Enzymatic browning of pineapple flesh

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Introduction

Enzymatic browning is a physiological disorder induced in pineapple fruit by low temperature or during post-harvest storage. Browning occurs near the fruit core and thus limite the export of fresh fruits. However, treatments currently used to inhibit or reduce enzymatic browning are not actually efficient enough.

The aim of this work was to precise parameters involved in the susceptibility of pineapple to cold stress in order to screen varieties for cold stress tolerance in breeding programs.

Materials and methods

Two varieties with contrasting resistance to cold stress were selected: *smooth Cayenne* (C, susceptible) and MD2 (resistant). Pineapple fruits were harvested at commercial maturity, selected with size and color uniformity criteria. Fruits were treated to cold stress for different periods of time (Table 1) and immediatly flash frozen in liquid nitrogen and stored at -80°C until needed. Electrolyte leakage was measured at room temperature using 5 g of pineapple flesh in a saccharose solution (1, 2).

Polyphenol oxidase and phenylalanine ammonia-lyase activities were determined in protein extract from pineapple flesh. Endoprotease gene expression was studied using semi-quantitative RT-PCR.

Table 1 : Different treatments submited to pineapple fruit

Name	Treatment
T0	Control fruit, immediately used after harvesting
F	Fruit exclusively stored at 10°C during 10 days
PF	Fruit stored at 10°C during 10 days and 25°C during 10 days

Figure 1: Cayenne [C] and MD2 pineapples varieties

Results and discussion

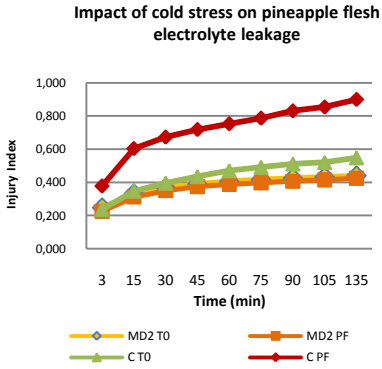

Figure 2: Electrolyte leakage of MD2 and C fruits under cold stress.

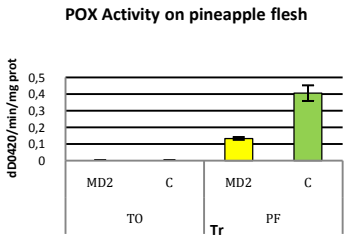

Figure 3 : POX activity of MD2 and C fruits under cold stress

Pineapple fruits of susceptible Cayenne variety exposed to 10 and 25 degree exhibited electrolyte membrane leakages unlike resistant MD2 (fig 2). Thus pineapple fruit resistance to cold stress correlated well with electrolyte leakage as it has been shown previously (2). Our data support the findings that fruit and plant varieties exhibited various resistance to membrane damage (related to membrane permeability), the resistant variety, greater membrane stability under stress. Results concerning POX activity suggested that this enzyme is involved in enzymatic browning (Fig 3) and conversely correlated with cold stress : MD2 variety (resistant) showing the lower values as compared to Cayenne (susceptible).

Cold stress induced an increase in PAL and POD activity in both pineapple varieties (MD2 and Cayenne) during continuous low temperature storage (F), being higher in C variety than in MD2. Rising the temperature after cold stress lowered PAL and POD activities (fig 4 and 5). According to the results : membrane permeability, POX, PAL and POD activities could be useful parameters to screen varieties for cold stress tolerance.

Previous studies (3) showed that endoproteolytic activities were involved in drought stress response of plants. Similarly the results obtained showed that cold stress induced a decrease in protease gene expression, particularly in the resistant variety (MD2). Therefore, it seemed that endoprotease activity is likely to play a role in chilling susceptibility. Experiments are in progress on proteolytic enzyme regulation during pineapple enzymatic browning.

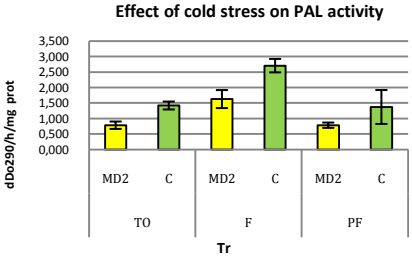

Figure 4 : PAL activity of MD2 and C fruits under cold stress

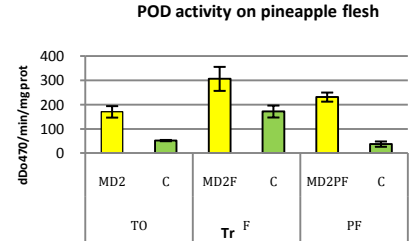

Figure 5 : POD activity of MD2 and C fruits under cold stress.

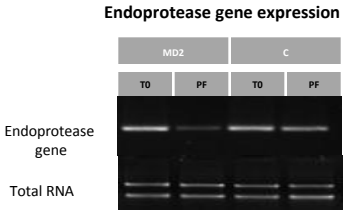

Figure 6: endoprotease gene expression of MD2 and C fruits under cold stress

References

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