

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

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Abstract

Survey of fruit market of Shahdol was done from July 2007 to June 2008 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 was studied and all 32 spoilage fungi were observed within 20 genera. The most common fungi found were *Alternaria alternata*, *Botryodiplodia theobromae*, and *Fusarium moniliforme*. Among these species *Alternaria alternata*, *Fusarium moniliforme*, *Phomopsis viticola* and *Botryodiplodia theobromae* were responsible for extensive spoilage in all four common fruits at Shahdol city. Isolated fungi showed positive pathogenesis. Results showed highest total percentage disease incidence in mango during rainy season. Extreme environmental conditions (i.e. High temperature and high related humidity) showing increased percent disease incidence. Therefore this study gives a brief account of mycoflora associated with spoilage of some common fruits at Shahdol city.

Keywords: environmental assessment, mycoflora, fruit spoilage, fruit sellers, economic loss

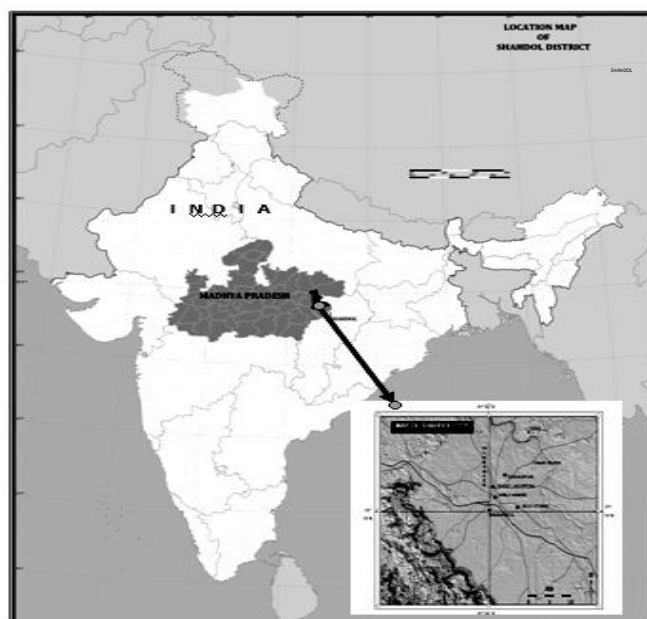
1. Introduction

Fruits have wide distribution in nature. The relatively short shelf-life period provoked by pathogens is one of the most important limiting factors that impact the economic value of fruits. Approximately 20-25% of the harvested fruits are deteriorated by pathogens during post-harvest handling even in advanced countries (Droby, 2006; Zhu, 2006) [5, 10].

Climatic conditions such as temperature and relative humidity have a strong effect on the nutritional quality of fruits. Delays between harvest and consumption or processing can result in losses of flavor and nutritional quality. The magnitude of these losses increases with exposure to temperatures, relative humidity outside the ranges that are optimum for each commodity during the entire postharvest handling system (Lee and Kader, 2000) [7]. 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 centres 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) [1].

Shahdol district is north eastern 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.



Source: www.wikipedia.org

Fig 1: Map - Location Map of Shahdol City

2. Materials and Methods

Samples were collected in the months of July 2007 to June 2008 from different fruit retailers of Shahdol city. The temperature during these months ranges from 05 - 44 ±2°C.

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.). Disease incidence was calculated by counting visibly diseased fruits each market in relation to total fruits.

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

The spoiled fruits were collected from Naigarhi market and nearby villages. Samples were brought in to the laboratory in separate sterilized polythene bags. Rotten samples were kept under refrigeration at 0°C to prevent further deterioration. Nichrome inoculating needles duly sterilized were used to isolate & the pathogens was transferred directly to PDA aseptically. The infected tissue was cut after surface application of alcohol & sterilization with 0.1% Hgcl₂ in sterilized distilled water.

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) [8] and observed under compound microscope. Identification of the pathogens was made with the help of available literature (Biligrani *et al.* 1981 and 1991, Subramanian 1971 and Barnett 1999) [9]. Some species were identified in the 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

Fungal spoilage of fruits was studied and in all 32 fruit spoiling fungal species belonging to 20 genera were observed. The finding of this study showed most common fungi found in all four fruit were *Alternaria alternata*, *Botryodiplodia theobromae*, and *Fusarium moniliforme*. Among all four common fruits Apple have maximum 18 fruit spoiling fungi followed by 14 (within 11 genera) spoilage fungi on banana, 14 (within 10 genera) and minimum of 06 (within 06 genera) spoilage fungi on chikoo were found. Among these species *Alternaria alternata*, *Fusarium moniliforme*, *Phomopsis viticola* and *Botryodiplodia theobromae* (with 17.63%, 7.53%, 5.65% and 5.49% disease incidence respectively) were responsible for extensive spoilage in all four common fruits at Shahdol city. Among all 4 common fruits maximum individual percent disease incidence was 28.66% in mango and 12.2% in chikoo as given in table 1 and 2. Among these highest Percent Disease Incidence 53.64 % was in Mango during rainy season and lowest percent disease of incidence was in Banana during winter season. The present investigation revealed Fruit spoilage fungi during extreme environmental conditions (rainy season) showing increased percent disease incidence in the Shahdol city. During rainy season temperature and related humidity were high in all four fruit seasonal percent disease incidence were respectively highest in all seasons.

Table 1: List of Fungi Recorded In Spoiled Fruits of Shahdol.

Genus	Species	Type of Fruit			
		Apple	Banana	Chikoo	Mango
Alternaria	A. Alternata	+	+	+	+
Aspergillus	A. Flavus	-	-	+	+
	A. Nidulans	-	-	-	+
	A. Niger	+	-	+	-
	A. Terrus	-	-	-	+
	A. Versicolor	+	-	-	-
Botryodiplodia	B. Theobromae	+	+	+	+
Botrytis	B. Cinerea	-	+	-	-
Cladosporium	C. Cladosporioides	-	+	-	+
	C. Herbarum	+	-	+	-
Colletotrichum	C. Musae	-	+	-	-
Curvularia	C. Lunata	+	-	-	+
Cylindrocarpon	C. Lichenicola	-	+	-	-
Fusarium	F. Equiseti	-	+	-	-
	F. Moniliforme	+	+	+	+
	F. Oxysporum	+	+	-	+
	F. Roseum	-	+	-	-

Mucor	M. Hiemalis	-	+	-	-
	M. Piriformis	+	-	-	-
Nigrospora	N. Oryzae	+	-	-	+
Penicillium	P. Crustosum	+	-	-	-
	P. Expansum	+	-	-	+
	P. Nigricans	+	-	-	+
Pestalotia	P. Hartigii	+	-	-	-
Pestalotiopsis	P. Versicolor	-	-	+	-
Phoma	P. Multirostrata	-	-	-	+
	P. Violacea	+	-	-	-
Phomopsis	P. Viticola	-	+	-	-
Rhizopus	R. Stolonifer	+	-	-	+
Thielaviopsis	T. Paradoxa	-	+	-	-
Trichoderma	T. Viride	+	-	-	-
Trichothecium	T. Roseum	+	+	-	-
Total Genera - 20		14	11	06	10
Total Species - 32		18	14	07	14

+: Present, - : Absent

Table 2: Percentage Incidence of Disease on Apple at Shahdol during 2007-2008

Genus	Species	Type of Fruit				% Incidence
		Apple	Banana	Chikoo	Mango	
Alternaria	A. alternata	4.43	4.85	2.64	5.71	17.63
Aspergillus	A. flavus	-	-	1.32	0.66	1.98
	A. nidulans	-	-	-	2.85	2.85
	A. niger	0.78	-	1.65	-	2.43
	A. terrus	-	-	-	0.74	0.74
	A. versicolor	0.85	-	-	-	0.85
Botryplodia	B. theobromae	0.42	2.26	1.32	1.49	5.49
Botrytis	B. cinerea	-	0.6	-	-	0.6
Cladosporium	C. cladosporoides	-	1.29	-	0.36	1.65
	C. herbarum	0.35	-	1.32	-	1.67
Colletotrichum	C. musae	-	1.50	-	-	1.5
Curvularia	C.lunata	0.28	-	-	2.06	2.34
Cylindrocarpon	C. lichenicola	-	4.63	-	-	4.63
Fusarium	F. equiseti	-	1.29	-	-	1.29
	F. moniliforme	2.14	1.45	0.32	3.62	7.53
	F. oxysporum	0.64	0.53	-	1.51	2.68
	F.roseum	-	1.02	-	-	1.02
Mucor	M. hiemalis	-	0.53	-	-	0.53
	M. piriformis	0.57	-	-	-	0.57
Nigrospora	N. oryzae	0.35	-	-	0.85	1.2
Penicillium	P. crustosum	0.35	-	-	-	0.35
	P. expansum	0.92	-	-	2.85	3.77
	P. nigricans	0.50	-	-	2.30	2.8
Pestalotia	P. hartigii	0.57	-	-	-	0.57
Pestalotiopsis	P. versicolor	-	-	3.63	-	3.63
Phoma	P. multirostrata	-	-	-	0.91	0.91
	P. violacea	0.78	-	-	-	0.78
Phomopsis	P. viticola	-	5.65	-	-	5.65
Rhizus	R. stolonifer	0.21	-	-	2.75	2.96
Thielaviopsis	T. paradoxa	-	0.59	-	-	0.59
Trichoderma	T. viride	0.57	-	-	-	0.57
Trichothecium	T. roseum	0.57	0.54	-	-	1.11
Total percent Disease Incidence		15.28	26.73	12.2	28.66	81.76

- : Fungus not reported

Table 3: Seasonal Percent disease incidence on common fruits during this investigation.

Season of survey	Type of fruit (seasonal Percent disease incidence)			
	Apple	Banana	Chikoo	Mango
RAINY (July- Oct.)	17.16	53.64	-	33.37
WINTER (Nov. – Feb.)	12.71	6.48	15.11	-
SUMMER (Mar. - Jun)	17.40	22.84	3.85	47.55

- : fruits not available in Shahdol city market

4. Conclusion

Present study was aim to assess the fruit spoilage mycoflora with respect to environmental factors. The above work signifies and confirms that environmental factors affect fruit spoilage. The earlier results 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 fruit spoilage in relation to environmental conditions.

5. References

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