METASPEQ

Near-Infrared Spectroscopy

APPLICATION NOTE

Unlocking Ginger Quality and Traceability with NIR Spectroscopy

MetaspeQ near-infrared spectrometers, powered by AI/ML-driven **SpectraFind™**, provide rapid, non-invasive ginger powder quality assessment and geographic traceability. By accurately quantifying 6-gingerol content and classifying samples by origin, this technology offers efficient, cost-effective quality control, surpassing traditional methods. AI-enhanced chemometrics ensure scalability and reliability for the agri-food/spice industry.



AT A GLANCE

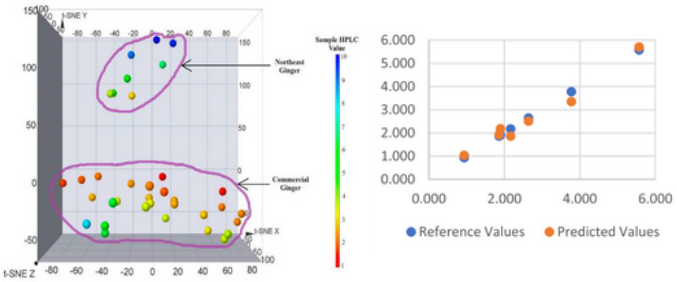
- **Technology**: MetaspeQ™ Near-Infrared Spectroscopy
- **Objective**: Fast and accurate assessment of ginger powder quality through NIR fingerprinting.
- **Industry**: Agricultural, Spice and Food Quality Control
- **Solution**: NIR spectroscopy for non-invasive evaluation of ginger's 6-gingerol content and geographic traceability.

Challenges

- Time-Consuming Traditional Methods
- Complex Data Interpretation
- Expensive,time-consuming testing with no portability

Benefits

- Rapid and Non-Destructive Testing
- Accurate and Reliable Quantification
- Cost-Effective Quality Control Solution
- Geographic Traceability



3D T-SNE VISUALIZATION OF GINGER SAMPLES

NEXT-GENERATION QUALITY ANALYSIS

OBJECTIVES

Assess Ginger Quality Based on 6-Gingerol Content: Evaluate the concentration of 6-gingerol, a bioactive compound, in ginger samples.
SpectraFind™ Geographic Traceability: NIR spectral fingerprinting combined with Principal Component Analysis (PCA) and t-SNE to differentiate between ginger samples based on their origin.

SOLUTIONS

Advanced NIR Spectroscopy for 6-Gingerol Quantification- Metaspeq™ NIR technology offers a non-invasive and rapidanalysis of ginger powder to determine the concentration of 6-gingerol.

AI-Powered Chemometric Analysis: Advanced preprocessing methods like Standard Normal Variate (SNV) were applied to enhance spectral quality. PCA and t-SNE algorithms were used to classify ginger samples based on their geographic origin, providing clear and accurate traceability.

BENEFITS

Faster Analysis Time: Conduct honey authenticity tests up to 90% reduction in analysis time compared to traditional methods, enabling rapid decision-making in quality control processes.

Non-Destructive Testing: Analyze samples without destroying samples and allow for further testing if needed.

Accurate, Reliable Quantification & Geographic Traceability: The NIR model delivered robust performance, with an RMSEP of 0.24 for prediction and an R^2P value of 0.973, ensuring high precision in predicting the 6-gingerol content. The combined use of PCA and t-SNE algorithms offers improved clustering of ginger samples based on their geographic origin, supporting traceability and promoting a sustainable value chain.