Chromatography of Photosynthetic Pigments

Aim: To determine the different photosynthetic pigments found in spinach and find their relative front values using paper chromatography.

By grinding the spinach leaves, its pigments were extracted in order to run a thin layer of chromatography film.

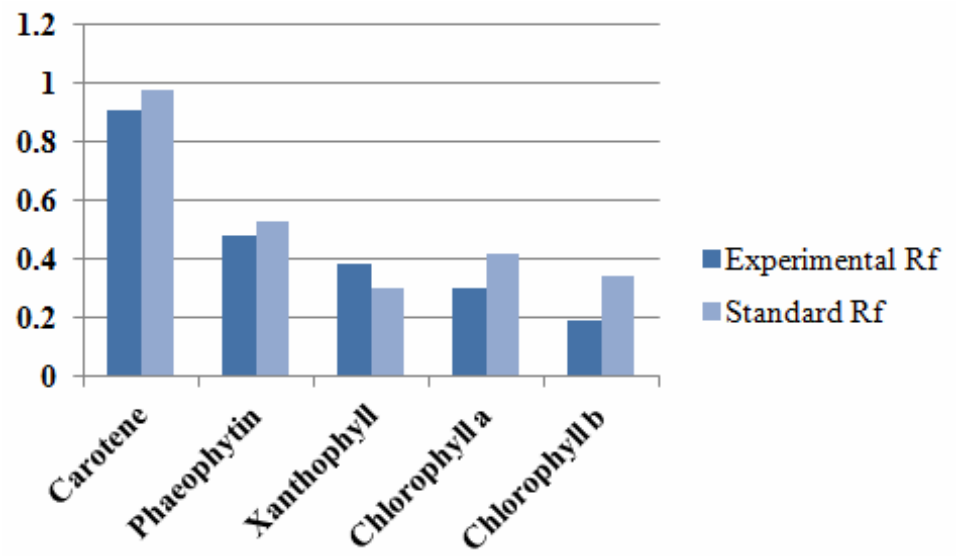
The relative front values for every photosynthetic pigment are found by dividing 'a' (distance each pigment travelled from the loading line in cm) by 'b' (distance solvent travelled from the same loading line in cm).

Pigment	Color
Carotene	Yellow
Phaeophytin	Yellow-grey
Xanthophyll	Yellow-brown
Chlorophyll a	Blue-green
Chlorophyll b	green

Calculations for the Relative Fronts of Different Pigments

Pigment	a (cm)	b (cm)	Experimental Rf	Standard Rf
Carotene	5.7	6.2	0.91	0.98
Phaeophytin	3	6.2	0.48	0.53
Xanthophyll	2.4	6.2	0.38	0.3
Chlorophyll a	1.9	6.2	0.3	0.42
Chlorophyll b	1.2	6.2	0.19	0.34

Comparison of the Experimental and Standard Relative Fronts of Photosynthetic Pigments



Evaluation

Carotene travelled the furthest away from the loading line (5.7cm) while chlorophyll a demonstrated the shortest distance travelled (1.2).

This is because carotene is more water soluble than chlorophyll a and is able to move up the chromatography paper with the solvent through capillary actions until the dipole-dipole forces between carotene and the solvent weakens and breaks. This process leaves a mark at a certain height on the paper.

Chromatogram is the pattern pigments form as they are revealed as color streaks on the chromatography paper.

All pigments absorb different wavelengths of light and this explains the different rates at which the pigments climbed up the chromatography paper.

The rate at which the pigments travel up the chromatography paper is dependent on the solubility of the substance in the solvent used and the adherence of the substance to the paper.

The photosynthetic pigments evident after the lab were not so obvious by observing the green spinach as a whole. This is because of the presence of an abundant amount of chlorophylls in the chloroplasts of plant cells. These chlorophyll pigments reflect green wavelengths of light

and absorb the other visible wavelengths of light. This is why plants tend to appear to be green to our eyes.

In this lab, chlorophyll a showed the greatest difference between standard and experimental Rf values: 0.15

Overall, the standard and experimental Rf values were fairly close to each other for all the pigments detected in the spinach leaves.

Errors

- Bending or changing the position of the filter paper in the cylinder during the paper chromatography process.
  Result: difficulty distinguishing the individual pigment bands.
- Not grinding the spinach leaves well
  Result: harder to distinguish the different pigments present from each other.

Conclusion

By going through the process of paper chromatography, various pigments present in the spinach leaves were made visible to our eyes: carotene, phaeophytin, canthophyll, chlorophyll a, and chlorophyll b.

References

Chemistry Guide,Chromatography paper,
http://www.chemguide.co.uk/analysis/chromatography/paper.html (accessed 9 Feb,2012)

Bellevue College, Chromatography,
http://scidiv.bellevuecollege.edu/rkr/biology160/labs/pdfs/Chromatography101.pdf (accessed 19 Feb,2012)

Biology Junction, Chromatography of simulated plant pigments ,
http://www.biologyjunction.com/chromatography_of_simulated_plan.htm(accessed 20 Feb,2012)

Schoolwork Helper, *Chromatography lab answers,*
http://schoolworkhelper.net/2010/11/chromatography-lab-answers/ (accessed 20 Feb,2012)