

Damiran, D., Yu, P. 2009. Discrimination and classification of the new co-products from bio-energy production using infrared spectroscopy with multivariate techniques-AHCA and PCA: Comparison among blend DDGS, wheat DDGS and corn DDGS and between wheat and wheat DDGS, and corn and corn DDGS [abstract]. In: Abstract for the 2009 Joint ADSA-CSAS-ASAS Annual Meeting. July 12-16, 2009, Montreal, Quebec, Canada.

Discrimination and Classification of the new Co-Products from Bio-energy Production Using Infrared Spectroscopy with Multivariate Techniques-AHCA and PCA: Comparison among Blend DDGS, Wheat DDGS and Corn DDGS and between wheat and wheat DDGS, and Corn and Corn DDGS

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Abstract

Dramatic increase in bio-ethanol production has resulted in different types of new co-products: wheat dried distillers grains with solubles (DDGS), corn DDGS, and blend DDGS. There is an urgent need to quickly understand molecular structural profile in these co-products. The objective of this study was to investigate molecular structural features of the new co-products from Bio-energy product using infrared spectroscopy with two multivariate spectral analysis techniques as a novel approach: agglomerative hierarchical cluster (AHCA) and principal component analyses (PCA) and compared among blend DDGS, wheat DDGS and corn DDGS, wheat and wheat DDGS, and Corn and Corn DDGS. The results show that by application of these two multivariate techniques of AHCA (Distance method: Euclidean; Cluster method: Ward's algorithm) and PCA with the infrared spectroscopy, it makes possible to quickly discriminate and classify the inherent molecular structural features among the different types of DDGS and between wheat and wheat DDGS and between Corn and Corn DDGS with a great efficiency, in the fingerprint region of protein amide I and II ca. 1720-1484 cm^{-1} . The DDGS and feedstock inherent structures can be grouped in separate ellipses. The first principal component explained > 90% of the total variance. Information from this study may provide a

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further insight as to why DDGS exhibit different biodegradation behaviours and nutrient availability in animals.

KEYWORDS

Classification and discrimination of Molecular Spectra, Co-Products from Bio-energy Production
DDGS