Enzymes in Food Systems

Activity #2

Determining Changes in Plant Pigments with Blanching

A Science Unit for Secondary School Curriculum



Institute of Food Technologists
The Society for Food Science and Technology

TEACHER INFORMATION SHEET

Determining Changes in Plant Pigments with Blanching

Color is one of the most important quality attributes of foods. The first impression of the quality and acceptability of a particular food product is judged on its appearance. Pigments, which are the prime contributors to coloration, are thus important quality constituents to analyze in foods.

Chlorophylls, the most abundant plant pigments, are responsible for capturing the energy of sunlight and using this energy in the process of photosynthesis to convert atmospheric carbon dioxide and water into sugar. The plant then uses the sugar as its energy source for growth and reproduction. Carotene, responsible for the yellow coloring in many vegetables, is believed to protect the plant from damage by oxygen. Xanthophylls are the colors seen in autumn leaves after the chlorophylls die off. Anthocyanins are the pigments found in yellow, red, and orange vegetables.

Plant pigments can be separated and identified using paper chromatography. The chlorophylls, carotene, and xanthophylls are fat-soluble pigments, while the anthocyanins are water soluble. An unknown mixture of pigments is applied to a paper strip (the stationary phase) which is then placed into a separation liquid or solvent (the mobile phase). As the liquid moves up the paper by capillary action, the individual pigments will each move at a different speed, depending on their attraction to the paper and their solubility in the separation liquid. Each individual pigment can be identified by comparing the distance it moved to the distance the solvent moved. This ratio is called the reference front or R_f value. The R_f value varies from 0 for a sustance that does not move past the starting point to 1 for a substance that moves the same distance as the solvent. If the conditions for separation are held constant, the R_f for a given pigment also will be constant.

Visual Master 1 illustrates a completed chromatogram with the pigments separated into four distinct spots: Chlorophyll B with an $R_{\rm f}$ of 0.17, chlorophyll A with an $R_{\rm f}$ of 0.37, carotene with an $R_{\rm f}$ of 0.63, and xanthophylls with an $R_{\rm f}$ of 0.87. Thus, the xanthophylls moved the greatest distance while the chlorophyll B moved the least.