International Journal on Science and Technology

One Day National Seminar on

"Advances in Life Sciences for Diversity, Applications, and Human Welfare"

(ALSDAHW – 2025)

Organized by Department of Microbiology & Department of Biotechnology

M.V.S. Government Arts & Science College (Autonomous), Mahabubnagar-509001

E-ISSN: 2229-7677 • Website: www.ijsat.org • Email: editor@ijsat.org

New Distribution Record and Medicinal Significance of *Podaxis pistillaris* (L.) Fr. from Mahabubnagar District, Telangana State, India

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Abstract:

Podaxis pistillaris (L.) Fr., a cosmopolitan gasteroid fungus of the family Agaricaceae, is predominantly found in arid and semi-arid regions across the world. During a recent mycological survey in the Mahabubnagar District of Telangana State, India, this species was recorded for the first time in the region. Basidiocarps were collected from sandy soils in open scrublands and examined for macroscopic and microscopic characteristics, with identification confirmed through comparative taxonomic evaluation. This new regional record extends the known distribution of *Podaxis pistillaris* within peninsular India and provides ecological insight into its adaptation to semi-arid habitats. Beyond its ecological importance, *Podaxis pistillaris* possesses considerable potential for human welfare due to its reported bioactive compounds with antioxidant, antimicrobial, antitumor, and immunomodulatory properties. These pharmacological attributes suggest promising applications in nutraceutical and pharmaceutical research. The discovery of *Podaxis pistillaris* in this underexplored region emphasizes the need for continued fungal biodiversity surveys in the Deccan Plateau, both to enhance understanding of xerophilic mycobiota and to identify novel fungal resources beneficial to human health and wellbeing.

Keywords: *Podaxis pistillaris*, Agaricaceae, Fungal diversity, Semi-arid ecosystems, Medicinal mushrooms, Bioactive compounds, Mahabubnagar District & Telangana mycobiota.

1. Introduction:

The genus *Podaxis* Desv. comprises 44 recognized species [1] listed in Index Fungorum and represents a group of gasteroid fungi commonly known as 'desert stinkhorns' or 'stalked puffballs' due to their

distinctive morphology and remarkable adaptation to arid and xeric environments." *Podaxis pistillaris* (L.) Fr. is the most widespread species, occurring across Africa, Asia, Australia, and parts of the Americas. In India, it has been reported from Tamil Nadu [2], Haryana [3], Odisha [4], Rajasthan [5], Madhya Pradesh [6], Chandigarh [7], Maharashtra [8], Uttar Pradesh [9] and Jammu and Kashmir [10] mainly from sandy or disturbed soils. The present paper documents the first confirmed record of *Podaxis pistillaris* from Mahabubnagar District, Telangana State, thereby contributing to the fungal inventory of southern India.

2. Materials and Methods:

Fieldwork was conducted during the post-monsoon season (August–October 2024 & 2025) in the Mahabubnagar District (16.74°N, 77.98°E), characterized by semi-arid climate and red sandy loam soils. Specimens were photographed in situ and collected in sterile paper bags. Macroscopic features were recorded from fresh basidiocarps, while microscopic features were studied using a Labomed trinocular research microscope (40×) after mounting spores in lactophenol cotton blue. Spore dimensions were measured using MICAPS MicroView Software. The collected specimen was carefully dried and preserved as a voucher specimen under the accession number MVSGASC-F-2025-2608-01-3 in the Fungorum registry, representing the MVSGASC Mycological Collection. The authenticated specimen has been formally deposited in the Herbarium of the Department of Botany, M.V.S. Government Arts & Science College (Autonomous), Mahabubnagar, Telangana State, India, where it is maintained for future reference and scientific verification. The identification of the species was conducted using standard taxonomic monographs and regional checklists, including Benny and Wright (1981) and Kirk et al. (2008) [11, 12].

3. Results:

Macroscopic Characters (Fig. 1):

Basidiocarps (sporophores) measured 15–18 cm in height and were robust in appearance. The pileus was 3–8 cm long and 1.5–5 cm broad, cylindrical to ovate in shape, and did not expand at maturity. In young stages, the pileus appeared whitish with irregular margins and remained partially attached to the stipe; it became free upon maturation.

The exoperidium was whitish when immature, gradually turning flesh-colored at maturity. The surface was scaly, with membranous, evanescent scales. The endoperidium was tough, fleshy, and exhibited a silky-fibrillose texture. True gills were absent; instead, a pulverulent gleba was present. The gleba was white in immature stages, turning yellowish, then reddish-brown to blackish, and ultimately powdery at full maturity.

The stipe was centrally positioned, 8–10 cm long, uniform in diameter throughout, and abruptly bulbous at the base. It was often slightly twisted, concolorous with the pileus, and extended into the pileus apex. The interior was hollow, and the surface ranged from fibrillose to scaly, with scales sloughing off as the basidiocarp aged.

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Microscopic Characters (Fig. 2):

Basidiospores measured 7.8 × 8.6 µm, subglobose to broadly ellipsoid, occasionally globose, smooth, and hyaline. The spores were double walled, with a thickened outer wall and a distinct apical germ pore.

Fig.1. *Podaxis pistillaris* (L.) Fr. (A) Fruiting body observed in its natural environment. (B) Macromorphological and structural examination of *Podaxis pistillaris*. (C) Spores enclosed within a protective peridial layer.

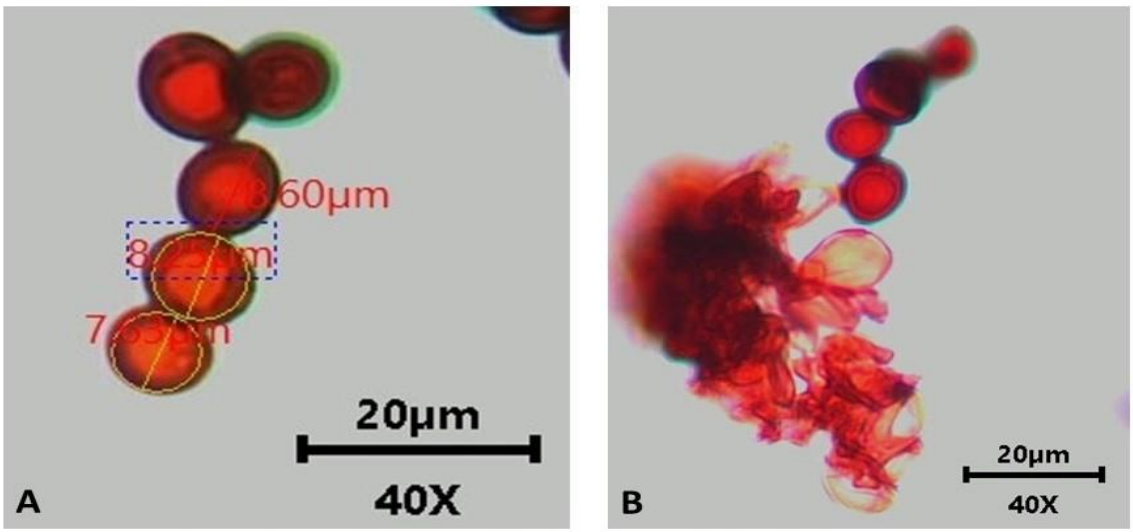

Fig.2. *Podaxis pistillaris* (L.) Fr. (A) Photomicrographs depicting basidiospores. (B) Microscopic images illustrating basidia, basidioles, and capillitial threads.

4. Discussion:

The documentation of *Podaxis pistillaris* from Mahabubnagar District represents a significant expansion of its recognized distribution within peninsular India. Previous records of this species have primarily originated from western and southern dry zones, particularly arid and semi-arid landscapes. Its occurrence in Telangana highlights the ecological flexibility of the genus and confirms its ability to establish in xeric and disturbed habitats. The specimens were observed growing on sandy soils in open scrubland areas, indicating strong adaptation to dry microhabitats. Such habitats are typically characterized by low organic matter content, suggesting that *P. pistillaris* may contribute meaningfully to the decomposition of organic substrates and nutrient cycling. This ecological function is especially valuable in semi-arid ecosystems, where organic matter turnover is naturally limited.

Morphological examination revealed that the present collection closely matches the diagnostic features previously described for the species, including sporophore morphology, peridial structure, glebal transformation, and overall taxonomic characteristics. However, a distinct variation was noted in basidiospore dimensions. The Telangana specimens exhibited smaller spores (7.8 × 8.6 µm) compared to earlier reports describing spore measurements of 14–20 × 11–14 µm. This discrepancy may reflect intraspecific variability or suggest the presence of a smaller-spored population within the species complex. Further molecular analysis, particularly sequencing of the internal transcribed spacer (ITS) region, is recommended to clarify the taxonomic status and phylogenetic position of the Telangana population. Integrative taxonomic approaches will provide greater insight into species delimitation and regional adaptation patterns within *Podaxis pistillaris*.

Medical significance: Beyond its ecological importance, *Podaxis pistillaris* demonstrates noteworthy potential for human welfare due to the presence of diverse bioactive compounds exhibiting antioxidant, antimicrobial, antitumor, and immunomodulatory activities. Such pharmacological properties highlight its promise in nutraceutical and pharmaceutical research aimed at developing safer and plant-derived therapeutic agents. The medicinal value of wild mushrooms has long been recognized by indigenous communities, where they are traditionally consumed both as food and as remedies for various ailments, reflecting their ethnomedicinal significance [13, 14].

Methanolic extracts of *Podaxis* species have shown considerable antimicrobial activity against a broad spectrum of pathogenic bacteria and fungi affecting humans as well as plants [15, 16, 17, 18]. Notably, antibacterial efficacy has been reported against clinically important pathogens including *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Bacillus subtilis*, *Serratia marcescens*, *Proteus mirabilis*, and *Micrococcus flavus* [19, 20]. These findings support its potential role in addressing microbial resistance challenges.

Ethnomedicinal applications of *P. pistillaris* are geographically diverse. In Mexico, Yuman communities apply the spore mass topically for treating wounds, burns, and skin lesions, benefiting from its anesthetic and hemostatic properties [21]. Similarly, in Yemen and parts of Africa, the fruiting bodies are traditionally used for managing skin disorders, inflammation, and sunburn (Al-Fatimi et al., 2006). The Bedouin Arabs of Sinai consume roasted fruiting bodies as a nutritious food source rich in proteins,

essential amino acids, carbohydrates, lipids, and minerals (El-Fallal et al., 2019). In Australia and West Africa, the dark spores are used as hair dye, desiccative baby powder, and even as a fly repellent [22, 23, 24].

The medicinal efficacy of *P. pistillaris* is attributed to its chemical composition, including nitrogenous compounds, proteins, carbohydrates, lipids, and mineral content [25, 26, 27, 28]. Collectively, these attributes underscore the therapeutic relevance of *Podaxis pistillaris* and support further biochemical and pharmacological investigations to validate and harness its bioactive potential for modern healthcare applications.

5. Conclusion:

The present study confirms *Podaxis pistillaris* as a newly documented species in Mahabubnagar District, significantly extending its known distribution within peninsular India. Its occurrence in sandy, semi-arid scrublands highlights both its ecological resilience and its role in nutrient cycling within resource-limited habitats. The observed variation in spore dimensions suggests possible intraspecific diversity, warranting further molecular investigation for taxonomic clarity. Beyond its ecological relevance, *P. pistillaris* demonstrates promising medicinal potential, supported by documented antimicrobial and bioactive properties. Continued integrative research combining taxonomy, molecular analysis, and phytochemical evaluation is essential to fully understand and sustainably harness its ecological and therapeutic significance.

Acknowledgements:

The authors thank the Department of Botany, M.V.S. Government Arts & Science College (Autonomous), Mahabubnagar, for laboratory facilities and field support.

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