

Influence of Heat-Treatment of Bambara Groundnut Seeds Using Infrared, Microwave, and Combined Heat Treatment on the Beany Flavour of Flours and Porridge

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Abstract

Introduction: Bambara groundnut hard-to-cook (HTC) phenomenon limits their consumption as whole grain, requiring longer cooking times. This is due to the strengthening of the cell wall by forming insoluble calcium pectates. In addition, milling Bambara groundnut into flour may lead to the development of off-flavour, such as beany flavour. Lipoxygenase catalyses the oxidation of unsaturated fatty acids in Bambara, forming volatile compounds responsible for the off flavour. Heat treatment can denature lipoxygenase and mitigate its activities in Bambara flours.

Methodology: Bambara groundnut grains were moisture conditioned to reach 20% moisture level, then heat treated for 10 min using infrared and microwave separately and in combination. The grains were then dried in an oven. The cooking time of the grains was determined. Bambara grains were milled into flour, and another batch was cooked into porridge. A trained sensory panel evaluated the flour and the porridge.

Results and Discussion: The cooking time for untreated Bambara grains was about 3 hours, which was reduced to about 23 minutes in combined heat treatment with microwave and infrared. The flours from heat-treated grain showed a significant reduction in pasting viscosity. The results for both flour and porridges showed significant differences in appearance, flavour, and overall difference from the control. The nutty flavour was perceived by most of the panellists in the microwave and the combined treated flour and porridge. The results showed that the beany flavour was associated with untreated samples. The “raw green beans” descriptor from the panellists was closely associated with the untreated samples.

The beany flavour may be caused by volatile compounds such as pentanol, hexanal, and hexanol found in Bambara seed. These compounds are formed following a cascade of events initiated by the oxidation of unsaturated fatty acids catalysed by lipoxygenase. The heat treatment denatures the latter.

Conclusions: This study demonstrates that heat treatment of Bambara seeds reduced cooking time of the grains and beany flavour in their flours. The finding from this study may help enhance the utilisation of Bambara flour in foods such as soup, snacks, and pastry.