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Basal Application of Fused Magnesium Phosphate (FMP) on the Incidence of Post-harvest Internal Browning of Mauritius Pineapple

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ABSTRACT. *A field study was carried out on the effect of fused magnesium phosphate (FMP) as a pre harvest treatment on the development of internal browning (IB) in pineapple variety Mauritius. The recommended rate of fertilizer was kept constant for all treatments. The treatments consisted of three different levels of fused magnesium phosphate (FMP) (0 kg, 250 kg and 500 kg/ha) applied as basal dressing in a randomized complete block design.*

Immediately after harvesting, fruits were stored in a cold room for four weeks. Biochemical parameters of fruits were determined immediately after harvest and at weekly intervals after a three day exposure at room temperature (27-29°C).

The application of FMP to the soil reduced internal browning. Fruits harvested from plants treated with FMP (250 kg/ha and 500 kg/ha) and stored for 1, 2, 3 and 4 weeks at 15°C after three days at room temperature had significantly lower IB intensity than in fruits grown without FMP control. Fruits affected by IB had low ascorbic acid content and total soluble solid, and higher titratable acidity.

INTRODUCTION

Internal browning is an important physiological disorder of pineapple, which has been reported from many parts of the world. This disorder limits both storage (Rohrbach and Paull, 1982) and export of pineapple (Akamine, 1976).

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Fruits often show various browning symptoms that have been attributed to deficiencies in mineral constituents (Wills *et al.*, 1989). Beverly *et al.* (1993) stated that the fertilizer application, either directly on to the plant or to the soil, is the most beneficial intervention recommended when nutrient deficiencies threaten to limit the yield.

A definite Ca-Mg ratio in the soil is necessary for optimum growth of each crop. The antagonistic effect of either calcium or magnesium on the uptake of the other nutrients was more pronounced on applied cations than on native soil forms (Ananthanarayana and Hanumantharaju, 1992). According to Marschner (1995), deficiency of magnesium in soil will cause a calcium deficiency.

Internal browning in pineapple can be controlled by applying a higher level of calcium (150 kg/ha) as a basal dressing in the field (Selvarajah *et al.*, 1998). Since FMP has about 30% CaO the response to the application of FMP can control IB in pineapples. The present study was carried out to examine the effect of calcium and / or magnesium on the incidence of internal browning (IB) in pineapple variety Mauritius as a result of chilling injury during export.

MATERIALS AND METHODS

This experiment was conducted from August 1996 to February 1998 with cv. Mauritius planted at Narammala (Kurunegala district) on red yellow podzolic soils having strongly mottled subsoil and low humic gley soils texture.

Each site of the experiment received the recommended basal fertilizer application (N, P, K) which has kept constant for all treatments. Three levels FMP fertilizer treatments (0 kg/ha, 250 kg/ha and 500 kg/ha) were applied as basal dressing in a randomized complete block design (RCBD) with six replicates. The sources of nutrients were: N-Urea; P-Super phosphate; K-Murate of Potash; Ca; Mg-Fused Magnesium Phosphate.

Fruits were harvested when less than a quarter ripe stage, graded to fruit size and sixty uniform fruits per plot were selected (twenty from each treatments) and placed in a cool room at 80-85% humidity and 15°C temperature. After 0, 7, 14, 21, 28 days of storage, fruits were removed and held at room temperature for three days. Chemical analysis of fruits from

FMP applied plots were compared with the control where no FMP was applied.

IB intensity was determined by using a scale from 0 to 5 (0 = free from IB, 5 = 100% IB of the flesh) (Teisson, 1979), ascorbic acid by titration with 2, 6 dichloro-phenol indophenol (Askar and Treptow, 1993), total soluble solids by refractometer, titratable acidity by titration with 0.1 N NaOH, and pH value by pH meter.

Results were analyzed to determine the effects of each treatment on internal browning intensity. The analysis of variance (ANOVA), correlations and Duncan Multiple Range Test (DMRT) were used for statistical analysis. The Friedman test was used for qualitative characters.

RESULTS AND DISCUSSION

The ascorbic acid content (Figure 1), intensity of browning (Figure 2) and weight loss (Figure 3) of the fruits harvested from plants treated with

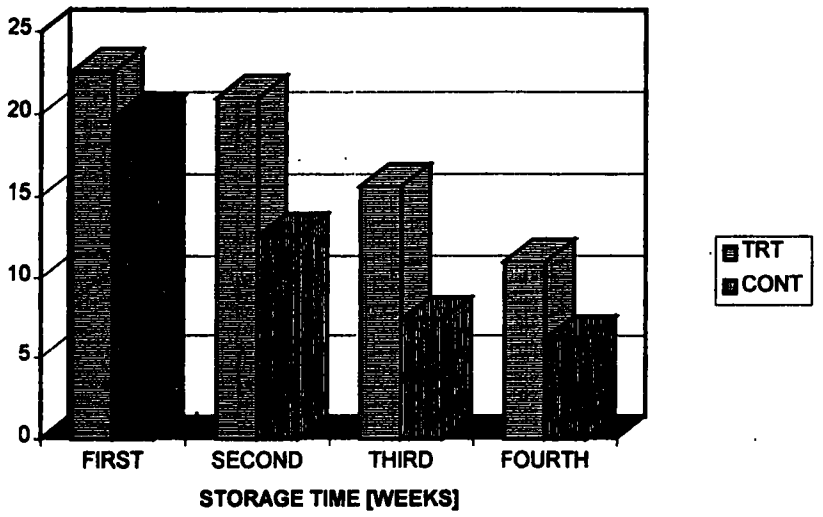

Figure 1. **Effect of FMP on ascorbic acid content (mg/100 g) of Mauritius pineapples during storage at 15°C.**
[Note: TRT - treated with 250 kg/ha of FMP, CONT - without FMP]

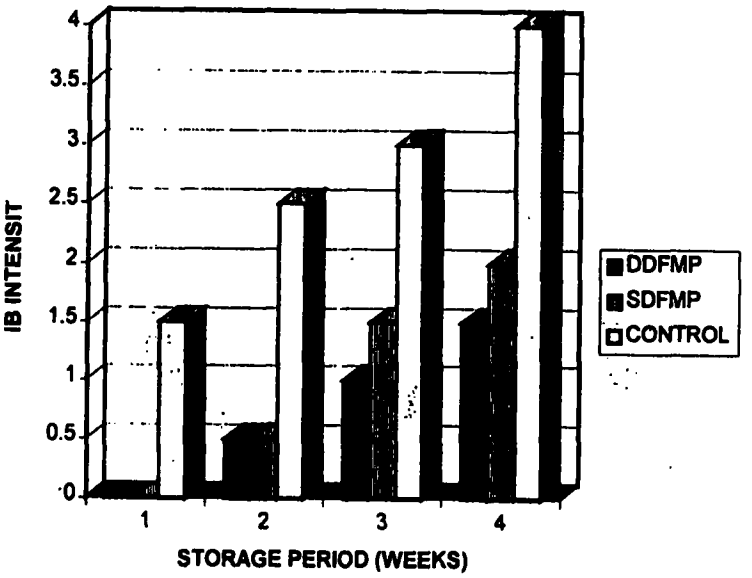

Figure 2. **Effect of FMP on IB intensity of Mauritius pineapples during storage at 15°C.**
[Note: DD - 500 kg/ha of FMP; SD - 250 kg/ha of FMP, CONT - without FMP]

fused magnesium phosphate were significantly different when compared to those of the control treatment during cold storage.

The concentration of magnesium has also been associated with storage disorders, and Perring (1968) found that, at low temperature breakdown of tissues is less likely in apples with high levels of magnesium and potassium than in apples with low concentrations of these elements.

The total acid content in the fruit grown with FMP had a range of 0.78 to 0.98 from one to four weeks after cold storage whereas the control (NPK) had a higher range (0.92 to 1.56%). There was no change in the pH, but the weight loss was greater in the control. The total soluble solids (TSS) on the other hand was slightly higher in FMP treated fruits (Figure 3).

The incidence of internal browning was also related to the level of ascorbic acid. Higher levels of ascorbic acid in the fruit reduces the incidence

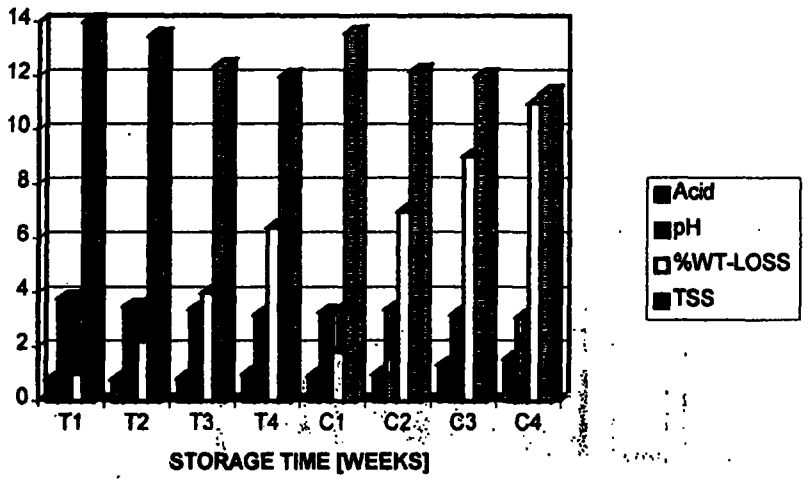

Figure 3. Effect of FMP on titratable acidity, pH, TSS (brix) and, weight loss of Mauritius pineapples during storage at 15°C. [Note: T - treated with 250 kg/ha FMP; C - without FMP; 1, 2, 3, 4 - storage time in weeks]

of internal browning and the application of FMP 250 kg/ha or more increased the ascorbic acid content in the fruit (Figure 1). Further research is needed to establish the minimum level of FMP that is required to control internal browning or pineapple core deterioration due to cold storage in Mauritius pineapple.

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REFERENCES

Akamine, E.K. (1976). Postharvest control of endogenous brown spot in fresh Australian pineapple with heat. Hort. Sci. II: 586-588.

Ananthanarayana, R. and Hanumantharaju, H. (1992). Interactions of Ca or Mg with other plant nutrients. pp: 51-65. *In*: Tandon, H.L.S. (Ed). Management of Nutrient Interactions in Agriculture. Fertilizer Development and Consultation Organization, New Delhi, India.

Askar, A. and Treptow, H. (1993). Quality Assurance in Tropical Fruit Processing. Berlin Heidelberg, New York.

Beverly, R.B., Latimer, J.G. and Smittle, D.A. (1993). Preharvest physiological and cultural effects on postharvest quality. pp. 74. *In*: Shewfelt, R.L. and Prussia, S.E. (Eds). Postharvest Handling - A System Approach. Academic Press, New York.

Marshner, H. (1995). Mineral nutrition of higher plants. (2nd Edition). Academic Press, London. pp. 1-889.

Perring, M.A. (1968). Apple disorders. J. Sci. Fd. Agric. 19: 640-645.

Rohrbach, K.G. and Paull, R.E. (1982). Incidence and severity of chilling induced internal browning of waxed (Smooth Cayenne) pineapple. J. Amer. Soc. Hort. Sci. 107: 453-457.

Selvarajah, S., Herath, H.M.W., Bandara, D.C. and Abeysinghe Banda, D.M.G. (1998). Effect of pre-harvest calcium treatment on post-harvest quality of pineapple. Trop. Agric. Res. 10: 214-224.

Teisson, C. (1979). Internal browning of pineapples: I. History: II. Materials and Methods. Fruits. 34(4): 245-261.

Wills, R.B.H., Mc Glasson, W.B., Graham, D., Lee, T.H. and Hall, E.G. (1989). Postharvest: A introduction to the physiology and handling of fruits and vegetables. 3rd Edition. Blackwell Scientific, Boston.