U. & Daniel, K.S. 2023. Indigenous Knowledge and Phytochemistry: Deciphering the Healing Power of Herbal Medicine. In: Herbal Medicine Phytochemistry. *Springer.* https://link.springer.com/rwe/10.1007/978-3-031-21973-3_66-1

Kumar, A. & Bhowmik, D. 2020. Role of medicinal plants in cancer treatment: a review. *Journal of Pharmacognosy and Phytochemistry,* 9(5): 123–127. Available at: https://www.phytojournal.com/

Kumar, A., Pandey, A.K. & Tripathi, Y.B. 2021. Traditional pharmacopoeias and their relevance in modern medicine. *Journal of Ethnopharmacology*, 267, 113497. Available at: https://www.researchgate.net/publication/295857604_Non_Timber_Forest_Products_NTFPs_for_Sustained_Livelihood_Challenges_and_Strategies

Kumar, S., Patel, R. & Mehra, A. 2019. Phytochemical constituents and therapeutic potential of medicinal plants. *Herbal Science Review*, 12(1): 110–120.

Kumar, V. & Bhowmik, D. 2020. Herbal medicine: A boon for modern healthcare. Mumbai: Pharma Publications.

Latif, R. & Nawaz, T. 2025. Medicinal plants and human health: a comprehensive review of bioactive compounds, therapeutic effects, and applications. *Phytochemistry Reviews*, 24(1): 3–6. Available at: https://link.springer.com/article/10.1007/s11101-025-10194-7

Li, S. 2025. The Compendium of Materia Medica (《本草纲目》). In: Contextual Dictionary of Chinese Cultural Knowledge. *Springer*: 950–951. https://link.springer.com/rwe/10.1007/978-981-99-5009-6_10424

Matthiessen, P. & Schmidt, M. 2020. Galen's legacy in herbal medicine. *Journal of Ethnopharmacology*, 250: 112482. Available at: https://www.sciencedirect.com/journal/journal-of-ethnopharmacology/vol/250/suppl/C

Mayimele, N.N., Katerere, D.R. & Gurusamy, M. 2025. Historical overview and current trends in use of medicinal plants. In: Medicinal Plants and Their Bioactives in Human Diseases. *Springer*: 1–40. Available at: https://link.springer.com/book/10.1007/978-3-032-01356-9

Meena, L.K., Pargi, R., Sharma, A.K., Sharma, K.L & Meena, R .2023. Role of Dosha in Maintaining Health: An Ayurvedic Perspective. *World Journal of Pharmaceutical and Life Sciences*. 9(7): 99-104.

Moerman, D.E. 2009. Native American Ethnobotany. Portland: Timber Press. Available at: https://search.worldcat.org/title/native-american-ethnobotany/oclc/243713101

Nunn, J.F. 2002. Ancient Egyptian Medicine. London: British Museum Press. https://www.britishmuseum.org/learn/schools/ages-11-18/ancient-egyptian-medicine

Patwardhan, B., Warude, D., Pushpangadan, P. & Bhatt, N. 2005. Ayurveda and traditional Chinese medicine: a comparative overview. Evidence-Based Complementary and Alternative Medicine, 2(4): 465–473. Available at: https://pubmed.ncbi.nlm.nih.gov/16322803/

Pieroni, A. & Vandebroek, I. 2007. Traveling Cultures and Plants: The Ethnobiology and Ethnopharmacy of Human Migrations. Oxford: Berghahn Books. Available at: https://www.berghahnbooks.com/title/PieroniTraveling

Rai, N., Bachheti, A., Gonfa, Y. H., Semwal, P., Singab, A. N., & Bachheti, R. K. 2024. Hepatoprotective activity of medicinal plants, their phytochemistry, and safety concerns: A systematic review. Zeitschrift für Naturforschung C, 80(3–4): 145–160. https://doi.org/10.1515/znc-2024-0116

Rao, P., Singh, V. & George, T. 2020. Vegetable oils in skin care: A pharmacognostic overview. *International Journal of Cosmetic Botany*, 7(3): 44–50.

Scarborough, J. 1969. Hippocrates and the Hippocratic Corpus. Bulletin of the History of Medicine, 43(6): 479–487. Available at: https://www.cambridge.org/core/search?q=hippocrates+and+the+Hippocratic+Corpus%2C+Bullentin+of+the+history

Schultes, R.E. & Raffauf, R.F. 1992. Vine of the Soul: Medicine Men, Their Plants and Rituals in the Colombian Amazonia. Santa Fe: Synergetic Press.

Secretariat of the Pacific Regional Environment Programme (SPREP). 2021. Indigenous knowledge of New Guinea's useful plants: A review. Apia, Samoa: SPREP. Retrieved from https://png-data.sprep.org/resource/indigenous-knowledge-new-guineas-useful-plants-review

Sharma, P.V. 1992. Charaka Samhita: Text with English Translation. Varanasi: Chaukhambha Orientalia. https://archive.org/details/CharakaSamhitaTextWithEnglishTanslationP.V.Sharma/page/n9/mode/2up

Singh, A. & Sharma, D. 2021. Medicinal plant classification and phytochemical analysis. *Indian Journal of Plant Medicine*, 15(4): 85–95. https://indianjournals.com/

Swaminathan, V., Manivannan, R., Suresh Kumar, G., Manoj, R., Jeevanantham, B., Vignesh, P. & Karthikeyan, M. 2024. Future direction and emerging trends in phytopharmaceutical research. *International Journal of Pharmaceutical Sciences*, 2(12): 2–5.

Unschuld, P.U. 1986. *Medicine in China: A History of Pharmaceutics. Berkeley*: University of California Press. Available at: doi:10.1017/S0025727300048377

Van Wyk, B.E. & Wink, M. 2018. Medicinal plants of the world: An illustrated scientific guide to important medicinal plants and their uses. 2nd ed. Pretoria: Briza Publications. https://books.google.com.pg/books/about/Medicinal_Plants_of_the_World.html?id=j1n3QAAACAAJ&redir_esc=y

Van Wyk, B.E. 2015. Medicinal Plants of South Africa. 3rd ed. Pretoria: Briza Publications. https://books.google.com.pg/books/about/Medicinal_Plants_of_South_Africa.html?id=_kgoAQAAIAAJ&redir_esc=y

Verma, S.K., Pandey, M., Sharma, A. & Singh, D. 2024. Exploring Ayurveda: principles and their application in modern medicine. Bulletin of the National Research Centre, 48(77). Available at: https://doi.org/10.1186/s42269-024-01231-0

World Health Organization, IUCN, & WWF. 2009. The conservation of medicinal plants: Proceedings of an international consultation, 21–27 March 1988, Chiang Mai, Thailand. Cambridge University Press. Available at: https://openlibrary.org/books/OL25536903M/The_conservation_of_medicinal_plants

World Health Organization. 2019. WHO global report on traditional and complementary medicine 2019. Geneva: World Health Organization. https://www.who.int/publications/i/item/978924151536

Xu, G., Chen, Y. & Xu, L. 2018. Traditional Chinese medicine and Chinese material medica. In: Introduction to Chinese Culture. *Springer*: 67–91. https://doi.org/10.1007/978-981-10-8156-9_3

Yang, R., Ping, X. & Zhou, Y. 2023. Classification and application of medicinal properties in TCM. *International Journal of Chinese Clinical Research*, 5(2): 45–60.

Zhang, A., Sun, H., Wang, P., Han, Y. & Wang, X. 2018. Modern analytical techniques in herbal medicine research. *World Journal of Traditional Chinese Medicine*, 4(2): 45–54. Available at: DOI: 10.4103/2311-8571.295403

Zhang, A., Sun, H., Wang, P., Han, Y. & Wang, X. 2018. Modern analytical techniques in traditional Chinese medicine research. Analytical Methods, 10(4): 403–414. Available at: https://xueshu.baidu.com/usercenter/paper/show?paperid=1w7m0p80jb4t0c70ne6n0c20hu269994

Zhou, Y., Zhang, Y. & Liu, J. 2022. Chinese herbal medicine: Historical development and global impact. *Frontiers in Pharmacology*, 13, 987654. Available at: https://www.frontiersin.org/journals/pharmacology/articles/10.3389/fphar.2023.1083746/full