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Abstract

Nuclear Magnetic Resonance Metabolomics of Three Tomato Cultivars †

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With the continuous increase in the popularity of vegetarianism and veganism, either as a diet or lifestyle, fruits and vegetables are becoming essential components of human nutrition. Among vegetables, tomato (*Solanum lycopersicum* L.), consumed either as fresh fruit or as processed products, is one of the most frequently consumed, mainly due to its availability, accessible price and healthy metabolites, such as folate, vitamin C, potassium, phenolic compounds, carotenoids and lycopene. Tomato consumption has been associated with a reduced onset of cardiovascular disease and certain cancers. These health benefits have been attributed to different metabolites and interactions in tomato. Owing to its short life cycle, tomato has become the model plant for different environmental studies.

This study aims to characterize the composition of metabolites in fresh tomatoes from different cultivars.

Tomato fruits from three cultivars (Signora, Arawak and Cherry) grown by different Romanian producers were analyzed through NMR spectroscopy. Aqueous extracts were obtained by squeezing 2–3 fresh tomato fruits from the same cultivar in a juicer with a snail. The obtained liquid extracts were centrifuged in order to remove any solid particles. For NMR analysis, 0.9 mL of liquid was mixed with 0.1 mL of phosphate buffer in D2O containing TSP as an internal standard. Signal assignments were performed based on reference spectra and literature data, with 16 metabolites being identified and quantified (Figure 1).

Concentrations of 16 metabolites were determined for the three cultivars. No significant differences between cultivar were obtained for valine, leucine, isoleucine, tyrosine or malic acid. For the rest of metabolites, including phenylalanine, threonine, alanine, asparagine, gamma-aminobutyrate, glutamate, glutamine, citric acid, glucose and fructose, the concentrations were cultivar-dependent. The most significant differences were obtained for cherry tomatoes in the case of asparagine, gamma-aminobutyrate and citric acid.

The identification of several metabolites present in freshly squeezed tomato juice without any separation step was described. Some metabolites that presented significant concentration differences among cultivars can be used as variety markers.

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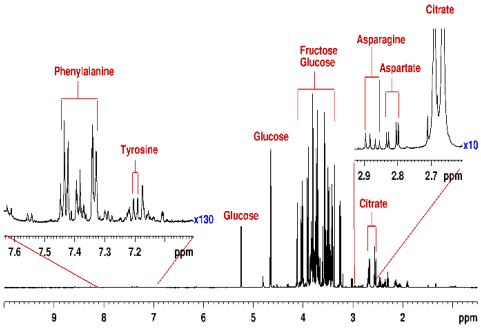

Figure 1. 1H NMR spectrum of the tomato aqueous extract with two enlarged regions for better visualization of metabolites' signals.

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