Anthocyanins and Assessment of Authenticity of Red/Black Juices

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Abstract
Although the majority of suppliers are honest, there are always a few that take a "flexible view" on what is allowed or are "duped" by their suppliers and do not have the appropriate "checks and balances" in place to detect any extensions. There is a requirement under FSSAI(4) for all producers to have a quality assurance program in place and have evidence to verify that the materials they are using are of a suitable quality.

Any authenticity assessment of a red/black juice or purées should always include a screen of the anthocyanin pigments. These natural pigments provide a very useful fingerprinting tool to a reflex to detect the extension of these types of products with cheaper juices and/or colorants. However, as with most methods it needs some reference or database for comparison. A recent example of a limitation of this type of approach occurred when a "new" raspberry variety, Driscoll’s Maravilla, passed from use in the fresh fruit area into the processing sector. Although the fruit shows the “normal” raspberry pigments, the actual levels of the individual pigments are very different to that seen in other raspberry varieties. Presented in this poster are some data for this “new” variety that will be of use for anyone who buys or uses this type of fruit for processing.

Introduction
The economic adulteration of fruit juices is a problem that occurs from time to time, but is particularly important when commodity prices are high or a juice is in short supply. Due to this risk there is a statutory requirement, under the food safety Modernisation act(3) for all producers to verify that the products that they pack are authentic. Many different approaches are used to detect the economic adulteration of fruit juices/purées, which include: isotopic methods, conventional testing for bulk components (like sugars, acids and minerals) and fingerprinting methods (oligosaccharides and anthocyanins).

Stable isotopic methods have been found very useful to detect the addition of added sugar and/or acids, which are considerably cheaper than the fruit juice solids. An authoritative review of this area(2) is to be published shortly by the International Fruit Juice Union (IFU) which will provide an extensive overview of the application of isotopic methods. The use of polyphenols as a fingerprinting tool for fruit juices and purées has also recently been reviewed by IFU(5). Ideally any analysis undertaken in this area should use validated methods. Although ADAC provides a number of validated procedures for the use on fruit juices, the most comprehensive list of methods is provided by the IFU(6).

The adulteration of most juices generally involves the substation of fruit juice solids with cheaper sugars and/or acids. This addition may be detected using conventional methods, isotopic procedures and fingerprinting methods such as oligosaccharide and polyphenol profiling. The oligosaccharide method developed by Prof. Lowe (University of Saskatchewan)(7) still proves useful at detecting the addition of added sugar, synonyms, that share a common sugar profile (levels of the simple sugars) to fruit juices (IFU rec 4).

All assessments of red/black juices should include an analysis of the “colored” compounds, as any significant extension is likely to need the addition of a material to “top up” the color. This can take the form of: a synthetic colour such as FDIC (Figure 4): a natural color extract from a fruit or vegetable (e.g. grape skin or black carrot extract) (Figure 5) or a cheaper juice (e.g. red grape, elderberry). This addition can be detected using either thin layer chromatography(4) or ideally HPLC. IFU has a method for this analysis (IFU 71), which has recently been extensively updated. Peak resolutions have been improved, by the use of column with a smaller particle size. Published as part of the method is a reference library which now details the individual anthocyanin pigments in each fruit, so it is ideal for the less experienced analyst. Unfortunately the analysis of the product is only part of the story. Once the data have been collected it needs interpretation. Data may be compared with your own reference samples, if available, or with published data. However, the validity of published data may sometimes be suspect. Another, source is available on the Technical Centre for Juice and Purée webpages:...