

Paper Chromatography Lab-Report

Chromatography is an analytical technique for mixture separation. The mixture is dissolved in a liquid known as the mobile phase that carries it through a stationary phase, a structure that holds another material. It is a technique that uses physical separation to identify dyes in food. Paper chromatography is a technique that uses the mobile phase and the stationary phase components. The paper will analyse the M&M coating of candies and compare it with standard dyes to determine the R_f of individual dyes.

Procedure

Ten ml of mobile phase (0.10% Wt. /v solution of Nail H₂O) was put into a beaker and a Para film enclosed the beaker to prepare the developing tank. On a chromatography paper, a straight line was drawn and marked at 1.5 cm from the edge with a perpendicular tick at 2 cm intervals (Cserháti 2007). On the chromatography paper, a dot was marked using a tube and one of the standard pigment solutions at one of the marks. All the labelling was done by use of a pencil. The chromatography paper was formed into a cylinder; the paper was stapled together and placed into the developing tank ensuring a gap was left between the edges. The Para film was replaced quickly after uncovering. The D dye was determined by the D solvent.

$$R_f = \frac{D \text{ dye}}{D \text{ solvent}}$$

How to Identify and Separate M&M Candies Dyes

Four M&M candies were put in a beaker making sure they were all similar in colour. A third of equal parts of ethanol and water was put on already dissolved coating of candies and swirled to ensure all the components completely dissolved (Cazes 2001). Another chromatogram was prepared and put on a designated area for observation under an ultraviolet lamp.

Results and Discussion

Standard Dyes Results

| dye | Color | Distance Dye Traveled (D_{dye})(mm) | R_f |
|-----------|------------|---|-------|
| Red #3 | Pink | 11mm | 1.5 |
| Red #40 | Light red | 41mm | 5.8 |
| Blue #1 | Blue-green | 66mm | 0.94 |
| Blue #2 | Blue | 45mm | 0.64 |
| Yellow #5 | Yellow | 49mm | 0.7 |

M&M Candies Coat Dyes Results

| M&M Color | Dye Color | D_{dye} (mm) | R_f |
|--------------|-----------|----------------|-------|
| Red | Light red | 15 | 0.22 |
| | | | |
| | | | |
| | | | |
| Brown | | | |
| | Brown | 18 | 0.26 |
| | Blue | 32 | 0.47 |

| | | | |
|--------------|-------|----|------|
| | | | |
| Green | Green | 23 | 0.34 |
| | Blue | 48 | 0.67 |
| | | | |
| | | | |

| M&M Color | Color | D_{dye} (mm) | R_f |
|--------------------------|--------------|-----------------------------|----------------------|
| Blue | Blue | 48 | 0.71 |
| | | | |
| | | | |
| | | | |
| Orange | Orange | 20 | 0.2 |
| | | | |
| | | | |
| | | | |
| Yellow | | | |
| | Yellow | 21 | 0.31 |
| | | | |
| | | | |

Questions

1. In chromatography what do the mobile and stationary phases do?

The stationary phase facilitates the components to transit through different speeds while the mobile phase pushes the analyte.

(a) What is the mobile phase in this experiment? Salt solution.

(b) What is the stationary phase in this experiment? The chromatography paper.

2. Why was a pencil used to mark the paper rather than a pen or marker?

A pencil does not react or cannot be broken down unlike the pen that will lead to separation of colours.

3. Why is it important for the initial dye “spots” to be small?

It would be difficult to compare the spot once they spread out and also to reduce the risk of the spots merging together.

4. Define Fluorescence?

It is the U.V light luminescence that occurs when energy is supplied by electromagnetic radiation (Cserháti 2007).

5. Define Phosphorescence?

It is the light produced by things that do not heat or the emission of light after exposure to radiation.

6. In chemistry or other sciences, what is chromatography used for?

Chromatography is used for purification and analysis of chemical mixtures and it is a technique that uses physical separation.

7. What is the possible range of values for R_f ?

The lowest was 0.12 and the highest was 0.70.

References

Cazes, J. (2001). *Encyclopedia of chromatography*. New York, NY: Marcel Dekker.

Cserháti, T. (2007). *Liquid chromatography of natural pigments and synthetic dyes*.

Amsterdam, the Netherlands: Elsevier.