ACCELERATED AGEING OF COCOA MUCILAGE WINE THROUGH HYDRODYNAMIC CAVITATION

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ABSTRACT OF THESIS

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ABSTRACT

Rich in bioactive substances with anti-inflammatory and antioxidative qualities, cocoa (*Theobroma cacao L.*) is an essential plantation crop and export commodity. As a sustainable substitute for soft drinks, cocoa wine can be made from the by-products of cocoa processing, such as mucilage, a nutrient-rich pulp that surrounds the beans. By employing bubble implosion, hydrodynamic cavitation (HC) a new green technology, was used to speed up wine ageing and cause notable physicochemical changes. Hence this study is proposed to develop a suitable equipment system for small scale accelerated ageing effects on the cocoa mucilage wine. The study mainly concentrated on the development of a hydrodynamic cavitation reactor system for the accelerated ageing of cocoa mucilage wine. The system includes a storage tank, a pump system, various cavitation elements with different geometries, a digital flow meter, pressure gauges and a piping assembly. Its operation relies on the cavitation effect, which is induced in the fluid flowing through a closed pipe at varying operating pressures. The accelerated aging of cocoa mucilage wine is performed by the combined action of temperature and pressure generated inside the cavitation element. In this study, three different process parameters with three levels were selected for the accelerated ageing of cocoa mucilage wine viz. process pressure (3,3.5 and 4 bar), time of flow (30,45 and 60 mins) and type of cavitation element such as slit venturi, elliptical venturi and orifice were optimised using central composite design combined with response surface methodology. The optimized process parameters obtained for hydrodynamic cavitation were process pressure (3.26 bar) and time of flow (47.6991 mins) in the slit venturi. Characteristic study of accelerated aged cocoa mucilage wine, conventionally aged wine and untreated wine were carried out to obtain the quality as well as the proximate composition. Various quality parameters like TPC, ascorbic acid, antioxidant activity, reducing sugar content, pH, TSS, colour etc. were determined for all the three wines. Sensory evaluation revealed that the optimized HC-treated wine attained the highest overall acceptability score in comparison to the conventionally aged and fresh wine samples. The production cost of one liter of accelerated aged cocoa mucilage wine using HC treatment was

estimated at ₹227.105/-. The developed HC reactor system was economically feasible and commercially exploited. The developed hydrodynamic cavitation reactor system was highly efficient and feasible.