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Medicinal Plants in *Plague* Management: A Review of Traditional Persian Medicine

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A B S T R A C T

Plague, caused by Yersinia pestis, remains one of the most devastating infectious diseases in human history. While modern antibiotics have significantly reduced mortality rates, historical medical systems, including traditional Persian medicine, have documented various preventive and supportive approaches involving medicinal and aromatic plants. This review examines the role of these plants in managing plague, as described in Persian medical sources, and highlights their potential relevance in modern pharmacological research. Classical Persian physicians recommended plants such as Peganum harmala, Ferula gummosa, Myrtus communis, Zataria multiflora, Allium sativum and Boswellia sacra for air purification, reducing inflammation and strengthening the body's defences. Contemporary studies suggest that many of these plants contain bioactive compounds with antimicrobial, antioxidant and anti-inflammatory properties. However, direct evidence of their efficacy against *Y. pestis* remains limited. Further research is needed to investigate their mechanisms, safety, and potential contribution to future antimicrobial strategies.

Keywords: Medicinal herbs, Plague, Remedy

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Introduction

Yersinia pestis is the bacterium that causes the plague, a serious and extremely contagious infectious disease [1]. In lab settings, this rod-shaped, gram-negative, non-spore-forming organism manifests as short, oval bacilli [2]. In humans and animal reservoirs, especially rodents, Y. pestis can proliferate and cause severe inflammation and toxin release, which can result in systemic disease [1,2]. After entering the human body, Y. pestis first grows at the location of a local wound or insect bite before moving on to nearby lymph nodes. The painful, enlarged lymph nodes known as "buboes," which are indicative of bubonic plague, are produced by this process [3]. The bacterium causes septicemic plague, which is characterized by a high fever, widespread weakness, skin and mucous membrane hemorrhages, and multi-organ dysfunction [3]. With symptoms including fever, hemoptysis, severe pulmonary inflammation,

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and widespread weakness, pneumonic plague is the most contagious type [3,4]. Infected flea bites or direct contact with infected rodents are the main ways that the disease is spread [5]. Disease transmission is further aided by environmental factors like humid or polluted air and poor sanitation [5]. According to traditional Persian medicine, plague was caused by "corruption of the air" and an imbalance of the body's humors, which sped up the spread of toxic substances to critical organs. Antibiotics have made the plague treatable thanks to modern medicine. It has been demonstrated that when given promptly, medications like streptomycin, tetracycline, chloramphenicol, co-trimoxazole, and sulfadiazine can lower mortality rates to less than 10–20% [6]. With comparatively less attention paid to preventive environmental measures, modern treatment mainly concentrates on therapeutic intervention and disease control following infection. In the past, Persian doctors offered comprehensive advice on how to manage and prevent plague. Syrian rue, galbanum, myrtle, Shirazi thyme, garlic, saffron, Damask rose, mint, frankincense, sweet marjoram, pennyroyal, cypress, basil, lemon balm, and licorice were among the aromatic and medicinal plants used in these [7–13].

Scientific Context

Table 1 summarises the Persian medicinal plants that have traditionally been used to prevent and treat plague, alongside their botanical classification.

Table 1: Medicinal plants traditionally used in Persian Medicine for plague prevention and management

Persian Name	Common English Name	Scientific Name	Plant Family
Espand	Syrian Rue	*Peganum harmala* L.	Nitrariaceae
Barijeh	Galbanum	*Ferula gummosa* Boiss.	Apiaceae
Moord	Myrtle	*Myrtus communis* L.	Myrtaceae
Avishan-e Shirazi	Shirazi Thyme	*Zataria multiflora* Boiss.	Lamiaceae
Sir	Garlic	*Allium sativum* L.	Amaryllidaceae
Zaferan	Saffron	*Crocus sativus* L.	Iridaceae
Gol-e Mohammadi	Damask Rose	*Rosa damascena* Mill.	Rosaceae
Nana	Mint	*Mentha longifolia* (L.) L.	Lamiaceae
Kondor	Frankincense	*Boswellia sacra* Flueck.	Burseraceae
Marzanjush	Sweet Marjoram	*Origanum majorana* L.	Lamiaceae
Pooneh	Pennyroyal	*Mentha pulegium* L.	Lamiaceae
Sarv	Mediterranean Cypress	*Cupressus sempervirens* L.	Cupressaceae

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Reyhan	Sweet Basil	*Ocimum basilicum* L.	Lamiaceae
Badranjboyeh	Lemon Balm	*Melissa officinalis* L.	Lamiaceae
Shirin Bayan	Licorice	*Glycyrrhiza glabra* L.	Fabaceae

A review of classical Persian medical literature reveals that Iranian physicians developed numerous preventive and therapeutic approaches to the plague long before its microbial cause was identified. A significant proportion of these strategies centred on environmental modification, air purification and the use of aromatic medicinal plants believed to have disinfectant properties [14]. The frequent recommendation of fumigation or incense made from plants such as Syrian rue (*Peganum harmala*), galbanum (*Ferula gummosa*), myrtle (*Myrtus communis*), Shirazi thyme (*Zataria multiflora*) and frankincense (*Boswellia sacra*) demonstrates an early understanding of the importance of environmental factors in the transmission of epidemic diseases. Although these practices were formulated within a different theoretical framework, they can be viewed as preventive measures that share certain conceptual similarities with modern infection-control strategies aimed at reducing exposure to pathogenic agents. Contemporary pharmacological research has provided partial support for several of these traditional applications. Many of the medicinal plants referenced in Persian medicine are rich in bioactive constituents, such as phenolic compounds, flavonoids, terpenoids, alkaloids and volatile oils. These constituents have demonstrated antimicrobial, anti-inflammatory, antioxidant and immunomodulatory properties [15]. Thymol and carvacrol from *Zataria multiflora*, allicin from *Allium sativum* and various alkaloids present in Peganum harmala have shown inhibitory activity against a broad spectrum of microorganisms in experimental investigations [16]. Nevertheless, direct evidence confirming the efficacy of these plants against Yersinia pestis remains limited. Therefore, they should not be regarded as substitutes for established antibiotic-based therapies. Instead, the historical and empirical knowledge preserved in Persian medical sources provides a valuable basis for future scientific research. Investigating the phytochemical profiles of these plants and the mechanisms underlying their antimicrobial activities could lead to the discovery of new natural compounds and contribute to the development of additional methods for preventing and managing infectious and epidemic diseases. Traditional Persian medical texts suggest that medicinal and aromatic plants played a significant role in preventing and supporting the management of the plague. These plants were particularly recommended for purifying the air, reducing inflammation and boosting the body's defences. While direct scientific evidence of their efficacy against Yersinia pestis is limited, many of these botanicals contain bioactive compounds with well-documented antimicrobial and anti-inflammatory properties. Consequently, the rich knowledge preserved in Persian medicine could inspire future research aimed at identifying new natural compounds. Ethnobotanical research and traditional medicine studies are invaluable for documenting indigenous knowledge and longstanding practices related to medicinal plant use, providing a foundation for identifying promising natural resources and novel bioactive compounds. By integrating traditional knowledge with contemporary pharmacological approaches, these studies can guide the scientific investigation of the antimicrobial, anti-inflammatory, and other therapeutic properties of medicinal plants [17,18]. Accordingly, the systematic documentation and scientific validation of traditional medicinal plant uses are essential not only for preserving cultural and ethnomedical heritage but also for advancing natural product research and facilitating the discovery of potential new therapeutic agents [19,20].

Conclusion/Future Outlook

Traditional Persian medicine provides valuable historical evidence regarding the use of medicinal and aromatic plants to prevent and support the management of the plague. While many of these plants contain bioactive compounds with antimicrobial and anti-inflammatory properties, there is limited direct evidence of their effectiveness against Yersinia pestis. Therefore, they should not replace established antibiotic therapies, but they could potentially inform the development of future drugs. Further studies using modern pharmacological and microbiological approaches are needed to evaluate their

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mechanisms of action, safety profile, and potential role in complementary strategies for combatting infectious diseases.

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Competing interests

The authors have no competing interests to declare that are relevant to the content of this article.

Ethics approval

This study was performed in line with the principles of the Declaration of Helsinki.

Consent to participate

Informed consent was obtained from all individual participants included in the study.

Author contributions

MB and MT: Conceptualization, the original draft writing, investigation, writing including reviewing and editing and investigation and formal analysis; MT: Conceptualization, supervision, and project administration; MB and MT Conceptualization, the original draft writing, investigation, writing including reviewing and editing.

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