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Nuclear magnetic resonance applied to food analysis

Elenilson Godoy Alves Filho[1,2]
[1]Federal University of Ceara, Brazil
[2]Embrapa Agroindústria Tropical, Brazil

The nuclear magnetic resonance (NMR) spectroscopy is widely used in food analysis driven by quality control since NMR is non-destructive technique and provides qualitative and quantitative information (by applying correct parameters) about the sample composition with little or no pre-treatment. NMR analysis provides information on a wide range of compounds present in the food matrix in a single experiment, offering advantages in terms of simplicity of sample preparation and short time of data acquisition. Nevertheless, due to highly complex NMR datasets from food matrices and the inherent similarity between the samples composition, applications of chemometric analysis to complement the analytical methods are necessary. In this context, NMR coupled to chemometrics was applied to differentiate conventional and transgenic common beans, grown in greenhouse or under the same field conditions. Another aim was to evaluate the effect of new non-thermal technologies (atmospheric cold plasma and ozone) in orange juice, and evaluate the different pasteurization conditions on passion fruit juice composition, both applied on the key compounds like sugars, amino acids and short chain organic acids. Additionally, the ultimate aim of the study was to apply a non-targeted NMR analysis to identify and investigate the variability of organic compounds in nine different cowpea seeds, without any complex pre-treatment. Finally, NMR combined to chemometric analysis was applied to understand the response mechanisms of orange trees when attacked by *Xanthomonas axonopodis* bacterium. Therefore, NMR data and chemometrics were suitable to reach all the aims proposed in these studies, providing comprehensive and quantitative information about different foodstuff matrices.

elenilson.godoy@yahoo.com.br

Studies on effect of cold plasma treatment on soaking and cooking properties of chickpea [*Cicerarientinum* L.]

FLPathan, **RRDeshmukh** and **US Annapure**
Institute of Chemical Technology, Mumbai, India

The effects of cold plasma treatment on soaking and cooking properties of chickpea (*Cicerarietinum* L.), Kripa (Kabuli type) cultivar were studied. The plasma treatment was given with the varying voltage from 40 V, 50 V and 60 V and the exposure time of the grains to the plasma treatment at each voltage was maintained for 10 minutes, 15 minutes and 20 minutes. Plasma treated and control chickpea samples were compared for soaking and cooking properties. The samples were soaked in the distilled water and 1% sodium bicarbonate solution for 8 hours. After soaking the samples were cooked by pressure cooking. Plasma treated and control un-soaked samples were compered for cooking properties with the soaked and then cooked samples. The control chickpea samples absorbed less moisture in distilled water as compared to 1% sodium bicarbonate solution. The control samples cooked without soaking taken longest time for cooking as compared to cooking after soaking in distilled water and 1% sodium bicarbonate solution.Among cold plasma treated samples highest moisture absorption in distilled water and in 1% sodium bicarbonate soaking was observed in sample treated with 60 V, and exposure time 20 minutes. Lowest moisture absorption in distilled water and 1% sodium bicarbonate was observed in sample treated with 40 V, and exposure time 10 minutes. The least cooking time and more moisture absorption was observed in samples treated with 60 V, and exposure time 20 minutes in un-soaked cooking as well as cooking after soaking in distilled water and 1% sodium bicarbonate.The more cooking time and less moisture absorption in un-soaked cooking and cooking after soaking in distilled water and in 1% sodium bicarbonate was observed in sample treated with 40 V, and exposure time 10 minutes.

udayannapure@gmail.com