Prevention of postharvest browning of litchi by soaking in an acid solution: effect of application conditions and performance of the treatment

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Several acid dip treatments were performed to stabilise the red colour of litchi shells. The most promising results were given by a combination of citric acid and chitosan (M.N. Ducamp). Transposition to a larger scale gives varying results, leading to supposing that a

Method

Different conditions of application of acids (pH, immersion time, temperature) were compared according to the different physiological states of the shell. Treatment performance was codified by monitoring of pH values and shell titratable acidity combined with a browning score.

Results

Incidence of the dips

The results of the treatment naturally depend on the initial pH (Figure 1); the immersion time has little effect. Monitoring of phenols and anthocyanins showed that the acidification level slows phenol oxidations and degradation of anthocyanins Figure 2).

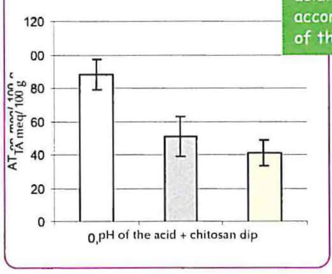

Figure 1. Titratable acidity in the shell according to the pH of the dip.

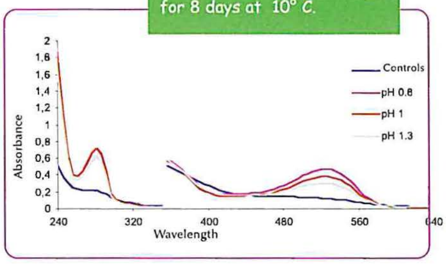

Figure 2. Phenol (280 nm) and anthocyanin contents (527 nm) of litchi shells after storage for 8 days at 10° C.

Incidence of shell moisture content

The initial shell moisture content affects the degree of acid impregnation. Partial drying of the shell resulting simply from storage before treatment improves the acid coating. This drying can be controlled by using a chart (Figure 3).

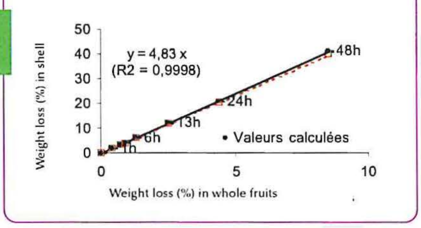

Figure 3. Shell dehydration chart.

The shell browning rate depends on the pH, the degree of drying and enzymatic activity; phenol oxidation induces the formation of o-quinones that initiate the breakdown of anthocyanins. At a given temperature, the expression of browning depends on the combined evolution of the shell pH and the degree of drying.
The acid impregnation coefficient Ia, defined as the ratio of titratable acidity to percentage postharvest weight loss, gives a dynamic appraisal of this link. The evolution of browning according to Ia shows the incidence of the pre-treatment moisture content (Figure 4). The threshold value of coefficient Ia at which harmful browning occurs is positively correlated with storage temperature as enzymatic activity also depends on temperature.

These results provide some information about the sometimes unforeseeable performance of fruits subjected to the acid treatment. The ongoing research also shows that the stage of maturity of the fruit may influence the rate of browning (unpublished data).

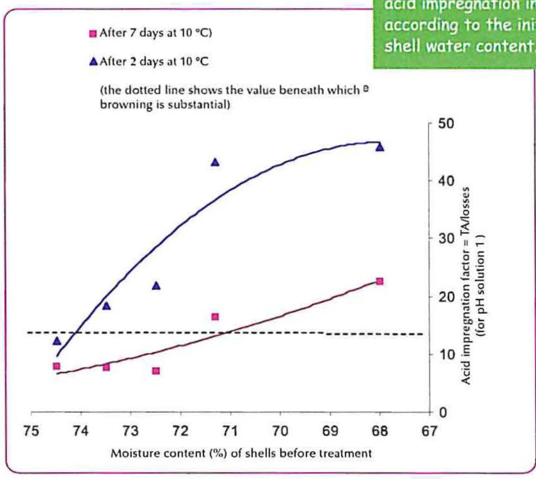

Figure 4. Evolution of the acid impregnation index according to the initial shell water content.

Prospects

Combining stages of maturity, the degree of pre-harvest drying, the postharvest drying rate and storage temperature, the study of browning planned for the next season should provide sufficient information for the accurate identification of the factors of variability of response to the treatment.

CIRAD
Centre de coopération internationale en recherche agronomique pour le développement
Département des productions fruitières et horticoles

Conception et réalisation : Cirad, département Flhor, avril 2004