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Metabolic changes in *Brassica rapa* L. subsp. *sylvestris* during postharvest storage

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INTRODUCTION & AIM

Friariello Napoletano is a local ecotype of *Brassica rapa* L. subsp. *sylvestris*, traditionally cultivated in Southern Italy and appreciated for its distinctive taste and high levels of health-promoting compounds, such as glucosinolates, vitamin C, phenolics, and carotenoids. Despite its nutritional potential, little is known about its postharvest physiology [1].

Storage temperature and duration play a key role in modulating biochemical changes after harvest, particularly those related to oxidative stress, nutrient loss, and senescence.

This study aims to investigate tissue-specific metabolic responses in leaves and inflorescences stored at 4 °C and 10 °C for 2 or 20 days, in order to identify markers of senescence and suggest strategies to prolong shelf life while preserving quality.

METHOD

Plants of the 'Sessantino Riccia di San Marzano' ecotype were grown under standard field conditions and harvested 60 days after sowing. Inflorescences and leaves were stored at 4 ° C and 10 ° C for 2 or 20 days.

Samples were then processed for metabolic analysis:

- Soluble sugars, starch, organic acids, and proteins were extracted and quantified by enzymatic and spectrophotometric methods [2].

Figure 1. *Brassica rapa* L. sub. *sylvestris*

- Free amino acids, glucosinolates, and tocopherols were extracted and analyzed by HPLC [3].

Analyses were carried out separately on leaves and inflorescences to assess tissue-specific changes.

The analytical workflow is summarized in **Figure 2**.

Figure 2. Sample extraction (**A**) Spectrophotometric analysis (**B**) HPLC analysis (**C**)

RESULTS & DISCUSSION

Cold storage induced significant metabolic changes in both tissues, with leaves showing higher sensitivity.

- Leaves showed strong signs of senescence including chlorophyll loss and decreased levels of ascorbate, glutamate, and glutamine.
- Inflorescences were more resilient, with stable antioxidants and increases in α-tocopherol, proline, and GABA.

Both tissues accumulated carboxylic acids, suggesting enhanced mitochondrial activity. The heatmap (**Figure 3**) reveals distinct shifts in primary and secondary metabolites between tissues, reflecting tissue-specific postharvest responses.

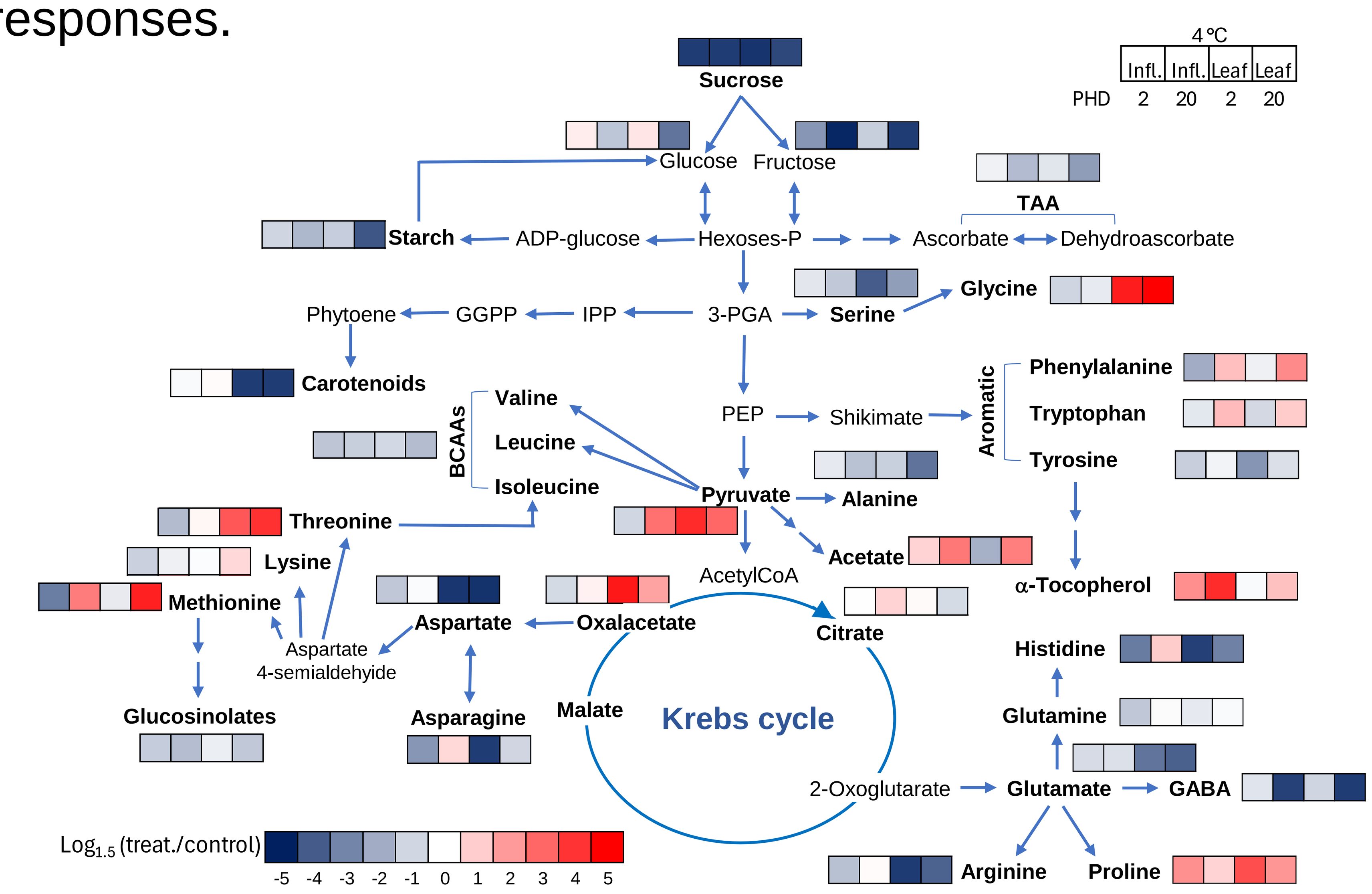

Figure 3. Metabolic pathway map summarizing the effects of postharvest storage on primary metabolites and antioxidants in *Friariello Napoletano* inflorescences and leaves stored at 4 ° C. The heatmap integrates tissue-specific responses in pigment content, sugars, organic acids, amino acids (including essential amino acids, EAAs; and branched-chain amino acids, BCAAs) and glucosinolates. Values represent log1.5 fold-changes of each treatment relative to the respective control and are visualized using a false-color scale, where red indicates increased levels and blue denotes reductions.

CONCLUSION

During postharvest cold storage, both inflorescences and leaves exhibited clear biochemical changes over time. These modifications were more pronounced in leaves, indicating a higher sensitivity compared to inflorescences. The accumulation of stress-related metabolites and alterations in ion profiles suggest the activation of defense and adaptation pathways. Overall, these findings underscore the complexity of tissue-specific postharvest dynamics and provide valuable insights for improving storage practices and preserving the functional and nutritional value of this traditional vegetable.

REFERENCES

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