International Journal of Humanities and Social Science Invention
ISSN (Online): 2319 – 7722, ISSN (Print): 2319 – 7714
www.ijhssi.org || Volume 2 Issue 12 || December. 2013 || PP.23-27

Lipstick Stain: A Silent Clue for Criminal Identification

Ankit Srivastava[1], Swapnil Gupta[2] and Kopal Gupta[3]
[1,]*Corresponding Author & Assistant Professor, Institute of Forensic Science & Criminology, Bundelkhand University, Jhansi (U.P.) – India – 284128*
[2,] *Lab. Assistant, CFSL (CBI), New Delhi, India*
[3,]*Scientific Assistant, FSL, Delhi, India*

Abstract: *Stains play an important role for criminal identification in different type of cases such rape, murder, theft, burglary. Stains i.e. blood, semen, saliva, lipstick are the most common evidence found at the crime scene. Lipstick is one of the important type of evidence, which is mostly found on clothing's, papers, tissue-papers, cigarette-buts, skin or any other surface or thing. Questioned lipstick stains can be matched with the suspected one for the criminal identification. In the present study an attempt has been made to analyze the Lipstick stains by Thin Layer Chromatography. For this a total of 30 samples (3 each of Pink, Grey & Brown Shades of 10 different brands of lipsticks) were taken from market. TLC is done for most famous brands of Lipsticks such as Lakme, Blue-Heaven, Revlon, Elle-18, Loreal, Personal, Davis, Rimlin, Sheel & Image.*

Keywords: *stains, crime, criminal, thin layer chromatography*

I. INTRODUCTION

Lipstick is a type of physical evidence usually found in the cases of rape, murder, theft, burglary etc. It is found on the scene of occurrence on clothing's, papers, tissue-papers, cigarette-buts, skin or any other surface or thing. The questioned sample found on the crime scene is matched with the standard sample. In the same way questioned lipstick stain found on the crime scene present on different thing is compared with standard lipstick stain collected from custody of suspect e.g. Handbags, drowers, bathroom cupboard, on dresser-tops & similar places where lipstick might be laid down, carried or stored. Then the examination of lipstick stain is done. Many types of techniques are used for the analysis. Thin Layer Chromatography which is relatively simple & economical technique is usually used for analyzing such smears. The colouring agent in these lipstick stains may be separated by Thin Layer Chromatography. This colour analysis may be used to identify the lipstick used to make a smear. So the present work attempts to analyze various lipstick stains with the help of TLC.

Lipstick is a type of cosmetics. Cosmetics are substances used to protect the appearance or odor of the human body e.g. Creams, Lotions, Powders, Perfumes, Lipsticks, Nail polishes, Eye & facial makeup, Eye shadow, Eye linner, Mascara, Shimmer, Glitter, Hair colours, Hair gel & Hair spray etc. Cosmetics have more significant value in forensic science although these are present in small quantities.

Lipstick is the firm fatty substance like a wet substance in a tube. It is applied to the lips to leave a thin coating of colour. Lipstick is known to be used around 5000 years ago in ancient Babylon. In those times it was usually made from focus-algin, iodine & bromine. It became popular in 16nth century, where it was made from bees wax & stains of plants. But now a days it is composed of different ingredients.

Composition of lipstick

A lipstick typically consists of oil, wax, dyes, pigments & perfumes. The composition of typical lipstick is given below-

Castor oil-	65%
Bees wax-	15%
Carnauba wax-	10%
Lanolin-	5%
Soluble & insoluble dyes-	4%
Perfumes-	1%

Lipstick is found in liquidy paste form. Lipstick consists of many other ingredients including Lipid, Beeswax, Carnauba wax, Candelilla wax, Castor oil, Lanoline, Ozokerite, Branched chain compounds, Ceresin, Fatty acid esters, Stearic acid, Higher alcohols, Hydrogenated fats and oils Mineral oil, Petrolactum, Polyethylene glycol, Polyethylene glycol ester and ethers, Synthetic waxes, Vegetable oils, Membrane forming agent, Pigments Colour agent in powder form.

Types of lipstics

There are different types of lipstick according to use and character. The important types of lipsticks are given below-

A) Matte lipsticks : These are great for fuller lips as it doesn't reflect light. So doesn't make the lips look larger. Matte lipsticks are best worn for office wear or outdoor activity.

B) Cream lipsticks : This one is an all time favorite. It gives a softer look and doesn't dry the lips as much as matte lipsticks. It is applied from straight position on lips.

C) Sheer lipsticks : They are great for a very natural looking lip colour. These lipsticks give the natural colour to the lips and also give the casual look.

D) Shiny-glassy lipsticks: These lipsticks are great to wear, albeit temporarily as they tend to bleed outside the lip line. It can be worn for an evening out or even on top of matte lipsticks to give a dramatic look.

E) Metallic lipsticks : These are great for a shimmery look. They are easy to use directly on the lips and give an illusion of fuller lips. Metallic colours look best with garments, diamonds, silver or gold work on them.

F) Semi-opaque glass : These are the great option for those who feel their natural lip colour is discoloured. These soft glasses make any lip good. It is applied by a brush on to the lips.

II. MATERIAL & METHODOLOGY

In the present work an attempt has been made to analyze the Lipstick stains by Thin Layer Chromatography. For this a total of 30 samples (3 each of Pink, Grey & Brown Shades of 10 different brands of lipsticks) were taken from market. Here the TLC is done in 3 popular colours of 10 popular Brands, i.e. Pink, Grey & Brown Shade. The popular Brands of lipsticks are- LAKME, BLUE-HEAVEN, REVLON, ELLE-18, LOREAL, PERSONAL, DAVIS, RIMLIN, SHEEL & IMAGE.

Extraction

Present study has been made from the volunteer (female) lip prints on the tissue papers. Volunteer were asked to put selected lipsticks on their lips & further they were asked to press their lips on folded tissue papers. Now extraction of lipsticks were done from tissue papers. Tissue papers having the lipstick smear were taken, they were cut 1 by 2 cm section of a lipstick sample by a scissor from the tissue paper and putted into a test tube. Test tubes were labelled it with the Lipstick brand & colour. This is repeated for each tissue paper into separate test tubes.

Methanol is used as an extracting solvent. 15-20 drops of Methanol was added to each test tube. The test tubes were shaken thoroughly and they were allowed to stand to extract the lipstick for 10-15 minutes, with occasional stirring.

Glass rod was used to remove the extracted tissue paper from each test tube. Each test tube was placed in a Centrifuge and spined for 5 minutes. Then each sample was removed carefully. Now each test tube contained extracted lipsticks which were used for sampling on to the TLC plates.

Thin Layer Chromatographic analysis

TLC is a widely used chromatography technique used to separate chemical compounds. It was developed by Stahl in 1958.

Basic principle

TLC is based on the Adsorption, which is a surface phenomenon. It is depend upon Retention time. In this type of chromatography, the stationary phase is deposited on a thin layer on a glass plate and mobile phase is a mixture of solvents.

Preparation of TLC plates

TLC consisted of 2 phases i.e. Stationary Phase & Mobile Phase. Firstly stationary phase is required, so for this Silica gel G is used. Silica gel G is mix with Distilled Water (1 part Silica gel G + 2 part Distilled Water. This mixture is spread as slurry on to the glass plate. Glass plate is having size of 8 by 3 cm. Silica gel should be spread uniformly on the glass plates having thickness of .25mm.

Activation of TLC plates

Glass plates is then activated by heating in an oven to remove the water contents of the stationary phase. So plates are heated for 1 hour at 100° c Tem, so upper layer is activated for Adsorption.

Spotting of TLC plates

The sample solution, having lipstick dyes, is applied as a spot to the TLC plates about 1cm from the base. Sample is the material which has to be analyzed. Sample can be applied on glass plate by capillary tube of 1 cm of a part. So each glass plate has 2 spots. After spotting all 2 samples in their places, Heat for 30 seconds, followed by 10 seconds of cooling.

Development of TLC plates

TLC plates are dried after spotting and then put into the development chamber containing a suitable solvent (mobile phase). This solvent is called as Developing Solvent. There are mainly 4 types of Developing Solvents for Lipstick analysis.

(a) System 1st **(b) System 2nd**

Isoamyl Alcohol- 35%
Acetone- 35%
Distilled Water- 25%
Ammonium Hydroxide- 5%

Methyl Butanol- 35%
Propanone- 35%
Distilled Water- 25%
Ammonia- 5%

(c) System 3rd
Ethyl Acetate- 70%
Methanol- 15%
Ammonia- 15%

(d) System 4th
Cyclohexane- 50%
Pentanol- 40%
Con. Hcl- 10%

Put the developing solvent into the chamber or glass beaker to a depth of 1cm. It is closed by a glass plate or Al coil, so the saturation is take place. Then the solvent rises by the capillary action. The separation takes place with different components traveling different distance on the plate. The development is takes place usually in once. Once the development is finished (it takes 10 minutes), When the solvent front traveled a distance of 6 cm. It is taken out of the chamber. The plate is dried and the components can be seen with nacked eyes but sometimes components which are colourless are located by various methods.

E.g. By the spray of iodine vapours which reviles the component as colour spot under ordinary or UV light.

Measurement of TLC plates (Fig. c)

Each separated component is characterized by Rf value= Retention factor, which is the ratio distance travel by the constituent to the distance traveled by the solvent. This can be expressed as follows;

Rf = d solute/ d solvent

RF value is always less than 1 because solvent runs always more than solute. Rf is unitless because it is only a ratio. Rf values are usually measured in centimeters. If Rf value is multiplied by 100 then Rf value is called as hRf value (Height of Retention factor). Since Rf value are a function of a number of variables, they should be considered only as guideline values.

Whenever two compounds absorbed at the same site, the more strongly absorbed compound will displace the other. The displaced compound will then form a spot further away from the origin. The more similar to adsorptive properties of two compounds are, the more difficult it is to separate them.

III. RESULT AND DISCUSSION

In the present work an attempt has been made to analyze the Lipstick stains by Thin Layer Chromatography. For this a total of 30 samples (3 each of Pink, Grey & Brown Shades of 10 different brands of lipsticks) were taken from market and analyzed through Thin Layer Chromatography.

TLC separate the different dyes component present on the lipstick. The colour of the lipstick is due to presence of dyes in it. Lipstick consists of mainly aluminium, calcium or barium dyes.

There are many types of lipsticks having different colours present in the market. A lot number of company manufactured lipsticks. Here the TLC is done in 3 popular colours of 10 popular Brands, i.e. Pink, Grey & Brown Shade. The popular Brands of lipsticks are- Lakme, Blue-Heaven, Revlon, Elle-18, Loreal, Personal, Davis, Rimlin, Sheel & Image.

PINK SHADE LIPSTICKS (Table 1)

S.N.	Name Of Lipstick Brands	Coated Plate	Stationary Phase (Adsorbent)	Mobile Phase (Solvent System)	No Of Spots	Colour Of Spots	hRf Value
1	LAKME	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Light Blue	90
2	BLUE- HEAVEN	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Dark Orange	93
3	REVLON	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Light Orange	92
4	ELLE-18	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Light Green	91
5	LOREAL	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Light Orange	90
6	PERSONAL	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Light Pink	90
7	DAVIS	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Yellow	90
8	RIMLIN	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Dark Orange	90
9	SHEEL	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Dark Pink	88
10	IMAGE	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Light Pink	96

GREY SHADE LIPSTICKS (Table 2)

S.N.	Name Of Lipstick Brands	Coated Plate	Stationary Phase (Adsorbent)	Mobile Phase (Solvent System)	No Of Spots	Colour Of Spots	hRf Value
1	LAKME	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Orange	88
2	BLUE- HEAVEN	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Yellow	92
3	REVLON	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Yellow	90
4	ELLE-18	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Light Orange	86
5	LOREAL	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Orange	96
6	PERSONAL	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Light Yellow	90
7	DAVIS	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Light Green	90
8	RIMLIN	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Pink	86
9	SHEEL	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Dark Pink	84
10	IMAGE	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Green	90

BROWN SHADE LIPSTICKS (Table 3)

S.N.	Name Of Lipstick Brands	Coated Plate	Stationary Phase (Adsorbent)	Mobile Phase (Solvent System)	No Of Spots	Colour Of Spots	hRf Value
1	LAKME	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Light Pink	93
2	BLUE- HEAVEN	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Orange	91
3	REVLON	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Dark Pink	91
4	ELLE-18	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Light Pink	88
5	LOREAL	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Yellow	90
6	PERSONAL	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Light orange	94
7	DAVIS	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Orange	84
8	RIMLIN	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Light Pink	90
9	SHEEL	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Light Yellow	78
10	IMAGE	Glass	Silica Gel – G	IAA/ Acetone/ Dis.Wat./ AH	2	Light Pink	91

Where,
IAA = Iso Amyl Alcohol
Dis. Wat. = Distilled Water
AH = Ammonium Hydroxide
hRf = Height Of Retention Factor

IV. SUMMARY AND CONCLUSION

Lipstick is a type of cosmetics, which is widely used all over the world to give the colouring and special look to the lips. This is the common physical evidence found in cases of rape, murder, burglary, theft etc. Lipstick which available in different varieties of colours due to presence of various dyes and their mixtures. Normally the lipstick can be differentiated by the viewing of its colour. But when two or more of same colour of lipstick smear is present on the crime scene, then it is identified by different techniques. There are different colour shades of lipstick. But the common and popular ones i.e. Pink, Grey & Brown Shades of different brands which have been chosen for the analysis for present study with TLC and following conclusions made;

(1) Thin Layer Chromatography is one of the best, economical technique which can be used for the identification of lipstick smear.
(2) The entire lipstick smear can be identified by colour of spot & Rf Value.
(3) RF value ranges from 78 to 96. (I.e. hRf Value).
(a) For Pink Shade it ranges from 88 to 96.
(b) For Grey Shade it ranges from 84 to 96.
(c) For Brown Shade it ranges from 78 to 94.

REFERENCES

[1.] **Castello, A., Alvarez-Segui, M., Verdu, F. (2005),** "Luminous lip-prints as criminal evidence.", *Forensic Sci Int; vol 155(2-3), pp 185-7.*
[2.] **Davidek, J., Pokorny, J., Pokoma, V. (1962),** "Analysis of dye in lipstick by means of thin layer chromatography.", *Cesk Hvg (Czech); vol 7, pp 548-54.*
[3.] **Deshusses, J., Desbaumes, P. (1955),** "Identification of dyes in cosmetics by paper chromatography.", *Mitt Leb Hyg (French), vol 46(2), pp193-9.*
[4.] **Deshusses, J., Desbaumes, P. (1954),** "Paper chromatography for identification of colouring matter in cosmetics, dyes & tining shampoos.", *Mitt Leb Hyg (French), vol 45(6), pp 484-9.*
[5.] **Deshusses, J., Desbaumes, P. (1953),** "Identification of dyes in lipsticks by paper chromatography.", *Mitt Leb Hyg (French), vol 44(6), pp 500-7.*
[6.] **Desiderio, C., Marra, C., Fanali, S. (1998),** "Quantitative analysis of synthetic dyes in lipstick by micellar electrokinetic capillary chromatography.", *Electrophoresis; vol 19(8-9), pp 1478-83.*
[7.] **Felman, G. (1993),** "Direct upper-lip lifting ; a safe procedure.", *Aesthetic Plast Surg, vol 17(4), pp 291-5.*
[8.] **Garliardi, L., Amato, A., Cavazzutti, G., Chimenti, F., Bolasco, A. (1987),** " Identification of cosmetic dyes by ion-pair reversed-phase HPLC.", *J Chromatogr; vol 394(2), pp 345-52.*
[9.] **Garliardi, L., Amato, A., Cavazzutti, G., Tonelli, D. (1988),** "Identification of xanthene dyes in lipsticks by reversed-phase HPLC.", *J Chromatogr; vol 448(2), pp 296-300.*
[10.] **Gupta, V.K. (1975)**, " Syntetic dyes – Cosmetic dyes" vol 10, Chapter 15
[11.] **Lucas, D.M., Eijgelaar, G. (1961),** "An evaluation of a technique for the examination of lipstick stains.", *J Forensic Sci; vol 6(3), 354-62.*
[12.] **Reuland, D.F., Crinler, W.A. (1980),** "A comparison of lipstick smears by HPLC.", *J Forensic Sci; vol 20(2), pp 111-20.*