

Post harvest fungal spoilage in mandarin at different levels of marketing

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Abstract: A systematic survey was conducted during the year 2000-2001 to assess the extent of loss due to post harvest diseases in mandarin orange in Coimbatore at field, wholesale, retail and consumer levels. The magnitude of the loss due to post harvest diseases on mandarin orange varied at different stages of storage and marketing. Fungal spoilage of mandarin orange was higher at retail (27.9 to 40.3% in local mandarin and 23.6 to 35.6 per cent in Nagpur mandarin) and consumer level (15.1 to 22.1 per cent in local mandarin and 14.4 to 18.6 per cent in Nagpur mandarin) and minimum at wholesale (2.5 to 3.1 per cent in local mandarin and 5.1 to 7.1 per cent in Nagpur mandarin) and field level (1.3 per cent). Among the post harvest diseases of mandarin orange, Green mold caused by *Penicillium digitatum* and blue mold caused by *P. italicum* caused the major damage.

Key words: Survey, Post harvest diseases, Mandarin orange, Green mold, Blue mold.

Introduction

Fruits constitute an important item of our food and they play a significant role in the human diet through the supply of vitamins and minerals. Over last three to four decades, the production of fruits have increased rapidly. The area under fruit crop in India was estimated as 3.2 million hectares with a total production of 33.2 million tonnes, the contribution to the total world production by India being 8.6 per cent (Anon., 1995). Citrus fruits are third in importance in India. Among the citrus fruits mandarin orange is commercially important and occupy over 50 per cent of citrus growing area (Baura *et al.* 1992). In India mandarin orange is grown in an area of about 71000 hectares with the annual production of 701900 tonnes. It accounts 7 per cent of total world production. Post harvest losses in fruits are due to many factors, among which post harvest diseases are considered as a principal cause. Dasgupta and Mandal (1989) described more than 300 parasitic diseases of fruits and vegetables after harvest. The estimated post harvest losses during 1987-88 varied from 8.0 to 30.7 per cent in orange. The present study was undertaken to assess the post harvest losses at different

stages of marketing viz. field, wholesale, retail and consumer levels.

Materials and Methods

A systematic survey was conducted to assess the extent of loss due to post harvest diseases in citrus fruits in Coimbatore at field, wholesale, retail and consumer levels. The information's about the place of origin, variety, duration of transport and distance traveled were collected. The temperature and relative humidity of the storage godown were recorded.

The loss due to fungal spoilage was assessed at weekly intervals for four months (May to August, 2000) at different levels of handling after harvest from three samples each having 20 fruits selected at random. At consumer level loss due to post harvest diseases was assessed either by holding samples under conditions that stimulate those in home kitchens or surveying house hold regularly (Harvey, 1978).

The intensity of the disease was assessed using a special score chart based on the area of infection.

Table 1. Post harvest fungal spoilage in mandarin at consumer level - 2000-2001

Month	Variety	Percent Disease Index (PDI)					Total
		Green mold	Blue mold	Sour rot	Anthracnose	Stem end rot	
November 2000	Local	8.5	4.3	0.5	1.0	0.8	15.1
	Nagpur	7.5	4.0	1.3	0.8	0.8	14.4
December 2000	Local	11.3	6.0	0.8	0.8	1.0	19.9
	Nagpur	9.0	4.5	1.5	0.5	0.5	16.0
January 2001	Local	12.0	7.0	0.8	1.0	1.3	22.1
	Nagpur	10.3	5.2	1.8	0.5	0.8	18.6
February 2001	Local	10.0	5.3	0.5	0.5	1.0	17.3
	Nagpur	8.3	4.0	1.5	0.5	0.5	14.8
Grand Mean		9.61	5.04	1.09	0.70	0.84	17.28

Table 2. Post harvest fungal spoilage in mandarin at retail market - 2000-2001

Month	Variety	Percent Disease Index (PDI)					Total
		Green mold	Blue mold	Sour rot	Anthracnose	Stem end rot	
November 2000	Local	16.5	8.3	1.0	0.8	1.3	27.9
	Nagpur	13.3	6.8	2.0	0.5	0.8	23.6
December 2000	Local	19.8	10.0	0.8	0.5	0.8	31.9
	Nagpur	15.8	7.5	2.5	0.5	1.0	26.3
January 2001	Local	23.5	14.3	1.0	0.5	1.0	40.3
	Nagpur	20.0	10.5	3.5	0.8	0.8	35.6
February 2001	Local	18.3	9.5	1.3	0.5	0.8	30.4
	Nagpur	16.5	9.3	3.0	0.5	1.0	29.3
Grand Mean		17.96	9.53	1.89	0.58	0.94	30.90

Description	Category
No infection	0
< 1 per cent fruit surface infection	1
1 -5 per cent fruit surface infection	2
6 -25 per cent fruit surface infection	3
26 -50 per cent fruit surface infection	4
> 50 per cent fruit surface infection	5

$$PDI = \frac{\text{Sum total of all individual ratings}}{\text{Total number of fruits graded}} \times \frac{100}{\text{max. grade}}$$

The loss due to post harvest diseases was expressed in Per cent Disease Index (PDI) (Rose, 1974).

During survey, the infected fruits were collected in sterile polythene bags for isolation and Koch's postulate was proved for each pathogen.

Results and Discussion

The magnitude of loss due to fungal spoilage in mandarin varied with stage of marketing and storage.

Consumer Level

The magnitude of loss due to post harvest diseases was lesser at consumer level more at retail stage since the consumers use to keep the fruits only about five days after purchasing it from retail markets.

The extent of loss in local mandarin varied from 15.1 to 22.1 per cent in which spoilage due to green mold ranged from 8.5 to 12.0 per cent followed by blue mold of 4.3 to 7.0 per cent. Other diseases of lesser importance were sour rot, anthracnose and stem end rot.

Nagpur mandarin fruits which were transported from a distance of 1000-1500 km recorded a total loss of 14.4 to 18.6 per cent at consumer level (Table 1).

Table 3. Post harvest fungal spoilage in mandarin at Wholesale market - 2000-2001

Month	Variety	Percent Disease Index (PDI)					Total
		Green mold	Blue mold	Sour rot	Anthracnose	Stem end rot	
November 2000	Local	1.5	1.3	0.0	0.0	0.0	2.5
	Nagpur	3.0	1.8	0.3	0.0	0.0	5.1
December 2000	Local	1.5	1.0	0.0	0.0	0.0	2.5
	Nagpur	3.5	1.8	0.5	0.0	0.0	5.8
January 2001	Local	2.0	0.8	0.3	0.0	0.0	3.1
	Nagpur	4.5	1.5	0.8	0.0	0.3	7.1
February 2001	Local	2.5	1.0	0.5	0.0	0.0	3.0
	Nagpur	4.0	1.5	0.8	0.0	0.0	6.3
Grand Mean		2.66	1.33	0.4	0.0	0.04	4.43

Table 4. Post harvest fungal spoilage in mandarin at farm level - 2000-2001

Production centre	Month	Percent Disease Index (PDI)			Total
		Green mold	Blue mold	Others*	
Kothagiri	November, 2000	.5	0.3	0.0	0.8
	December, 2000	1.0	0.5	0.0	1.5
	January, 2001	0.8	0.8	0.0	1.6
	Mean	0.8	0.5	0.0	1.3

*Others include *G.candidum*, *C.gloeosporioides* and *B.theobromae*

Retail level

Mandarin fruits at retail level were more vulnerable to post harvest diseases. The spoilage at this stage was higher than consumer level. It was seen from the Table 2 that the extent of post harvest decay varied from 27.9 to 40.3 per cent in local mandarin and 23.6 to 35.6 per cent in Nagpur mandarin. In both the cases *Penicillium* spp. was the main cause of decay. The incidence of sour rot was higher in Nagpur mandarin (2.0 to 3.5%) compared to local mandarin (0.8 to 1.3 per cent). Anthracnose and stem end rot were the other diseases involved in the decay.

Whole sale Market

The extent of post harvest loss in mandarin at this level was less as they are retained only for one or two days before disposal to retailers (Table 3). Here it was interesting to note that the extent of spoilage was higher in Nagpur mandarin (5.1 to 7.8 per cent) than in local mandarin as against the loss recorded in the consumer and retail level where local mandarin recorded more spoilage. This may probably be due to the long duration of transport (more than one week) as the distance exceeded 1000-1500 km in case of Nagpur mandarin.

At wholesale market, loss in local mandarin was only by green, blue mold and sour rot while anthracnose and stem end rot were conspicuous by their absence. In respect of Nagpur mandarin also spoilage was mostly due to green, blue mold and sour rot, while stem end rot and anthracnose were present only in lesser extent.

Field level

Post harvest fungal spoilage in local mandarin at field level assessed at Kothagiri farms and the results were given in the Table 4. The loss after harvest at field level was 1.3 per cent only. It was due to the injuries sustained during harvesting.

The post harvest loss in mandarin was higher in January, 2001 compared to other months. This fluctuations in the incidence of post harvest disease in mandarin over the period surveyed might be due to the favourable temperature and relative humidity during pre-harvest and post harvest stages.

Mandarin oranges were mainly received at Coimbatore from Kothagiri and Kodaikanal areas of Tamil Nadu and Nagpur area of Maharashtra. The incidence of green and blue mold at retail and consumer levels were higher in the local mandarin than those from Nagpur. Since, the local mandarins were usually transported in bamboo basket, the injuries sustained were more than in Nagpur mandarin which were packed in wooden boxes.

During storage *Penicillium digitatum* and *P. italicum* account for severe losses in mandarin worldwide. Mandal (1981) has reported from West Bengal as high as 35 per cent loss due to *Penicillium* spp. alone in mandarin orange. Sharma and Kaul (1975) surveyed fruit markets, stores and godowns and assessed the loss in mandarin fruits due to sour rot in Himachal Pradesh. Nagavi and Dass (1994) conducted a systematic survey in Nagpur, Amaravathi and Wardha districts of Maharashtra to trace out the existing practices of harvest, transport, storage, marketing and post harvest losses of Nagpur mandarin. The losses were assessed from farmer level to consumer level. Post harvest loss in mandarin due to microbial spoilage was reported by Mandal (1981), Adisa and Fazola (1982), Vilasa (1986) and Nagvi (1990).

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(Received : October 2003; Revised : October 2004)
