SUGARS AND STARCH IN KIWIFRUIT PRODUCTS

E. Cocconi, A. Trifirò, A. Zanotti, C. Zoni, R. Fragni, M. Müller

In Italy the cultivation of kiwifruit (Actinidia deliciosa) is undoubtedly an important economic resource within the domestic fruit production. With its 430 thousand tons of annual production, Italy ranks amongst the top world producers of kiwifruit. In kiwifruit, glucose and fructose account for 98% of total sugar; sucrose and maltose are present in low concentrations or trace levels, while starch is contained in moderate amounts, especially in the early stages of kiwi ripening. As reported in the literature, for fresh fruit and purées a glucose/fructose ratio below 1 is an index of authenticity.

In the production of clear juice, the industrial practice is that of using pectolytic and amylolytic enzymes, which can lead to an increase of the glucose/fructose ratio in the final juice. The aim of this study was to assess the possibility, even in the processed product, of using a glucose/fructose ratio below 1 as an index of authenticity.

For this purpose, the sugar content (soluble solids, glucose, fructose, sucrose and maltose) was analysed on fresh and processed samples taken directly from the processing line of concentrated kiwi juice at the Zipperle S.p.A. Company in Merano during the processing period November 2011/May 2012. The sampling was carried out at different points of the processing line to assess also the effect of processing on the sugar content.

To check the degree of ripeness of the fruit used industrially, kiwifruits taken from the fresh fruit market were analysed as a reference, assuming that a product can be considered ripe if it is deemed fit for direct sale to the consumer.

It was observed that the treatment with amylolytic enzymes in the finished product determines a rise in the glucose/fructose ratio that, in the samples with a starch content higher than 0.2%, greatly exceeds the value of 1.0. As a consequence, the limit of 1.0, valid for purées is not applicable to juices derived from processes that use amylolytic enzymes.

The increase in glucose takes place in parallel to an increase in the maltose content, which can reach values of up to 400mg/kg in the finished product at 13 Brix.

According to the 2012 CSO - Fruit and Vegetable Service Centre [1] Dossier, the world area devoted to the cultivation of kiwi is 160 thousand hectares, for a total production of over 1.3 million tons. This data means that kiwifruit accounts for 22% of the world fruit production.

The top five growing countries are China, Italy, New Zealand, Chile and Greece, which together account for 87% of the total production value. China ranks first with over 490 thousand tons of product (27% of the total), followed by Italy with 430 thousand tons (24%), New Zealand with 385 thousand tons (20%), Chile with 187 thousand tons (10%) and Greece with 80 thousand tons (5%). (Data is the average of the years 2008-2011).

In Italy the growing focuses on 4 main producing regions: Lazio, with over 30% of the national production; Piedmont about 20%; Emilia Romagna 16% and Veneto 15%.

Minor, but still important production activities are found in Calabria, Campania and Friuli. The harvesting of kiwi-fruits in Italy takes place in the months of October-November. Choosing the right time to proceed with the harvesting is influenced by two factors:

- the state of physiological development of the fruits, since they reach their typical conformation only in the last ripening stage (late October or early November)
- climatic conditions.

Harvesting is recommended when the ripening process has started, but has not yet reached its peak and, anyway, before the rain and frost begin. The main difficulty encountered in determining the harvesting period is given by the fact that, at a visual examination, the fruit does not show signs of its state of ripeness. There are no colour changes or palpable softening of the pulp. The Brix degree is then measured to overcome this problem. Notably, the fruits harvested earlier (content of soluble solids <6.5 Brix) are poorly suitable for conservation, both because of their overall organoleptic characteristics and for the loss of consistency they undergo during maturation.