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Assessment of mycoflora associated with spoilage of some common fruits at Shahdol (M.P.)

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Abstract
Periodic survey of fruit market of Shahdol was done from July 2008 to June 2009 to collect useful information about spoilage of fruits from stockists and resellers of fruits to obtain fungal spoilage of four selected common fruits in the market of Shahdol city of M.P. Periodic sampling from the common fruits depicted variable intensity of fungal flora. Fungal fruit spoilage of four selected fruits were studied and all 31 spoilage fungi within 20 genera were observed. The most common fungi found were *Alternaria alternata*, *Botryodiplodia theobromae*, and *Fusarium moniliforme*. Among these species *Alternaria alternata*, *Fusarium moniliforme*, and *Aspergillus flavus* (with 16.06%, 10.87% and 5.14% disease incidence respectively) were responsible for extensive spoilage in all four common fruits at Shahdol city. Isolated fungi showed positive pathogenesis. Therefore this study gives a brief account of mycoflora associated with spoilage of some common fruits at Shahdol city.

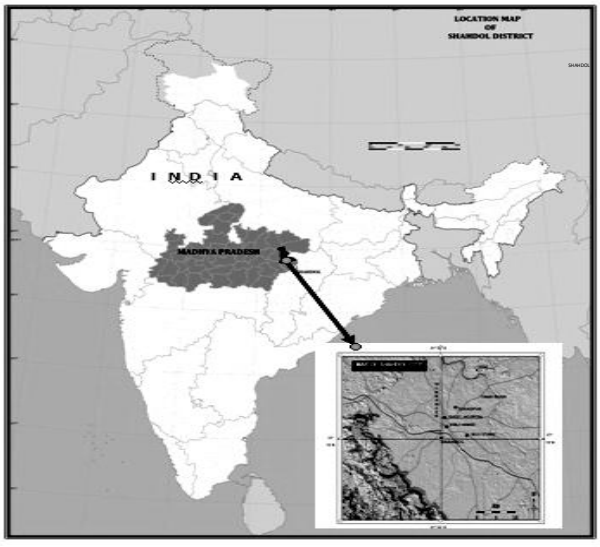
Keywords: assessment, mycoflora, fruit spoilage, common fruits

1. Introduction
During the last five years, considerable emphasis has been given to the production of horticultural crops in India. The area under fruit production has increased by 172 % during the period 1961 to 1993 and productivity per hectare has nearly doubled (from 5.52 to 10.28 T / ha). Resulting in a 320 % increase in production at the same time, considerable post-harvest losses occur in fruits and vegetables, due to lack of suitable harvesting equipment, collection centers in major producing areas, suitable packing containers, commercial storage facilities, a cold chain and proper transportation systems. Losses in fruits are estimated to vary between 20 and 30 % valued at nearly 8000 crores annually depending upon the fruit variety and the postharvest handling system. (Ahsan, 2008) [2].

Fungal fruits infection may occur during the growing season, harvesting, handling, transport and post-harvest storage and marketing conditions, or after purchasing by the consumer. Fruits contain high levels of sugars and nutrients element and their low pH values make them particularly desirable to fungal decayed (Singh and Sharma 2007) [8].

Present investigation Assessment of Mycoflora Associated with Spoilage of Some Common Fruits at Shahdol (M.P.) envisages the study of fungal pathogens responsible for the post-harvest decay and deterioration of economically important fruits of this region. Apple, mango, banana and chikoo have been selected for the study due to their economic importance in the local market.

Shahdol district is situated in north eastern part of Madhya Pradesh, under 23°17'47'N latitude and 81°21'21"E longitude. Total geographical areas sums up to 5671 sq/km. and has a population of 908148. It is bounded in the north by Satna and Sidhi district, in the east by Korea district, in the south by Anuppur district, in the west by Umaria district. The aim of this study to assess the environmental factors with mycoflora associated with spoilage of common fruits of Shahdol city. Shahdol city lies at 23°18' N Latitude and 81°22' E Longitude at about 459 meters above Mean Sea Level.



MAP - LOCATION MAP OF SHAHDOL CITY

(Source - www.wikipedia.org)

2. Materials and Methods
Periodic survey of fruits in the markets and store houses of Shahdol city of M.P. was made from July 2008 to June 2009.

Collection, Isolation, identification and Pathogenicity test of fungal pathogens from fruits
a. Collection and Isolation of fungal pathogens from fruits
The sampling of spoiled common four fruits (viz. Apple, Banana, Mango and Chikoo) was done during morning (08

a.m. to 10 a.m.). During the survey diseased fruits were brought to the laboratory in pre-sterilized polythene bags separately. The fruits were randomly collected alongwith normal healthy looking fruits so as to record the incidence of disease and visual symptoms. Percentage incidence of disease was recorded as follows –

Percent Disease Incidence = no. of diseased fruits ÷ total no. of fruits

Rotten samples were kept under refrigeration at 0^0C to prevent further deterioration. Nichrome inoculating needles duly sterilized were used to isolate & the pathogens was transferred directly to PDA aseptically. Symptoms of naturally infected fruits were recorded immediately and the causal organism was isolated in potato-dextrose-agar medium by techniques suggested by Agarwal and Hasija (1986).

b. Identification of pathogens

The materials were examined critically with respect to symptomatology and etiology. In some cases the infected tissues were stained by cotton blue and Lactophenol (Mc Lean and Ivimey 1965) [7] and observed under compound microscope. The causal organisms were identified with the help of literature (Subramaniyam, 1971; Ellis, 1971-1976; Sutton, 1980, Von Arx, 1981; Barnett and Hunter, 1981) [4, 5, 10, 11, 3]. Agharkar Research Institute (ARI), Pune. Pure cultures of the pathogens were maintained in the laboratory on PDA slants for further study.

c. Pathogenicity test

The pathogens were isolated, identified and cultures were used to confirm their pathogenicity test in their respective hosts. Fresh disease free samples were brought in to the laboratory and surface sterilized with 0.1% Hgcl2. For inoculations, cork borers of (2mm) diameter were used. They were sterilized by placing in spirit lamp flame, dipping in alcohol & shaking off the excess alcohol by flaming (Granger and Horne 1924) [6]. The inoculated samples and their respective controls were kept under sterile humid conditions at room temperature under bell jars. The artificially inoculated samples were examined daily & the extent of damage was recorded. The pathogens were reisolated and disease symptoms were clearly evident, the culture and symptoms signs were compared with original.

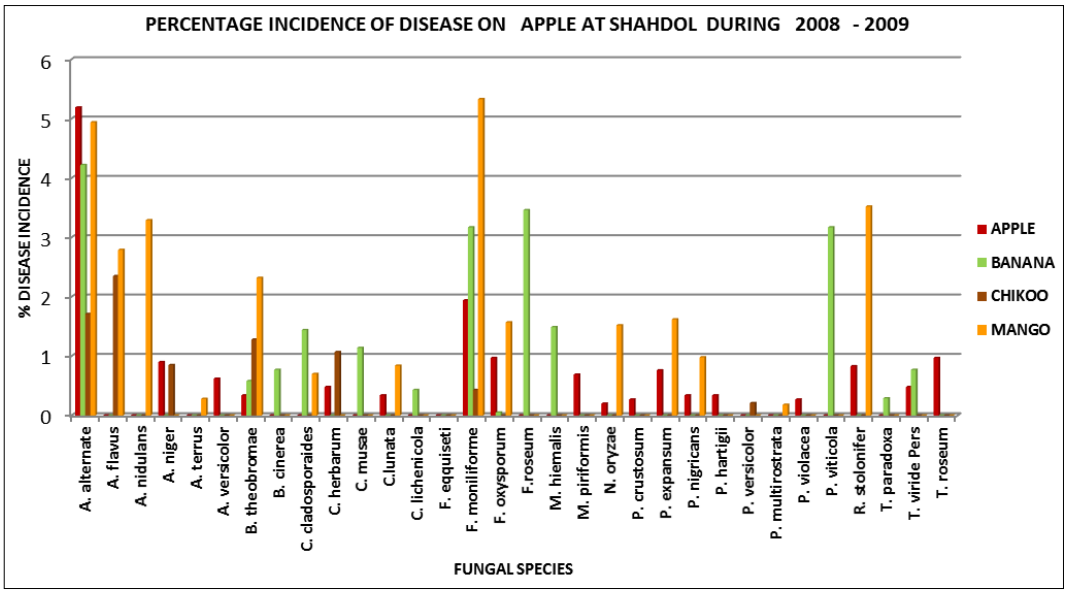
3. Results and Discussion

The table 1 shows 31 fungal species within 20 genera were found associated with fruit spoilage of selected all four common fruits. The finding of this study showed most common fungi found in all four fruit were *Alternaria alternata, Botryodiplodia theobromae*, and *Fusarium moniliforme.* Among these species *Alternaria alternata, Fusarium moniliforme,* and *Aspergillus flavus* (with 16.06%, 10.87% and 5.14% disease incidence respectively) were responsible for extensive spoilage in all four common fruits at Shahdol city. In all four common fruits highest percent disease of incidence 5.33% was found in mango due to *Fusarium moniliforme.*

Table 1: Percentage Incidence of Disease on Apple at Shahdol During 2008 – 2009

Genus	Species	Type of Fruit				
		Apple	Banana	Chikoo	Mango	% Disease Incidence
1. *Alternaria*	*A. alternate*	5.19	4.22	1.71	4.94	16.06
2. *Aspergillus*	*A. flavus*	00	00	2.35	2.79	5.14
	A. nidulans	00	00	00	3.29	3.29
	A. niger	0.90	00	0.85	00	1.75
	A. terrus	00	00	00	0.28	0.28
	A. versicolor	0.62	00	00	00	0.62
3. *Botryodiplodia*	*B. theobromae*	0.34	0.58	1.28	2.32	4.52
4. *Botrytis*	*B. cinerea*	00	0.77	00	00	0.77
5. *Cladosporium*	*C. cladosporaides*	00	1.44	00	0.70	2.14
	C. herbarum	0.48	00	1.07	00	1.55
6. *Colletotrichum*	*C. musae*	00	1.14	00	00	1.14
7. *Curvularia*	*C.lunata*	0.34	00	00	0.84	1.18
8. *Cylindrocarpon*	*C. lichenicola*	00	0.43	00	00	0.43
9. *Fusarium*	*F. moniliforme*	1.94	3.17	0.43	5.33	10.87
	F. oxysporum	0.97	0.05	00	1.57	2.59
	F.roseum	00	3.46	00	00	3.46
10. *Mucor*	*M. hiemalis*	00	1.49	00	00	1.49
	M. piriformis	0.69	00	00	00	0.69
11. *Nigrospora*	*N. oryzae*	0.20	00	00	1.52	1.72
12. *Penicillium*	*P. crustosum*	0.27	00	00	00	0.27
	P. expansum	0.76	00	00	1.62	2.38
	P. nigricans	0.34	00	00	0.98	1.32
13. *Pestalotia*	*P. hartigii*	0.34	00	00	00	0.34
14. *Pestalotiopsis*	*P. versicolor*	00	00	0.21	00	0.21
15. *Phoma*	*P. multirostrata*	00	00	00	0.18	0.18

	P. violacea	0.27	00	00	00	0.27
16. *Phomopsis*	*P. viticola*	00	3.17	00	00	3.17
17. *Rhizopus*	*R. stolonifer*	0.83	00	00	3.52	4.35
18. *Thielaviopsis*	*T. paradoxa*	00	0.29	00	00	0.29
19. *Trichoderma*	*T. viride Pers*	0.48	0.77	00	00	1.25
20. *Trichothecium*	*T. roseum*	0.97	00	00	00	0.97
Totalpercent Disease Incidence		15.93	20.98	7.9	29.88	



4. Conclusion

Present study was aim to assess the mycoflora associated with common fruits of Shahdol city. The above work signifies and confirms that 31 fungal species within 20 genera were associated with spoilage of common fruits at Shahdol. The results also revealed that poor infrastructure for storage, transportation and marketing of common fruits contributed to losses to the fruit sellers. Cold storage and better marketing practices could be minimizing the economic losses of fruit sellers. Therefore this study gives a brief account of fungal flora associated with spoilage of common fruits of Shahdol.

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