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RESEARCH ON POST-HARVEST CHANGES IN THE PHYSICOCHEMICAL AND PHYSIOLOGICAL PROPERTIES OF QUINCE (*CYDONIA OBLONGA* MILL.) DURING STORAGE

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Abstract: The research aimed to determine changes in key physicochemical and physiological indices during the post-maturation processes of quince.

This study evaluated post-harvest changes in three quince cultivars - "Bereczki", "Galbene Moldovenesti," and "Aromate" - by comparing initial experimental values with those recorded after 7 and 14 days of storage. The fruit was stored at two different temperatures: 22°C and 4°C. The following parameters were determined: fruit length, diameter, weight, firmness, pH, soluble carbohydrate content, and dry matter content. Descriptive analysis revealed decreases in fruit dimensions and weight across all cultivars. After 14 days, average weight had decreased by approximately 1.0% for "Bereczki," 2.5% for "Galbene Moldovenesti," and 2.5% for "Aromate." Firmness declined in all cultivars, with smaller losses observed at 4°C compared to 22°C. pH levels also decreased over time, with more significant reductions occurring at 22°C. Soluble carbohydrate content (°Brix) increased, while the percentage of dry matter decreased; the magnitude and direction of these changes varied depending on the cultivar and storage temperature. The "Bereczki" cultivar exhibited the greatest initial fruit weight and length, "Galbene Moldovenesti" had the highest initial dry matter content, and "Aromate" showed the highest initial soluble solids content. The results support the practical value of cold storage for maintaining firmness and limiting pH changes during this short storage period.

• Introduction

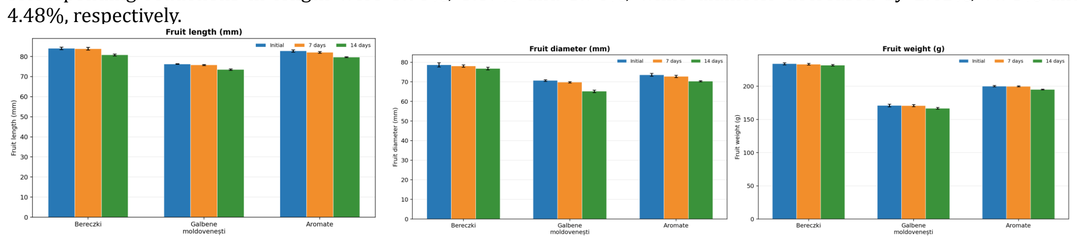
Quince (*Cydonia oblonga* Mill.) is a pome fruit appreciated for its characteristic aroma and its content of organic acids, sugars, dietary fibre, minerals and phenolic compounds. Despite this composition, fresh quince is often used for processing rather than eaten raw because its flesh is firm and its flavour may be sour and astringent. Reviews of quince research describe its nutritional and bioactive composition and its use in jams, jellies, juices and other processed products [1,6,7]. These characteristics make the fruit relevant both as a fresh horticultural product and as a raw material for food processing. Postharvest quality is determined by a combination of cultivar, harvest maturity, preharvest conditions, handling, and storage environment. Quality assessment commonly includes physical traits such as fruit size, mass, and firmness, as well as physicochemical indicators including soluble solids and acidity. These measurements describe different aspects of quality and should be interpreted together rather than as interchangeable indicators. Moretti et al. (2010) discuss how environmental conditions can affect fruit quality traits, while reviews of quince specifically identify maturity and storage conditions as important factors affecting firmness, composition, and the development of browning. Temperature management is one of the principal approaches used to slow postharvest deterioration. Refrigeration generally reduces respiration and other metabolic processes and can slow water loss, ripening, and decay; however, the effective storage regime depends on the species, cultivar, maturity, and duration of storage. In quince, low-temperature storage has been investigated alongside treatments such as 1-methylcyclopropene (1-MCP) and controlled-atmosphere storage. Gunes (2010) examined the effects of 1-MCP and growing region on the long-term storage quality of ‘Eşme’ quince, including firmness, soluble solids, acidity, weight loss, and browning. Nanos et al. (2015) also studied the effects of 1-MCP and storage temperature on quince quality. These studies underline the importance of considering both storage conditions and the particular quality attribute being monitored. Changes in quince during storage may include softening, changes in soluble-solids readings and acidity, moisture loss, colour changes and the development of internal or surface browning. Gunes (2008) identified flesh browning as an important limitation to long-term quince storage. In a separate experiment, Rashid et al. (2019) reported that gamma irradiation treatment affected firmness retention, colour, and fungal decay during ambient storage. These interventions are not directly equivalent to simple refrigerated or room-temperature storage, but they demonstrate the range of postharvest factors that can influence quince quality. More broadly, fruit-storage research shows that quality responses depend on crop biology and environmental conditions, so results from other fruit species should be used as context rather than assumed to apply identically to quince [4]. Although quince storage has been investigated in several studies, cultivar-specific comparisons remain useful because cultivars can differ in their initial physical characteristics and in their response during storage. Monitoring fruit at multiple time points can help describe the direction and magnitude of change, while comparisons across temperatures can provide a practical basis for planning further storage trials. This study compares three quince cultivars - ‘Bereczki’, ‘Galbene Moldovenesti’, and ‘Aromate ’- using measurements taken at the initial stage and after intervals of 7 and 14 days. The analysis focuses on fruit length, diameter, and weight, as well as pH, firmness, dry matter, and soluble solids, at temperatures of 22°C and 4°C.

• Material and method

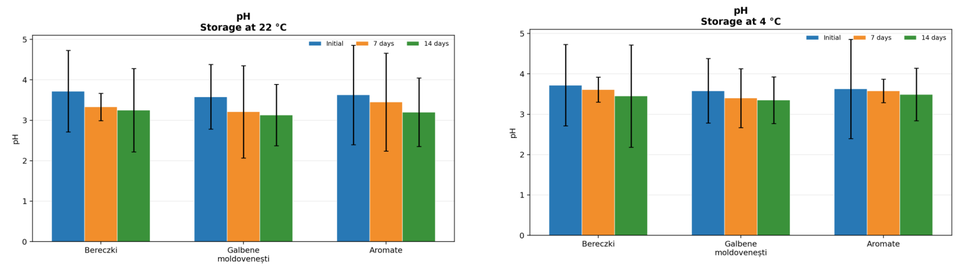
The biological material consisted of three quince cultivars (Bereczki, Galbene Moldovenesti, and Aromate). The research aimed to determine changes in physicochemical and physiological parameters during the post-harvest process of the quince fruit. The fruit was stored for 7 and 14 days at temperatures of 4°C and 22°C. The main parameters utilized were fruit weight, diameter, and length, as well as total soluble solids, acidity, firmness, and dry matter content. For all analyses, 25 fruits of each variety were used. Height and diameter were measured with a digital caliper and expressed in mm. The mass of the fruit was determined individually using an electronic balance (KERN ABS) with an accuracy of 0.001 g. The total soluble solids content was determined by a digital refractometer (Kruss DR 201-95) at room temperature (25°C) using samples from the fruit pulp. The pH was determined by measurements with a digital pH meter (CONSORT C933) from 25 homogenized samples at 25°C. To measure firmness, the fruit was peeled (very thin layer) in 2 different places in the equatorial region of the quinces. Firmness was measured with a penetrometer (FORCE GAUGE PCE-FM 200) and expressed in lbf. Dry matter content was determined with a thermobalance Kern MLS in percent units. For each genotype, observations and determinations were carried out regarding the main fruit characteristics, in accordance with the established objectives. The average fruit weight was determined by weighing 25 fruits collected as a representative sample, followed by calculating the mean weight per fruit.

• Results and discussions

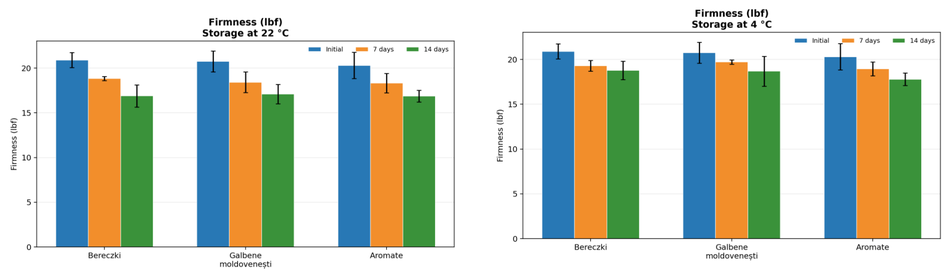
At the initial measurement, “Bereczki” had the largest reported fruit length (84.08 mm), diameter (78.7 mm), and weight (233.84 g). “Aromate” was intermediate for all three traits, whereas “Galbene Moldovenesti” had the lowest initial means (76.3 mm, 70.7 mm, and 171.06 g, respectively). All three traits declined over the 14 days. Based on the reported means, fruit weight decreased by 0.98% in “Bereczki”, 2.49% in “Galbene Moldovenesti” and 2.47% in “Aromate”. The corresponding reductions in length were 3.90%, 3.67% and 3.74%, while diameter decreased by 2.41%, 7.78% and 4.48%, respectively.



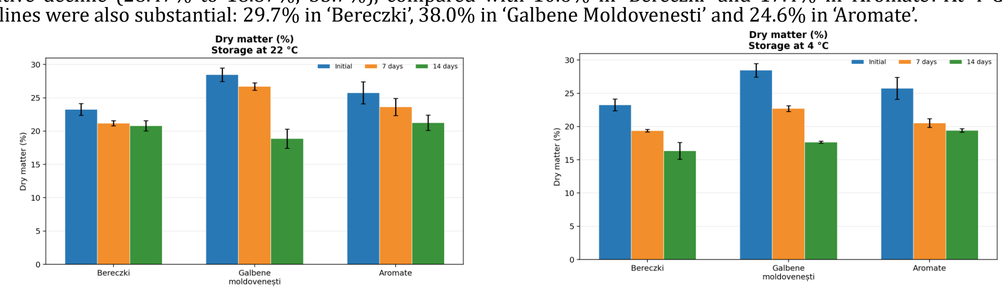
The decrease in pH indicates a shift in the fruit’s measured acidity during storage. At 22 °C, the initial-to-day-14 decline was 0.47 units for ‘Bereczki’ (3.72 to 3.25), 0.45 for ‘Galbene Moldovenești’ (3.58 to 3.13), and 0.43 for ‘Aromate’ (3.63 to 3.20). At 4°C, the corresponding decreases were smaller: 0.27, 0.23, and 0.14 units. This pattern is consistent with slower physicochemical change under refrigeration over the observed period.



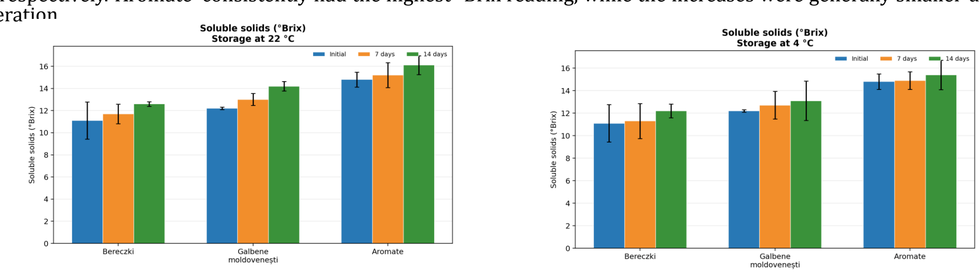
Firmness declined in each cultivar, consistent with postharvest softening. Practically, firmness matters for handling, transport, and resistance to mechanical damage. The magnitude of the decline differed among cultivars and storage conditions, suggesting that cultivar identity and temperature should be considered together when evaluating storage performance. At 22 °C, firmness losses from the initial measurement to day 14 were 19.2% for ‘Bereczki’, 17.7% for ‘Galbene Moldovenesti’ and 16.9% for ‘Aromate’. At 4°C, losses were lower at 10.2%, 10.0% and 12.4%, respectively. ‘Bereczki’ retained the highest mean firmness at day 14 under 4°C (18.77 lbf), narrowly followed by ‘Galbene Moldovenesti’ (18.68 lbf); at 22°C, ‘Galbene Moldovenesti’ had the highest day-14 mean (17.09 lbf). These results suggest that refrigeration moderates softening, although the cultivar ranking varied with temperature.



Dry matter declined in all cultivars in both storage conditions. At 22 °C, ‘Galbene Moldovenești’ showed the largest relative decline (28.47% to 18.87%; 33.7%), compared with 10.6% in ‘Bereczki’ and 17.4% in ‘Aromate’. At 4°C, the declines were also substantial: 29.7% in ‘Bereczki’, 38.0% in ‘Galbene Moldovenesti’ and 24.6% in ‘Aromate’.



The reported soluble-solids readings increased over time in every cultivar. At 22 °C, day-14 values were 12.6 °Brix for ‘Bereczki’, 14.2 °Brix for ‘Galbene Moldovenesti’ and 16.1 °Brix for ‘Aromate’. At 4 °C, values reached 12.2, 13.1 and 15.4 °Brix, respectively. ‘Aromate’ consistently had the highest °Brix reading, while the increases were generally smaller under refrigeration.



Conclusions: Across the 14 - day observation period, the three quince cultivars showed declines in pH, firmness, and dry matter and increases in reported soluble-solids readings. The extent of change varied among cultivars and between the two reported storage temperatures (22 °C and 4 °C) for the physicochemical measurements.
‘Bereczki’ had the largest initial fruit length, diameter, and weight among the reported physical measurements. Firmness loss indicates softening during storage, while changes in pH, dry matter, and soluble solids demonstrate that storage was accompanied by shifts in measured physicochemical properties. The results show that storage was associated with measurable changes in the quality attributes of all three quince cultivars. The clearest common patterns were a decrease in pH, firmness, and dry matter, together with an increase in the reported soluble-solids readings. These trends indicate that the fruit changed during the 14 - day observation period. Soluble-solids readings increased in all cultivars over the storage period. This pattern may be associated with changes in fruit composition and water balance during storage. The results support evaluating quince cultivar and storage temperature jointly when planning postharvest handling.