PRE AND POST HARVEST TREATMENTS FOR REDUCING THE INCIDENCE OF CHILLING INJURY IN PINEAPPLE

By

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ABSTRACT

Mauritius is the main variety of pineapple presently grown in Sri Lanka for the local market as well as for export. Internal browning (IB) disorder in pineapple is a common problem encountered by exporters as a result of cold storage during sea shipment.

This study was carried out to minimize or prevent the IB (physiological disorder) and to extend the storage life of pineapples (*Ananas comosus* cv. Mauritius).

Field experiments followed by cold storage investigations using fruits were carried out to study this phenomenon. The three field experiments were carried out in different locations and treatments consisted of three different levels of urea, potassium, calcium, fused magnesium phosphate and two different flowering hormones namely ethrel and planofix in a randomized complete block design.

Immediately after harvesting fruits from all experimental locations were stored in a cold room (15^0C and 80-85% RH) for four weeks. Biochemical parameters of fruits were determined immediately after harvest and at weekly intervals followed by three days exposure art room temperature.

In the first experiment of post harvest study, mucilaginous press-sap of *Neolitsea cassia* (L) Kostermans ('Dawul Kurundu') leaves was applied as a surface coating on Mauritius fruits and treated and untreated fruits were stored in a cold room. In another

experiment, fruits were sealed in polypropylene, polyethylene bags and stored at 8, 10, 20^{0}C and room temperatures. Different temperature effects (8, 10, 15, 20^{0}C and room temperature) on IB and pre heat treatment effects were also examined in the post harvest experiments. In the pre heat experiment, weighed fruits were stored in an incubator at different temperatures (32, 34, 38, 42, 46 and 50^{0}C) for 24 hours and transferred to cold room at 15^{0}C for further storage for three weeks. A set of weighed fruits were dipped in hot water at 55^{0}C for 10 minutes and stored in the cold room at 15^{0}C for three weeks.

For the above experiments, evaluations of quality changes of the fruit and some physical (weight, texture and colour) physico-chemical (pH, titratable acidity and soluble solids) chemical (ascorbic acid) and biochemical (polyphenol oxidase activity, peroxidase acivity, phenylalanine ammonia lyase activity and free sugars) characteristics and sensory attributes (colour, firmness) of pineapple fruits were studied at weekly intervals. Prior to measurements, the fruits were removed from cold storage and kept for three days at ambient temperature.

Coated fruit showed a significant difference over the control in percentage of weight loss, ascorbic acid content and IB under cold storage. The incidence of symptoms associated with IB was less when a heat pre-treatment was combined with edible coating. Fruits packed in sealed polypropylene bags and stored under cold storage at 8 and 10^{0}C temperature showed a significant difference over the control in percentage of weight loss, ascorbic acid and intensity of internal browning. However as storage

period extended to the third week , internal browning intensity increased and the fruits had an unacceptable odour, taste and flavour.

Fruits stored at 8 and 10^0C recorded the best ratings for taste and fruit quality. However, after 14 days of storage the IB was observed and intensity increased. The intensity of flesh browning was found to increase as storage period extended. However storage for four weeks at 15^0C resulted in a lower development of the disorder than the 10 and 8^0C.

At 20^0C moderate levels of decay developed after two weeks and with time there were changes in the shell, flesh colour and slight fermentation with an odour and change in taste. Accelerated ripening and increased colour development of ripening and increased colour development of shell and flesh translucency occurred at room temperature after seven days of storage.

The pre heat treatment decreases the activities of polyphenol oxidase (PPO), peroxidase (POD) and ascorbic acid, acidity and the spoilage rate. The hot water treatment reduced the development of IB when compared to other treatments, during the later stages of storage. Fruits in the control showed more intensity of IB than treated fruits.

The fruit affected by IB had low ascorbic acid content and total soluble solids and higher titratable acidity than unaffected fruit. Role of pH on IB was not clear. The

relations between the intensity of IB (X) with the ascorbic acid content (Y_1) and total soluble solids (Y_2) could be expressed as: $\log Y_1 = 0.7842-0.0052X$; $Y_2 = 12.6401-0.4451X$.

The interaction effect of nitrogen and flowering hormones on internal browning was not statistically significant. However, double the recommended level of urea application increases the size of the fruits and intensity of IB. Fused Magnesium Phosphate application also significantly decrease the internal browning intensity. Fruits harvested from plants treated with lower level (75 kg/ha) of calcium (CaO) and stored for 1, 2, 3, and 4 weeks at 15^0C followed by three days at room temperature had significantly lower IB intensity than the controls. With higher levels of calcium (150 kg/ha) at 15^0C there was no IB up to fourth week.