



**CALIFORNIA STATE SCIENCE FAIR  
2004 PROJECT SUMMARY**

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<b>Project Title</b> <b>Going, Going, Gone! Loss of Pigments and Proteins during Natural Leaf Senescence in Mulberry (Morus alba L.)</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Change in the color of tree leaves is often associated with autumn. What causes this change in color? The objective of this project was to measure changes in the amounts of leaf pigments during natural senescence of the mulberry tree in my backyard. Because these leaves usually change from green to yellow before they abscise, my hypothesis was that chlorophyll would be lost first, leaving the yellow carotenoid and xanthophyll pigments behind. Based on background reading, I further hypothesized that protein would be lost from the leaves at about the same rate as the chlorophyll.</p> <p><b>Methods/Materials</b> Leaf samples were collected weekly during autumn. To check for possible differences in different parts of the tree canopy, one leaf from the outer part of the canopy and another leaf from the inner part of the canopy on each of the four cardinal sides of the tree were collected at each week. Five 12-mm diameter disks were cut from each leaf and chopped in 80% acetone to extract the pigments. The acetone-insoluble residue was suspended in water to extract protein. Pigment levels in the acetone extracts were determined by measurement of absorption of light, and protein levels in water extracts were determined by colorimetric assay.</p> <p><b>Results</b> Chlorophyll levels were fairly stable from mid-October to mid-November and then began a gradual decline that accelerated in mid-December until the leaves were lost in early January. As the chlorophyll was lost, the chlorophyll A to B ratio was fairly stable. The total chlorophyll to carotenoid ratio gradually declined until mid-December, after which it fell sharply. The drop in protein content was similar to the drop in chlorophyll content, and the chlorophyll to protein ratio was stable until late November, at which it started to make a gradual decline. In late December, it made a rapid descent and then remained stable for the last two weeks.</p> <p><b>Conclusions/Discussion</b> The results are consistent with the hypothesis that chlorophyll is lost first, leaving the carotenoids and xanthophylls behind to make the leaves yellow. The hypothesis that protein would be lost from the leaves at about the same rate as the chlorophyll is only partially correct because the protein loss late in senescence did not accelerate as much as the chlorophyll loss.</p>	
<b>Summary Statement</b> The aim of the project was to find out which pigment is lost first during natural leaf senescence in mulberry and how fast the leaf proteins are lost during senescence.	
<b>Help Received</b> I did the lab work at UC Riverside with my dad's supervision.	