

IIT Roorkee undertakes study for easy identification of spoiled coconut

A study to develop a low cost and easy to use sensor for detecting spoiled coconut at pre – processing stage is undertaken conducted by IIT, Roorke with the financial assistance of CDB.

Coconut is one of the most important palm crops of India accounting for 31% of total global production of coconut. Coconut water has tremendous health-protective properties. During the production of value added products from coconut, mostly the water gets contaminated at pre-processing stage due to mixing of spoiled coconut water. As a result a huge amount of coconut water is wasted without any value addition. Presently no technology is available for the detection of spoiled coconuts at pre-processing stage to avoid mixing of spoiled coconut water with good water. Now IIT, Roorkee has approached the Board with a project to identify spoiled coconut at pre-processing stage using a hybrid sensor technology. Initially, changes in the permittivity of healthy and spoiled coconut will be tested in terms of changes in the output frequency of radio-frequency (RF)-signal and then specific volatile metabolites present in the spoiled coconut will be detected using a suitable semiconductor metal oxide transducer. There is a major gap in current research for an accurate, automatic, cost effective, and durable spoiled coconut detection aid.

The objective of the study is to develop a low cost and easy to use sensor so that spoiled coconuts at pre – processing stage can be identified. Metabolite profiling of healthy and spoiled coconut at various stages will be made to detect specific volatile metabolites associated with spoiling stage.

At various stages of study, coconut cultivars at various developmental stages will be selected for the study. Three groups of coconut will be selected for sample preparations viz. healthy coconut at various stages of development, naturally infected coconut and artificially infected coconut.

Volatile metabolites will be analyzed directly using head –space GC-MS. For enhanced analysis of targeted group of volatiles, suitable chemical traps, sorbents and solid phase micro extraction (SPME) based analysis will be adapted. Unknown metabolites are also subjected to LC-MS/MS analyses for knowing molecular mass.

Spoiling associated metabolites that serve potential biomarkers for sensing using e-nose will be established. As part of the study differentially accumulating volatile metabolites will be identified from infected coconut. Multivariate statistical analyses and a database of metabolite profiles will be established by IIT Roorkee as part of study. Volatile metabolites that are unique to spoiling stage will be targeted as biomarker for e-nose development

The project is expected to provide information on spoiled coconut-associated metabolites as biomarkers that can represent early degradation stages in coconut. Such metabolic profile would help to delineate the biochemical pathways and molecular networks that are responsible for differential accumulation of volatile metabolites in spoiled coconut as well as the nutritional status of healthy coconut. IIT is using an array of novel metal oxide semiconductors as sensing material (antenna) to catch specific volatile metabolite emitted by spoiled coconut. The final outcome would be a sensitive low cost, non-invasive wireless sensor prototype capable of detecting spoiled coconut. This conceptual advancement can also be applicable to other agricultural crops towards pest and pathogen management. In addition, the study would provide an opportunity to explore the science behind the novel electronic circuits for development of electronic e-nose sensor.

Dr. Debabrata Sircar, Assistant Professor, Department of Biotechnology, IIT Roorkee, Roorkee is the Principal Investigator of the project.

During the half yearly review of the project, Dr. Sircar informed that his team is working on three models for identification of spoiled coconut. First, the mobile based app that can be used by the common man. Secondly, for the detection of spoiled coconut from heap of coconut and finally a conveyor based model for the use of industry. ■