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Incident of Vegetable Decay in Davangere City Market, Davangere Distrist, Karnataka

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ABSTRACT
Fungal pathogens are major contributors to post-harvest deterioration of vegetables, causing significant economic losses and food safety risks. In this study, healthy and diseased samples of garlic, onion, potato, parwal, and green pepper were collected from local markets and examined for fungal rot incidence. Pathogens were isolated using standard tissue isolation techniques on Potato Dextrose Agar (PDA) and Czapek's agar, and their pathogenicity was confirmed through artificial inoculation under controlled conditions. Among the tested vegetables, maximum disease incidence was recorded in garlic (16%) and potato (12–30%), whereas green chilies exhibited the lowest incidence (8.1%). A total of 19 fungal species belonging to *Aspergillus*, *Fusarium*, *Alternaria*, *Curvularia*, *Drechslera*, *Penicillium*, *Rhizoctonia*, and *Absidia* were identified. Distinct symptoms such as soft rots, watery secretion, pigmentation, mycelial growth, and foul odor were observed across hosts. The findings highlight the diversity and destructive potential of fungal pathogens in market vegetables and emphasize the urgent need for effective post-harvest disease management strategies to reduce food spoilage and health hazards.

KEYWORDS: Post-Harvest Diseases, Fungal Rots, *Aspergillus*, *Fusarium*, Vegetables, Pathogenicity, Storage Losses

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INTRODUCTION

Vegetables form an essential part of the human diet, supplying vital nutrients, fibers, and phytochemicals. However, their high moisture content and delicate physiology make them highly perishable commodities. Globally, 30–50% of vegetables are lost between harvest and consumption due to microbial spoilage, inadequate handling, and poor storage infrastructure (Tripathi et al., 2022). Post-harvest diseases caused by fungi are among the most destructive factors, leading not only to quantitative losses but also to qualitative deterioration, such as mycotoxin contamination, reduced nutritional value, and unacceptability to consumers (Kumar et al., 2021). Fungal pathogens such as *Aspergillus flavus*, *A. niger*, *Fusarium oxysporum*, *F. solani*, and *Alternaria alternata* have been frequently reported from

infected vegetables and fruits worldwide. These organisms thrive under warm and humid conditions that prevail during handling, transportation, and storage. In addition to causing visible rots, many species produce secondary metabolites including aflatoxins, fumonisins, and trichothecenes, which pose severe health risks (Ortega-Beltrán et al., 2024). Thus, fungal spoilage is a dual challenge involving both economic and food safety dimensions.

In India and other developing countries, post-harvest fungal diseases are particularly problematic because vegetables are often marketed through informal supply chains with limited cold storage and minimal disease management. Studies have reported incidence of *Fusarium* rots in potato tubers (Pan et al., 2023), *Aspergillus* and *Penicillium* species in garlic and onion bulbs, and *Curvularia* and *Drechslera* in chili and cucurbits (Prashanth Kumar et al., 2023). The spectrum of fungal pathogens varies across regions, depending on local climate and market conditions. Although several earlier works documented post-harvest fungal diseases of vegetables in India, many were limited to specific crops or regions and are now outdated. With changing climate, transport systems, and consumer demand, there is a need to update pathogen occurrence records and assess their pathogenic potential under current conditions. Recent advances also emphasize biological control and natural antifungal agents, but effective application requires a clear understanding of prevalent pathogens and their symptomatology (Pan et al., 2023).

The present study was therefore designed to investigate fungal pathogens associated with post-harvest rots of commonly consumed vegetables collected from local markets. The objectives were: (i) to record disease incidence in selected vegetables, (ii) to isolate and identify the associated fungi, and (iii) to evaluate their pathogenic potential under controlled inoculation conditions. The outcomes are expected to contribute baseline data useful for designing sustainable management strategies and reducing post-harvest losses in vegetables.

MATERIALS AND METHODS

Sample collection: Fresh and diseased vegetables (garlic, onion, potato, parwal, green pepper, green chili) were randomly collected from local markets during peak seasons. Disease incidence (%) was calculated based on the proportion of visibly infected samples.

Isolation of pathogens: Diseased tissues were surface sterilized with 0.1% mercuric chloride ($HgCl_2$), rinsed in sterile distilled water, and aseptically cut into small pieces. These were plated on Potato Dextrose Agar (PDA) and Czapek's agar. Plates were incubated at 28 ± 2 °C, and emerging fungal colonies were purified using single-spore or hyphal tip methods.

Pathogenicity tests: Isolated fungi were inoculated into healthy vegetables using the artificial inoculation method (Tandon & Mishra, 1969) with five replicates per isolate. Controls were maintained with sterile agar plugs. Inoculated samples were incubated at 28 ± 2 °C, and symptom development was recorded daily for 7–10 days.

Identification: Fungi were identified based on colony morphology and microscopic features using standard manuals.

RESULTS

Incidence of fungal rots:

- Maximum disease incidence was observed in garlic (16%) and potato (12–30%).
- Green chilies showed the least infection (8.10%).
- Infected vegetables displayed softening, discoloration (brown, black, gray), and mycelial growth.

Identified fungi and their pathogenicity:

A total of 19 fungal pathogens were isolated. Their major hosts and symptoms are summarized below:

1. *Absidia repens* – black, soft rot in garlic.
2. *Alternaria alternata* – soft rot in green pepper, garlic, onion; blackish-brown lesions.

3. *Aspergillus flavus* – severe rot in onion, green pepper, garlic; pulpy brown tissues with green sporulation and foul smell.
4. *A. fumigatus* – yellowish to blackish macerated rot in onion and garlic.
5. *A. nidulans* – brown pulpy rot in onion with watery secretion.
6. *A. niger* – black sporulating rot in garlic and onion; sticky secretion and foul odor.
7. *A. terreus* – soft rot in garlic and onion, with luxuriant sporulation and foul smell.
8. *Curvularia lunata* – soft rot in green pepper.
9. *Drechslera tetramera* – hard brown patch in garlic; tissues shriveled, garlic smell lost.
10. *Fusarium culmorum* – severe rot in potato and parwal; watery secretion in both hosts.
11. *F. moniliforme* – rot in garlic, onion, parwal, potato; repugnant odor and watery secretion.
12. *F. equiseti* – soft rot in parwal with watery secretion.
13. *F. lateritium* – hard brown rot in potato with pink lining.
14. *F. nivale* – grayish to purple soft rot with watery secretion.
15. *F. oxysporum* – rot in green pepper, garlic, parwal, potato; no odor or secretion.
16. *F. roseum* – soft rot in parwal and potato; cottony mycelial mat evident.
17. *F. solani* – brown soft rot in onion.
18. *Penicillium citrinum* – bluish-green sporulation on garlic; soft macerated tissues.
19. *Rhizoctonia solani* – yellowish-brown patch with black core in garlic; disagreeable smell.

DISCUSSION

Recent reports emphasize that *Fusarium solani* and *A. niger* are among the most common storage pathogens worldwide (Pan et al., 2023; Prashanth Kumar et al., 2023). Our findings confirm their high pathogenicity under local conditions. Importantly, fungi like *Penicillium citrinum* and *Curvularia lunata* also emerged, highlighting the need to broaden management strategies beyond traditional focus on *Aspergillus* and *Fusarium*. This study demonstrates that fungal rots remain a major cause of post-harvest vegetable spoilage, contributing to 20–30% loss. Control strategies should integrate improved storage hygiene, temperature management, and eco-friendly biocontrol agents (Kumar et al., 2021; Prashanth Kumar et al., 2023).

CONCLUSION

The present study reveals a substantial incidence and diversity of fungal pathogens associated with post-harvest decay of vegetables sold in the Davangere city markets, emphasizing the continuing challenge of microbial spoilage in local supply chains. A total of 19 fungal species were identified across garlic, onion, potato, parwal, green pepper, and green chili, with garlic and potato exhibiting the highest disease incidence, indicating their greater vulnerability under existing market conditions. Pathogenicity tests confirmed that species such as *Aspergillus niger*, *A. flavus*, *Fusarium solani*, *F. moniliforme*, and *Penicillium citrinum* possess strong rot-inducing ability, producing symptoms such as softening, discoloration, foul odour, watery secretion, and extensive mycelial growth. The detection of multiple toxin-producing fungi further highlights potential food safety risks for consumers. Overall, the findings demonstrate that fungal rots remain a major cause of quantitative and qualitative losses in vegetables, largely due to improper handling, inadequate hygiene, and lack of scientific storage practices in local markets. Strengthening storage hygiene, improving ventilation and temperature control, training vendors on sanitary handling, and promoting eco-friendly biocontrol options are essential to reduce spoilage. This study provides updated baseline information that can support future interventions aimed at minimising post-harvest losses and enhancing the quality and safety of vegetables available to consumers.

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