



CALIFORNIA STATE SCIENCE FAIR  
2006 PROJECT SUMMARY

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<b>Project Title</b> Comparison of Turmeric and Curcumin: The Effect on Metal Ions	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Turmeric, a household spice, is thought to help in Alzheimer's Disease (AD). Plaques are formed in the brain that causes AD. Turmeric (and curcumin, which is 70% component in turmeric) may reduce these plaques by directly removing them, or by reducing their formation. To form these plaques metal ions are needed. My question was to investigate the difference in how metal ions complex with turmeric and curcumin.</p> <p><b>Methods/Materials</b> MATERIALS: Turmeric, Curcumin, zinc acetate, copper (II) acetate, iron (II) acetate, manganese (II) acetate, ethyl alcohol, Vials, Spatula, Analytical balance, Water Bath, TLC sheets, Parafilm, Centrifuge. METHODS: Turmeric, curcumin, and metal ion salts were dissolved in ethyl alcohol. The metal ion solutions were added to turmeric and curcumin solutions. All 16 different mixtures were then put into the water bath at 37 oC. The complexes were isolated, washed and dried and used for analysis. I had two variables: 1) different metal ions 2) different concentrations of turmeric or curcumin. The sample size was 8 for turmeric and 8 for curcumin. Isolated complexes were weighed to calculate the yield of the complexes and analyzed using electrospray mass spectrometry for molecular weight.</p> <p><b>Results</b> Curcumin (MW=368) showed a clean mass peak at 390 (M+Na-H), whereas turmeric mass spectrum showed other components as well such as curcumin II (360), and sodiumcuruminate (412). The mass spectra of curcumin to metal ions showed clear peaks of all metal complexes. In the turmeric-iron mass spectra there are some traces that could be a complex with iron and curucuminoids. In the majority of the turmeric mass spectrum there are high traces of curcumin (390), curcumin II (360), and sodiumcuruminate (412). There are other components of turmeric that were not seen in the mass spectra. This could be due to the fact that when dissolving the turmeric there was some difficulty. In the curcumin 2:1 mixture, mass spectrum revealed 2:1 complexes actually are effective.</p> <p><b>Conclusions/Discussion</b> The effect of curcumin on metal ions vs. the effect of turmeric on metal ions is very different. While the curcumin and metal ion mixtures formed #beautiful# complexes the turmeric and metal ion mixtures were less definable and were harder to decode. This may have been because of interference from other components in turmeric such as curcumin, curcumin II, curcumin III, sodiumcurcumin, ar-turmerone, etc.</p>	
<b>Summary Statement</b> Turmeric and curcumin form metal-ion complexes but are not identical in nature.	
<b>Help Received</b> Used lab equipment at University of California-Irvine.	