ADSORPTION OF METHYLENE BLUE BY MAGNETIZED ACHIOTE (*Bixa orellana*) PERICARP ASH: EFFECT OF pH AND KINETICS

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THESIS SUBMITTED TO THE FACULTY OF INSTITUTE OF COMPUTING, ENGINEERING AND TECHNOLOGY, DAVAO DEL SUR STATE COLLEGE, MATTI, DIGOS CITY IN PARTIAL FULFILLMENT OF THEREQUIREMENTS FOR THE DEGREE OF

BACHELOR OF SCIENCE IN AGRICULTURAL AND BIOSYSTEMS ENGINEERING

June 2024

ABSTRACT

ARELLANO, JERAMAY M. Davao del Sur State College- Institute of Computing, Engineering and Technology, Matti, Digos City. June 2024." **ADSORPTION OF METHYLENE BLUE BY MAGNETIZED ACHIOTE (*Bixa Orellana*) PERICARP ASH: EFFECT OF pH AND KINETICS".** Undergraduate Thesis.

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Wastewater management has long been a significant issue for society. In the Philippines, achiote pericarp is often considered an agricultural waste. It is typically left in open fields or burned in the open air near the trees where they are harvested. This study explores the potential use of this waste material (achiote pericarp ash, APA) in removing dye from liquid solutions. To improve the adsorption capacity of APA, it is necessary to incorporate Fe_3O_4 into it. This will enhance its ability to effectively adsorb Methylene blue solution. To address this, APA had been impregnated with Fe_3O_4 nanoparticles to produce magnetized APA (MAPA). The APA used in this study was sourced from the farmlands of J. P. Laurel Malungon, Sarangani, Philippines. An adsorption experiment was thoroughly conducted, investigating the effects of pH and kinetic changes. The MB adsorption process was found to fit with a pseudo-quadratic model, with

maximum adsorption observed at pH 10. The identification of functional groups presents before and after magnetization was conducted using Fourier transform infrared spectroscopy (FTIR). Among them were -OH (intramolecular H-bond), O=P-OH (phosphorus oxoacid), -CO-CH3 (ketone), -OH (primary alcohol), and -SiCl3 (silicon compounds). These findings encourage farmers to reuse agricultural waste as a valuable product. Future related research could investigate the use of a different dye color or another type of biomass. Ultimately, this investigation provides significant knowledge about the potential role of agricultural by-products for wastewater treatment processes.

Keywords: adsorption, methylene blue, magnetization, achiote pericarp ash, effect of pH and kinetics