

Assessment of fungal spoilage and economic loss of some common fruits at Tehsil - Mauganj, Disst. – Rewa (M.P.)

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Abstract

The survey of Fungal Spoilage and Economic Loss of Some common Fruits in the markets of town – Mauganj and nearby villages of Tahsil – Mauganj, Disst – Rewa (M.P.) was undertaken. 150 fruit vendors were randomly selected and interviewed to obtain socio-economic characteristics. Descriptive statistics was used to analyze the data collected. Recurrent sampling from the some common fruits depicted variable intensity of fruit spoiling fungal flora. Fungal spoilage of 5 selected common fruits were studied and in all 12 spoilage fungi were observed. Among these *Alternaria alternata*, *Fusarium moniliforme* and *Cladosporium* were Found to be major fruit spoiling fungi. *Fusarium*, *Alternaria*, *Rhizopus*, *Cladosporium* were responsible for extensive fruit spoilage in the markets of Mauganj tahsil of district Rewa (M.P.). Isolated fungi showing positive pathogenesis. Therefore this study gives a brief account of fungal fruit spoilage and their impact on economic loss of fruit vendors.

Keywords: fungal fruit spoilage, fruit vendors, economic loss

1. Introduction

Fruits and vegetables typically constitute an essential part of the daily diet in India and they are in great demand round the year from most sections of the population. The commercial value of fruits and vegetables in terms of direct consumption, processing as well as trade has risen substantially in recent years. Their economic importance has also increased and high labor intensity in the production of most fruits and vegetables production also makes them important from the employment angle as well (Sharma 1991).

Post-harvest losses during handling, transport, storage and distribution are the major problems in agrarian economy especially in perishable fruits and vegetables. Besides resulting in low per capita availability and huge monetary losses, these increase transport and marketing costs also (Subrahmanyam, 1986). 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). These post-harvest losses are caused by the disease which occurs on fruits and vegetables. Post-harvest diseases destroy 10-30 % of the total yield of crops and in some perishable crops especially in developing countries; they destroy more than 30% of the crop yield (Kader, 2002; Agrios, 2005).

The aim of this study to assess the economic loss of fruit sellers experienced due to fungal fruit spoilage with locally available fruits in Mauganj town and nearby village markets at Tahsil – Mauganj. Mauganj is a town and a nagar panchayat in Rewa district in the state of Madhya Pradesh, India. It is one of the eleven tahsils located in the eastern part of Rewa district, Madhya Pradesh at 24°41'N 81°53'E 24.68°N 81.88°E.^[2] It

has an average elevation of 313 metres (1026 feet). Mauganj is 65 km from Rewa, and villages Ghurehta, Dhera, Panni, Barahata, Khatkhri, Padar etc. are nearby villages. The climate here is generally hot and dry whereas in the rainy season it is humid.

2. Materials and Methods

Samples were collected in the months of August, 2015 – July, 2016 from different fruit retailers of Mauganj town and nearby villages. The temperature during these months ranges from 06 - 46 ±2°C

2.1 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 fruits (viz. Apple, Banana, Grapes, mango and Orange) 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

$$= \frac{\text{no. of diseased fruits}}{\text{total no. of fruits}}$$

The spoiled fruits were collected from Mauganj 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) and observed under compound microscope. Identification of the pathogens was made with the help of available literature (Biligrami *et al.* 1981 and 1991, Subramanian 1971 and Barnett 1999). 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). 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.

2.2 Sampling procedure for assessment of rural economics

A sample was randomly drawn from a population of 150 fruit sellers. In picking the sample, attempts were made to ensure representation of all fruits sold in the market.

Primary and secondary data collection

The study was conducted along with Collection, Isolation, identification and Pathogenicity test of fungal pathogens from fruits, using the self- administered questionnaires approach designed to address specific objectives of the study. The approach enabled the collection of both qualitative and quantitative information on various aspects from respondents (Prinsloo, 2000). The questionnaire was divided into two parts: section A (Personal information) and section B (information on postharvest loss of fruits). The administered questionnaires generated information on age of respondents,

level of education, type of fruit sold with price, distance of farms or source from the market, type of transport used to the market, frequency of fruit harvest, purchase or supply, quantity sold or lost, most frequent type of losses, type of storage facilities, problems encountered during storage, security of produce at the location, measures taken to control post-harvest loss and any suggestions to minimize losses. Secondary data were from various relevant books, electronic media and other sources (Aliber *et al.*, 2006).

Data processing and analysis

The data generated from the questionnaire were captured using a template before applying descriptive statistics of frequency and percentage (Trochim, 2006). Statistical Package for the Social Sciences (SPSS) program was used to generate data.

3. Results and Discussion

Among 150 fruit sellers interviewed, their gender, age and average monthly loss of fruits were quantified. In gender category, 97(64.67 %) of them were males and rests of them were females. It shows the males were involved much in fruit vending. Among the age groups of the fruit venders, the maximum of 68 members were 31-40 years of age followed by 48 members (21 to 30 years) and 26 members(≥41 years) of age and the minimum of 16 venders belongs to ≤ 20 years of age. The average monthly economic loss of fruits due to fungal spoilage in the markets among the fruit vendors, the maximum 102 fruit vendors loss 21 – 30 % fruits followed by 24(11 – 20%), 13(0-10%) fruit vendors and minimum of 11(31-40%) fruit vendors as given in table 1.

In other hand fungal spoilage of fruits were studied and in all 12 fungal species were observed. Among these highest Percent Disease Incidence (19.8 %) was shown by *Alternaria alternata* and lowest Percent Disease Incidence was shown by *Penicillium crustosum*. The present investigation revealed *Fusarium*, *Alternaria* and *rhizopus* were found to be the disease causing organisms responsible for extensive damage to common fruits in the markets of tahsil Mauganj region as given in table 2 and 3.

Table1: Socio-economic characteristics of the fruit venders in Tahsil – Mauganj and nearby villages

Socio-Economic Characteristics of Fruit Vendors		Frequency	Percentage (%)
Gender	Male	97	64.67
	Female	53	35.33
Age	≤ 20	16	10.67
	21-30	40	29.33
	31-40	68	45.33
	≥41	26	17.33
Sole Business	Owner	126	84
	Employee	24	16
Average Monthly Economic Loss Of Fruits Due To Fungal Spoilage	0-10%	13	8.67
	11-20%	24	16
	21-30%	102	68
	31-40%	11	7.33

Table 2: Summary of different types of fungal species isolated from spoiled common fruit samples during this investigation.

Genus	Species	Type of fruit				
		Apple	Banana	Grape	Mango	Orange
<i>Alternaria</i>	<i>A. alternata</i>	+	+	+	+	-
<i>Aspergillus</i>	<i>A. niger</i>	+	-	-	-	-
<i>Cladosporium</i>	<i>C. cladosporioides</i>	-	+	-	+	-
	<i>C. herbarum</i>	+	-	-	-	-
<i>Curvularia</i>	<i>C. lunata</i>	+	-	-	+	-
<i>Colletotrichum</i>	<i>C. musae</i>	-	-	-	-	-
<i>Fusarium</i>	<i>F. moniliforme</i>	+	+	+	+	+
	<i>F. oxysporum</i>	+	+	-	+	-
<i>Mucor</i>	<i>M. hiemalis</i>	-	+	-	-	-
<i>Penicillium</i>	<i>P. crustosum</i>	+	-	-	-	-
	<i>P. expansum</i>	+	-	-	+	-
<i>Rhizopus</i>	<i>R. stolonifer</i>	+	-	-	+	-
No. of genera		07	04	02	06	01
No. of species		09	05	02	07	01

+: Present, - : Absent

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

Genus	Species	Type of Fruit					Total % Disease Incidence
		Apple	Banana	Grape	Mango	Orange	
<i>Alternaria</i>	<i>A. alternata</i>	6.01	3.89	2.87	3.02	4.01	19.8
<i>Aspergillus</i>	<i>A. niger</i>	1.18	00	00	00	0.95	2.13
<i>Cladosporium</i>	<i>C. cladosporioides</i>	00	1.34	00	3.24	00	4.58
	<i>C. herbarum</i>	0.39	00	00	00	0.23	0.62
<i>Curvularia</i>	<i>C. lunata</i>	0.36	00	00	2.77	00	3.13
<i>Colletotrichum</i>	<i>C. musae</i>	00	00	00	00	00	0.33
<i>Fusarium</i>	<i>F. moniliforme</i>	2.05	2.12	3.66	2.59	2.77	13.19
	<i>F. oxysporum</i>	1.03	1.70	00	2.11	2.44	7.28
<i>Mucor</i>	<i>M. hiemalis</i>	00	0.85	00	00	00	0.85
<i>Penicillium</i>	<i>P. crustosum</i>	0.23	00	00	00	0.12	0.35
	<i>P. expansum</i>	0.80	00	00	1.89	00	2.69
<i>Rhizopus</i>	<i>R. stolonifer</i>	0.88	00	00	6.31	00	7.19
Total % Disease Incidence		12.93	10.23	6.53	21.93	10.52	62.14

Conclusion

This investigation embraces an extensive survey of the fungal biota associated with common fruit spoilage from a population of 150 fruit sellers from different localities in town – Mauganj and nearby villages. Several fungal species (12) belonging to 09 Genera could be regarded as most common cause of fungal fruit spoilage in the market. The study revealed that poor infrastructure for storage, transportation and marketing of common fruits contributed to losses to the fruit sellers.

Education and awareness about fruit transportation, handling, storage and marketing could be minimizing the economic losses of fruit vendors and give a better employment also in fruit sole business to rural population. This study gives a brief account of fungal fruit spoilage and their impact on economic loss of fruit vendors.

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