Optimasi pembuatan herbisida glyphosate menggunakan response surface method (RSM) dan artificial neural network genetic algorithm (AAN-GA) = Optimization of herbicide glyphosate making using response surface method (RSM) and artificial neural network genetic algorithm (ANN-GA)

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Abstrak

Pengembangan produk baru merupakan hal yang sangat penting dalam menjaga pertumbuhan perusahaan. Herbisida glyphosate dengan kemampuannya yang spesifik dan efektif dalam menghambat enzim 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS) menjadi herbisida yang luas dipakai di seluruh dunia termasuk di Indonesia yaitu sebesar 51% pasar pada Maret 2013. Proses pembuatan produk baru ammonium glyphosate 400 g/L SL dilakukan melalui dua metode optimasi yaitu Response Surface Method (RSM) dan Artificial Neural Network-Genetic Algorithm (ANN-GA). Kemampuan prediksi respon RSM dan ANN dibandingkan melalui nilai root mean squared error (RMSE). Dari hasil prediksi RSM, RMSE untuk pembuatan ammonium glyphosate berbasa NH4OH dan berbasa NH4HCO3 secara berturut-turut adalah 44.37 dan 73.2. Sedangkan dengan prediksi ANN RMSE untuk pembuatan ammonium glyphosate berbasa NH4OH dan berbasa NH4HCO3 secara berturut-turut adalah 122.04 dan 143.80. Pada penelitian ini juga ditunjukkan bahwa RSM memiliki kemampuan lebih baik dalam menentukan kondisi optimal jika dibandingkan dengan ANN-GA. Berdasarkan hasil optimasi, formulasi ammonium glyphosate berbasa NH4OH dapat menurunkan biaya sebesar 3.71% dan dengan berbasa NH4HCO3 dapat menurunkan biaya 11.08% dari komposisi yang sudah ada.
.....New product development is very important for the companies to maintain the growth. Since its specificity and affectivity in inhibits 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS), glyphosate becomes a worldwide herbicide including in Indonesia with 51% market size in March 2013. The making of the proposed new product, ammonium glyphosate 400 SL, is optimized by the two methodologies Response Surface Method (RSM) and hybrid of Artificial Neural Network-Genetic Algorithm (ANN-GA). Prediction capability of the RSM and ANN model were determined by comparing the root mean squared error (RMSE). From the RSM prediction, the RMSE for the NH4OH and NH4HCO3 experiment were 44.37 and 73.2, respectively. And from the ANN prediction, the RMSE for the NH4OH and NH4HCO3 experiment were 122.04 and 143.80, respectively. In this study, RSM also showed its superiority in determine the optimum condition for making ammonium glyphosate compared to the ANN-GA. Based on the optimization result, NH4OH base formulation gave the 3.71% cost saving and

NH_4HCO_3 base formulation gave 11.08% cost saving compared to the existing product.