YEAR 10 SCIENCE

SCIENCE RESEARCH PROJECT

“Separating colors in leaves using Chromatography”

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INTRO: Chromatography is a technique that is used to separate the substances present in a mixture. It is also widely used to determine the identity of a substance; particuly organic compounds.

In paper chromatography absorbant paper, in this case filter paper, is used as the stationary phase. A solution of the sample that is to be analysed, in this case leaves and leaf mixtures, is made up and placed onto one end of the paper as a small spot of the mixture. The position of the spot is known as the 'origin'.

For paper chromatography the components of a mixture can be identified by the distance they travel along the stationary phase compared to the distance travelled by the solvent, in this case isopropyll. This is known as the Rf value and is expressed as.

$$Rf = \frac{\text{Distance moved from origin by mixture}}{\text{Distance moved from origin by solvent}}$$

Each component has a characteristic Rf value for the conditions under which the chromatogram was obtained. By comparing the Rf values of the components of a particular mixture with the Rf values of a known substance under identical conditions, the compounds present in a mixture can be identified.

AIM: to compare and analyse the colors and Rf levels of single leaves and a combination of leaves before and after the chromatographic process.

MATERIALS:

- 4 Camelia tree leaves
- 4 Manchurian Pear tree leaves
- 4 Maple tree leaves
- 4 Azalea tree leaves
- 6 baby food jars
- Plastic wrap
- Isopropyll – available from the supermarket
- Paper filters – I used coffee filters
- Shallow pan
- Luke warm tap water
- Masking tape
- Pen
- Morter and pestle (if you don't have one use the end of a hammer, or anything that you can use to crush will be fine)
- Clock / timer.

METHOD:

- Grind up the leaves into mushy paste.
- Apply each sample to the bottom of their individual strips of paper.

- The 6 samples should be 1 Maple, Azalea & Maple, Azalea,Maple & Camelia, Camelia, Manchurian Pear
- Fill the jars with enough Isopropyll to cover the strips.
- Use masking tape and pen to make a label to label to leaf jars
- Cover jars with platic wrap.
- Fill shallow pan with 1 inch of luke warm water and place jars in pan from 20 min.
- Allow strips to dry in sun or on clothesline.

OBSERVATIONS & RESULTS

My results from conducting this experiment are as follows:

SAMPLE:	Maple	Azal.maple	Azalea	Mapl.Came	Camelia	Manch.
Measurment 1	6cm	5.5cm	2cm	7cm	4cm	1cm
Measurment 2	12cm	10cm	10cm	12cm	10cm	10cm
Rf Level	0.5	0.55	0.2	0.583	0.4	0.1
Shape 1	2.5cm circle	2cm rectangle	2.5cm square	2cm rectangle	3cm oval	1.5 cm thumbprint
Shape 2	2.5cm oval	1.5cm oval	0.5cm oval	3cm thin rectangle	0.5cm thumbprint	4cm oval
Description 1	Large area of dark purple, light voilet and pink around it	Light green with dark spots with voilet and pink dots	Light and dark green scattered dots	Thick dark green and burgundy spots with smaller light green dots.	Large dark green and light green spots with light green dots around	Brown and voilet dots
Description 2	Smaller area of dark purple with voilet, pink and dark purple spots	Light voilet oval with darker voilet and pink dots	Light green with dark green spots	Thick Burgundy spots with fewer light green dots	Fewer large dark green spots and light green dots around	Scattered brown and voilet dots

DISCUSSION:

The main thing I noticed was that after the sample had moved it had changed shape and colour. I noticed that in both the Maple & Azalea, Maple, and the Maple & Camelia samples, there were high Rf levels recorded, which indicated a high distance travelled by the compound. All these samples were mixtures and had maple in them and, once travelled throught the solvent, had changed appearance by losing most, if not all, of the other compound's indentity, making the maple a more stronger compound.

The worse performer was Manchurian pear.It moved only 1 cm and changed by spreding itself out, which indicates that the compounds found in Manchurian pear leaves are weak, thus only alloing the sample to travel a short distance. Whereas the Maple compounds are strong, allowing the sample to move further distances, retain similar shape and more dominant in colour.

Azalea was another of the lesser performers , by moving only 2 centimetres. I am not surprised by this as the leaves were very soft and , along with the Manchurian Pear, was very easy to crush into a paste when placed on filter paper.

CONCLUSION

It seems that when too organic compounds are mixed, they don't really mix to form another mixture, they just stick together and still retain many of their original features. It also appears that some compounds found in various leaves are stronder than others, allowing them to travel further in the chromatographic process and rise over other colours once mixed

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