CONTROL OF POST-HARVEST SPOILAGE IN MANGOES

By

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ABSTRACT

Methods of controlling post-harvest spoilage of mango were studied. Green unbruised mangoes were treated either by application of fungicides or by hot water dip methods. The mangoes were stored at a temperature ranging between 10°C and 20°C, R.H. 85%. Treatment of mangoes with Benlate was found to reduce the amount of spoilage.

INTRODUCTION

In Zambia, the mango fruit *(Mangifera indica)* can be found in most parts of the country, the greatest concentration occurring along the edges of the Zambezi plain and dambo areas of Western Province. At present attempts are being made in these laboratories and by the National Agricultural Marketing Board to utilize the fruit in various fruit products. However, a major problem arises from spoilage of the fruit during the post-harvest ripening stage and its storage life at ambient temperature is short.

Storage at temperatures below ambient has been tried on different varieties of mango but in many cases this results in loss of typical aroma, flavour and flesh colour or chilling injury *(1-4)*. Several post-harvest treatments to control post-harvest spoilage of mangoes have been investigated. These have included treatments with hot water, zineb, benomyl and sodium diethyldithiocarbamate *(5-10)*.

The purpose of this study was to investigate the control of post-harvest spoilage of local mangoes by the use of Benlate [containing 50% benomyl (methyl 1-(butylcarbamoyl-2- benzimidazolecarbamate)], Mertect 340 [containing 40% thiabendazole (2-(4′-thiazolyl)-benzimidazole)] and by hot water dip treatment *(11)*.

MATERIALS AND METHODS

Mature, preclimacteric mangoes from unsprayed trees were collected from the Mongu District of the Western Province of Zambia. A description of these is given in Table I. The unbruised fruit were individually wrapped in newspaper, packed in open wooden boxes and transported to the laboratories.

TABLE I: DESCRIPTION OF MANGOES USED

Average weight (g)	*Average size*[a] (cm)	*Skin colour*	*Flesh colour*	*Shape*	*Edible portion* (%)	*Skin stone* (%)
265.5	9.7 x 6.1 x 6.8	Green-Yellow	Orange	Kidney	60	40

(a) Length x Breadth x Thickness

The mangoes were randomly divided into ten batches and treated as shown in Table II. The mangoes were then repacked in open wooden boxes – approximately 50 mangoes

per box; 3 boxes per batch. During storage the room temperature varied between 10°C and 20°C and the relative humidity, R.H. remained at 85%. At regular intervals the number of fruit showing signs of spoilage was counted and the spoilage calculated as a percentage of the total number of fruit in the batch. Spoilage took the form of brown to black areas on the surface and fruits exhibiting a total area of diameter 1cm or more were counted as spoiled. The spoilage was not investigated microbiologically but was presumed to be anthracnose, caused by infection of the fruit skin with the fungus *Colletotrichum gloeosporioides.*

TABLE II: METHODS OF TREATMENT OF MANGOES

Batch	*Treatment*
1	Tap water wash (control)
2a	Dipped in 0.01% Mertect 340[(a)] at 60 ± 2°C for 2 min.
2b	Dipped in 0.20% Mertect 340[(a)] at 60 ± 2°C for 2 min.
2c	Dipped in 0.50% Mertect 340[(a)] at 60 ± 2°C for 2 min.
3a	Dipped in 0.5% Benlate[(b)] at 60 ± 2°C for 2 min.
3b	Dipped in 0.2% Benlate[(b)] at 60 ± 2°C for 2 min.
3c	Dipped in 0.4% Benlate[(b)] at 60 ± 2°C for 2 min.
4a	Dipped in hot water at 50 ± 2°C for 5 min.
4b	Dipped in hot water at 60 ± 2°C for 5 min.
4a	Dipped in hot water at 70 ± 2°C for 5 min.

(a) Manufacturers: MSD (Pty) Ltd, Johannesburg, South Africa.
(b) Manufacturers: E.I. du Pont de Nemours Co. (Inc.), Wilmington, Ohio, U.S.A.

RESULTS AND DISCUSSION

Table III shows that Mertect 340, Benlate and the hot water dip at 60°C ± 2°C reduced post-harvest spoilage for up to 14 days. For longer periods of storage 0.4% Benlate proved to be the best. Hot water at 50°C ± 2°C was only slightly better than the control sample. Hot water at 70°C ± 2°C caused gross damage to the fruit due to heat injury; the skin developed a brown discolouration and physical damage leading to widespread

TABLE III: EFFECT OF DIFFERENT TREATMENTS ON SPOILAGE OF MANGOES DURING RIPENING[(a)]

Batch	*Storage in days*				
	6	11	14	17	20
1	22	92	100	-	-
2a	18	43	69	98	-
2b	7	24	46	80	93
2c	19	38	69	88	94
3a	23	36	49	72	96
3b	16	38	51	81	86
3c	13	20	36	47	73
4a	24	68	96	100	-
4b	34	38	64	96	-
4c	69	100[(b)]	-	-	-
Unwashed	-	-	-	94	-

(a) Results expressed as percentage spoiled fruits
(b) Caused by secondary fungal infection following scalding of the skin by hot water.

mold growth. A batch of totally untreated mangoes left over after preparation of the ten batches under study was observed to suffer from less spoilage than any of the samples treated with tap or hot water alone.

No attempt was made to assess the residues of fungicide on the treated fruit. As this is of great importance for any products designed for eventual human consumption it is intended to make this the subject of further studies.

CONCLUSIONS

Benlate and to a lesser extent Mertect 340 were found to be effective in the control of spoilage at the concentrations used. Hot water treatment proved to be less satisfactory. The best result was achieved with a concentration of 0.4% Benlate.

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REFERENCES AND NOTES

1. H.S. Chatper, G. Gai, A.K. Mattoo and V.V. Modi, *Acta Hort.*, **24**, 243-250 (1972).
2. S.K. Musa, *Trop. Sci.*, **16**(2), (1974).
3. R. Sadasivam, S. Muthuswamy, J.S. Sundararaj and V. Vasudevan, *Indian J. agric. Sci.*, **41**(8), 715-716 (1971).
4. P. Thomas, *J. Fd Sci.*, **40**(4), 704-706 (1975).
5. H. Subramanyam and N.V.N. Moorthy, *Pestic. Sci.*, **4**(1), 25-31 (1973).
6. S. Lakshminarayana, C.A. Krishnaprasad and M.S. Shetty, *J. hort. Sci.*, **49**(4), 365-371 (1974).
7. S. Krishnamurthy and H. Subramanyam, *Trop. Sci.*, **15**(2), 167-193 (1973).
8. J.J. Smoot and R.H. Segall, *Pl. Dis. Reptr.*, **47**(8), 739-742 (1963).
9. C.J. Jacobs, H.T. Brodrick, H.D. Swarts and N.J. Mulder, *Pl. Dis. Reptr.*, **57**(2), 173-176 (1973).
10. W. Pennock and G. Maldonaldo, *J. Agric. Univ. P. Rico*, **46**, 272-283 (1962).
11. Reference to a company or product name does not imply approval or recommendation of the product by the National Council for Scientific Research.