

CHAPTER - 1 INTRODUCTION

Fingerprints are the common and easily available evidence from any crime scene. The identification of criminals through fingerprints are based on its unique, permanent and classifiable characters. Mainly classification was based on Hendry System which was developed in India and used in most part of world. For the development of these fingerprints generally powder method, chemical method and photography are used based on surface.

Powder methods are generally done in latent prints. These prints are not readily visible to the naked eye. As a result these “hidden prints” must be developed in some way to increase their visibility and contrast. The most common method of development latent fingerprints on nonporous object is to physically enhance it by applying fingerprint powders. Powder composed of many different ingredients that can vary greatly depending on the formula used. Most black fingerprints powders used which contain rosin black ferric oxide and lamp black. Many inorganic chemicals such as lead, mercury, cadmium, copper, silicon, titanium and bismuth.^[4]

Chemical methods are generally used in porous surface such as paper, typically processed with chemicals including Ninhydrin and the physical developer to reveal latent fingerprints. These chemicals react with specific components of latent fingerprints residue such as Amino acids and Inorganic salts. In other chemical methods superglue or cyanoacrylate fuming method is a forensic technique that uses vapours of super glue to develop the fingerprints. The fuming performed by using chambers, super glue, and water which allows the vapour to adhere to fingerprints making the fingerprint visible.^[5]

Photography is used in bloody fingerprints, prints from chocolate soap so on. For this other instrumental techniques like IR, UV, X-rays radiations are also commonly used for fingerprint development. The primary application of forensic light source is for enhancing the detection of latent fingerprints. The use of fluorescent enhancement processes that compliment a light source greatly increase

the types of surface from which a latent fingerprints can be detected. In dusting, lifting a print of from surfaces like plastic bags, thin aluminium foil, heavy grained wood, concrete wall, brick are very difficult, So forensic light source are very much necessary. Two primary way of making fingerprint fluoresces through the use or treatment with fluorescent powder or fluorescent liquid dyes.

Fingerprints has been used for identity suspects and solve crimes for many years, it remains on extremely valuable tool for law enforcement. Fingerprint is biometric security which common in all aspects life. Collection and identification of fingerprints are the most important task because fingerprints are very fragile evidence. Cases like Homicide, Burglary, Rape, Physical assault fingerprints are very evident and according to type of cases surfaces and sites will be variable. If proved, this principle would mean a fingerprint could give a molecular signature that could reveal aspects of an individual's lifestyle and environment, such as their job, their eating habits or their medical problems. This might help the police work out who the prints belong to.

Today, latent fingerprint collection is "a staple of every crime scene" where there are surfaces from which prints can be lifted, by forensic scientists. Forensic technicians typically visualize the prints by dusting them with powder and lifting them with adhesive tape, using a dye stain, or fuming the area with cyanoacrylate (vaporized superglue). The prints are then photographed or scanned. At that point, an examiner must decide whether a collected print is good enough to attempt an individualization. This means comparing the latent fingerprint with a fingerprint from a known subject and determining if there is enough information in the ridges and whorls to suggest both samples were left by the same person. Forensic scientists use the term individualization instead of the word match because the analysis is about probability, not necessarily certainty.

Instead of using common fingerprint powder here organic powders especially waste material's ashes are taken as powder to develop fingerprints. When compare these materials to commercial fingerprint powder organic powder are very cheap, reliable, and eco-friendly. And also it is hazard less substances.

These materials are easily available and we have the choice of reusability. Surfaces used for conducting study are very common to all persons in daily habitat. It include ordinary porous surface like tiles to plastic surface of switch board.

Previously the research was conducted about the development of fingerprints using the common and easily available materials which we using in our daily life such as Turmeric powder, Chilli powder, using various Food colours and festival colours coal so on. Except from that in this project is based on development of fingerprints from organic powders and organic ashes. Here organic compounds means substance which are produced naturally and as well common as in our daily life. In case of organic ashes which are produced by waste ash from paper, vegetables, it do not cause any toxicity and it is very eco-friendly.^[7]

CHAPTER – 2 LITERATURE REVIEW

Matej Trapecar (2007) studied Fingerprint Recovery from Human skin surface. The study was conducted to investigate whether certain dactyloscopic powders and reagents can recover latent fingerprints on human skin surfaces. Examination was done in intentionally deposited fingerprints on skin of five victims with a particular time interval between death and deposition of prints ranging from 35 minutes to 36 hours. Whilst the time interval between placing the latent prints and examination ranged from 1 to 5 hours, for four cases positive results are obtained. Methods used in this study are only those methods which Slovenian experts are applied to use, focus on Swedish powder fingerprints were intentionally deposited on the skin surface of 15 living persons and on 5 dead bodies separately. Results give fingerprints were assessed by their visibility and the clearness of ridge details. Fingerprints are poor but still visible ridge detail and limited identification potential were assessed as marks with limited value. The study has shown that there was no difference in results obtained between live and death skin surfaces, both are same in physical aspects while comparing the properties.

Renee jelly et.al (2007) studied about Lawsone: a novel reagent for the detection of latent finger-marks on paper surface. Lawsone (2-hydroxy-1,4-naphthoquinone) reacts with latent finger print deposits on paper surface to yield purple brown impression of ridge details which are also photo luminescent. This compound represents the first in a completely new class of finger marks detection reagent. Latent finger marks were collected on filter paper from number of different volunteers. The filter paper is dipped in the lawsone reagent solution, air dried and heated in oven or by direct heat using laundry press. As a result developed marks which also exhibit strong photoluminescence when illuminated with forensic light source at 555nm.

Matej Trapecar et. Al (2008) studied a preliminary study of the technique for recovery on vegetables and fruits used. Methods in this study include, fingerprints

were intentionally deposited on the surfaces of fruits as well as vegetables for various studies. Forensic light source was asked to visually scan for latent fingerprints on vegetables and fruits prior to free from contamination. Then labelled of deposited site with ordinary number of fruits and vegetables like apples, Banana, Tomatoes and Potatoes. Two donors -one male and other female has been chosen for experiment. Examination was conducted on 22-26degree Celsius and the relative humidity roughly 50% .The participants made contact with fruits and vegetables surfaces for 3-5 seconds in each case. Results gives immediate enhancement of the fingerprints on apples or banana were achieved using silver special powder and Swedish black. In both cases friction ridges were easily identified and characterized regardless of the surface. Low convincing results obtained from cyanoacrylate method. Best result achieved with silver special powder on tomato facilitating the observation of ridge detail while Swedish black and cyanoacrylate fuming works in.

Sumrit Mopoung et.al (2009) studied coloured intensity enhancement of latent fingerprints powder obtained from banana peel activated carbon with methylene blue. Fingerprints has been used scientifically establish the identity of suspected criminals. Methods used very simple, solid turmeric was crushed with mortar and pestle. Result gives on the basis of visual observation it was found that coal powder offered the best result Turmeric powder gave better result when compared to pepper and chilli powder. The ridges were clearly visible when coal and turmeric powder were used. In the case of pepper and chilli powder the ridges were not that clear as coal powder. The finger prints were lifted using a cellophane tape and pasted on a white sheet of paper. Only coal powder offered the best quality whereas other powders didn't give result as good as coal powder.

Harish Kumar et.al (2011) studied new visualizing agent for latent fingerprints, Synthetic food and festival colours. This paper presents new powdering method for development of latent fingerprints on different substrates as preliminary studies. 20sets of fingerprints were collected from 20individuals. The method used herein development of latent fingerprints is powder method without using brush. In order to develop latent fingerprints with synthetic food colour, powders taken should

contain some dye content. 3 colours were applied for the visualization. Surfaces are, Aluminium foil, Top surface of CD, Aluminium sheet. Results are same as in brushing methods, used for development of latent fingerprints on different surfaces. It is observed that latent fingerprints of pure sweat were not developed on normal paper using food colours while the same get developed using conventional black powder. Aluminium foil surface showed have comparatively better results. Both sebum and sweat has having good results. Similar type of result are observed by using Holy colours use for development of latent fingerprints.

Rakesh. K. Garg et.al (2011) studied a new technique for visualization of latent fingerprints on various surfaces using powder from turmeric, A Rhizomatous herbaceous plant (*Curcuma longa*). New technique has been introduced for fingerprint detection but traditional fingerprints detection technique for detecting latent fingerprints is powdered method. Here study was based on how will be extract or develop the latent fingerprints using organically and here turmeric powder used as powder for development of fingerprints. 11 test latent fingerprints were collected on various surfaces. The experiments were carried out in the months of May/June when the temperature varied from 35 to 42 C and the relative humidity between 60% and 80%. The powder is sprinkled over a surface and then excess of powder is removed by tapping in order to get a clear print. In order to get comparative evaluation. The surfaces give successful results in nine surfaces. The development of latent fingerprints presents on surface like sample paper, bind paper, thermal paper, aluminium foil, transparency sheet, wood, plastic, painted sheet, writing surface of CD could be successfully done. It gives clear ridges for identification. Turmeric powder is easily available, which is nontoxic and simply used in various surfaces successfully for crime investigations.

Jasmine Kaur Dhall et.al (2013) studied a novel of the development of latent fingerprint recovered from arson stimulation. Methods used in number of individuals both males and females with variable donor capabilities were asked to give groomed fingerprints for cleaned using detergents and air dried. Latent fingerprints were placed on, Smooth surfaces- glass, ceramic tile. Metallic surfaces- aluminium foil, tin cans, metallic spoon. Substrates were exposed to high

temperature 100-900 degree in a muffle furnace for one hour. It gives results, recovery of latent fingerprints which produced clear ridge details was 89.5%. Fingerprints do not be developed at 900degree and above glass it will starts to disintegrate above greater than 830 degree. Aluminium foil becomes excessively crinkled and disintegrated at 750 degree. Hence the latent fingerprints development was impaired on both the surfaces with clear ridge details could be developed into 500 degree on the base of tin cans. Poor results are from sides of cans. It is concluded that it has been observed that fingerprints can be developed at high temperature. Fingerprints will survive even after rinsing with water fluorescent SPR may prove very useful in such cases.

R.Adhithya et.al 2015 studied on the topic- Latent fingerprint printing technique by using turmeric, Chilli, Pepper and Coal in forensic detection. Fingerprints are major evidence when comes through forensic field. Sebaceous gland, sudoriferous eccrine and apocrine glands are three glands. In thus study Turmeric powder, Chilli powder, Pepper powder and coal are used. Experiment conducted on glass, steel and plastic surfaces using these powders. On the basis of visual observation it was found that coal powder offered the best image. Turmeric powder gave better result when compared to pepper and chilli powder. The ridges were clearly visible when coal and turmeric powder were used. In the case of pepper and chilli powder the ridges were not that clear as coal powder. Hence it can be concluded that coal powder is the best when compared to other three powders.

Seerat et.al 2015 studied on topic comparative study of different natural products for the development of latent fingerprints on non-porous surfaces. They include glass, metal, plastics, painted wood, and rubber. Latent prints on these substances are more susceptible to damage because the fingerprint residue resides on the outermost surfaces. Seventy-six samples of latent fingerprints were taken. Volunteers were asked to hold non porous surfaces such as glass, tile, plastic, spoon etc. Seventy-six samples of latent fingerprints were taken. Marigold Powder, Mustard Oil Soot, Turmeric and Red Chilli Powders are the powders taken for study. Black Charcoal Powder Tile, Plastic, Stainless Steel Plate, Glass, China Dish, Spoon, Switch Board Ply, Aluminium Composite Plate (ACP), Aluminium Home Foil and Mirror. Prints are clearly developed on all surfaces. Marigold

Powder Prints are clearly visible on all surfaces except on plastic and glass surfaces. Mustard Oil Soot Prints are clearly developed on all surfaces.

Helio L Barros et.al(2018) studied Micro-structured fluorescent powders for detecting latent fingerprints on different types of surfaces. In this study they developed and evaluated micro structures on porous and non-porous surfaces and different colour surfaces. Fingerprints were not visible before the development process. After processing the prints with the powders and under visible light, the visualization depended on the type of surface background. For latent fingerprints, samples of latent fingerprints were impressed on different type of surface and different colours. Five fresh same fingerprints were made on surfaces to obtain prints. Other fingerprint samples were taken from donor without replenishment. In this sample are collected from 10 donors -5males and 5 females which is aged between 20-41. Work demonstrated that the micro structured fluorescent powder development was successful in latent fingerprints on different surfaces and different colours. Fingerprints powders are very sensitive, selective, adhering only to fingerprints and not in entire surface. Powder formulation used in silica as matrix which is bio degradable and eco -friendly.

Renee jelly et.al (2007) studied about Lawsone: a novel reagent for the detection of latent finger-marks on paper surface .Lawsone (2-hydroxy-1,4naphthoquinone react with latent finger print deposits on paper surface to yield purple brown impression of ridge details which are also photo luminescent this compound represents the first in a completely new class of finger marks detection reagent. Latent finger marks were collected on filter paper from number of different volunteers. The filter paper is dipped in the lawsone reagent solution, air dried and heated in oven or by direct heat using laundry press. As a result developed marks which also exhibit strong photoluminescence when illuminated with forensic light source at 555nm.

CHAPTER - 3 AIM AND OBJECTIVES

AIM

To develop the latent fingerprints on different surfaces using Organic Ash Powders and Organic Powders.

OBJECTIVES

- To compare development of latent fingerprints by commercial fingerprint powder and organic powders.
- To study the evolution of latent fingerprints in organic manner from various surface by using naturally available materials.

CHAPTER - 4 MATERIALS AND METHODOLOGY

Materials Required:

Surfaces

- Tiles
- Granite
- Aluminium surface
- Glass
- Switch board surface
- Steel

Powders

- Paper ash powder
- Vegetable peel ash powder
- Holy ash powder
- Mehendi powder

Other materials

- Gloves
- Fingerprint brush (camel feather brush and fibre brush)
- Mask

Instruments

- Camera
- Lens



Figure 1: Canon EOS 1500D digital SLR camera

METHODOLOGY

Samples were collected from five individuals on each surface at normal room temperature and humidity in the month of January at various eight surfaces like Tiles, granite, aluminium surface, steel, glass, switch board. The test latent prints were collected from different substrates. For collection of samples individuals were asked to clean their hands with soap and water. After cleaning the hands individuals were informed to dry and palm was closed for sweating. The surface were also cleaned with soap and water allowed to dry. Fingerprints were collected from individual on various surfaces within regular intervals and different powders were applied for the development of fingerprints.

There are four test fingerprint powders prepared from organic and natural processes. In order to develop latent finger print with materials and its ashes only few rams of powder were taken.

Paper ash powders are developed by commonly using newspaper. Newspapers were burned into ashes using fire. Papers are burned on free fire, then collect the ashes carefully and then filter it using cotton materials. The fine black ash powders were obtained.

Vegetable Waste ash powder were prepared by using commonly available vegetables like onion and garlic which contain dry outer peeling ,it should be burn into ashes using free fire .The burned ashes are collected and filtered it using cotton materials .Black coloured ash will be obtained.

Holy ash which used for this experiment are commonly available commercial holy ash, which generally prepared by using cow dung ashes and using other herbs that are mainly used for smell. Colour of holy ash would be different according to its composition and constitutions. Here ivory white coloured ash powders are obtained.

Mehandi powders are extracted from mehandi plant leaves which are dried and made into fine powder. It was also available as commercial packets which contain additional chemicals which gives green coloured powder.

Most of these materials were gave black, white and green coloured powder to develop fingerprints. Powders were sprinkled on surface and excess powder was removed by using fingerprint brushes. Developed fingerprints from various surfaces comparative study. Fingerprints were to get examined by using lens to get minor details and observed the prints. The developed fingerprints were compared from organic powder and ordinary fingerprint powder is for further examination.

CHAPTER-5 OBSERVATION

Surfaces	Powders	Result
Tiles	Paper ash powder	Developed
Tiles	Vegetable ash powder	Developed
Tiles	Mehandi powder	Not Developed
Tiles	Holy ash powder	Developed
Granite	Paper ash powder	Not Developed
Granite	Vegetable ash powder	Not Developed
Granite	Mehandi powder	Developed
Granite	Holy ash powder	Developed
Mobile phone surface	Paper ash powder	Not Developed
Mobile phone surface	Vegetable ash powder	Not Developed
Mobile phone surface	Mehandi powder	Developed
Mobile phone surface	Holy ash powder	Developed
Steel	Paper ash powder	Not developed
Steel	Vegetable ash powder	Developed
Steel	Mehandi powder	Not developed
Steel	Holyash powder	Developed
Aluminium surface	Paper ash powder	Developed
Aluminium surface	Vegetable ash powder	Developed
Aluminium surface	Mehandi powder	Not developed
Aluminium	Holy ash	Developed

surface	powder	
Switch board surface	Paper ash powder	Developed
Switch board surface	Vegetable ash powder	Developed
Switch board surface	Mehandi powder	Developed
Switch board surface	Holy ash powder	Not developed
Glass	Paper ash powder	Developed
Glass	Vegetable ash powder	Developed
Glass	Mehandi powder	Not developed
Glass	Holy ash powder	Not developed

Table1: Development of latent fingerprint using various powders

Chapter - 6 RESULT AND CONCLUSION

RESULT:

In case of tiles almost all powders are giving good friction ridges. In that black ash powder like paper ash powder and vegetable peel waste powders are more applicable and holy ash also shows good impact. Mehandi powder is not applicable on tiles.

In case of granite mehendi and holy ash powders gives clear friction ridge for analysis. And in case of holy ash which is in ivory white colour, gives positive results in granite, glass, tile, aluminium surface, mobile surface, steel only. The paper ash and vegetable waste ash powder are not applicable on granite.

Mehandi powder and Holy ash powder is admirable to Mobile phone surface. Other two black powders paper ash and vegetable waste ash powder will give negative result.

On steel surface paper ash powder and mehandi powder will give good results when compared to holy ash powder and vegetable waste ash powder due to colour variations.

On aluminium surface except mehendi powder other three powders like holy ash, paper ash powder, vegetable waste ash powder give good friction ridge for identification.

Holy ash powder is not applicable to switch board due to its sticky nature. Other three surfaces give good impact.

On glass surface mehendi powder is not applicable and paper ash powder, vegetable waste ash powder and holy ash is admirable.



Figure 2: Holy ash on Tile surface



Figure 3: Vegetable Waste ash on Tile surface



Figure 4: Paper ash on Tile surface



Figure 5: Mehandi Powder on Granite



Figure 6: Holy Ash Powder on Granite



Figure 7: Mehandi Powder on Mobile phone surface



Figure 8: Holy Ash powder on Mobile phone surface



Figure 9: Holy ash on Steel surface



Figure 10: Vegetable Waste ash Powder on Steel surface



Figure 11: Paper Waste ash Powder on Aluminium surface



Figure 12: Holy ash on Aluminium surface



Figure 13: Paper ash on Aluminium surface



Figure 14: Mehandi powder on Switch board



Figure 15: Paper ash on Switch board



Figure 16: Vegetable Waste ash Powder on Switch board



Figure 17: Vegetable Waste ash Powder on Glass surface



Figure 18: Paper ash Powder on Glass surface



Figure 19: Black powder on switch board



Figure 20: Black Powder on Tile



Figure21: Black powder on Steel surface



Figure 22: White powder on steel surface



Figure 23: White powder on Aluminium Surface



Figure24: White powder on Glass surface



Figure25: Black powder on Granite

Conclusion:

This study was carried out to develop latent fingerprints on non-porous surfaces by different natural products. The purpose was to compare which powder gives good and better result. It is concluded from the present study that these commonly and easily available as well as less expensive agents could be a useful substitute for the decipherment of latent prints deposited on different surfaces. Paper ash powder and vegetable peel waste powder are giving best results in case of holy ash and mehandi powder it have some restriction based on surfaces due to sticky nature. The quality of recovered fingerprints vary depend up on time since deposition of substrates greatly because it reduce recoverability potential. Quality of fingerprints will also depend on the fingerprints donor, fingerprint pressure and conditions of contact of surfaces (sweat content)

Comparatively black ash powder gives almost conceivable results is very useful and easy method to development fingerprints by using organic and naturally available products especially waste items. It is eco-friendly, hazard less and very simple to use in any crime scene only the basic task to identify the surface and the colour contrast before applying powders. The results as shown in figures are obtained when powder dusting method has been applied on different surfaces using conventional as well as new powders. The similar types of results are also obtained when brushing method is for development of latent prints on different surfaces.

The future work will be focused on fingerprint powders development by using material which are eco-friendly and developed from materials which can be reusable methods. Through this study, have to reduce the use of inorganic substances in a limit. Here materials taken to develop fingerprint powders are nontoxic to living being, and also will not cause any physical difficulties in process of development. Basically study was conducted to reduce health hazards using Inorganic and chemical compounds.

CHAPTER: 7 Reference

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