FIBRE DEVELOPMENT IN EARLY HARVEST GINGER GROWN IN SOUTH EAST QUEENSLAND

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Abstract

Fibre cell wall thickening and possibly lignification contribute to toughening of fibre bundles in early harvest ginger. A photographic record of fibre wall thickening was obtained. Rhizome fibre content (NDF%) and percent choice grade rhizome are poor indicators of fibre development because other plant components influence them more so than fibre content. Compressive resistance appears a useful indicator of fibre development.

Key words: Ginger, fibre, vascular bundles, rhizomes.

The Australian ginger industry is orientated chiefly towards the production of high quality, fibre-free ginger for the confectionary market. Ginger for this market is harvested when the rhizome is still young and tender and relatively free of well-developed fibre. This is called 'early harvest'. At early harvest the rhizome must be between 35 and 45% free of fibre resistant to the passage of a blunt knife (1). Ginger of this quality is designated choice grade ginger and a premium price is paid by the processor. The developmental changes in rhizome fibre, while important, have not been studied previously.

Studies were conducted to quantify the development of the various components of the rhizome including fibre, and to establish a relationship between compress-ive resistance and the presence of well-developed fibre.

Results and discussion

Plant samples were obtained from a commercially grown field of ginger at Yandina, Qld. Early harvest in the experimental plants covered the period from Julian day 65 to Julian day 85. Rhizome fibre dry weight increased over this period but percent NDF decreased (Fig 1a). This indicates some other rhizome component, probably starch, was increasing at a faster rate than fibre.? Starch comprises up to approximately 49% of the dry mass of mature ginger rhizome (2).

Mean fibre bundle width and mean fibre double-wall thickness were measured for the third and fourth order rhizome segments. These portions of the rhizome account for 75% of rhizome fresh weight at early harvest and as such developments in these components are considered most likely to influence changes in percentage choice grade rhizome.

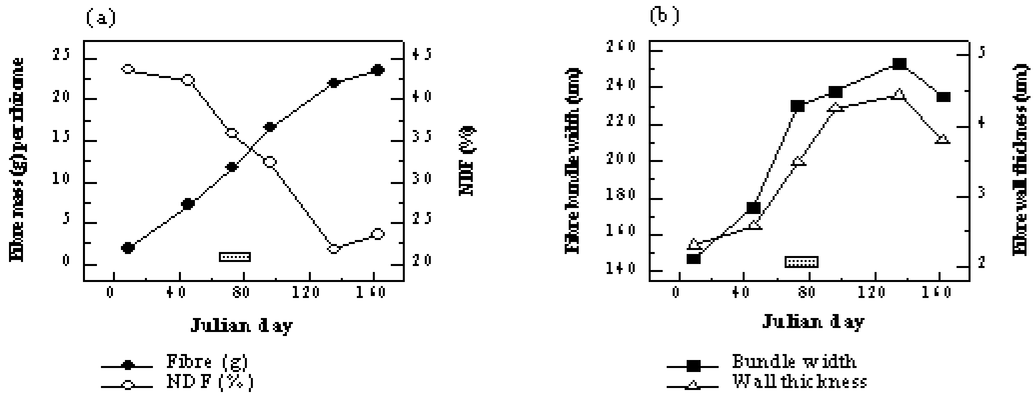

Figure 1. Graph (a) shows the temporal trend in rhizome fibre dry mass (g) and Neutral Detergent Fibre as a percentage of rhizome dry mass. Graph (b) shows the temporal trend in mean fibre bundle width and mean fibre double-wall thickness for third and fourth order rhizome segments. The bars in graphs (a) and (b) signify the early harvest period.

Fibre bundle width had increased to approximately 230 mm by early harvest but had begun to plateau and finally decline (Fig. 1b). This decline is thought to be the result of desiccation of the vascular bundle cell lumens. A decrease in fibre wall thickness, measured after early harvest, suggests fibre cell walls may also be desiccating. While the moisture content of cell lumens and cell walls were not measured directly, whole rhizome moisture content declined over the period from Julian days 43 to 160 by 11%.

Fibre wall thickness was approximately 3.5 mm at the time of early harvest and still increasing rapidly and as such is associated with the decline in percentage choice.? Lignification was not estimated but stained slide sections show its presence, particularly in fibre, in older portions of the rhizome. It is likely that lignification and increases in fibre cell walls both contribute to toughen-ing of the fibre bundles.

Compressive resistance was measured with a 10 mm wide and 0.90 mm thick stainless steel tip as is used in the commercial grading of processed ginger. Compress-ive resistance was greater in progressively older portions of the rhizome. Fibre was also rated by cutting through the rhizome with a 0.90 mm thick blunt knife, as is used for commercial grading of ginger, and rating the presence of fibre on a scale of 1-3, with 3 being obvious fibre and 1 no fibre. The subjective ratings of fibre presence showed a similar trend to compressive resistance with older portions of the rhizome having greater values.? Rhizome pieces with well-developed fibre had a compressive resistance of approximately 38 N or greater.? Rhizome pieces with very little well-developed fibre had a compressive resistance of approximately 21 N or less.

Conclusion

Data collected suggests both fibre cell wall thickening and possibly lignification contribute to the toughening of fibre bundles around early harvest time. Percent NDF is a poor indicator of rhizome fibre development without concurrent measurements of starch content.

Compressive resistance appears a good estimator of objectionable fibre. Rhizome segments with well-developed fibre has a compressive resistance greater than approximately 21N.

References

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