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CHANGES IN PHYSICOCHEMICAL AND SENSORY PROPERTIES OF STRAWBERRIES DURING PROCESSING INTO JUICE

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INTRODUCTION

Recently, strawberries have become more popular and preferred by consumers, but because of their short shelf life, they are often processed (1). For consumption, strawberries are harvested when fully ripe, but then they have a softer texture that can be damaged during transport, which affects their quality. The results of many studies have shown that quality parameters (e.g. physico-chemical and sensory properties) are also influenced by the degree of ripeness at harvest (2).

THE AIM OF STUDY

To evaluate physicochemical and sensory properties of strawberry (*Fragaria x ananassa* Duch., cultivar Albion) harvested at different stages of ripeness (75% of ripeness *vs.* fully ripe) and their changes during processing into juice.

MATERIALS AND METHODS

MATERIAL

Strawberry fruits (*Fragaria x ananassa* Duch.), cultivar Albion were harvested at two stages of ripeness (Figure 1A & 1B) in Donja Lomnica, Zagreb County (Croatia).

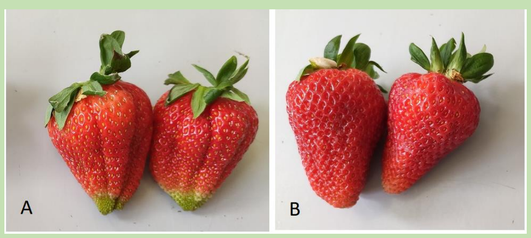
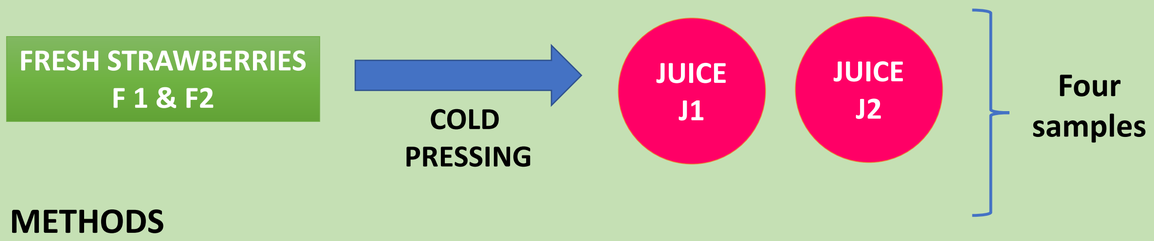


Figure 1. Fresh strawberries at two two stages of ripeness: (A) fruits corresponding to 75 % of the surface showing a red color (F1), and (B) fully ripe red fruits, 100 % red (F2)



METHODS

Physicochemical parameters:

Fresh fruits F1 & F2: Weight (g), hardness (kg x cm^{-2}), CIEL*a*b* colorimetry, pH, total soluble solids (°Brix), total acidity (%) (3)

Strawberry juices J1 & J2: CIEL*a*b* colorimetry, pH, total soluble solids (°Brix), total acidity (%) (3)

Sensory analysis: **Fresh fruits F1 & F2 and strawberry juices J1 & J2**

Quantitative Descriptive Analysis (QDA) whereas a total of 13 sensory descriptors were evaluated (4).

CONCLUSIONS

- **Although the results of the physicochemical analyzes showed significant differences between the fresh fruits and the corresponding juices due to the different degrees of ripeness, the overall sensory quality was rated good for both juices.**
- **The major advantage of processing F1 into juice is the significantly lower color change of the juice compared to processing F2, which could be an advantage for consumers.**
- **Strawberries with a lower degree of ripeness are less sensitive to disruption of quality during transport and, based on the results obtained, represent a good raw material for processing into functional juice without significantly affecting the quality compared to fresh fruit.**

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Acknowledgements

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RESULTS AND DISCUSSION

Fresh strawberries F1 have lower fruit weight, total soluble solids (TSS), pH, and higher hardness, total acidity, as well as L* and a* color values compared to F2 fresh samples (Figures 2 & 4). These results are in accordance with literature reports as strawberries usually undergo a decrease in acidity and an increase in the soluble solids during ripening (5).

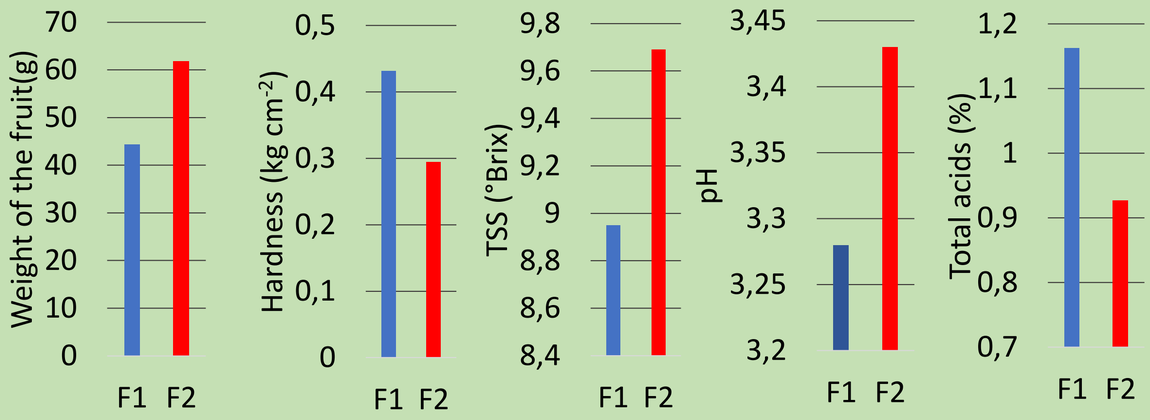

Figure 2. Physicochemical characteristics of fresh strawberries F1 and F2

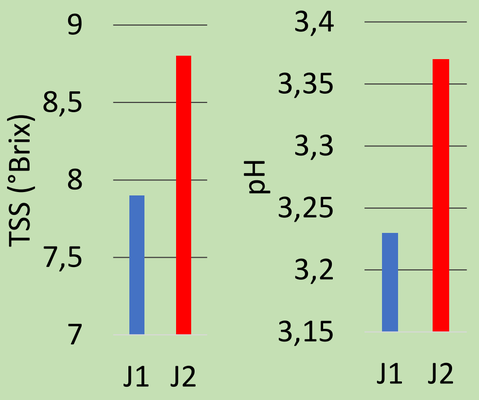

Figure 3. Physicochemical characteristics of strawberry juices J1 and J2

Juice J2 had higher TSS and pH than juice J1 (Figure 3). By processing strawberries (F1 and F2) into juices (J1 and J2), no significant changes in pH were observed which is in accordance with literature reports (6). Slight decrease in TSS was observed in juices when compared to fresh fruits. Literature reports showed that processing strawberry fruit into juice did not influence physicochemical parameters such as TSS and pH, because these characteristics are mostly affected by cultivar, degree of maturity and growing location (6).

When the color parameters are examined, it can be seen that the F1 samples had higher L*, a* and C* values and lower H* values compared to F2 (Figure 4). When processed into juice, a significant decrease in L* and a significant increase in H* values were observed for both ripening stages. More significant changes in color parameters were observed for the fresh samples (F1 and F2) than for the corresponding juices (J1 and J2).

However, the overall color difference (ΔE) was significantly lower when strawberries with lower ripeness were processed into juice than when fully ripe fruits were processed (4.2 versus 10.9), indicating that strawberries with lower ripeness can be used for juicing with stable color characteristics.

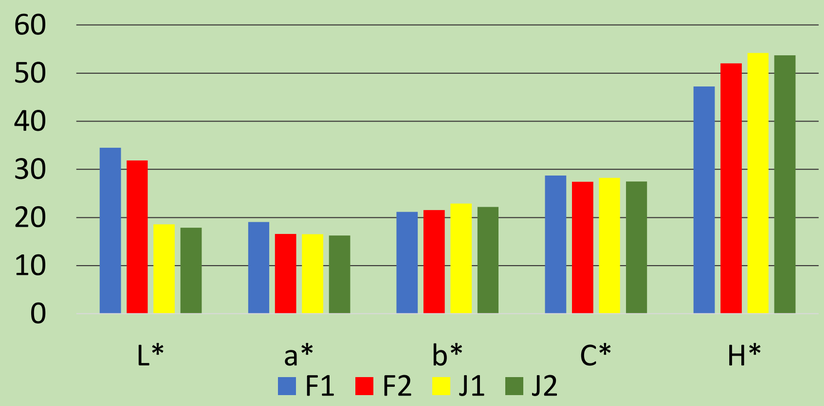

Figure 4. Color parameters for F1, F2, J1 and J2 samples

The results of the sensory analysis showed that the fresh F1 strawberries had lower perceived color and aroma intensity, lower floral and fruit aroma, lower flavor intensity, lower sweetness, and more harmonious flavor compared to the fresh F2 samples, and had higher green aroma, acidity, and firmness scores (Figure 5). The J2 juice performed better in almost all sensory parameters evaluated, except for green aroma, sour taste, and off-flavor. Due to the better overall sensory quality, juice J2 seems to be of greater importance for the production of functional foods than juice J1. Significant differences between fresh fruits (F1&F2) and juices of the same ripeness (J1&J2) were not found in terms of aroma and taste, except for harmonic taste and color intensity, which was rated slightly higher for fresh fruits.

When comparing the results of the sensory analysis of the both juices, significant differences were perceived in the attributes of aroma, taste, consistency and color, with greater color changes observed in F2-J2 than in F1-J1.

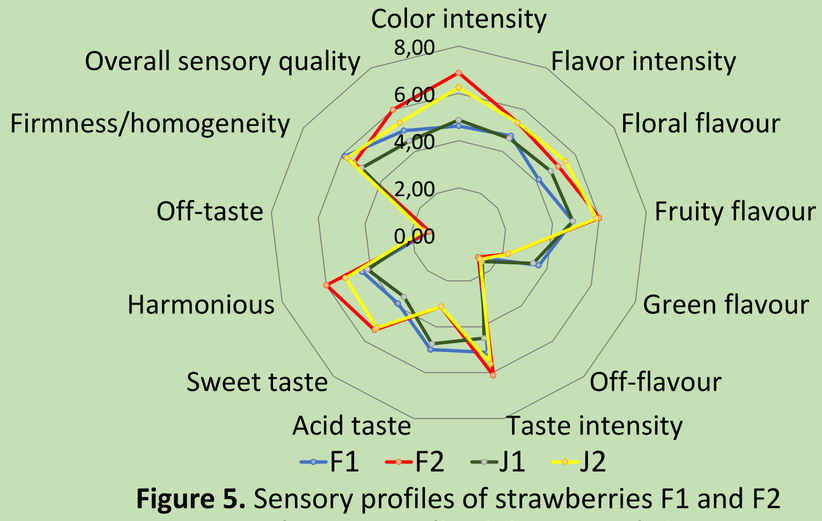

Figure 5. Sensory profiles of strawberries F1 and F2 and corresponding juices J1 and J2