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## Extraction and analysis of *Gmelina* seed oil using different soft computing approaches

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Artificial neural network (ANN) genetic algorithm (GA) interface and response surface methodology (RSM) has been compared as tools for simulation and optimization of *Gmelina* seed oil extraction process. A multi-layer feed-forward Levenberg Marquardt back-propagation algorithm was incorporated for developing a predictive model which was optimized using GA. Equally, design expert simulation and optimization tools were also incorporated for a detailed simulation and optimization of the same process using RSM. It was found that oil yield increased with increase in temperature, time and volume of solvent but decreased with increase in seed particle size. Optimal yield of 47.93% and 43.52% were observed for ANN-GA and RSM respectively under the same parameter design space of; 200 $\mu$ m particle size, 40 $^{\circ}$ C temperature, 100 ml volumes of solvent and 40 minutes extraction period. The performance of the models in predicting the responses was evaluated by mean square error (MSE) and coefficient of determination ( $R^2$ ) and the results show that the models were very efficient. Models validation experiments indicate that the predicted and the actual were in close agreement. Overall, ANN-GA hybrid was found to be more efficient by 10.13%. The extract was analyzed to examine its physico-chemical properties (acid value, iodine value, peroxide value, viscosity, saponification value, moisture and ash content, refractive index, smoke, flash and fire points and specific gravity) and structural elucidation by standard methods and instrumental techniques. Results revealed that the oil is not edible but find potential in biodiesel and alkyd resin production.

### Biography

Uzoh Chigozie Francolins is a Lecturer in Chemical Engineering Department, Nnamdi Azikiwe University, Nigeria. He is currently pursuing his PhD from the same Department and University. He has published a number of research articles in different ISI-indexed journals. He has demonstrated outstanding strength of character in area of moral rectitude, integrity, tenacity, dedication and capacity for hard work. His PhD research topic is novel approach to synthesize oxy-polymerizable alkyd resin from some inedible non-drying oil for surface coating application. He is a registered Member of Council for the Regulation of Engineering in Nigeria (COREN), a corporate Member of the Nigerian Society of Chemical Engineers (NSChE), the Nigerian Society of Engineers (NSE) and International Association of Engineers (IAENG). His research and teaching interests are alkyd resins, experimental process design, response surface methods and process dynamics, control and optimization. He has designed many processes for product and process synthesis using design of experiment and statistical screening analysis.

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