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Analysis of Pain Killer Drugs by Using Paper Chromatography.

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ABSTRACT

A major number of crimes dealt by forensic companies are drug related. A large number of crimes are related to unidentified substances which might be illegal drugs. The crime might involve death due to overdosing or abusing of drugs. It might not necessary be illegal drugs, it might also involve overdose of common over-the-counter (OTC) drugs like aspirin. In order to identify the reason for the death of a person or to catch individuals for the possession of illegal drugs, they need to be identified correctly by the forensic scientists. One technique used for identification of drugs is chromatography. It is a favored technique as it is simple to perform, easy to interpret and works for a large variety of drugs. We will be using paper chromatography technique for analyzing the common OTC painkillers. Some examples of painkillers that are abused are Tylenol, Anacin and Vicodin [5] but these drugs are most commonly not available without a prescription. Thus for the ease of the experiment we will be analyzing drugs which are easily available at medical stores without prescription like paracetamol, combiflam and disprin. The most of common active ingredients in OTC painkillers are aspirin, caffeine and acetaminophen. The substances mentioned above will be tested for the presence of the active ingredients aspirin and caffeine.

Keywords: OTC, aspirin, caffeine, stationary and mobile phase, paracetamol and combiflam.

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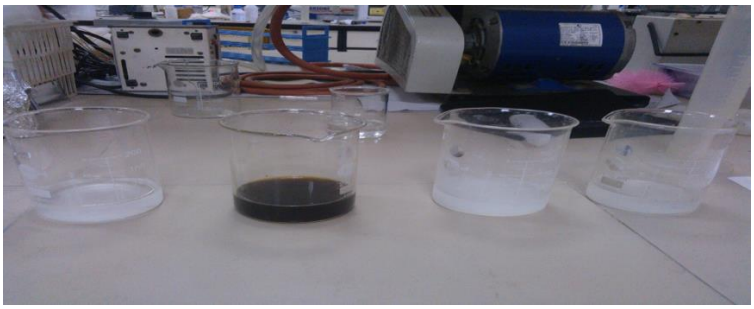
INTRODUCTION

Paper chromatography is an analytical technique for the used for separating and qualitatively analyzing the components of a mixture this method also used for testing the purity of substances and also identifying them. The main principle of this method is that the components of the mixture will get separated between a stationary phase and a mobile phase. Most commonly used stationary phase is a high quality filter paper and the mobile phase will be a solution that will travel up the stationary phase, carrying the samples along with it. The separation of the components depend on the strength with which they get adsorbed to the stationary phase versus how readily they dissolve in the mobile phase. Due to the different molecular structures of each component, each will have a different solubility in the mobile phase causing them to separate. More soluble a component is, more the distance travelled by it. In the case where water is used as mobile phase, more the polarity of the component, more the distance travelled up the stationary phase. The technique is employed here for identifying the active ingredients in some of the common OTC painkillers. The most commonly overdosed painkillers like Anacin, Tylenol etc. have the active ingredients aspirin, caffeine and acetaminophen. [1-7] here we will be identifying whether painkillers like crocin, combiflam etc. contain these active ingredients.

PROCEDURE

Paper chromatography of the above substances is carried out. To perform this first standard solutions are prepared for all the substances [1, 2].

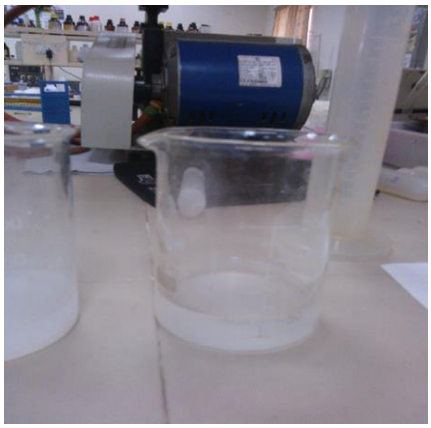
To prepare these standard solutions take 4 beakers of 200 ml each. Add 50 ml distilled water to each beaker. Label each of these beakers for all the above mentioned substances. Label a for aspirin, cf for caffeine, cm for combiflam and p for paracetamol.



The standard solutions in the above picture are aspirin, caffeine, combiflam and paracetamol from left to right.

For preparing standard solutions of combiflam and paracetamol, take one tablet of each and add to their respective labelled beakers. The heat the mixtures until a clear solution is obtained. Heating each solution for around 1 minute will give a clear solution.

Standard solution of combiflam



Standard solution of paracetamol

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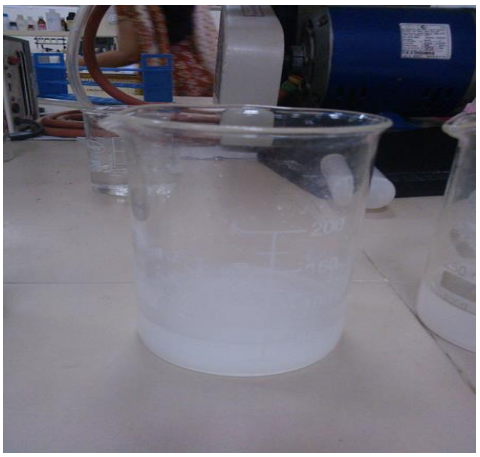
For preparing standard solution of aspirin, one tablet of disprin is dissolved in 50 ml of water in the respective labelled beaker. The solution is heated for around 1 minute to obtain a homogenous mixture. For preparing standard solution if caffeine, regular coffee powder was used. Around 2 tbsp. of coffee powder was mixed in 50 ml of water and mixed properly to get a homogenous mixture.



Standard solution of aspirin

Standard solution of caffeine

After all the standard solutions are prepared, the setup for paper chromatography is assembled. Take a large beaker in which the chromatography will be carried out. High quality what Mann filter paper no. 1 is used as the stationary phase and for mobile phase, a solution of n-butanol, acetic acid and water is prepared in the ratio 0f 4:1:1. [8, 10].

The beaker containing the mobile phase is covered when not being used so that it does not get evaporated. The filter paper is cut to an appropriate size so that it can properly fit into the beaker. A line is drawn at the bottom about 1 cm above the end. 4 spots are marked at a particular distance from each other. Each spot is labelled as a (aspirin), cf (caffeine), cm (combiflam) and p (paracetamol) from left to right. Then using a capillary tube, each of the standard solutions are spotted on to the filter paper at their respective assigned spots. After spotting place the paper in the mobile phase, the volume of mobile phase must be so that at least all the spotted points are immersed in it properly. Another line is drawn at the top of the filter paper. The mobile phase is allowed to travel only till this point. Then mobile phase is allowed to travel upwards and when it reaches the top line, remove the filter paper and allow it to dry. Then visualize the spots under UV. [7]

RESULT AND DISCUSSION

Retention factor is used to analyze the results. It is the distance travelled by the component divided by the distance travelled by the solvent front.

So the Rf value for each component is visualized and compared with rf value of aspirin and caffeine. This will tell whether aspirin and caffeine are present as the active ingredient in combiflam and paracetamol.

The respective Rf values were-

1) Rf of aspirin- 2.9/6.3 = 0.46
2) Rf of caffeine- 4.6/6.3 = 0.73
3) Rf of combiflam- Component 1- 2.7/6.3 = 0.43
   Component 2- 4.3/6.3 = 0.7
4) Rf of paracetamol- Component 1 - 3.1/6.3 = 0.49
   Component 2 – 4.34/6.3 = 0.69

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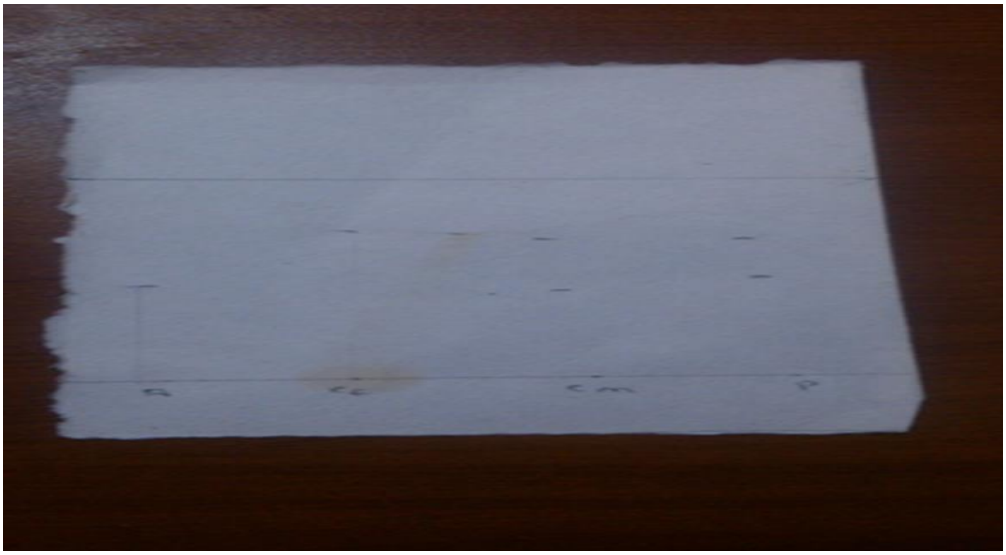

The picture above shows the developed chromatogram. The spots from left to right are aspirin, caffeine, combiflam and paracetamol respectively.

CONCLUSIONS

When visualized under the UV, two spots were obtained for both combiflam and paracetamol. On comparing with the Rf values of aspirin and caffeine, it was concluded that they were also present as the active ingredient in combiflam and paracetamol. From the Rf values it can be seen that component 1 in both paracetamol and combiflam have Rf value similar to that of aspirin, confirming the presence of aspirin. And the Rf value for component 2 for both combiflam and paracetamol represents that of caffeine. So we can also conclude that aspirin and caffeine are the active ingredients in many common painkillers and this can help us in easy identification of the unknown substances.

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