Grower Summary

FV 444

Investigation into the non-destructive detection of Brown Heart in swedes (*Brassica napus*) using ultrasound

Final **2015**

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Further information

If you would like a copy of the full report, please email the AHDB Horticulture office (hort.info.@ahdb.org.uk), quoting your AHDB Horticulture number, alternatively contact AHDB Horticulture at the address below.

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Project Number:	**FV 444**
Project Title:	**Investigation into the non-destructive detection of Brown Heart in swedes (*Brassica napus*) using ultrasound**
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Previous report/(s):	
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GROWER SUMMARY

This research investigated the non-destructive ultrasound technique to detect the internal defect Brown Heart in swedes, together with the texture and microstructure measurements, and suggests a viable proof of concept.

The Brown Heart condition influenced the ultrasound velocity on the swedes. The ultrasound technique showed a strong positive correlation with the Brown Heart severity as verified by subsequent visual inspection. Ultrasound velocity can be explained theoretically in terms of the volume ratio of air-water. This hypothesis is supported by microscopy of the internal cells of Brown Heart and healthy swedes and texture profile analysis.

Further research is required to fully explore different sample harvests and produce associated calibration data. In particular, to satisfy industry requirements, the techniques need to be able to evaluate swede samples radially without process 'cuts' and ideally with single transducers systems during in-line cleaning and weight grading processes. This would require a fully formulated research enquiry to fully parameterise the variation within the crop and post-harvest practices.

Headline

Ultrasound velocity measurements offer a potential method for the non-destructive detection of internal defects caused by Brown Heart deficiency in swedes (*Brassica napus* or Rutabaga).

Background

The aim of the research was to evaluate ultrasound techniques to identify interior defects with culinary swedes that currently may cause significant crop losses despite potentially low incidence within the entire harvest. This project primarily focused on Brown Heart detection in culinary swedes but the technology in principle may be exploited to detect other defect conditions and other vegetable formats enabling more efficient quality assessment.

The intended deliverable from the project was to establish a proof of concept in the use of ultrasound as a reliable methodology of internal defect detection in root vegetables. The research has shown that additional investigation and development is required to improve characterisation parameters and to design practical engineering solutions.

Summary

Preliminary assessment of the use of ultrasound to detect defects and to estimate the level of defect, indicated that ultrasound velocity measurements offer a potential method to accurately

identify Brown Heart defective swedes, although not to specifically identify the degree of the defect.

The aim of the research was to look at the development of an economical, non-destructive ultrasound method of internal defect determination within swedes. This will lay the foundations for later development of a production line system to identify defective individual roots on a conveyor belt during initial processing and provide a reliable quality assurance methodology. The project aimed to use ultrasound measurement techniques to evaluate swede crops non-destructively to accurately determine the presence of internal defects caused by stresses such as boron deficiency. This technique offers an objective method to rapidly evaluate the quality of individual swedes and minimize crop losses, offering the obvious financial benefits to growers and quality assurance to retailers.

Action Points and potential financial benefits

The work conducted in this project investigated the potential use of ultrasound measurements to non-destructively and non-invasively detect the presence of internal defects, specifically Brown Heart in swedes. The results suggest that this is a potentially viable technique which would benefit from a more detailed and extensive study to further explore the use of single transducer systems which do not require process cuts of samples (i.e. complete swedes) and test samples radially, as opposed to axial measurements which were conducted in this work.

Significant crop losses currently occur due to Brown Heart, resulting in entire crops being destroyed or wasted; this would be substantially reduced if a reliable detection method could be developed, offering the obvious financial benefits to growers and quality assurance to retailers.

