METASPEQ

Near-Infrared Spectroscopy

APPLICATION NOTE

Quality Analysis of Cinchona Bark Using NIR Spectroscopy and AI/ML Integration







MetaspeQ near-infrared spectrometers, use proprietary AI/ML technology, **SpectraFind**, as a cost-effective, rapid, and reliable alternative to HPLC to evaluate the concentration of quinine in different cinchona bark to identify the high yield variety for quinine production.

AT A GLANCE

- **Technology**: MetaspeQ™ Near-Infrared Spectroscopy
- **Objective**: Accurate quantification of quinine in Cinchona bark.
- **Industry**: Pharmaceutical & Botanical Research
- **Solution**: AI/ML-enhanced NIR spectroscopy for rapid and non-destructive testing.

Challenges

- Time-consuming sample preparation process.
- Requires expensive solvents and reagents.
- Complex and labor-intensive procedures.

Benefits

- Significant cost savings.
- Drastically reduces analysis time.
- Eliminates need for sample preparation.
- Accurate content quantification achieved.



Govt. Quinine Factory at Mangpu, Darjeeling West Bengal

NEXT-GENERATION QUALITY ANALYSIS

OBJECTIVES

Assess Quinine Content Accuracy: Evaluate the quinine concentration in Cinchona bark using advanced NIR spectroscopy and compare it to traditional gravimetric methods.
Improve Testing Efficiency: Compare the efficiency, cost, and time saved using NIR technology over conventional methods like HPLC and gravimetric analysis.
Validate SpectraFind™ Chemometric Models-Demonstrate the effectiveness of machine-learning algorithms in improving the predictive power and accuracy of NIR spectra analysis.

SOLUTIONS

Advanced NIR Spectroscopy for Quinine Analysis- Metaspeq™ NIR technology offers a non-invasive and rapid method for estimating quinine content in Cinchona bark.
AI-Powered Chemometric Analysis: The model showed strong correlations between predicted and actual values, with a low RMSE of 0.45 for calibration.
Improved Cost-Efficiency and Speed-NIR spectroscopy drastically reduces time and costs associated with traditional chemical testing methods. By eliminating the need for solvents, reagents, and complex procedures, it provides a faster, more efficient solution for routine quality control.

BENEFITS

Faster Analysis Time: Achieve up to a 90% reduction in analysis time compared to traditional methods, enabling rapid decision-making in quality control processes.
Non-Destructive Testing: Analyze samples without destroying them, preserving the integrity of Cinchona bark and allowing for further testing if needed.
Cost-Effective Quality Control: Reduce the operational costs by eliminating the need for expensive reagents and solvents. With no need for sample preparation, the overall complexity and cost of testing are significantly lowered.
Accurate and Reliable Results: The AI-enhanced NIR system offers accuracy comparable to traditional methods like gravimetric with minimal error.