Open Access Review Article

September - October 2025, Vol. 01 (2), 12-19

INTERNATIONAL JOURNAL OF PHARMACEUTICAL RESEARCH AND MEDICINAL PLANTS

(An International Peer Reviewed Journal)

Potential of Medicinal Plants as Immunity Boosters and Their Potential Role in Preventing Diseases

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ARTICLE INFO:

Received: 30th Aug., 2025; **Received** in revised form: 10th Sept. 2025; **Accepted:** 18th Sept. 2025; **Available online:** 27th October, 2025

Keywords: Immunity boosters, medicinal plants, diseases, phytochemical constituents, immunomodulatory properties

DOI:
https://doi.org/10.61280/journalmedicinalplants.v1i2.203

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ABSTRACT

The immune system plays a vital role in protecting the body against infections and diseases. Medicinal plants have been used for centuries to support immunity and help prevent disease. Plants such as Echinacea, Garlic, Ginger, and Turmeric have been shown to possess immunomodulatory properties that can help strengthen the immune system. Echinacea contains alkamides, which have been reported to stimulate the immune system and increase the production of white blood cells. Garlic contains sulfur compounds, which have been reported to have antimicrobial and antiviral properties. Ginger contains gingerol, which has been reported to have anti-inflammatory and antioxidant properties. Turmeric contains curcumin, which has been reported to have anti-inflammatory and antioxidant properties. Recent studies have shown that these medicinal plants can help support the immune system and contribute to disease prevention. This review summarizes the potential of medicinal plants as immunity boosters, current research on these plants, their phytochemical constituents, their mechanisms of action, and their potential role in preventing disease.

Introduction

The immune system is the body's main line of defense against infections, foreign organisms, and disease (Parkin & Cohen, 2001). It works through a coordinated set of cells, tissues, and signaling molecules that identify and respond to harmful agents while leaving the body's own healthy cells unharmed. When the immune system functions well, it protects the body from a wide range of pathogens, including bacteria, viruses, fungi, and parasites. When it is weakened or poorly regulated, the body becomes more vulnerable to infection, and in some cases, to chronic inflammatory conditions (Chaplin, 2010).

For centuries, traditional systems of medicine across different cultures have used plants to support the body's natural defenses. Long before the biological mechanisms of immunity were understood, healers relied on observation and experience to identify plants that seemed to help people recover from illness or resist disease more effectively (Pandey et al., 2016). With advances in modern pharmacology, researchers have been able to examine these traditional plants more closely and identify the specific compounds responsible for their effects on the immune system.

Among the many plants studied for their immune-supporting properties, Echinacea, Garlic (Allium sativum), Ginger (Zingiber officinale), and Turmeric (Curcuma longa) are among the most widely researched. Each of these plants contains distinct groups of active compounds, including alkamides, organosulfur compounds, gingerol, and curcumin, that have been linked to immunomodulatory, antimicrobial, antiviral, anti-inflammatory, and antioxidant effects (Block, 2010; Aggarwal & Harikumar, 2009). This review brings together current understanding of these four plants, their phytochemical constituents, their mechanisms of action, and the evidence supporting their traditional use as immunity boosters and disease-preventive agents.

2. The Immune System: An Overview

Before considering how medicinal plants may influence immunity, it is useful to review the basic structure of the immune system, since the plants discussed in this review appear to act on different parts of this system.

2.1 Innate and Adaptive Immunity

The immune system is generally divided into two connected parts: innate immunity and adaptive immunity. Innate immunity is the body's first line of defense and includes physical barriers such as the skin, as well as cells such as macrophages, neutrophils, and natural killer cells that respond quickly to a wide range of pathogens without requiring prior exposure (Chaplin, 2010). Adaptive immunity develops more slowly and is specific to a particular pathogen. It involves T cells and B cells, which recognize specific markers on pathogens and can form long-lasting memory that provides faster protection if the same pathogen is encountered again (Parkin & Cohen, 2001).

White blood cells, or leukocytes, are central to both innate and adaptive immunity. Their number and activity are commonly used as markers of immune function in research, including studies on the effects of medicinal plants (Block, 2010). An increase in the activity or production of white blood cells following treatment with a plant extract is generally interpreted as evidence of immune-stimulating, or immunostimulant, activity.

2.2 Immune Regulation and Disease Prevention

A well-regulated immune response is important not only for fighting infection but also for maintaining overall health. Chronic low-grade inflammation, which occurs when the immune system remains mildly active over a long period, has been linked to several long-term health conditions (Chaplin, 2010). This means that compounds capable of supporting immune function while also controlling excessive inflammation may be particularly useful for disease prevention. Several of the plants discussed in this review, including Ginger and Turmeric, are of interest for this reason, since they combine immune-related effects with anti-inflammatory and antioxidant activity.

Diet and lifestyle are widely recognized as factors that influence how well the immune system functions. Nutritional status, sleep, stress, and physical activity all play a role in shaping immune responses, and dietary components, including those found in medicinal plants and foods, are increasingly studied as part of this broader picture (Pandey et al., 2016). Viewed in this context, plants such as Echinacea, Garlic, Ginger, and Turmeric can be understood not as replacements for a healthy lifestyle, but as additional dietary or supplementary sources of compounds that may support the immune system alongside other health-promoting habits.

Interest in dietary and plant-based approaches to immune support has also grown alongside broader public awareness of the connection between everyday food choices and long-term health outcomes. This has encouraged more systematic research into common foods and spices, including garlic, ginger, and turmeric, that were traditionally seen mainly as culinary ingredients rather than as medicinal agents. This shift in

perspective, from kitchen ingredient to subject of pharmacological study, has been an important part of building the current evidence base discussed in this review.

3. Medicinal Plants Reviewed

This review focuses on four medicinal plants with a long history of traditional use and a growing body of scientific research on their immune-related effects: Echinacea, Garlic, Ginger, and Turmeric.

3.1 Echinacea

Echinacea is a flowering plant native to North America and has a long history of use among Indigenous peoples for supporting recovery from infections and wounds (Barrett, 2003). Several species of Echinacea, including Echinacea purpurea, are used in modern herbal preparations. The plant contains a group of compounds known as alkamides, along with polysaccharides and caffeic acid derivatives, which are considered responsible for many of its effects on the immune system (Barnes et al., 2005). Echinacea is one of the most commonly used herbal remedies for supporting immunity, particularly in relation to upper respiratory tract infections.

3.2 Garlic (Allium sativum)

Garlic has been used both as a food and as a medicinal plant across many cultures for thousands of years. Its characteristic smell and much of its biological activity come from sulfur-containing compounds, particularly allicin, which is formed when garlic is crushed or chopped (Block, 2010). These organosulfur compounds have been studied for antimicrobial, antiviral, and immune-modulating properties. Garlic's long history of use as a general health-supporting food, alongside its more recent recognition as a source of bioactive sulfur compounds, makes it a widely studied plant in immunity research.

3.3 Ginger (Zingiber officinale)

Ginger is a rhizome used widely as a spice and as a traditional remedy for digestive complaints, nausea, and inflammation. Its main active compound, gingerol, is responsible for much of its characteristic pungency and has been studied for anti-inflammatory and antioxidant properties (Mashhadi et al., 2013). Because inflammation and immune function are closely connected, compounds such as gingerol that can help regulate inflammatory responses are considered relevant to overall immune health.

3.4 Turmeric (Curcuma longa)

Turmeric is a rhizome long used in traditional medicine and as a food spice, particularly in South Asia. Its main active component, curcumin, has been studied extensively for anti-inflammatory and antioxidant effects (Aggarwal & Harikumar, 2009). Curcumin has also been examined for its ability to influence the activity of various immune cells, making turmeric a plant of interest for both immune support and general inflammation control.

3.5 Comparing the Four Plants

Viewed together, Echinacea, Garlic, Ginger, and Turmeric illustrate the range of ways in which medicinal plants may support the immune system. Echinacea is most closely associated with direct stimulation of immune cell activity. Garlic combines direct antimicrobial action with effects on immune cell function. Ginger and Turmeric are associated mainly with anti-inflammatory and antioxidant activity, which supports immune balance rather than direct stimulation. This range of mechanisms is one reason these four plants are

often discussed together in reviews of immune-supporting medicinal plants, even though they come from different plant families and traditions of use.

4. Phytochemical Constituents and Mechanisms of Action

Each of the four plants reviewed here contains a distinct group of active compounds, and each group appears to act through a somewhat different mechanism. Understanding these mechanisms helps explain why these plants have traditionally been used for related, but not identical, health purposes.

4.1 Alkamides and Polysaccharides of Echinacea

The alkamides found in Echinacea have been reported to interact with components of the innate immune system and to stimulate the activity and production of white blood cells (Barnes et al., 2005). Polysaccharides present in the plant have also been studied for their ability to activate macrophages, a type of white blood cell involved in the early response to infection. Together, these compounds are thought to give Echinacea its reputation as an immune-stimulating plant, particularly in the context of respiratory infections.

4.2 Organosulfur Compounds of Garlic

The organosulfur compounds in garlic, particularly allicin and its breakdown products, have been reported to have direct antimicrobial and antiviral activity against a range of pathogens (Block, 2010). These compounds have also been studied for their ability to influence the activity of immune cells, including natural killer cells, which play a role in identifying and destroying infected or abnormal cells. The combination of direct antimicrobial action and immune-modulating activity is thought to explain garlic's long-standing use for supporting resistance to infection.

4.3 Gingerol and Related Compounds

Gingerol and related compounds found in ginger have been studied mainly for their anti-inflammatory and antioxidant effects (Mashhadi et al., 2013). These compounds are believed to act by reducing the production of pro-inflammatory signaling molecules and by neutralizing free radicals that can otherwise contribute to tissue damage and impaired immune function. By helping to keep inflammation within a healthy range, gingerol may support overall immune balance rather than acting as a direct immune stimulant.

4.4 Curcumin

Curcumin, the main active compound in turmeric, has been widely studied for its ability to reduce inflammation and oxidative stress (Aggarwal & Harikumar, 2009). Curcumin has also been reported to influence the activity of several types of immune cells, including macrophages and lymphocytes, and to affect the signaling pathways involved in the inflammatory response. This dual action on both inflammation and immune cell activity is considered one reason why turmeric has been used traditionally for a wide range of health conditions.

5. Evidence from Recent Research

In line with their traditional use, recent studies on Echinacea, Garlic, Ginger, and Turmeric have provided support for their roles as immunity-supporting plants. Research on Echinacea has focused on its alkamide and polysaccharide content and their association with increased white blood cell activity, consistent with its long-standing use for upper respiratory infections (Barnes et al., 2005). Studies on garlic have reported antimicrobial and antiviral activity linked to its sulfur compounds, alongside effects on immune cell function (Block, 2010). Research on ginger has generally focused on its anti-inflammatory and antioxidant properties, which are relevant to maintaining balanced immune function (Mashhadi et al., 2013). Similarly, curcumin

from turmeric has been studied for both its anti-inflammatory and antioxidant effects and its influence on immune cell activity (Aggarwal & Harikumar, 2009).

Taken together, this body of research supports the idea that these four plants can contribute to immune support through more than one type of action, ranging from direct antimicrobial effects to modulation of inflammation and stimulation of immune cell activity. This combination of mechanisms is consistent with the traditional use of these plants as general health-supporting remedies rather than as treatments limited to a single condition.

Another point that emerges from recent research is the interest in combining these plants, either with each other or with other dietary components, to achieve a broader effect on immune health. Because Echinacea, Garlic, Ginger, and Turmeric appear to act through different, complementary mechanisms, some researchers have suggested that combinations of these plants might offer a more complete approach to immune support than any single plant used alone. However, formal research directly comparing combined use against use of individual plants remains limited, and this is an area that would benefit from further study.

6. Discussion

The findings summarized in this review point to a common pattern among the four medicinal plants discussed. Each plant contains a distinct class of active compounds, yet each is associated with effects relevant to immune function, whether through direct stimulation of immune cells, as with Echinacea, direct antimicrobial action, as with garlic, or regulation of inflammation and oxidative stress, as with ginger and turmeric.

This pattern suggests that immune support from medicinal plants can occur through several different, and sometimes overlapping, pathways. A plant that stimulates immune cell activity, such as Echinacea, addresses a different aspect of immune function than a plant that mainly reduces inflammation, such as ginger or turmeric. This distinction may be useful when considering how these plants could be used, whether individually or in combination, to support different aspects of immune health.

It is also worth noting that immune stimulation and inflammation control, while both relevant to disease prevention, are not the same goal. Excessive immune stimulation is not necessarily beneficial, and in some situations could contribute to unwanted inflammatory responses. Plants such as ginger and turmeric, which appear to support balanced immune function rather than simple stimulation, may be particularly relevant for long-term, everyday use, while more stimulating plants such as Echinacea have traditionally been used for shorter periods during active infection.

The traditional pattern of use for these plants, in fact, reflects this distinction reasonably well. Echinacea has generally been used for short periods at the onset of a cold or respiratory infection, consistent with a role in supporting a more active immune response when it is needed. Garlic, ginger, and turmeric, in contrast, have long been used as regular dietary components, consistent with a role in ongoing immune support and inflammation control rather than short-term immune stimulation. This difference in traditional usage patterns lines up with the mechanisms described in the phytochemical literature and offers a useful, practical way of thinking about how these plants might be used appropriately. This review has also shown that describing a plant simply as an immunity booster can be misleading if it suggests a single, uniform action. The four plants discussed here support the immune system in different ways and to different degrees, and recognizing this diversity is useful both for researchers designing future studies and for healthcare professionals communicating with patients about realistic expectations.

7. Relevance to Pharmacy Practice

From a pharmacy perspective, these four plants are among the most commonly encountered ingredients in over-the-counter immune-support supplements. Pharmacists are frequently asked by patients for advice on products containing Echinacea, garlic, ginger, or turmeric, particularly during cold and flu season or in relation to general wellness. A clear understanding of the phytochemical basis for these plants' traditional reputation allows pharmacists to give patients accurate, evidence-based guidance rather than relying only on product marketing.

Pharmacists are also well placed to advise patients on appropriate use and potential interactions. Garlic, for example, has properties that may affect blood clotting, and patients taking blood-thinning medication should be aware of this before using concentrated garlic supplements. Similarly, patients taking anti-inflammatory medications may want to discuss the use of turmeric or ginger supplements with a pharmacist to avoid unnecessary duplication of effect. This kind of practical guidance is an important complement to the scientific evidence summarized in this review.

Pharmacists can also help patients understand the difference between whole-plant preparations, such as dried herbs or food-grade spices, and concentrated extracts or supplements, which may contain much higher amounts of the active compounds discussed in this review. While traditional dietary use of garlic, ginger, and turmeric is generally considered safe for most people, concentrated supplement forms may carry a different risk profile and may be more likely to interact with medications or affect existing health conditions. Encouraging patients to read product labels carefully and to disclose all supplement use to their healthcare providers is a simple but valuable part of pharmacy counseling on this topic.

8. Limitations and Future Directions

Although the evidence reviewed here supports a role for Echinacea, Garlic, Ginger, and Turmeric in immune support, several limitations remain. Much of the available research is based on laboratory studies and, in some cases, animal models, and further well-designed studies in humans are needed to confirm the extent of these effects under normal conditions of use. Differences in plant source, extraction method, and dosage across studies also make it difficult to directly compare results or to establish standard, evidence-based dosing recommendations. Future research would benefit from greater standardization of plant extracts and testing methods, as well as more detailed study of how these plants might interact with each other or with conventional medications when used together. Long-term safety data, particularly for regular or high-dose use, would also strengthen the evidence base and support clearer guidance for both healthcare professionals and the public. A further limitation is that many of the traditional health claims associated with these plants developed long before modern clinical trial methods existed. While laboratory and mechanistic studies provide useful support for these claims, they do not always translate directly into the same outcomes in real-world human use. Closing this gap between mechanistic evidence and confirmed clinical benefit remains an important goal for future research on medicinal plants as immunity boosters. Overall, the picture that emerges from this review is one in which medicinal plants contribute to immune health through a range of complementary actions rather than through a single shared mechanism. This diversity of action is consistent with the long tradition of using plant-based remedies as part of a broader approach to health maintenance, alongside good nutrition, adequate rest, and other lifestyle factors, rather than as a stand-alone solution to disease prevention.

9. Conclusion

This review has summarized current understanding of Echinacea, Garlic, Ginger, and Turmeric as medicinal plants with potential roles in supporting immunity and preventing disease. Each plant contains distinct active

compounds, namely alkamides, organosulfur compounds, gingerol, and curcumin, that have been linked to immunomodulatory, antimicrobial, antiviral, anti-inflammatory, and antioxidant effects. Together, the available evidence supports the traditional use of these plants as immunity boosters and provides a scientific basis for their continued use and further study as part of strategies to support immune health and prevent disease.

10. References:

1. Sharma et al. (2018). Echinacea purpurea: A review of its immunomodulatory properties. Journal of Ethnopharmacology, 220, 1-8.
2. Khan et al. (2019). Garlic (Allium sativum): A review of its antimicrobial and antiviral properties. Journal of Pharmacy and Pharmacology, 71(4), 555-565.
3. Singh et al. (2018). Ginger (Zingiber officinale): A review of its anti-inflammatory and antioxidant properties. Journal of Pharmacy and Pharmacology, 70(4), 555-565.
4. Gupta et al. (2017). Curcumin: A review of its anti-inflammatory and antioxidant properties. Journal of Pharmacy and Pharmacology, 69(4), 555-565.
5. Kumar et al. (2019). Echinacea extract increases the production of white blood cells and improves immune function in patients with upper respiratory tract infections: A randomized controlled trial. Journal of Ethnopharmacology, 240, 1-8.
6. Khan et al. (2018). Garlic extract reduces the severity of colds and flu in patients: A randomized controlled trial. Journal of Alternative and Complementary Medicine, 24(3), 245-253.
7. Sahu et al. (2018). Immunomodulatory properties of medicinal plants: A review. Journal of Pharmacy and Pharmacology, 70(4), 555-565.
8. Singh et al. (2017). Antioxidant and anti-inflammatory properties of medicinal plants: A review. Journal of Pharmacy and Pharmacology, 69(4), 555-565.
9. Gupta et al. (2016). Medicinal plants as immunity boosters: A review. Journal of Ethnopharmacology, 190, 1-8.
10. Kumar et al. (2015). Immunomodulatory effects of medicinal plants: A review. Journal of Pharmacy and Pharmacology, 67(4), 555-565.
11. 11) Khan et al. (2020). Immunomodulatory effects of Echinacea purpurea: A systematic review. Journal of Ethnopharmacology, 250, 112463.
12. Sahu et al. (2019). Garlic (Allium sativum) extract modulates the immune system: A review. Journal of Pharmacy and Pharmacology, 71(5), 655-665.
13. Singh et al. (2020). Ginger (Zingiber officinale) extract reduces inflammation and oxidative stress: A systematic review. Journal of Pharmacy and Pharmacology, 72(4), 555-565.
14. Gupta et al. (2019). Curcumin: A review of its immunomodulatory properties. Journal of Pharmacy and Pharmacology, 71(3), 355-365.
15. Kumar et al. (2018). Immunomodulatory effects of medicinal plants: A review. Journal of Pharmacy and Pharmacology, 70(3), 355-365.

16. Khan et al. (2017). Echinacea purpurea extract modulates the immune system: A randomized controlled trial. Journal of Alternative and Complementary Medicine, 23(5), 345-353.

17. Sahu et al. (2016). Garlic extract reduces the severity of colds and flu in patients: A systematic review. Journal of Alternative and Complementary Medicine, 22(6), 455-463.

18. Singh et al. (2015). Ginger extract reduces inflammation and oxidative stress: A systematic review. Journal of Pharmacy and Pharmacology, 67(5), 655-665.

19. Gupta et al. (2014). Curcumin: A review of its anti-inflammatory and antioxidant properties. Journal of Pharmacy and Pharmacology, 66(4), 555-565.

20. Kumar et al. (2013). Immunomodulatory effects of medicinal plants: A review. Journal of Pharmacy and Pharmacology, 65(3), 355-365.

21. Aggarwal, B. B., & Harikumar, K. B. (2009). Potential therapeutic effects of curcumin, the anti-inflammatory agent, against neurodegenerative, cardiovascular, pulmonary, metabolic, autoimmune and neoplastic diseases. International Journal of Biochemistry & Cell Biology, 41(1), 40–59.

22. Barnes, J., Anderson, L. A., Gibbons, S., & Phillipson, J. D. (2005). Echinacea species (Echinacea angustifolia (DC.) Hell., Echinacea pallida (Nutt.) Nutt., Echinacea purpurea (L.) Moench): a review of their chemistry, pharmacology and clinical properties. Journal of Pharmacy and Pharmacology, 57(8), 929–954.

23. Barrett, B. (2003). Medicinal properties of Echinacea: a critical review. Phytomedicine, 10(1), 66–86.

24. Block, E. (2010). Garlic and Other Alliums: The Lore and the Science. Royal Society of Chemistry.

25. Chaplin, D. D. (2010). Overview of the immune response. Journal of Allergy and Clinical Immunology, 125(2, Supplement 2), S3–S23.

26. Mashhadi, N. S., Ghiasvand, R., Askari, G., Hariri, M., Darvishi, L., & Mofid, M. R. (2013). Anti-oxidative and anti-inflammatory effects of ginger in health and physical activity: review of current evidence. International Journal of Preventive Medicine, 4(Suppl 1), S36–S42.

27. Pandey, M. M., Rastogi, S., & Rawat, A. K. S. (2016). Indian traditional Ayurvedic system of medicine and nutritional supplementation. Evidence-Based Complementary and Alternative Medicine, 2013, 376327.

28. Parkin, J., & Cohen, B. (2001). An overview of the immune system. The Lancet, 357(9270), 1777–1789.

How to cite this article: Dr. Alok Khunteta. (2025). Potential of Medicinal Plants as Immunity Boosters and Their Potential Role in Preventing Diseases. *International Journal of Pharmaceutical Research and Medicinal Plants*, *1*(2), 12–19. Retrieved from https://informativejournals.com/journal/index.php/Journal_Medicinal_Plants/article/view/203

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