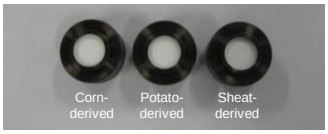
The Classification of the Starch by 3-D Fluorescence Spectra Measurement (Fluorescence Fingerprint) using the Multivariate Analysis

INTRODUCTION

Currently, in fields including the food field, the study to apply a 3D fluorescence spectrum (fluorescence fingerprint), with a large amount of sample-specific numerical data, for the determination of agricultural product origins and the evaluation of grain powder types and grades is being conducted.
In general, chemical analysis is used for the analysis of foods and agricultural products. However, the preparation is necessary and it takes a long time to analyze multi-specimens.
On the other hand, the analysis by a fluorescence spectrometer, which provides a sample-specific fluorescence fingerprint, characteristically allows the direct measurement of a sample without any preparation.
This time, the 3D fluorescence spectra of starches from different raw materials were measured by using this method and the types were determined.
F-7000 Hitachi fluorescence spectrophotometer, because of the highest 3D fluorescence spectrum throughput for the instrument class (about 3 minutes under the analytical conditions used this time), is used for a broad range of applications from cutting-edge research to quality control.

SAMPLE

Sample : Starch (corn derived)
Starch (potato-derived)
Starch (wheat-derived)
(Wako, Osaka, Japan)



ACCESSORY

Solid sample holder
(P/N : 650-0161)

ANALYTICAL CONDITIONS

Instrument	: F-7000	Slit on excitation side	: 5 nm	Photomultiplier Vol.	: 250 V
Excitation wavelength range	: 200 - 600 nm	Slit on fluorescence side	: 5 nm	Full scale	: 200
Fluorescence wavelength range	: 200 - 600 nm	Response	: Automatic	Contour line interval	: 2
Scan speed	: 60000 nm	Detector	: R928F		

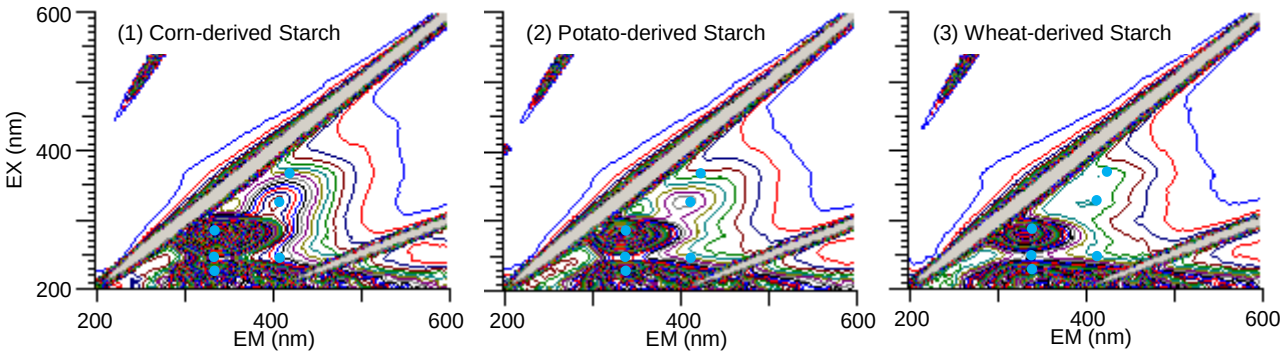


Figure 1 3D Fluorescence Spectrum of Starch

The 3D fluorescence spectra of the starches produced by using (1) corns, (2) potatoes, and (3) wheat as the raw materials were obtained. As a result of the measurements, their characteristic fluorescence fingerprints were obtained (Figure 1). By focusing on the 6 sets of excitation and fluorescence wavelengths (Plot in Figure 1) of these fluorescence fingerprints, multivariate analysis was performed (next page).

KEY WORDS
Bio/Medical Science/Food/Pharmaceutical, Food, Starch, Corn, Potato, Wheat, Food, Fluorescence Fingerprint, Multivariate Analysis, EEM, Main Component Analysis, Quality Determination, Distinction Analysis, 3D Fluorescence Spectrum, FL, F-7000

Fluorophotometer (FL)

Sheet No. FL130004-01

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Figure 2 shows the results of the multivariate analysis for the main components performed based on the fluorescence intensities that were obtained by measuring each sample 9 times(Scatter diagram of main component score) .

In addition, the scatter diagram of the factor loading is shown in Figure 3.

The scatter diagram of the main component score showed the trend different for each starch raw material and the types of the starch raw materials could be determined.

In addition, the factor loading scatter diagram showed that the behaviors at 225/335 nm and 365/415 nm were different, indicating that the data is effective for the main component analysis. On the other hand, it was found that the behaviors at 245/335 nm and 280/335 nm were similar for the main component analysis. As a 3D fluorescence spectrum provides a large amount of information, one measurement allows these analyses from multiple points of view.

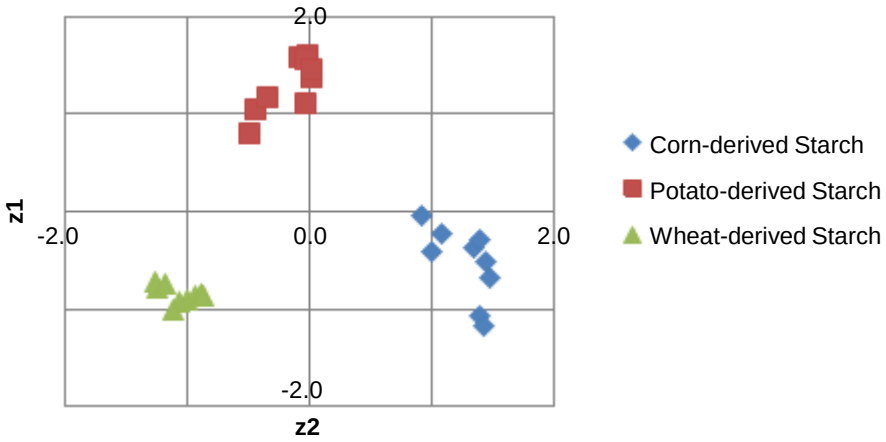

Figure 2 Scatter Diagram of Main Component Score

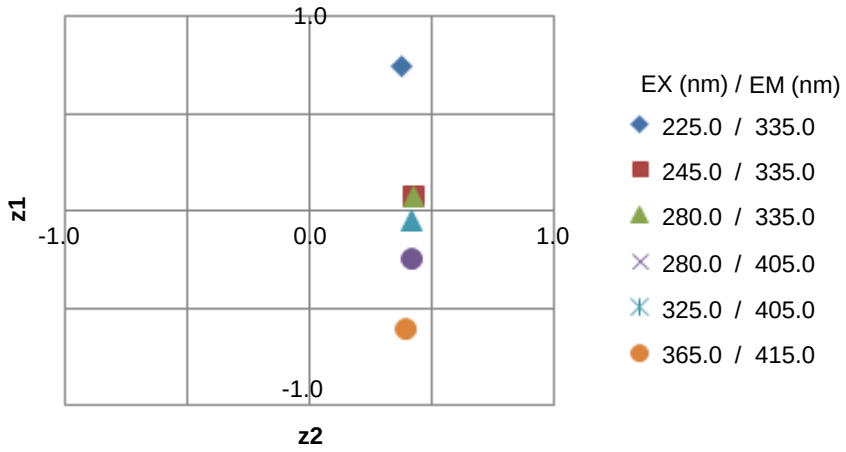

Figure 3 Scatter Diagram of Factor Loading

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Fluorophotometer (FL)

Sheet No. FL130004-02