RESHAPE

APPLICATION NOTE

Digitized Seed Scoring

Instant and reliable seed scoring with AI-powered high-resolution imaging

APPLICATION

Instant and reliable seed assays with AI-powered high-resolution imaging

Why is it a critical need?

Seed assays, including health scoring, variety tracking, and germination rate assessment, are traditionally performed manually, making them subjective, time-consuming, and prone to operator variability. In modern breeding and crop development, where thousands of samples must be evaluated rapidly and with precision, this creates a significant bottleneck. Even subtle phenotypic differences can have major downstream implications, and inconsistent scoring compromises data reliability. Automating seed scoring with AI enables objective, standardized, and high-throughput analysis, accelerating decision-making while significantly improving data quality and reproducibility.

How does Reshape help?

Reshape enables instant and reliable seed scoring through automated, high-resolution imaging combined with AI-driven analysis. The system captures standardized images under controlled conditions and applies analysis models to quantify germination, growth, and phenotypic traits objectively and reproducibly. This removes manual bottlenecks, eliminates subjectivity, and delivers structured, decision-ready data in real time, thereby helping agricultural R&D teams scale their screening workflows and reduce time-to-result.

Introduction

Seed scoring is fundamental to plant research, breeding programs, and quality control workflows. Whether assessing germination, varietal purity, morphology, or contamination, researchers rely on accurate and reproducible measurements.

Traditional seed scoring methods are often manual, time-intensive, and prone to operator bias. Even semi-automated approaches can struggle with reflections, plate artifacts, uneven lighting, and subtle morphological differences between seed types.

Reshape's Smart Incubator combines high-resolution imaging with instant AI-driven analytics to deliver rapid, reliable seed scoring, eliminating subjective variability while accelerating experimental throughput.

SHOWCASE I

High-Resolution Imaging Meets Instant AI Analytics

To evaluate the ability of Reshape's AI models to differentiate between seed types based on phenotypic traits (including color, shape, and size) multiple seed varieties were co-plated in a single Petri dish and subjected to automated imaging. AI models using computer vision were applied to identify, classify, and group individual seeds, generating variety-specific counts without manual intervention.

All experiments were conducted in the Reshape Smart Incubator, which integrates high-resolution imaging with controlled environmental conditions (e.g., temperature) to ensure biologically relevant and reproducible data acquisition. The system features dual illumination modes: top lighting for accurate color-based analysis and bottom lighting for transmitted imaging, enhancing detection of subtle morphological differences in shape and structure.

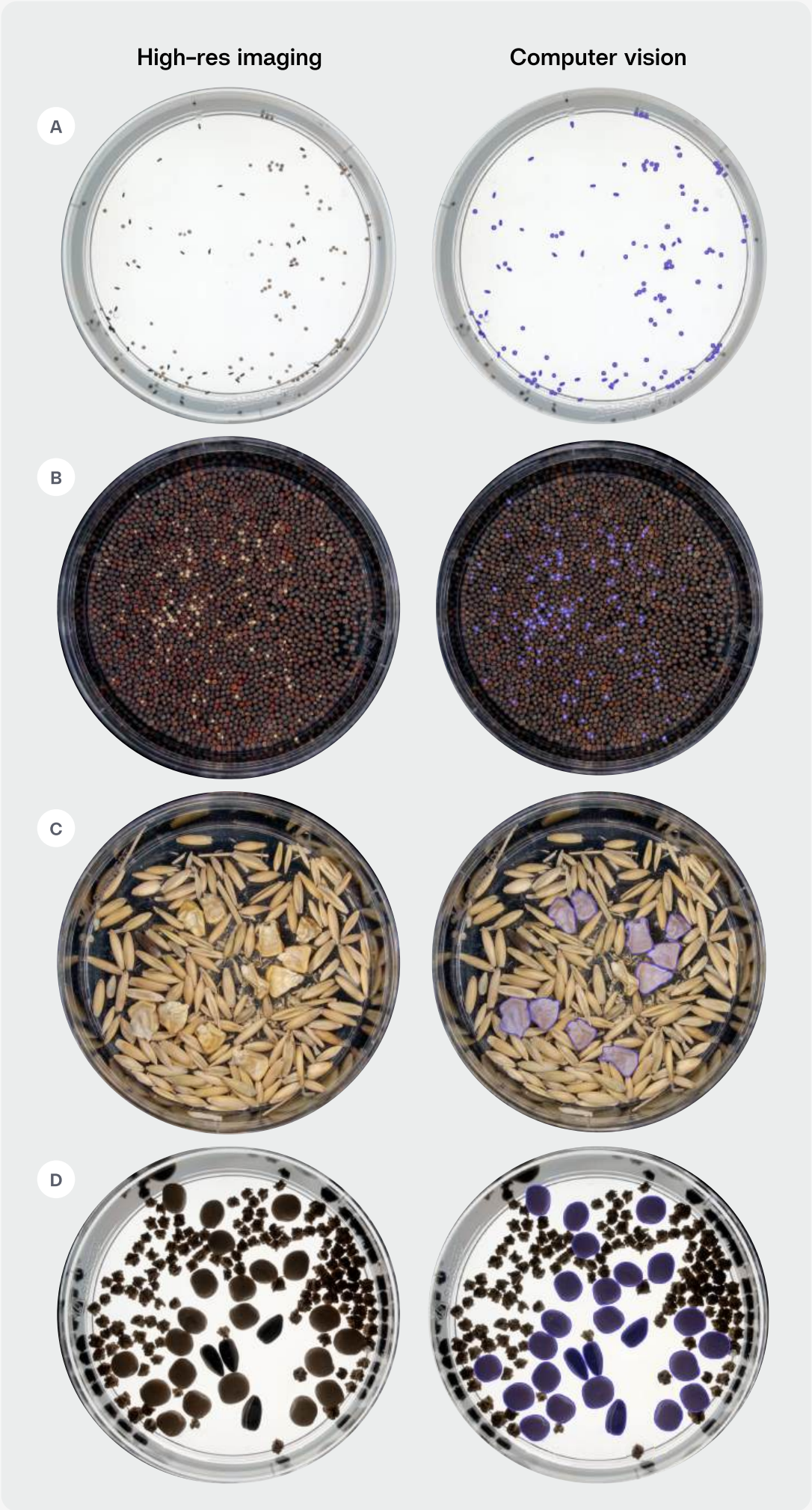

Figure 1. High-resolution images captured using Reshape's Smart Incubator, showcasing a range of seed assays alongside real-time AI-driven analytics.

(**A**) Accurate, reflection-free object detection enabling reliable counts without interference from plate artifacts or glare.

(**B**) Precise differential quantification of specific seed varieties, with computer vision distinguishing subtle morphological traits based on color.

(**C**) Advanced classification based on size and shape, allowing robust identification across heterogeneous samples.

(**D**) Transposed light imaging illustrating complementary acquisition modes that enhance morphological feature extraction and improve computer vision accuracy.

SHOWCASE II

Seed Germination Rates

Determining seed germination rates traditionally requires manual inspection at discrete time intervals, often leading to imprecise identification of the exact moment of radicle emergence. This intermittent monitoring limits temporal resolution and can obscure subtle differences in germination kinetics.

Sealed oat seeds

To evaluate the performance of Reshape's AI models for automated germination analysis, oat seeds were monitored continuously over a 6-day period in the Reshape Smart Incubator. Time-resolved imaging enabled automated classification of germinated versus non-germinated seeds, providing both absolute counts and germination ratios across the full experimental timeframe.

Results & Discussion

Reshape's AI model accurately detected and classified non-germinated (orange) and germinated (green) seeds throughout the 6-day assay (Figure 2). Automated image acquisition combined with real-time classification enabled continuous quantification of both absolute counts and germination ratios, eliminating the need for manual scoring. This approach ensures objective, reproducible measurements and enables extraction of full germination kinetics rather than endpoint-only data. In parallel, the assay was maintained at stable environmental conditions (28 °C), providing consistent and controlled conditions for germination monitoring. The integration of environmental control with automated imaging ensures that observed differences in germination dynamics reflect biological variation rather than fluctuations in incubation parameters.

A minor practical limitation was observed when rapidly germinating seeds produced elongated shoots that occasionally displaced the Petri dish lid or partially obscured neighboring seeds. This effect can be mitigated by optimizing seed density per plate to maintain clear spatial separation and unobstructed imaging. Given that up to 15 Petri dishes can be monitored simultaneously (and up to 75 dishes using the Reshape Rack) the platform maintains high throughput while preserving analytical accuracy through simple experimental design adjustments.

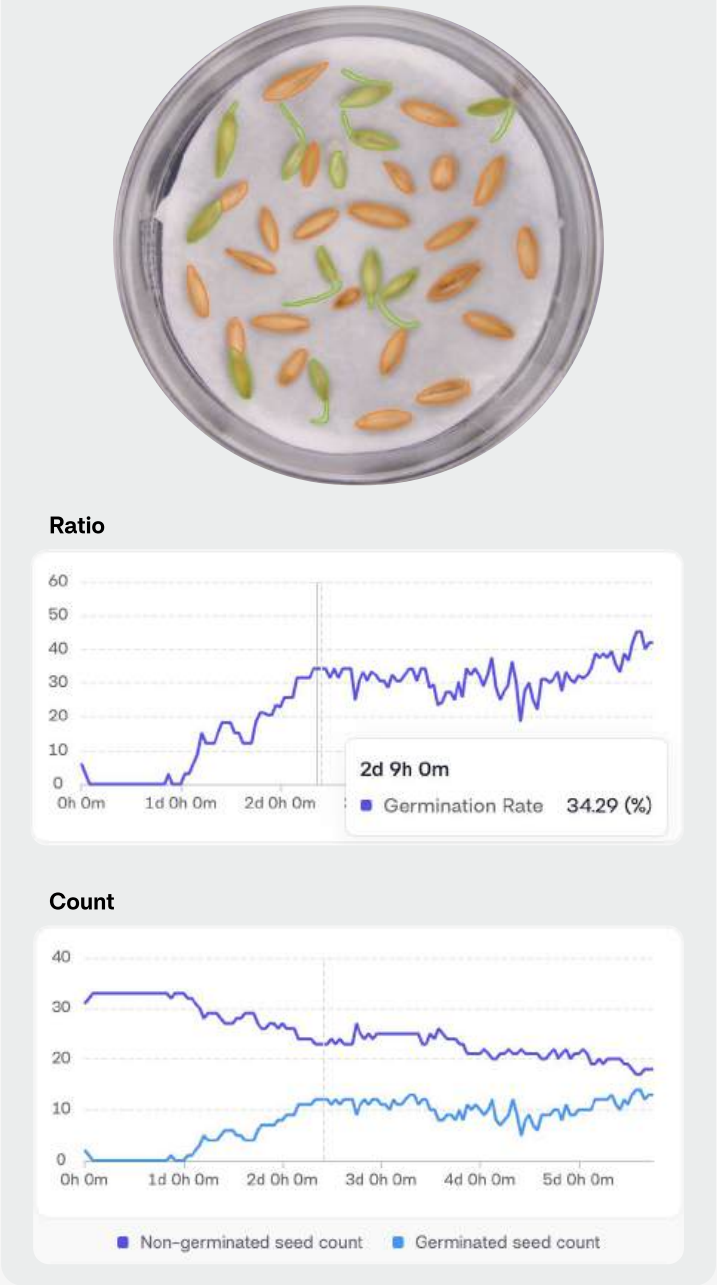

Figure 2. AI-based classification of non-germinated and germinated oat seeds along with immediate insights available in Reshape's Discovery Platform, including non-germinated vs germinated ratios and total germinated counts.