Texture deterioration in cooked apricot: characterization of the loss of firmness and visualization of the unmethylated pectin in two varieties with very different patterns

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INTRODUCTION

Texture deterioration of cooked apricot is a major concern for food industry, since the severe pulp softening of the apricots upon thermal treatment compromises the quality and acceptation of the final product. The generalized assumption that texture loss in processed fruits is directly linked to that of the raw material needs to be revised, accordingly to recent literature [1]. Actually, a few recent works have addressed the influence of the biochemistry of raw material with the texture changes in apricot. The methyl-esterification influences to a great extent the biochemical properties of pectin and is therefore a key factor to be considered when studying the fruit texture properties.

METHODOLOGY

This work presents different tools for the characterization of texture deterioration of apricot. Fruits from two varieties (Iranien and Goldrich) were selected at similar ripening stages, according to their firmness using a compression test [1].

Texture loss during thermal treatment was measured either after a mild thermal treatment of halved apricots (85 °C in cane sugar syrup) by means of Kramer shear test [1] (Fig. 1a), or by real-time creep test [3] (Fig. 1b) performed at 23 °C and 79 °C.

The unmethylated pectin of the cell wall was visualized under fluorescence microscopy using the LM19 antibody, which binds strongly to the unmethylated pectin [2].

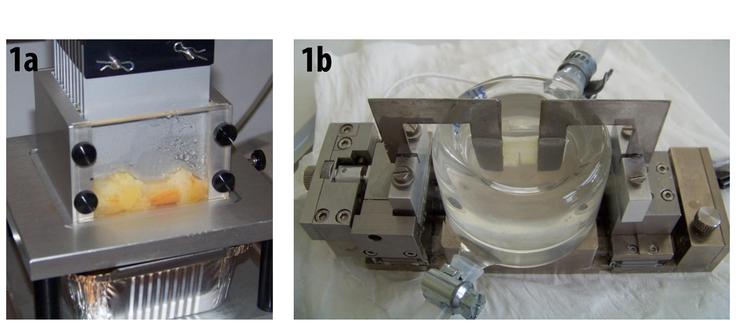

Fig. 1. Tools for the characterization of the apricot texture: Texturometer with a Kramer shear test cell (1a) and real-time creep test (1b).

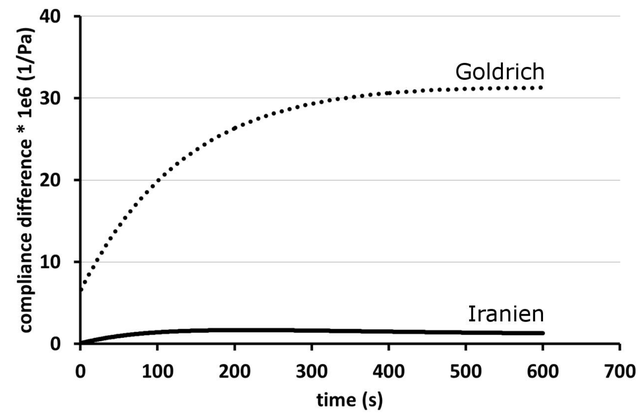

Fig. 2. Compliance difference of apricot tissue (varieties Goldrich and Iranien) during the real-time creep test (79 °C).

RESULTS & DISCUSSION

The two methodologies indicated the high resistance of Iranien and the low resistance of Goldrich apricots to texture loss during thermal treatment, showing a clear differentiation in the texture deterioration behaviour:

- The **Kramer shear-test** showed low maximal forces (Fmax) for Goldrich (87 ± 6 N) and high Fmax for Iranien (504 ± 90 N).
- The **creep test** gave a real-time kinetics of tissue softening. In concordance, it clearly showed that texture loss under cooking conditions was greater for Goldrich than for Iranien. The tissue firmness, which can be estimated as the inverse of the compliance difference, fell by 80% in Goldrich and 30% in Iranien after 10 minutes at 79 °C (Fig. 2).

In parallel, **LM19 immunolabelling** brought to light the very different methylation patterns of the two varieties: while the antibody clearly recognized wide domains along the cell walls of Goldrich (Fig. 3a), Iranien cell walls were very weakly labelled, showing that the domains of unmethylated pectin were much more prevalent in Goldrich than in Iranien (Fig. 3b). LM19 also recognised areas surrounding the cell walls, indicating a possible leaching of unmethylated pectin from the cell wall assembly.

CONCLUSIONS

The different methylation patterns between Goldrich and Iranien were linked to different texture loss upon thermal treatment. Further studies must be conducted in order to elucidate wether other biochemical factors might be involved in the differential texture loss of the two apricot varieties.

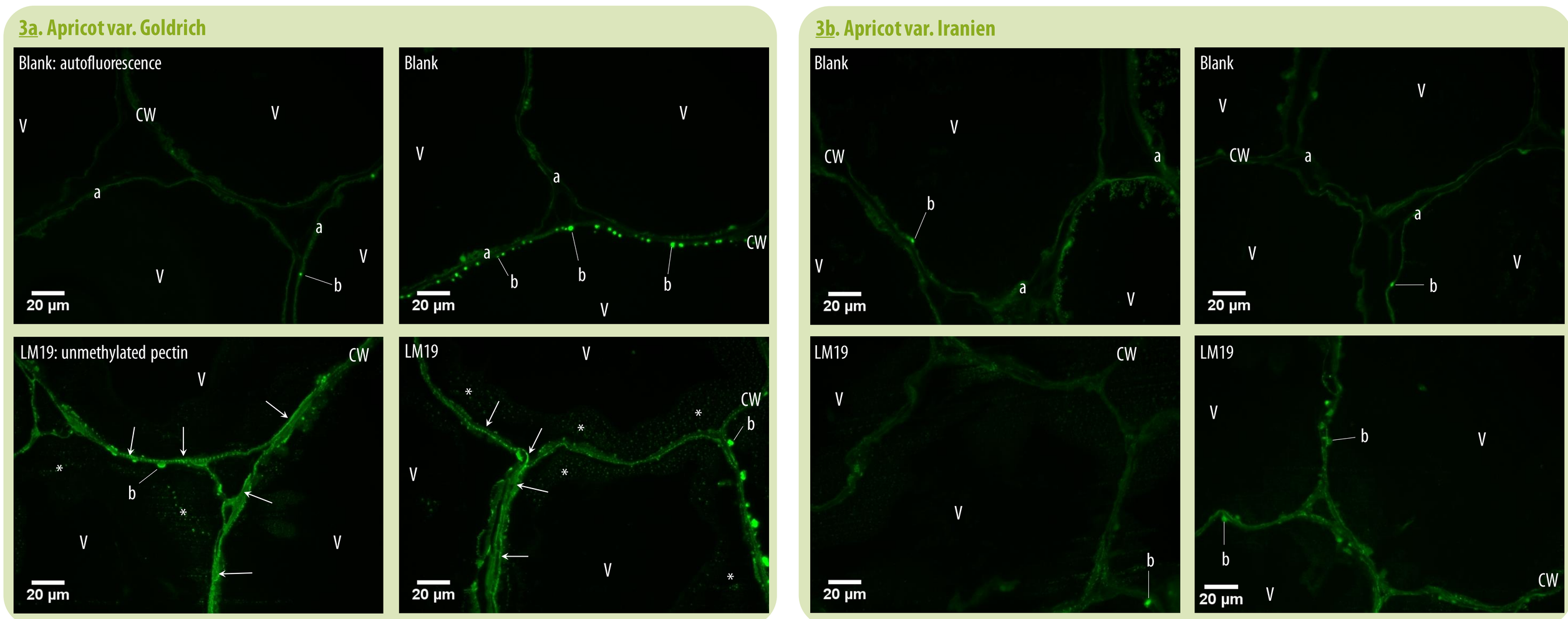

Fig. 3. Fluorescence microscopy images of Goldrich (3a) and Iranien (3b) apricot mesocarp cells. Top images show autofluorescence and bottom images show both autofluorescence and the unmethylated pectin domains as labelled by the LM19 antibody. Sources of autofluorescence are (a) polyphenols (bound to cell wall) and (b) carotenoids (chromoplasts). Arrows indicate zones with high recognition of unmethylated pectin; asterisks indicate possible zones of unmethylated pectin leached out from the cell wall. CW: Cell wall; V: Vacuole.

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This work was financed by the Agence Nationale de la Recherche under the project ILLIAD (ANR-11-ALID-0006)
The authors gratefully acknowledge UPPIA and the Prix de Recherche en Nutrition Institut Appert 2014 for economic support

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