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Abstract	:	This study aimed to optimize the adsorption capacity of Acacia mangium wood activated carbon (AMW-AC) against bromocresol green (BCG) dye using a face-centered central composite design of response surface methodology (RSM). The variables considered for optimization are AMW-AC dosage (0.5-1.5 g/L), contact time (30-120 min), and BCG dye initial concentration (50-300 mg/L) to maximize the adsorption capacity (mg/g) of AMW-AC. The statistical design resulted in a quadratic model with only two significant factors: adsorbent dosage and initial concentration of BCG dye. The contact time was not an important factor because the adsorption was quick, and maximum adsorption occurred within 30 minutes of the contact time. The adsorption capacity data fit well in the proposed RSM model, which indicates that the control change in independent variables (AMW-AC dose, contact time, and initial BCG dye concentration) regulated the variability in the response (adsorption capacity). The optimal value of independent variables for the maximum adsorption capacity of AMW-AC (580.4 ± 11.4 mg/g) was 0.5 g/L of AMW-AC dosage, 30 min of contact time, and 300 mg/L of BCG dye concentration. The kinetic data of BCG dye adsorption followed the pseudo-second order model, and the isotherm data fit well with the Freundlich isotherm model (predicted q_{max} 586.22 mg/g). Thermodynamic evaluation of BCG dye adsorption data revealed that adsorption was exothermic and spontaneous. This study also illustrated the BCG adsorption mechanism. The AMW-AC adsorbent surface is mostly comprised of C, N, O, and P-based functional groups.