Separating and Identifying Food Dyes by Paper Chromatography

Purpose and Goals

- To determine
  - Retention factors (R_f) of seven food dyes in three different solvent systems
  - The best effective solvent of the three systems
- To Separate and Identify the dyes in unknown mixtures and commercial products

Chromatography

- Group of techniques used to separate colored mixtures into their component parts

Paper Chromatography

- Simplest form
- Uses
  - Separation
  - Identification
- Chromatography paper
  - Stationary phase
- Solvent
  - Mobile phase

Terms

- Spotted
  - Application of sample
- Origin line
  - Place near bottom of paper where spotting occurs
- Solvent front
  - Leading edge of mobile phase

Terms

- Chromatogram
  - Pattern produced in dye separation
- Resolved
  - Separation of two or more components

Terms

- Retention Factor
  - R_f = Distance traveled by component (cm)/ distance traveled by solvent front (cm)
  - Ranges from 0.0 to 1.0
    - 0.0 no movement
    - 1.0 complete movement
  - Used to determine the best solvent

Procedure I

- Work in groups of three
- Get 3 Microscope slides and petri dish covers
- Label three 250ml beakers and fill with 7ml
  - Water
  - Rubbing alcohol
  - 10% NaCl solution
- Prepare and label chromatography paper

Procedure I

- Using a separate dropper for each dye, transfer one drop each of the seven pure solutions to the three slides
- Label drops by placing paper with ID under the slide
- Use a clean wood toothpick to spot the dye to the proper spot along the origin line on the chromatography paper

Procedure I

- Allow spot to dry before applying more dye
- Roll C.P. to form a cylinder with the dye spots on the outside and the origin line at the bottom
- Staple the ends together with the ends of the paper touching but not overlapping

Procedure I

- Place the cylinder into the appropriately labeled beaker with the origin line at the bottom
- Record the time (Start time)
- Remove the cylinder when the solvent front is about 1.5 cm from the top and record the time (Ending time)

Procedure I

- Carefully unroll the paper and allow to dry
- Do calculations 1-4 on the handout in order to determine the best solvent systems
- Flush solvents down drain with plenty of tap water
- Wash and Dry glassware for part II

R_f calculation for Green 3

$$R_f = \frac{\text{distance traveled by component(cm)}}{\text{distance traveled by solvent front(cm)}}$$

$$= \frac{5.4\text{cm}}{6.7\text{cm}} = .81(\text{water})$$

$$= \frac{2.3\text{cm}}{6.0\text{cm}} = .38(\text{alcohol})$$

Procedure II

- Measure 7ml of the best solvent and transfer to a 250ml beaker, cover with petri dish
- Prepare a fourth piece of chromatography paper for determination of 3 unknown samples
- Obtain three unknown samples and record on both the Chromatography paper and data sheet

Procedure II

- Spot each of the unknowns five times each allowing the spots to dry each time
- Repeat procedure for analysis
- Do calculations 5-11 on the handout
- Record the results on Data Sheet 2

Procedure III

- Measure 7ml of the best solvent and transfer to a 250ml beaker, cover with petri dish
- Obtain seven commercial samples and three felt pens; record on both the Chromatography paper and data sheet
- Prepare a fifth piece of chromatography paper for determination of the commercial samples

Procedure III

- Spot each of the solutions on the chromatography paper as before
- **Quickly** touch the tip of the pens to the corresponding spot
- Repeat procedure for analysis
- Do calculations 12-16 on the handout
- Record the results on Data Sheet 3