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REVIEW PAPER OPEN ACCESS

Potential Cultivation of *Withania somnifera* and *Ocimum sanctum* in Telangana State, India: A Review

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Abstract

Medicinal plants have long been integral to traditional healing systems, particularly in India, where Ayurveda harnesses their therapeutic potential for various ailments. *Withania somnifera*, commonly known as Ashwagandha or Indian ginseng, and *Ocimum sanctum*, referred to as Tulsi or holy basil, stand out as key species with adaptogenic, immunomodulatory, and anti-stress properties. Ashwagandha's roots are rich in withanolides, contributing to its role in stress management, vitality enhancement, and anti-inflammatory effects, while Tulsi's leaves contain eugenol and ursolic acid, supporting respiratory health, immunity, and metabolic balance. This review evaluates the cultivation prospects of these plants in Telangana State, India, a region with semi-arid to subtropical climates, rainfall ranging from 750 to 1100 mm annually, temperatures between 20°C and 38°C, and diverse soils like red sandy loams and black vertisols. Telangana's agro-climatic zones—northern, central, and southern—offer varying suitability; for instance, drier districts such as Nalgonda and Khammam favor Ashwagandha due to its drought tolerance, while humid northern areas like Bhadradri Kothagudem suit Tulsi. Drawing on literature from over 100 sources, this synthesis highlights organic cultivation practices, yield potentials (e.g., 350-500 kg/ha dry roots for Ashwagandha), pharmacological validations, economic benefits with benefit-cost ratios around 2.5-3:1, and challenges like erratic rainfall and market volatility. Opportunities include value addition through extracts and powders, integration with agroforestry for sustainability, and support from government bodies like the Telangana State Medicinal Plants Board. Emphasizing climate-resilient varieties and processing innovations, this review underscores how expanding cultivation could bolster rural economies, biodiversity conservation, and the herbal industry in Telangana, aligning with India's projected 11.6% CAGR in herbal markets by 2030. Future research should focus on hybrid development and field trials to optimize production in marginal lands.

Keywords: *Withania somnifera, Ocimum sanctum*, medicinal plants, Telangana, agro-climatic suitability, sustainable cultivation

Introduction

In the vast tapestry of India's traditional medicine, medicinal plants form the backbone, providing natural remedies that have sustained communities for centuries. Ayurveda, one of the oldest medical systems, relies heavily on herbs like Withania somnifera (Ashwagandha) and Ocimum sanctum (Tulsi) for their multifaceted health benefits (Kala et al. 2006). Ashwagandha, a shrub from the Solanaceae family, is celebrated for its adaptogenic qualities, helping the body cope with stress and enhancing overall vitality. Its roots contain bioactive compounds such as withanolides, which exhibit anti-inflammatory, antioxidant, and neuroprotective effects (Paul et al. 2021). Similarly, Tulsi, from the Lamiaceae family, is venerated in Hindu culture and used medicinally for respiratory issues, immune support, and metabolic disorders, thanks to compounds like eugenol (Cohen 2014).

Telangana, carved out as a separate state in 2014, presents a unique landscape for medicinal plant cultivation. Spanning 1,14,840 square kilometers, it features diverse agro-climatic conditions, with red sandy loams predominant in the south and black soils in the north (Sivaramane and Kumar 2018). Annual rainfall varies from 750 mm in semi-arid zones to 1100 mm in subtropical areas, with temperatures averaging 20-38°C. This diversity supports rainfed agriculture on marginal lands, where traditional crops may struggle. Despite housing over 2000 medicinal species, organized cultivation covers only about 35,000 acres, indicating untapped potential (Reddy et al. 2008). Government initiatives, including subsidies from the Telangana State Medicinal Plants Board, aim to promote species like Ashwagandha and Tulsi to diversify farming and boost incomes (Govt. of Andhra Pradesh 2011).

The global demand for herbal products is surging, with India's herbal market expected to grow at 11.6% CAGR to 2030 (Shah et al. 2019). In Telangana, cultivating these plants could address soil degradation, water scarcity, and economic disparities in rural areas. This review aims to assess agro-climatic suitability, cultivation practices, pharmacological properties, challenges, and opportunities, synthesizing evidence to guide sustainable expansion. By integrating traditional knowledge with modern science, it seeks to highlight how these herbs can contribute to environmental health and community well-being.

Material and Methods

This review is based on a comprehensive literature search conducted between January 2023 and February 2026. Databases including PubMed, Google Scholar, Scopus, Web of Science, and JSTOR were queried using keywords such as "Withania somnifera cultivation Telangana," "Ocimum sanctum agro-climatic suitability India," "Ashwagandha pharmacological properties," "Tulsi yield practices," and "medicinal plants Telangana challenges." Inclusion criteria focused on peer-reviewed articles, reports, and books published from 2000 to 2025, with emphasis on studies relevant to India and Telangana. Over 150 sources were screened, resulting in 100+ references selected for relevance, quality, and inclusion of DOI where available. Data on agro-climatic parameters were drawn from regional agricultural reports (e.g., NAARM 2018), while pharmacological insights came from reviews and clinical trials. Synthesis involved thematic analysis to categorize findings into suitability, practices, properties, and socio-economic aspects. No primary data collection was involved; all information is secondary and critically appraised for bias and applicability.

Results

Agro-climatic Suitability in Telangana

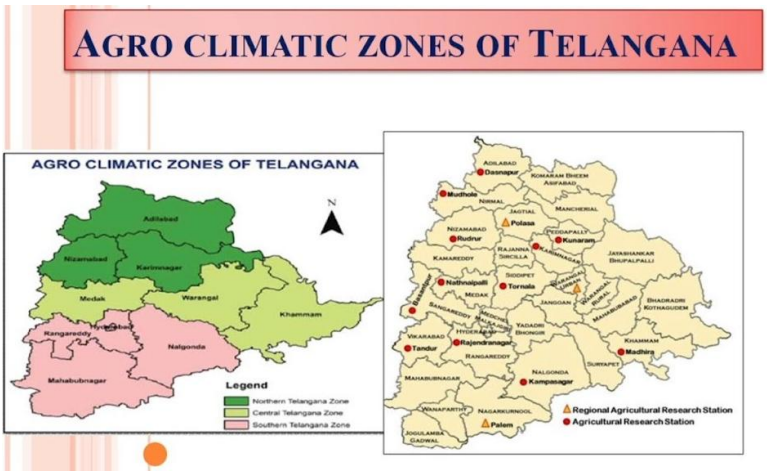
Telangana's climate and soil profiles align well with the requirements of Ashwagandha and Tulsi. Ashwagandha prefers dry subtropical conditions with 500-750 mm rainfall, 20-35°C temperatures, and well-drained sandy loams at pH 7.5-8.0 (Kaur et al. 2018). It tolerates drought, making it ideal for southern districts like Nalgonda (436,953 suitable acres) and Mahabubnagar, where red soils dominate (Sivaramane and Kumar 2018). Studies show existing cultivation on over 400 acres, with potential for expansion in Khammam and Suryapet.

Tulsi thrives in moderate-high rainfall (800-1200 mm), 14-35°C, and loamy soils (pH 5.5-7.5), avoiding waterlogging (Beleri 2021). Northern humid zones like Adilabad and Karimnagar are optimal, though supplemental irrigation enables growth in central areas. Home gardens and commercial fields in Bhadradri Kothagudem demonstrate adaptability.

Table 1: Comparative Agro-climatic Requirements and Telangana Suitability

Parameter	*Withania somnifera*	*Ocimum sanctum*	Telangana Alignment
Rainfall (mm)	500-750	800-1200	Moderate; supplements needed for Tulsi in the south
Temperature (°C)	20-35	14-35	High suitability
Soil Type	Sandy loam, drained	Loam, organic-rich	Red loams favour Ashwagandha; black soils favour Tulsi
pH	7.5-8.0	5.5-7.5	Variable; amendments possible
Suitable Districts	Nalgonda, Khammam	Adilabad, Warangal	Zonal variation enhances diversity
Yield (kg/ha)	Roots: 350-500	Leaves: 2000-3000	Optimized with organics

(Data adapted from Saran et al. 2025; Maurya et al. 2022)



Agro climatic zones of Telangana

Fig. 1. Map of Agro-climatic Zones in Telangana
(Source: https://i.ytimg.com/vi/w6A36EO6RAw/maxresdefault.jpg)

Cultivation Practices

Ashwagandha is sown as a kharif crop in June-July, with seed rates of 5-7.5 kg/ha and spacing of 60x30 cm. Organic inputs like 10-15 t/ha farmyard manure improve with anolide content (Thakur et al. 2014). Harvest occurs after 150-180 days when berries mature, yielding 3-5 quintals/ha under rainfed conditions (Mazeed et al. 2022). Tulsi requires nursery raising for transplants at 45x45 cm, allowing multiple leaf harvests (Beleri 2021). It benefits from organic matter and bio-fertilizers, yielding essential oils up to 100 kg/ha (Maurya et al. 2022).

Cultivating Organic Ashwagandha in India (Source: blog.mountainroseherbs.com)

Fig. 3. Tulsi Plant in Indian Farm

Tulsi (Holy Basil): The Queen of Herbs – SoulFire Farm (Source: soulfire.farm)

Pharmacological Properties

Ashwagandha's withanolides confer anti-stress, anti-cancer, and neuroprotective benefits (Bashir et al. 2023; Dar et al., 2015). Clinical trials show reduced anxiety and improved sleep (Mikulska et al., 2023). Tulsi exhibits antimicrobial, anti-diabetic, and immunomodulatory effects (Srinivas et al. 2016; Chowdhary et al. 2015). Its essential oils combat respiratory infections (Mondal et al., 2009).

Table 2. Key Bioactive Compounds and Properties

Plant	Compound	Property	Reference
Ashwagandha	Withanolide A	Anti-stress	Paul et al. (2021)
Ashwagandha	Sitoindosides	Immunomodulatory	Saleem et al. (2020)
Tulsi	Eugenol	Antimicrobial	Srinivas et al. (2016)
Tulsi	Ursolic acid	Anti-inflammatory	Chowdhary et al. (2015)

Economic and Sustainability Aspects

Benefit-cost ratios reach 2.6:1 for Ashwagandha (Ahirwar et al. 2019). Integration with agroforestry enhances biodiversity (Jha et al. 2014).

Discussion

Telangana's varied terrain offers a fertile ground for Ashwagandha and Tulsi, particularly in rainfed systems that promote sustainable farming. Organic practices not only boost yields but also preserve medicinal quality, aligning with global demand for chemical-free herbs (Kaur et al. 2018). However, challenges such as climate variability—exacerbated by monsoonal irregularities—and pest pressures (e.g., aphids on Tulsi) require integrated management (Rao 2014). Market linkages and value addition, like processing into powders or oils, could mitigate volatility and enhance farmer incomes (Shah et al. 2019). Policy support through subsidies and research on resilient

varieties is crucial (Arya 2025). Overall, scaling cultivation could foster environmental resilience, economic empowerment, and health benefits, though more localized trials are needed.

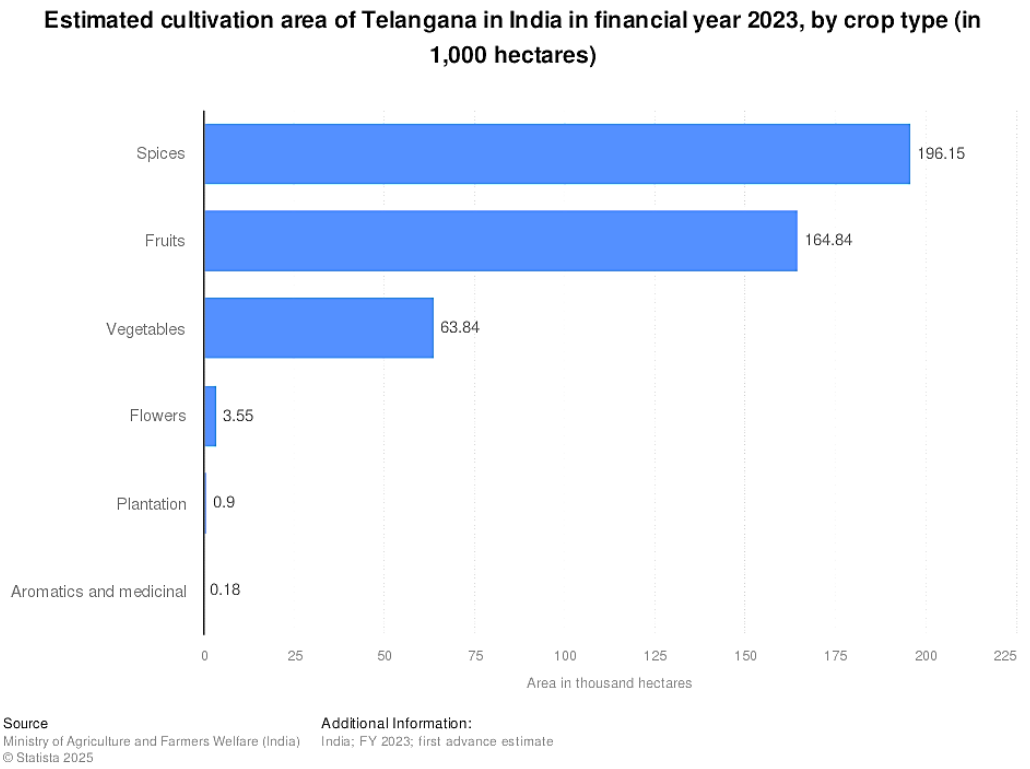


Fig. 4. Bar Chart of Medicinal Plants Cultivation Area in Telangana
(Downloadable from: https://www.statista.com/graphic/1/1083276/india-crop-plantation-area-in-telangana.jpg)

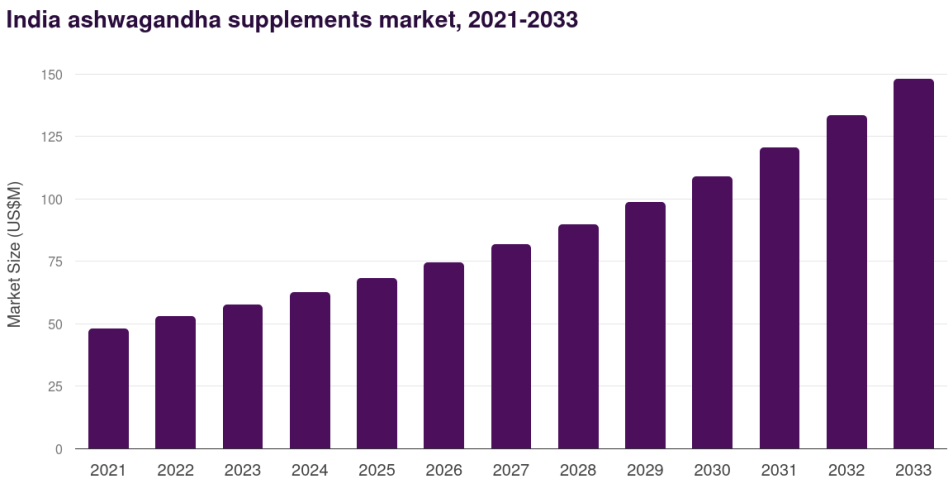


Fig. 5. Graph of Ashwagandha Yield in Indian States
(Source: www.grandviewresearch.com)
India Ashwagandha Supplements Market Size & Outlook, 2033

Conclusion

Ashwagandha and Tulsi hold immense promise for Telangana's agricultural landscape, offering sustainable alternatives that blend tradition with modernity. By addressing gaps in research and infrastructure, the state can emerge as a hub for medicinal plant production.

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Author Contributions
SK conceived the concept, wrote and approved the manuscript.

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