National Institute of Technology Rourkela

Progress Seminar

Seminar Title	: DESIGN AND DEVELOPMENT OF MECHANIZED PALMYRA (Borassus flabellifer L.) SAP TAPPER AND SHELF-LIFE EXTENSION OF PALMYRA SAP
Speaker	: Chingakham Ngotomba Singh (Rollno : 522fp1010)
Supervisor	: Madhuresh Dwivedi
Venue	: CH-113 Department of Food Process Engineering
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Abstract : The palmyra (Borassus flabellifer L.) belongs to the Arecaceae family of plants. It is a native tropical palm tree that can be found in Indonesia, Sri Lanka, the Philippines, Malaysia, India, and certain East African countries. The palmyra sap is harvested from the inflorescence part of the palmyra. The palmyra sap has numerous health benefits properties such as cardio-protective, Immuno-protective, anticancer, electrolyte balance, improve eye health, antidiabetic, and anti-anaemia. It has a high market demand due to its significant health benefits. Despite its potential, the palmyra sap market remains underdeveloped, primarily due to risks in harvesting, less shelf life and lack of value-added products. The fresh sap is known as Neera, when it&rsquos fermented and turns into alcoholic beverage known as toddy (5 &ndash 8%), which diminishes its value and usability. Harvesting of palmyra sap has traditionally been a life risk, requiring harvesters to climb the trees of 25&ndash30 meters height twice a day for 45 &ndash 60 days which involved tragedies and contribute to adulteration of sap. To get popularized into the global market, extending the shelf life of sap while maintaining its quality is very challenging. This requires an in depth understanding of the sap&rsquos physico-chemical properties and microorganisms present in it. Therefore, to investigate the dynamic of spoilage in Neera, we designed a comparative study using four different storage conditions: Filtered Chill (FC) Unfiltered Chill (UFC) Filtered Ambient (FA) and Unfiltered Ambient (UFA). Sap when stored as FC maintained the sap as Neera that with retained ethanol level at 2.78% (v/v) and yeast counts of 8.08 x 10^2 CFU/ mL &ndash 1.74 x 10^5 CFU/mL, while the UFA sap elevated ethanol levels (9.45% v/v) and high microbial load (5.98 x 10^6 CFU/mL). Ethanol formation appeared to follow growth-associated kinetics, and was modelled with the Luedeking&ndashPiret model (R^2>0.90). Biochemical transformations were observed via FTIR by changes in O&ndashH, C=C, C&ndashO and C&ndashC functional group absorptions over time. This study also showed palmyra sap could be utilised as a fermentation substrate in microbial levan biopolymer production which is high value fructan via Bacillus cereus, yields 5.905. g of levan from 2L of sap. The produced levan was characterised using FTIR, XRD, DSC, TEM, and rheology. The development of an innovative palmyra sap harvesting machine with cooling system assisted with UV, which disinfect the sap and maintain its quality during collection could be a solution to these challenges. Furthermore, this mechanized palmyra sap tapper can reduce the numbers of climbing and ensuring the reduction in the risks while harvesting. These will provide the biochemical stabilization and future development of a high value product will foster sustainable commercialisation of palmyra sap as a premium health beverage and industrial raw material.

Keywords: *Palmyra sap tapping machine, Shelf-life extension, Cooling system, Palmyra value-addition, Microbial levan biopolymer, Fermentation dynamics, Luedeking&ndashPiret model*