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*Comparative Study of Binding Strengths of Food Dyes FDA Red 40 & Natural Extract Betanin on Fibroin*

This project comparatively examines the binding strengths of FDA Red 40 with Betanin, the natural color pigment of beets. The project was chosen because of growing concern about health impacts and toxicity of artificial food coloring used in food. Recent research has linked health problems to Red 40 through binding. This project measures the binding capabilities of both dyes, in vitro, at the range of pH's of the human body to fibroin, an amino acid rich fabric commonly known as silk.

Each experimental run took a measured silk square, immersed it in a measured dye bath, and afterwards, two spectroscopic methods analyzed the change in concentration of the dye bath and the change in reflectance on the fibroin sample. Molar amounts were calculated to determine the moles of dye bound per moles of fibroin over a range of pH's.

The comparative data revealed that under the same conditions, Red 40 bound up to 350% more than Betanin at the lower pH range, 1 to 3.8. At pH 3.8 and above, both dyes' ability to bind decreased and their difference in binding capability was less conclusive.

The high binding differential between Red 40 and Betanin at the lower pH ranges is significant when considering the varying pH's of the human digestive system. Red 40's strong ability to bind at stomach pH's 1 to 3 is noteworthy, as is Betanin's weaker capacity at similar in vitro conditions. This project provides evidence that Betanin may exhibit fewer adverse health problems than Red 40.