



**CALIFORNIA STATE SCIENCE FAIR  
2008 PROJECT SUMMARY**

<b>Name(s)</b> <b>Shamik Mascharak</b>	<b>Project Number</b> <b>S0599</b>
<b>Project Title</b> <b>Fingerprinting with Genipin: A Green Reagent for Protein Detection in Solution and on Surfaces</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The objectives of this project are to determine whether Genipin, a naturally occurring compound found in the Gardenia plant, could be used as a fingerprinting reagent on paper, and to determine whether Genipin could be used as a green analytical reagent for qualitative and quantitative detection of amino acids and peptides.</p> <p><b>Methods/Materials</b> Materials: Genipin, Ninhydrin, amino acids, peptides, Trypsin, BSA, ethanol, ethyl acetate, petroleum ether, Cary 50 UV/Vis Spectromphotometer, Perkin-Elmer Flourimeter, Typhoon Trio Imager, water bath, thermometers, various kinds of paper, hot air oven. Methods: Aqueous solutions of amino acids of different concentrations were mixed with ethanolic solutions of genipin (1:1, 1:2 ratio) and heated at 70 deg oC for 1 hour. The intensities of the blue/purple colors (absorption max 580-620 nm) were measured specrophotometrically to evaluate the utility of genipin as a colorimetric reagent. Two peptides (KKRP and GGGGG) and two proteins (Trypsin and BSA) were detected with genipin using the same method. Latent fingerprints on different types of paper were then developed using a developing solution of genipin in ethanol/ethyl acetate/pet ether and heating the papers in a humidity chamber. The fingerprints were detected by their blue color as well as their strong fluorecence (excitation: 590 nm, detection: 620 nm).</p> <p><b>Results</b> Amino acids can be detected by genipin up to micromolar concentrations, and the intensity of the blue coloration is proportional to the amino acid concentration. Stains of amino acids on paper and skin can be easily detected by genipin. Peptides and proteins can also be detected by genipin. Latent fingerprints on white and brown paper are easily detected by using genipin as the reagent. Such fingerprints are stable and very comparable to those obtained with Ninhydrin. Additionally, the fingerprints can be viewed by fluorescence (unlike Ninhydrin).</p> <p><b>Conclusions/Discussion</b> Genipin is an effective reagent for the detection of amino acids, peptides, and proteins. As hypothesized, it can also be used as a fingerprinting reagent. In contrast to the potential health hazards of Ninhydrin, Genipin is a safe compound and affords fingerprints which can be viewed by fluorecence (an advantage over Ninhydrin when the fingerprints are on colored paper).</p>	
<b>Summary Statement</b> This project is about using Genipin as a green reagent for fingerprinting instead of toxic Ninhydrin.	
<b>Help Received</b> Rashia Turner (a graduate student at UCSC) provided the amino acids and N-protected amino acids. The peptides were obtained from the laboratory of Professor Glenn Millhauser. Michael Rose, a graduate student of UCSC, helped me in the spectrophotometric measurements.	