SeedSpectra

AI-Powered Single Seed Spectroscopy
for Maize Quality & Biochemical Analysis

S0817 - Development of Low - Cost Spectral Measurement Setup and Calibration Models for Single - Seed Biochemical Analysis in Maize

NIR Spectroscopy

AI-Powered Seed Classification

Digital Agriculture Technology

Single - Seed Biochemical Analysis

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Why SeedSpectra?

Modern breeding programmes and seed industries require rapid and accurate methods for analysing biochemical seed traits such as:

- Protein content
- Oil content
- Moisture
- Starch and quality-related parameters

Conventional laboratory analyses are often destructive, time-consuming and expensive.
SeedSpectra addresses this challenge by integrating:

- Low-cost spectral sensors
- Vis–NIR technologies
- Artificial intelligence-based calibration models
- Digital data analysis tools
- Automated seed analysis approaches

The project supports the digital transformation of seed quality analysis and next-generation breeding systems.

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Main Objectives

- Develop a low-cost spectral measurement setup for single-seed analysis
- Improve calibration accuracy for seed biochemical traits
- Integrate AI-supported modelling approaches
- Develop practical and scalable seed analysis workflows
- Support high-throughput breeding applications
- Strengthen cooperation between academia and industry

Expected Results

- Prototype low-cost spectral measurement system
- AI-supported calibration models
- Digital analysis workflows
- Applied datasets for seed biochemical analysis
- Industry-oriented validation studies
- Strengthened international cooperation in digital agriculture

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Technological Focus Areas

Spectral Technologies

- Vis–NIR spectroscopy
- Single-seed spectral acquisition
- Low-cost sensor integration

Artificial Intelligence and Data Analysis

- Machine learning models
- Predictive calibration systems
- Data-driven seed quality analysis

Breeding Applications

- Rapid seed screening
- High-throughput phenotyping
- Non-destructive seed quality assessment

Innovation and Impact

SeedSpectra combines low-cost spectroscopy, artificial intelligence and seed technologies within a single integrated platform.

The project contributes to:

- Faster breeding decisions
- Reduced analysis costs
- Sustainable seed quality monitoring
- Digital transformation in agriculture
- Industry-oriented innovation

Green and Digital Approach

The project promotes sustainable and resource-efficient agricultural technologies through:

- Non-destructive seed analysis
- Reduced chemical use in laboratory analyses
- Digital-first workflows
- Open and scalable data processing approaches

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Consortium Partners

Türkiye

- BAF Electronic Software Agriculture Inc.
- Tarım Kredi Tohumculuk A.Ş.
- Çanakkale Onsekiz Mart University (Subcontractor)

Austria

- S&H Labor für Innovative Analytik OG
- University of Innsbruck (Subcontractor)

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S0187 - SeedSpectra project has received funding from FFG and TÜBİTAK through the Eureka Cluster Programme and SMART Cluster.