

## **Application of machine-vision to assess admixture and discoloration in lentil and field pea**

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Lentil and field pea are typically traded based on broad market classes. Market acceptance is largely driven by the visual appeal of the split or whole-grain product. Colour and uniformity are major indicators of the grain quality however these have traditionally been assessed by subjective visual inspection. Colorimeters have also been used for assessment of grain colour and while these instruments are objective, they are not able to capture the variation and distribution of colour traits across the grains. Moreover, in the context of assessing pulse-specific quality traits, the pre-defined colour spaces used by colorimeters are not always intuitive.

Machine vision systems, comprising image capture and analysis, are becoming increasingly popular for quality evaluation of agricultural products. These systems offer the potential for objective, consistent, high-throughput and non-destructive assessments. Through image analysis visual properties of lentil and field pea grains can be quantified with mathematical models. Size and shape features can be calculated by transformations of the seed boundary coordinates and, provided the image-acquisition light-source is consistent, colour features can also be objectively defined through modelling.

In this study we apply a machine vision approach based on multi-spectral images to assess admixture and quantify the magnitude and distribution of discoloration in lentil and field pea grains. Visual features of the grains relating to size, shape and colour were extracted from digital images and used to train the models. Seed admixture was determined through Linear Discriminant Analysis models for quantifying levels of lentil off-types within lentil samples, field pea off-types within field pea samples and vetch seed within lentil samples. Discoloration of grains was quantified through transformations of modelled visible-reflectance spectra.