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Assessment of major post harvest fungal diseases of onion in Kalyana Karnataka

Ratnaprabha[1], Amaresh YS[1], Yenjerappa ST[1], Gowdar SB[1], Arunkumar H[2]
[1] Department of Plant Pathology, College of Agriculture, University of Agricultural Sciences, Raichur, Karnataka, India
[2] Special officer, Seed Unit, University of Agricultural Sciences, Raichur, Karnataka, India

Abstract
About 35 to 40 per cent onion is lost due to damage caused by storage diseases among which fungal bulb rot imparts 15 to 30 per cent losses during storage of different varieties. Post harvest diseases deteriorate the quality and quantity of the onion crop. Among which black mold, basal rot, green mold, blue mold and anthracnose are primary concern. An intensive roving survey was carried out in vegetable and APMC market of Kalyana Karnataka region during 2024-25 *viz.,* Bidar, Kalaburagi, Raichur, Yadgir, Vijayanagara, Koppal and Ballari. In each taluk50 bulbs from 3to 4 lots were selected to assess the infection and frequency of the diseases. The highest mean percent disease infection was recorded in Yadgir district (42.07%). The highest mean per cent frequency of *Aspergillus niger* was observed in Ballari district (73.33%) and the highest per cent frequency of *Penicillium* spp. was noticed in Koppal district (38.46%). Maximum per cent frequency of *Fusarium* spp. was recorded in Vijayanagara district (28.50%). Highest per cent frequency of *Aspergillus flavus* was found in Bidar district (23.00%). *Colletotrichum* spp. was detected only in Raichur district, with a frequency of 36.66 per cent.

Keywords: Onion**,** per cent frequency, per cent infection, post harvest diseases, post harvest loss

Introduction

Onion (*Allium cepa* L.) is a widely cultivated, ancient bulbous vegetable known for its unique flavour, aroma and medicinal properties. It is popularly called as "poor man's Kasturi", belongs to the family *Alliaceae* and genus *Allium* with approximately 300 species. It is an essential underground vegetable bulb of tropical and subtropical countries (Thompson and Kelly, 1979) [6]. The onion originates from the area comprising of North-West India, Afghanistan, the Soviet Republics of Tajik and Uzbek. The Mediterranean Sea is the secondary centers of origin (Choudhary, 1983) [2].

Onion is grown worldwide over an area of 5482.3 thousand hectares, with a total production of 1112 lakh tonnes and productivity of 19046 kg/ha. India is one of the world's largest producer and exporter of onion, and its stands second in the world after China with an area of 1740 thousand hectares, a total production of 302.08 lakh tonnes and a productivity of 17360.9 kg/ha. The major onion producing states are Maharashtra, Karnataka, Madhya Pradesh, Gujarat, Bihar, Andhra Pradesh, Rajasthan, Haryana and Telangana. Maharashtra ranks first in onion production with a share of 35 per cent followed by Madhya Pradesh with a share of 17 per cent (Anon., 2023).

Major post harvest diseases which affect onion are black mold (*Aspergillus niger* van Tiegh.), basal rot (*Fusarium oxysporum* Schlect.), blue mold (*Penicillium* spp.), Anthracnose (*Colletotrichum* spp.) and green mold (*Aspergillus flavus* Link.). these fungal diseases impart 15 to 30 per cent losses during storage of different varieties (Gupta and Verma, 2002) [3]. Keeping in view of the economic importance of onion and the destructive nature of post harvest diseases. An intensive roving survey was carried out to assess the infection of post harvest fungal diseases of onion.

Material and Methods

During 2024–25, an intensive roving survey was carried out across various vegetable and APMC markets to assess the incidence of major post harvest fungal pathogens of onion. The survey covered seven districts of Kalyana Karnataka, *viz*., Bidar, Kalaburagi, Raichur, Yadgir, Vijayanagara, Koppal and Ballari. From each district two to four taluks were surveyed. In each taluk50 bulbs from3to 4 lots were selected to assess the infection and frequency of the pathogens. The disease infection and frequency were calculated by using the formula

$$\text{Disease infection (\%)} = \frac{\text{No. of bulbs infected}}{\text{Total no. of bulbs observed}} \times 100$$

$$\text{Per cent frequency} = \frac{\text{No. of bulbs infected with particular pathogen}}{\text{Total no. of bulbs infected}} \times 100$$

Results and Discussion

Five fungal pathogens were isolated from the infected sample collected during survey *i, e.,* black mold caused by *Aspergillus niger* initially, they were marked by black, powdery masses of spores present on the outer scales, which could be easily rubbed off. The surface infections manifested as black streaks radiating from either the base or the top of the bulb. *Penicillium* spp., causes blue mold symptoms *viz*., infected bulbs were covered with a bluish, powdery mass and the affected scales became shriveled whereas, *Fusarium* spp., causes rotting at the base of the bulb. A whitish mycelial growth developed at the bulb base as the disease progressed leads to basal end rot (Fig. 1).

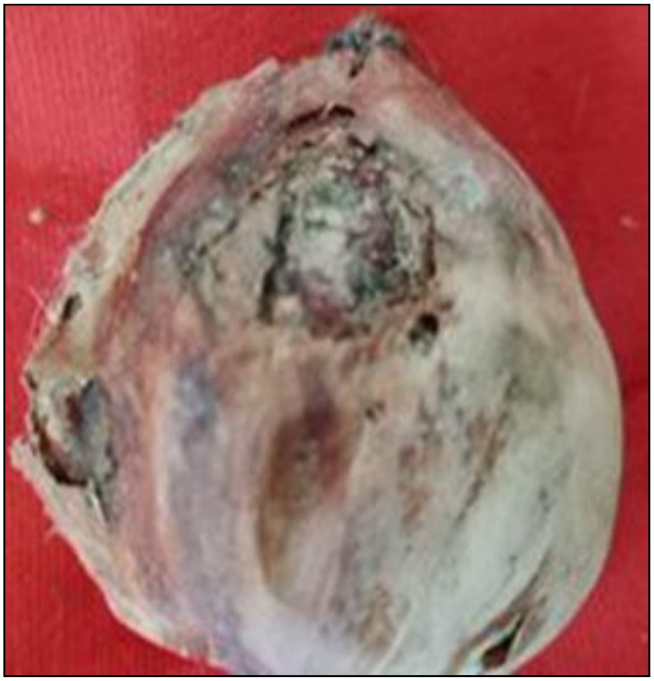
Aspergillus flavus causes green mold characterized by green, powdery masses of spores on the outer scales of the bulbs, which could be easily rubbed off. As the infection progressed, the affected bulbs turned dry and papery and *Colletotrichum* spp. causes anthracnose exhibit distinct

circular, sunken lesions that are surrounded by reddish or chlorotic margins. As the disease advances, these lesions enlarge, coalesce and become covered by black fruiting bodies appearing in concentric rings. The affected scales of the bulb turn thin, brittle and can detach easily at the lesion site (Fig. 1).

The data from the survey revealed that the per cent mean infection of post harvest diseases ranged from 27.87 to 42.07 per cent. The highest mean percent disease infection of disease was recorded in Yadgir district (42.07%), followed by Raichur (36.22%) and Bidar (36.12%). The lowest infection level was observed in Koppal district (27.87%).

Among the seven districts surveyed, the maximum per cent frequency of *Aspergillus niger* was recorded in Ballari district (73.33%), followed by Koppal district (69.26%). The minimum frequency was observed in Vijayanagara district (48.50%). The maximum per cent frequency of *Penicillium* spp. was recorded in Koppal district (38.46%), followed by Ballari (33.33%) and Bidar (33.30%) while the minimum frequency was observed in Raichur (29.29%) and Vijayanagara (29.30%). With respect to *Fusarium* spp. the highest per cent frequency was recorded in Vijayanagara district (28.50%), followed by Kalaburagi district (26.03%). The lowest

Black mold



Blue mold

Basal end rot

Anthracnose

Green mold

Fig. 1: Symptoms of post harvest fungal diseases of onion

Frequency was observed in Yadgir district (16.00 %). Highest per cent frequency of *Aspergillus flavus* was found in Bidar district (23.00%) this was followed by Raichur district (21.43%) and the minimum per cent frequency was noticed in Kalaburagi district (15.80%). Among the seven districts surveyed, *Colletotrichum* spp. was detected only in Raichur district, with a frequency of 36.66 per cent. Results were presented in (Table1 and Fig.2).

Table 1: Status of post harvest fungal pathogens of onion in different districts of Kalyana Karnataka during 2024-25

Sl. No.	Districts	Taluks	Lattitude (°)	Longitude (°)	% mean infection	% mean Frequency				
						Aspergillus niger	*Aspergillus flavus*	*Penicillium* spp.	*Fusarium* spp.	*Colletotrichum* spp.
01	Bidar	Bidar	17.89705	77.53649	47.50	54.16	12.50	33.30	-	-
		Humanabad	17.774032	77.124168	24.75	66.66	33.33	-	-	-
District mean					36.12	60.41	23.00	33.30	-	-
02	Kalaburagi	Kalaburagi	17.369046	76.827838	27.25	71.42	-	-	28.57	-
		Aland	17.335130	76.34674	37.50	52.16	15.80	31.57	-	-
		Jevargi	17.005018	76.462341	34.50	47.00	-	29.40	23.50	-
District mean					33.08	56.86	15.80	30.48	26.03	-
03	Yadgir	Yadgir	16.771357	77.136162	49.25	48.00	16.00	24.00	12.00	-
		Shahpur	16.701439	76.452657	35.75	58.80	-	41.70	-	-
		Shorapur	16.311560	76.452657	41.25	50.00	-	30.00	20.00	-
District mean					42.07	52.26	16.00	31.90	16.00	-
04	Raichur	Raichur	16.200768	77.324651	57.70	46.60	13.33	23.30	13.33	36.66
		Devadurga	16.424234	76.930202	28.60	71.40	-	-	28.57	-
		Sirwar	16.175424	77.028226	35.20	47.05	17.64	35.29	-	-
		Lingasugur	16.160692	76.519851	23.40	66.66	33.33	-	-	-
District mean					36.22	57.92	21.43	29.29	20.95	36.66
05	Koppal	Yelburga	15.614631	76.013671	28.50	61.53	-	38.46	-	-
		Kuknoor	15.491227	75.994216	27.25	77.00	-	-	23.07	-
District mean					27.87	69.26	-	38.46	23.07	-
06	Vijayanagara	Hagaribom manahalli	15.04751	76.21385	39.25	55.00	-	30.00	15.00	-
		Hoovinahad agali	15.011373	75.555466	27.45	42.00	-	28.60	42.00	-
District mean					33.35	48.50	-	29.30	28.50	-
07	Ballari	Sandur	15.08554	76.544452	30.50	73.33	-	33.33	-	-
		District mean			30.50	73.33	-	33.33	-	-

Survey and monitoring are the basis for any effective plant defence that depends on early identification of the disease followed by the timely implementation of controls (Veeresh *et al.*, 2023) [8]. Hence in the present investigation, a roving survey was carried out in seven districts of Kalyana Karnataka to assess the infection and frequency of post harvest pathogens.

The study revealed that *Aspergillus niger* and *Penicillium* spp. were the most dominant pathogens isolated from onion bulbs collected during the survey (Fig, 3). This prevalence

may be attributed to favourable storage conditions and the opportunistic nature of these fungi. Both pathogens are common saprophytes that can readily colonize onion bulbs, particularly when the bulbs are damaged or weakened due to improper storage practices.

The highest mean percent disease infection was recorded in Yadgir district (42.07%), followed by Raichur (36.22%) because fungi thrive in warm and humid conditions with temperature range around 28°C to 34°C, which favour fungal growth and infection. Yadgir, Raichur and Bidar districts located in regions with comparatively hotter and more humid climates relative to Koppal, Ballari and Vijayanagara. This climatic difference enables more aggressive fungal proliferation during the post harvest storage period. Poor drying of bulbs before storage and higher moisture content in stored onions provide ideal environments for fungal colonization and spread. Koppal, Ballari and Vijayanagara with relatively cooler, drier conditions and possibly better storage management in the districts reduce disease infection and post harvest losses.

The observations of Solanke *et al*. (1997) [5] revealed an incidence of 12.2 per cent by *Aspergillus niger* and 7.4 per cent of *Penicillium* spp. on soybean seeds. They noted that onion bulbs, being highly perishable and containing about 86.80 per cent

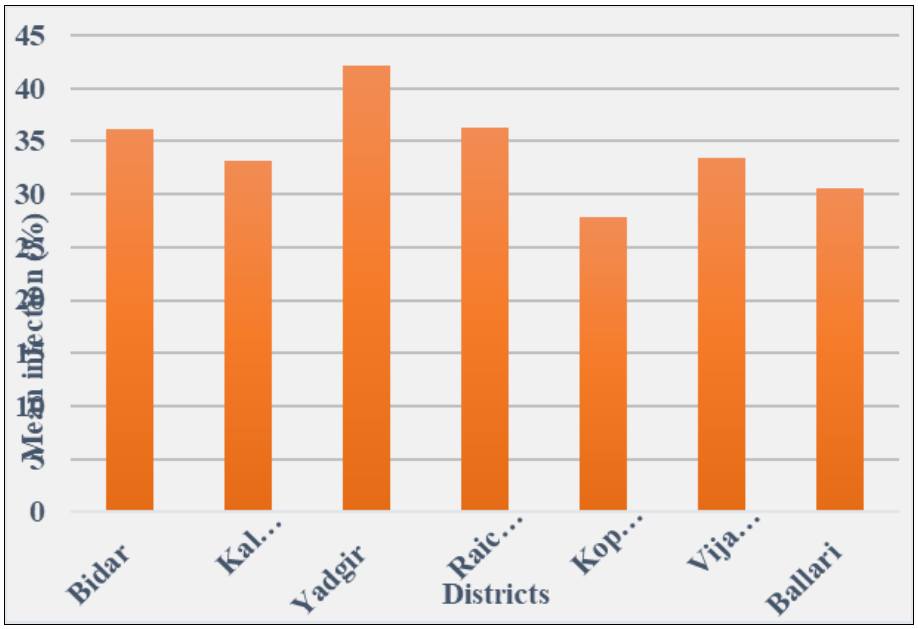


Fig. 2: District wise per cent mean infection of post harvest fungal pathogens of onion

Moisture, provided ideal conditions for the development of various postharvest fungal pathogens. Khatoon *et al.* (2017) [4] reported that Bhubaneswar locality of Odisha had with favourable environmental conditions showed maximum per cent disease incidence of black mold this suggests that environmental conditions, particularly rainfall, temperature and humidity, play a significant role in influencing disease incidence. (Yurgel *et al.*, 2018) [9] reported that globally some fungal genera are associated with bulb onion rot, namely *Aspergillus, Penicillium, Alternaria, Fusarium, Rhizopus, Colletotrichum* and *Botrytis.* According to Tischner *et al.* (2022) [7] climatic conditions have an effect on fungal pathogens prevalence and distributions.

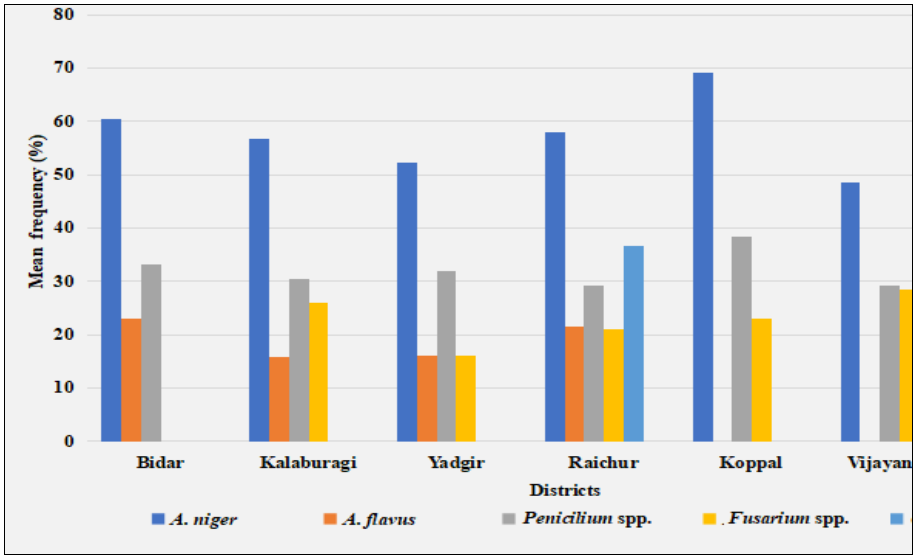


Fig. 3: District wise per cent mean frequency of post harvest fungal pathogens of onion

Conclusion

The survey on post harvest fungal diseases of onion revealed that storage conditions play a critical role in disease development and spread, with the incidence being notably higher in stored bulbs than in the field. Predominant fungi such as *Aspergillus niger, Penicillium* spp., *Fusarium* spp., *Aspergillus flavus* and *Colletotrichum* spp. were associated with significant bulb deterioration during storage. Environmental factors including temperature, relative humidity and rainfall influenced disease prevalence across different locations.

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