

# Optimization of the Acid Catalyst Concentration for Synthesis of Anti-Cancer Agent Gamavuton-0 by Using Mathematical and Statistical Software

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## Abstract

Cancer is a condition that occurs due to abnormal growth of cells in body tissue. One of the compounds that have pharmacological effects as anticancer compound is curcumin. However, curcumin's has problem with it's poor characteristics of bioavailability. To solve it's problem curcumin's derivatization performed. One of the curcumin's derivative is Gamavuton-0 (GVT-0). GVT-0 can be synthesized using *starting material* vanillin and acetone. Synthesis of GVT-0 are influenced by several factors, including the ratio of starting material, catalyst, temperature and heating time. This paper will explain the effect of various concentrations of catalyst (hydrochloric acid 37%) in the synthesis of GVT-0's compounds, as well as explaining the optimization process for founding the optimum catalyst concentration using mathematical and statistical software.

Experiment was conducted with the various concentration of hydrochloric acid 20  $\mu$ l, 40  $\mu$ l, 60 $\mu$ l, and 80  $\mu$ l in 10 ml acetone. Synthesis process carried out by taking 1 ml of acetone from a mixture of various concentration of hydrochloric acid and acetone that have been made. Mixed it with 4.141 gram vanillin which was dissolved in ethanol. After that, yield will be purified to obtain calculated mass of GVT-0. Yield analysis will be conducted using Stratigraphic Centurion 15 software with Anova method followed by regression analysis polinomial second order's. Value significance between yields can be determined by comparing the P-Value from Anova with acceptable quality level (AQL) at 10%.

AQL will determines the significance of P-vlue. P-value have a significant difference, if P-values does not exceed AQL. P-value obtained was 0.063. This may indicate a significant difference between the yield generated by various catalys concentration. The data analysis was continued using a second order polynomial regression's method. By fitting the yield and the concentration of catalyst, the curve and the polinomial equation was obtained. Analysis of the equation was conducted by compare the theoretical yield that calculated using the equation and the yield from the experimental result. Calculated yield was 2,658 gram and the experimental yield was 2,691 gram. The difference between theoretical and experimental was 1,22 %. This means that the difference was not more than 10%, hence the regression equation can be used to predict the levels obtained.

## Keywords:

GVT-0, Catalysts, Curcumin, Cancer, Optimization, Polynomial Second Order