

Phytochemical Analysis and pH-Dependent Adsorption Behavior of *Prunus amygdalus* Shells with Paracetamol as a Model Compound

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SUMMARY. Paracetamol, a widely used pain reliever, is commonly employed in studies of adsorption due to its well-defined properties. This research investigates the potential of *Prunus amygdalus* shells (almond shells), a waste product from the food industry, for paracetamol removal. These shells have previously shown promise in adsorbing metals and dyes. This study aimed to evaluate the physicochemical and phytochemical characteristics of almond shells and assess their effectiveness in adsorbing paracetamol. Standard protocols were followed to analyze the shells' raw powder for physicochemical properties and the methanolic extract for phytochemical composition. The shells' adsorption capacity was compared in three forms: raw powder, non-activated carbon, and activated carbon (used as a benchmark). The influence of pH (2, 4, 6, and 8) and adsorbent-paracetamol ratio (4:1, 8:1, 10:1, and 15:1) were investigated. The raw powder exhibited typical physicochemical properties. The methanolic extract revealed the presence of alkaloids, carbohydrates, and flavonoids. All shell forms achieved equilibrium adsorption within 60 min. Notably, adsorption capacity increased in the order of raw powder < non-activated carbon < activated carbon.

RESUMEN. El paracetamol, un analgésico muy utilizado, se emplea habitualmente en estudios de adsorción debido a sus propiedades bien definidas. Esta investigación investiga el potencial de las cáscaras de *Prunus amygdalus* (cáscaras de almendras), un producto de desecho de la industria alimentaria, para la eliminación del paracetamol. Estas cáscaras han demostrado anteriormente ser prometedoras en la adsorción de metales y colorantes. Este estudio tuvo como objetivo evaluar las características fisicoquímicas y fitoquímicas de las cáscaras de almendras y evaluar su eficacia en la adsorción de paracetamol. Se siguieron protocolos estándar para analizar el polvo crudo de las cáscaras en busca de propiedades fisicoquímicas y el extracto metanólico en busca de composición fitoquímica. La capacidad de adsorción de las cáscaras se comparó en tres formas: polvo crudo, carbón no activado y carbón activado (utilizado como punto de referencia). Se investigó la influencia del pH (2, 4, 6 y 8) y la relación adsorbente-paracetamol (4:1, 8:1, 10:1 y 15:1). El polvo crudo exhibió propiedades fisicoquímicas típicas. El extracto metanólico reveló la presencia de alcaloides, carbohidratos y flavonoides. Todas las formas de la cáscara alcanzaron la adsorción de equilibrio en 60 minutos. Cabe destacar que la capacidad de adsorción aumentó en el orden de polvo crudo < carbón no activado < carbón activado.

KEY WORDS: activated charcoal, adsorbing capacity, phytochemical, Rosaceae.

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