

Variety comparison and storage-related changes in the metabolite profile of open-pollinated onions

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Commercial onion breeders limit their selection criteria by focusing almost exclusively on conventional farming. This raises the demand for certain well known varieties, but lowers the general diversity available on the mainstream market. A way to maintain biodiversity is to preserve old open-pollinated varieties. Through their distinct aroma and flavor, these plants are again drawing the interest of farmers and consumers alike, making them a viable alternative to commercial varieties.

In addition to various preharvest aspects and variety differences, the quality and shelf life of onions is influenced by several postharvest factors. Variety, curing, storage conditions like temperature and humidity are factors that determine the long-term durability in harvested onions. Prolonged onion conservation during a lengthy product-marketing period can also be achieved normal atmosphere cold storage conditions. However, depending on the variety storage may also significantly affect quality, aroma, water content and metabolite profile.

The aim of the present study was to assess quality changes, changes in the metabolite profile, and differences between varieties during normal atmosphere cold storage. We evaluated nine old open-pollinated varieties and compared them with the well-established commercial onion variety Sturon.

After harvest and 6 weeks of curing, the onions were stored for up to 5 months at 2-3°C and a relative humidity of <60%. Before and after storage variety samples were extracted for the analysis of pungency, non-structural carbohydrates, dry matter, total soluble solids, and untargeted metabolite profiling by GC×GC-MS.

With the exception of the variety Jaune des Cévennes (progressive *Botrytis* and *Aspergillus* infestation) all varieties demonstrated good storability, without visual appearance of degradation and sprouting after 5 months under a controlled atmosphere. Furthermore, storage significantly affected the chemical composition of almost all varieties, including total sugar, amino acids, water content, organic acid and enzymatically-produced pyruvic acid.

As determined by a PCA analysis, the metabolic changes during storage were distinctly different for the variety Jaunes des Cévennes, compared to all other old open-pollinated varieties and the control Sturon. Overall, the chemical composition of this variety did not differ significantly between fresh and stored onions.

This study demonstrated that depending on the variety significant or no effect can occur in phytochemical components and single metabolites during cold storage conditions. Mainly monosaccharides, fructans, water content and enzymatically-produced pyruvic acid were affected during 5-months storage. With exception of the variety Jaune des Cévennes, the old open-pollinated varieties presented in average similar or even better conservation than the control “Sturon”, demonstrating the potential of the studied varieties.