

Analysis of Spices for Moisture, Fibre, Volatile Oils and more

Introduction

Accurate control of relevant multi-components and ingredients in spices and mixed spices affects both flavour quality and profitability. Parameters like moisture plays a role in shelf stability, fibre affects profitability and volatile oils affect the flavour profile and taste. Using the DA 7200, staff can perform their own analysis 24/7 and have instant access to the results. The results can be used for process and mixing optimization as well as prevention of costly mistakes.

The Near Infrared Reflectance (NIR) technique is particularly suited for measurement of different spices, but limitations of other instruments with older technology have not allowed users to reap the full benefits of NIR. Older instruments often required that samples be placed in closed samples cells. There is variability from one cell to another thus affecting accuracy of results. Additionally, the cells require cleaning which is both time consuming and a source of potential error if cells are not cleaned thoroughly. The DA 7200 analyzes samples in open faced, disposable cups, or reusable aluminium dishes – eliminating time.

Diode Array 7200

The DA 7200 is a full-spectrum, NIR instrument designed for use in food processing industries. Its innovative diode array technology means it performs each multi-component analysis in only 6 seconds with no sample preparation required. During this time, a large number of full spectra are collected and averaged. Since the sample is analyzed in open dishes, the problems associated with glass cells are avoided and operator influence on results is minimized.



Data Collection

Several hundreds samples of different spices from a processing plant served as the calibration set. The

spectral data was collected using a DA 7200 and the small sample dish. Spectra were collected in duplicate using a sample re-packs to account for variances in packing and particle size. The reference chemistry was supplied by the customers and was measured using a forced air drying method for moisture, a digestion method for fibre, and a steam distillation method for the volatile oils. Calibrations were developed using Partial Least Squares (PLS) regression. The spectra were pre-treated using Savitsky-Golay 1st Derivative with 3 point smoothing and the Standard Normal Variant Transform was applied.

Results and discussion

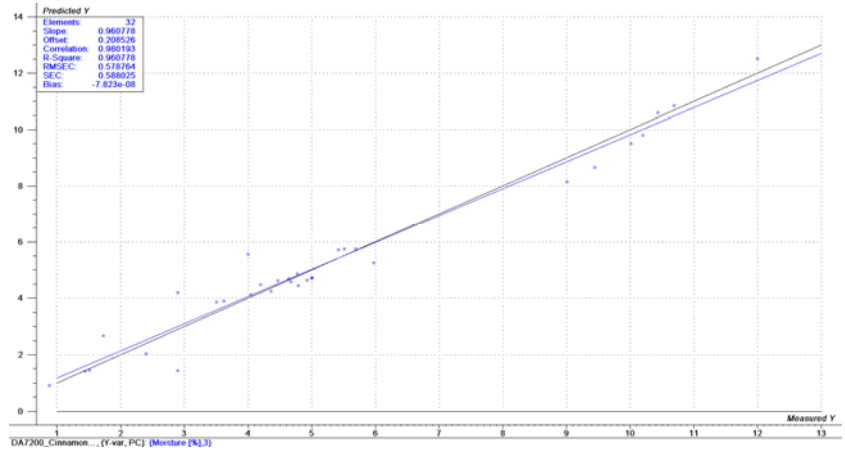
The DA 7200 results are very accurate when compared to the results from the reference methods. Developed calibrations of different spices and parameters are presented in the table below and graphs are displayed on page 2.

Spices	Parameters
Basil	Moisture, Volatiles Oils, Ash, Sand
Caraway	Moisture, Volatiles Oils
Cinnamon	Moisture, Volatiles Oils
Curcuma	Moisture, Curcumin, Ash, Volatiles Oils
Marjoram	Moisture, Volatiles Oils, Ash, Sand
Nutmeg	Moisture, Volatiles Oils, Ash, Sand
Oregano	Moisture, Volatiles Oils
Paprika	Moisture, Colour (ASTA)
Pepper	Moisture, Fibre, Volatiles Oils, Piperine

In summary, it is concluded that the Diode Array 7200 can accurately analyze multi-components like moisture, fibre and volatile oils in different spices. The speed of analysis allows users to easily and accurately analyze many samples a day in nearly real time, which helps to control mixing processes. The open faced, non-contact measurement removes the need for laborious cleaning of cells and eliminates a potential source of error. The instrument's ease of use and flexibility — make it ideal for use in spice labs and even plants worldwide.

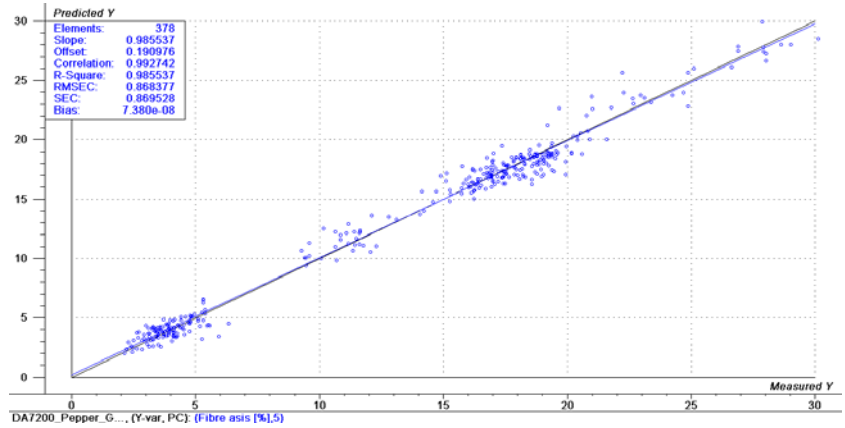
Moisture in Cinnamon

Moisture is accurately and readily measured across a wide range of values, which can help to optimise the production process.



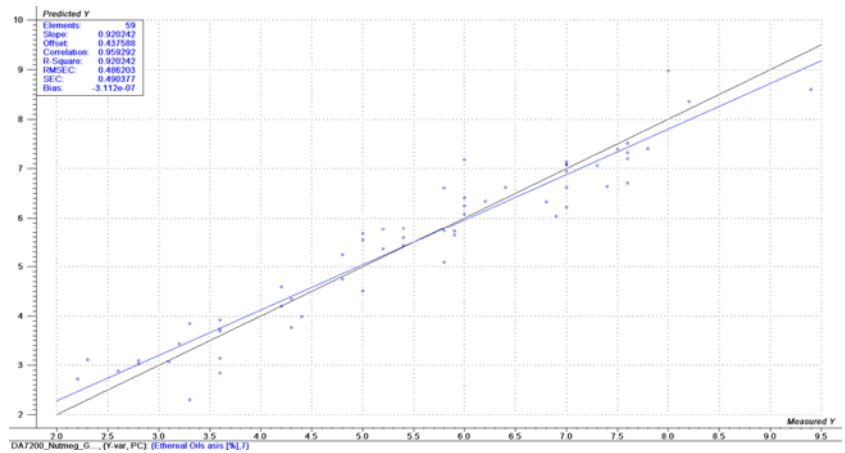
Fibre-as-is in Pepper

Traditional fibre measurements are time consuming and error prone. The DA 7200 makes it a simple and rapid test once calibrated.



Volatile Oils in Nutmeg

The 6 second analysis speed of the DA 7200 makes it ideal for a nearly real-time measurement of volatile oils. This gives the chance to check the flavour profile.



Colour in Paprika

An accurate control of multi-components in spices and mixed spices is useful to control and optimise the mixing process in spice plants

