Optimization of Microbial Growth Inhibition using Pineapple Leaves Juice

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ABSTRACT

The control of microbial growth is necessary in many practical situations. Providing with the right conditions, microbe can grow very quickly which can cause a bad thing. Therefore, microbial growth inhibitor is very important to prevent transmission of disease and infection. For this research, pineapple leaves juice was used as microbial growth inhibitor agent. Microbe from infected pineapple leaves was used as microbe model. Microbial growth inhibition experimental design setup was constructed by using Design Expert software (Ver 7.1.6) to analyze the condition required for the process. The range for the factors studied are 35 to 39 °C of temperature and 10 to 50 min of microbial inhibition time. In order to determine the optimum condition for microbial growth inhibition process, the experiments were designed according to a central composite design (CCD) in two variables following the response surface methodology (RSM). A quadratic polynomial model was generated to predict the microbial growth inhibition. This was achieved by measuring cell dry weight of microbe using dry weight measurement method following the condition suggested by Design Expert software. Among two parameters, microbial inhibition time showed significant effect on the microbial growth inhibition. Model validation experiments showed good correspondence between experimental and predicted values at error of 1.73%, 3.36% and 8.03% respectively for triplicate experiments. The highest error was achieved at 8.03%. The optimal condition obtained for microbial growth inhibition was at 37 °C and 34.25 min. Minimum cell dry weight was found at 0.0958 g which indicated the microbial growth inhibition at 90.06%. At this condition, the growth of microbe was predicted to be at their minimum rate where the growth was inhibited by pineapple leaves juice.

Keywords: optimization; microbial growth inhibition; microbe; pineapple leaves juice; central composite design; response surface methodology