C H A P T E R VII.

STUDIES ON SOME ASPECTS OF PRESERVATION OF MANGOES

Prolongation of storage life and maintenance of high quality mangoes are problems of direct concern to mango growers and traders. Fruit storage does not indicate that only the life of the tissue has to be preserved for as long as possible after removal from the tree, but also to maintain the characters associated with good eating quality.

Some fruits e.g. apple and citrus are stored in the ripe condition, while other fruits like pear, tomatoe, avoycado and mango are stored in the unripe condition and must be ripened at appropriate temperature after removal from the storage. Proper storage of mangoes will have an effect on its market price thus contributing to the agricultural economy.

Waxing of certain perishable products for prolongation of storage life has been practised for many years.[279-283] This practise probably started with the waxing of citrus fruits.[279-281] Although considerable research on waxing of deciduous fruits has been done, its application on commercial scale has received little attention.[282,283]

The commercial aspect of cold storage of mango has received some attention from many investigators.[24,145-147,277] Although methods involving gas and chemical treatment and cold storage have been developed

none has proved fruitful for longer storage period on the basis of palatability and keeping quality of mango.[146,278] Hatton et al[24] reported storage of hard mangoes at 1.67° C, 4.4° C and 2.2° C with practically no success. Akamine[290] however, reported successful storage of fully ripe mangoes at these temperatures for four weeks.

The problem of preservation of Alfanso mango has received some attention from this laboratory. Mattoo et al[291] have reported that the storage life could be prolonged to 45 days by gradually adapting the wax coated fruits to low temperature (5-10° C). Mattoo[153] also reported that wax coated mangoes, when ripened, were comparable to the untreated ones with regard to their physico-chemical characteristics.

Further investigation on these lines has continued. The unripe mature mangoes were coated with wax and then gradually adapted to low temperatures. The coating used in these experiments were of two kinds.

a) Woxol-W-12 : A six percent aqueous emulsion of this commercial wax (obtained from Central Food Technological Research Institute, Mysore, India) was prepared and the fruits were directly dipped in the liquid, for two minutes.

b) Tag : This is a patented aqueous emulsion of natural and synthetic waxes manufactured by Makhteshim Chemical Works Limited, Beersheva, Israel (obtained as a gift).

A foam of Tag was prepared by introducing a stream of compressed air at the bottom of the tank containing the wax. The mangoes were immersed in this foamed tag for one minute and then removed and dried in air at 30° C. The control and experimental fruits were then stored at 5-10° C. Ripening was carried out at 20-30° C. Results listed in Table XXII indicate that the fruits coated with wax could be stored for 60 days, after gradually adapting them to low temperatures. However, a 40-50% loss was encountered. Black spots were observed on these fruits.

TABLE XXII

Preservation of Mangoes with Wax Coating

Treatment	Days		Appearance	% loss
	Storage period at 5-10° C	Post harvest period		
Nil	-	15	Orange to yellow	Nil
Nil	15	25	-do-	20-30
Waxol-W-12	60	75	Yellow	40-50
Tag	62	76	-do-	40-50

Using the fruits harvested during three seasons Asnani et al[289] have reported the association of a fungus Rizoctonia bataticola with black spot formation. They have successfully developed the symptoms similar to natural black spot by artificially inoculating this fungal suspension

into healthy mangoes; it was observed that the fungal infection occured only in the partly ripe and fully ripe stages. The high acidic condition was thought to be one of the reasons for noninfection in the unripe fruit.

Results listed in Table XXIII support the earlier observations[289] obtained in the fruits that the infected tissue was highly acidic, pH was lower in the affected tissue than in the healthy counterpart; citric acid content was also found to be higher in these tissues (Table XXIII).

TABLE XXIII

pH, Total acidity and Citric acid content in Healthy and Affected Tissues of Mango

Nature of tissue	pH	Total acidity*	Citric acid g.%
Healthy	4.8-5.0	1.50	0.48
Affected	3.5-4.0	3.50	1.95

* In terms of citric acid.

The starch content did not change in the infected tissue to a great extent but there was a considerable reduction in the sugars (Table XXIV). These results suggest that the fungus utilises the sugars in the fruit with the production of acids due to which a decrease in pH and an increase in acidity is observed.

TABLE XXIV

Changes in Starch* and Sugar Contents* of Healthy and Affected Tissue

Nature of tissue	Free sugar	Total sugar	Sucrose	Starch
Healthy	5.45±2.05	13.43±3.50	7.98±1.50	1.98±0.50
Affected	3.90±1.30	7.91±2.50	4.00±1.25	2.81±0.30

* In g. %.
Average determinations of 4 values.

The use of antibiotics in checking the decay of fruits and vegetables have been explored by a number of investigators.[284-286,287] Most of the investigators were successful when the fruits were dipped in aqueous solutions of the antibiotic.[284-286,287] Aureofungin, a new antifungal antibiotic, discovered and manufactured by Hindustan Antibiotics, Pimpri (India) has been utilised with success in controlling post harvest fruit rot.[285,286,288]

Hatton and Reader[282] have successfully preserved mango fruits from post harvest development of fungal decay by submerging them in hot water at approximately 54.4° C for five minutes prior to packing.

Dip treatment of mangoes in a solution of aureofungin (300 mg./3.2 litres) resulted in lowering the wastage due to fungal spoilage to a minimum (Table XXV).

TABLE XXV

Preservation of Wax Coated Mangoes by Aureofungin*

Treatment	Days		Appearance	% loss
	Storage period	Postharvest period		
Nil	-	15	Orange to yellow	Nil
Nil	15	25	-do-	20-30
Aureofungin*	15	25	-do-	Nil
Aureofungin + Woxol-W-12	64	76	-do-	1-5
Aureofungin + Tag	66	78	-do-	1-5

* Obtained from Dr M.J.Thirumalachar, Hindustan Antibiotics, Poona (India).

The treated fruits on ripening were comparable to the untreated fruits with regard to the flavour and palatability. These results suggest that the antifungal treatment helps in preventing the fungal infection without affecting the palatability and appearance of the fruit.