

CHAPTER: I

INTRODUCTION

Fingerprints have often been and still are considered one of the valuable types of physical evidence in identification. It have been a constant since the birth of mankind. Over the several thousand years man has been in existence, fingerprints have not changed. Evolution has simply necessitated the analysis and understanding of the skin we possess on our hand and feet. What was once viewed simply as a covering for our skeletal/musculature mass, with distinct characteristics and configuration, we now know has a specific definition and application. As with all things in nature, we possess uniqueness within each of us. This was first observed and documented by Johannes Evangelista Purkinje in 1823. Prior to that time, there are documented instances where finger and palm prints were observed but not formal study or analysis was undertaken. The uniqueness of the impression was captured, but the specificity as to the individualization was not pursued. There are documented instance within various prehistoric sites, as well as other discoveries throughout the world, that indicate fingerprints were somehow used as a method of identity most probably for psychological or superstitious purposes. There has been no supporting documentation of a formula that may have been used with those findings. Assumption, simple or complex, must be utilized in an attempt to explain the presence of the fingerprints.

In general, three forms of fingerprint evidence may be found at a crime scene. They are Patent prints, Plastic prints & Latent prints. Patent prints are those fingerprints that are easily spotted (visible). Plastic prints are those prints are formed due to the impression on a soft surface like soap, wax. Latent print are not visible to the naked eye and thus require some means of development or enhancement for their visualization.

New technique have been developed for latent fingerprint detection but the traditional fingerprint detection technique for treating latent fingerprints is powdering method. When the fingerprint powder sprinkled over an affected area,

The powder adheres to the oil, sweat or other material left in a fingerprint. Powdering technique has been used as a technique since the early 1900s. Over this period, many fingerprint powder formulations have been in use, with each formula consisting of a colorant for contrast and a resinous material for good adhesion. Hundreds of fingerprint powder formulas have been developed over the year. In general, there are four classes of fingerprint powders-regular, luminescent, metallic and thermoplastic.

Whether one believe in the theological origin of man or goes with the anthropological school of thought, there can be no doubt that each person is individualized by his or her fingerprints. Today, fingerprint individuality is accepted and taken for granted all over the world, but only when we go back into the history of this discipline do we realize that Indians knew about the relevance and significance of fingerprinting before any other civilization had an linking of it. Indians have consistently studied and researched this branch of knowledge, traversing from initial speculation, through interpretation, to its development into the most perfect system of identification. One of the most important uses for fingerprints is to help investigators link one crime scene to another involving the same person. Fingerprint identification also helps investigators to track criminal's record, their previous arrest and convictions. Fingerprint identification is a type of tool for personal identifications due to their persistency and their uniqueness. A person's fingerprint do not change over time.

The fingerprint is mostly found in the theft, murder, robbery, assault & burglary cases. In that fingerprints are commonly seen in theft cases. Fingerprints are especially important in the criminal justice realm. Investigator can compare unknown prints collected from a crime scene to the known prints of victim, witnesses and potential suspect to assist in criminal cases.

Comparing the previous studies and the present study, powder dusting, Ninhydrin Dipping, Iodine Fuming and Silver Nitrate are the most commonly used methods for development of latent prints. These traditional methods are quite effective for many surfaces but not always effective. The scientists are trying to improve the existing method for the revealing of latent fingerprints. In that powder

method also having different types of powders which are used for different surfaces for developing latent prints. Some of the chemical substances used in the existing fingerprint powders are toxic and pose potential health hazards and they are expensive and not easily available. In order to overcome this disadvantages, attempted to use a new powder for developing latent fingerprints which are easily available, non-toxic, less expensive, and they are preparing from the kitchen waist (wooden ashes).

CHAPTER: II

LITERATURE REVIEW

2.1. Kulvir Singh et.al (2012) He studied on the topic “Visualization of latent fingerprint using silica gel G a new technique. They are the personnel’s present a new powder methods for the development of latent fingerprints. It is an less expensive, simple and easily available. They applied to the plastic, glass, ordinary mirror, and metallic surfaces, aluminum foil sheet, carbon paper, match box, etc.. They collected latent fingerprints on fifteen different surfaces which includes porous as well as non porous surfaces. The non-porous substrates used in this work are plastic bottle, transparency sheet, and gift wrapping plastic paper, coin etc. Porous surfaces are carbon paper (writing and inked surfaces), match box, white paper, currency notes and cardboard. They give a standard situations. They have taken temperature and relative humidity ranged from 10 to 25 degree Celsius and 50.2% to 51.4% respectively. They used another powder method. Taken on the clean and dry glass plate and then the powder layer was flattened using the glass rod. The latent fingerprint was developed by slightly pressing the latent fingerprint bearing surface on the silica gel G powder layer. The latent fingerprints on different substrates were successfully developed by using silica gal G powder in majority of the cases. It can be applied to the multicolored surfaces and give equivalent results as those of the conventional powder.of latent fingerprint. Are used to development of latent fingerprints. In this powder method, which is simple, nontoxic to human health, cheap in nature and can be utilized to development of latent fingerprint on various contrast surfaces, easily preparable.

2.2. Rakesh K. Garge et.al (2011) He studied on the topic “A new powder method for development methods that is soil and it has different color forms. They applied in this powder method to the plastic, aluminum surfaces, motor bike, painted area, car bonnet, glass table, CD and transparency, cotton, skin etc. They used powder

dusting method for development of latent fingerprints. They taken few grams of soil and put in oven for 20 min to dry before used. After that dried soil taken in 100 atm sieve and collected fine soil powder from base pan and used for development of latent fingerprint. The experiment conducted in the month of September, October. They gave temperature fluctuate from 18 to 36 degree Celsius and relatively humidity 38% to 90%. The powder is spread over the questioned surfaces and developed a clear print. They applied porous and non -porous surfaces. The snap capture by 16 megapixel camera with 5element lens, F/2.0,78 degree wide angle. They are the people successfully developed latent fingerprint on all the surfaces except skin and cotton by using this method. The soil is a good adsorbed on latent fingerprint residue and give clear ridge.

2.3. Rakesh K. Garg et.al (2011) He studied on the topic “A new technique for visualization of latent fingerprints on various surfaces using organic powder from turmeric. This paper present a new powdering method which is simple, non toxic, for the development of latent fingerprint it can be applied on the various surfaces. It was less expensive, simple and easily available turmeric powder, non toxic and it has so many medical uses, common ingredient in the Indian food. Eleven test latent fingerprints are collected on different surfaces. In order to develop latent fingerprint on surfaces are done by in normal ways. The development of latent fingerprint present on surfaces of simple paper, bond paper, thermal paper, aluminum foil, transparency sheet, wood, plastic sheet, painted steel, top and writing surfaces of the CD, could be successfully done and gives clear ridges. The experiment was carried out in the months of may/june the temperature was 35 to 42 degree Celsius and the relative humidity between 60% and 80%. They applied the turmeric powder to the both porous and non porous surfaces. During this process of new powder method will give good and clear results of latent fingerprints. The comparative evaluation of different surfaces with this powder reveals that it gives better results on contrast surfaces.

2.4.R. Adhithya and Suneetha V (2015). He studied on the topic “ A latent fingerprinting technique by using turmeric, chilli, pepper, and coal in forensic detection. In this study they will introduced a new type of powdering method those powders are coal, pepper, turmeric, chilly. These powders are easily available, non-toxic. The solid turmeric was prepared by crushing with motor and pestle. A fine powder was obtain from that they were dried to remove the moisture content. Pepper and coal powder both are making in same way. After making fine powder we can used for powder dusting method. They used powder dusting method for developing latent prints. Coal powder offered the best image and the turmeric powder will give better results comparing to pepper and chilly powder. The chilly and pepper will not give good print the ridges are not having clarity. They can give a good result on this powders.

2.5. Ashish Badiye et .al He studied on the topic “Efficacy of robin powder blue for latent fingerprint development on various surfaces. In this Robin powder blue it is a common household product (used as a post wash whitening agent and popularly known in India as Neel) which is user friendly, less expensive, nontoxic, nonhazardous, environmental friendly, simple and easily available substitute to the commercially available and costlier powder has been used. They collected ten healthy adult subject. The temperature ranged between 32 and 43 degree Celsius and relative humidity around 64 to 73 %. The scientists were used surfaces touch screen of smartphone, phone back, credit card, magnetic strip of credit card, pen drive (white & black), computer mouse, computer keyboard, metallic door knob, glass, steel cupboard, lock, stainless steel, silver surfaces, keychain, currency coin etc. The use of Robin powder blue is given a good and clear print of latent fingerprints. Powder dusting, light brushing method used developed clearly visible ridges. It will give good contrast to the pen drive white, credit card etc. And also it will give good result on the multicolored surfaces and in the dark surfaces give good prints. They can use successfully in this powder method for development of latent fingerprints.

2.6. Muhammad Yusof Omar and Laura Ellsworth (2012). He studied on the topic “Possibility of using fingerprint powders for development of old fingerprints. The study compared the number of positive identifications of each minutiae after application of black fingerprint powder and black magnetic fingerprint powder. Latent fingerprint from donor side deposited on clean microscope slides. The following prints were applied after thirty minutes. The slides were analyzed every week at similar intervals for six continuous weeks with black fingerprint powder and black magnetic fingerprint powder with specific indicator. Two different powder are used in this study. Those are black fingerprint powder and black magnetic fingerprint powder. The experiment was conducted by glass microscope slide from fisher scientific premium microscope slides plain, made of swiss glass, Catalog No. 12-544-1, 7.68cm* 2.56 cm* 1mm, approximately ½ gross. Every comparison photographs are taken with a Sony Digital Camera Model No. DCS-F717 with attached Carl Zeiss Vario Sonnar, 10* precision digital zoom cyber shot, 5.0 mega pixels. The study was conducted at Washington DC in October during fall season. Every sample will collected from one donor. The fingerprint from donor was deposited on clean microscope slides in a normal ways. Second print was applied after 30 thirty minutes in that also they will apply same pressure and length. The slides were kept at room temperature, exposure to dust and air condition. The slide were analyzed every week at similar intervals for six continuous weeks with black fingerprint powder and photographed. In this experiment, results showed different techniques and time for fingerprint development. An inverse relationship was found between positive points of identification over time. Different techniques for fingerprint development may contribute to different results. Therefore, it is important to apply procedure using both black fingerprint powder and black magnetic fingerprint powder on fingerprints at the crime scene. Both black and fingerprint powder and black magnetic fingerprint worked well in the first and second week. Black fingerprint powder only is use full for latent print up to the 3rd week, while black magnetic fingerprint powder works fairly well for up to the 4th continuous week. Two parameters were study in this experiment that are time and techniques. Result

proved that fingerprint development via black magnetic fingerprint powder was superior as it produced well developed fingerprints after the 4th week, compared with black fingerprint powder which can only be used for up to 3 weeks. The scientists are success in this development of old fingerprints.

2.7. Thatsanee Thonglon et.al 2010, He studied on the topic “ Magnetic fingerprint powder from a mineral indigenous to Thailand. A study was conducted to investigate whether natural magnetite (Fe₃O₄), which is an abundant mineral in Thailand, could be used as a magnetic powder in the detection of latent fingerprints. Because of the presence of impurities, powdered magnetite is only weakly attracted by a magnet and cannot be used as a magnetic fingerprint powder by itself. Mixing a small amount of magnetite powder with nickel powder greatly enhances the magnetic attraction. A mixture of magnetite powder and nickel powder in a mass ratio of approximately 1:100 was found to be suitable for use as a magnetic fingerprint powder. Fingerprints developed using the magnetite/nickel mixture on nonporous surfaces were found to exhibit good adherence and clarity. Using an automated fingerprint identification system, the number of minutiae detected in fingerprints developed by using the prepared powder on nonporous surfaces was found to be comparable to those detected in fingerprints developed by using a commercial black magnetic powder. The cost is lowered by more than 60%.

2.8. Gagan deep Singh (2006) et.al. He studied on the topic Development of latent fingerprints on fruits and vegetables. This study was conducted to determine the best procedure for developing latent fingerprints on fruits and vegetables. Grabm using radiography reported the development of latent fingerprints on the surfaces various fruits. In this study they used four fruits such as apple, banana, orange, guava, and three vegetables tomato, onion, potato. The temperature during the experimental work varied from 15 to 25 degree Celsius with approximately 60% relative humidity. They used two method for developing latent fingerprint first one

is the powdering method and lightening gray powder. In that two powder are used activated charcoal powder and lightning gray powder. They applied in normal ways and lifted iodine fuming method; Sample is exposed to iodine vapors by hanging in an enclosed glass chamber. These development latent fingerprint was lifted by using clear adhesive tape affixed to a clean white sheet of paper and scanned using a flatbed scanner 600 dots per inch, gray scale. The scanned prints were stored in a lossy compression format to facilitate better storage. They can successfully developed the latent fingerprint on various fruits and vegetable surfaces. Apple surfaces responded well to the gray powder good contrast was observed in the black powder. They find that the black powder is give good prints. Print also affected by the condition of the fruits and vegetables.

2.9.Hong Chen et.al (2017), He studied on the topic “Fluorescence development of latent fingerprint with conjugated polymer nanoparticles in aqueous colloidal solution. Poly (p-phenylenevinylene) (PPV) nanoparticles in aqueous colloidal solution have been prepared via a modified Wessling method, with the addition of surfactant. The fluorescent colloidal solution was used as the developing solution to develop the fingerprints on different substrates. The developing process was accomplished simply by immersing the substrates into developing solution and then taking out, followed by rinsing with deionized water. The initial study about the fingerprints on the adhesive tapes showed that the developing solution is very effective in fluorescence development on both fresh and aged visible fingerprints; and such an effect was negligibly affected by treating the fingerprints with water or other organic solvents, whether before developing or after. At least 6 months of storage of the colloidal solution did not reduce the developing effect; and each developing solution (3.6 mg/mL, 5.0 mL) can be used to develop at least 30 fingerprints without sacrificing the legibility of the pattern. The preliminary mechanism investigation suggested that selectivity achieved toward the ridge of the fingerprint is very likely due to the affinity between PPV molecules and oily secretions of the fingerprints. Digital magnification of the developed fingerprints provided more details about the fingerprint.

2.10. Putra, SaesarioLaksmana (2018), He studied on the topic “Recovery of fresh latent fingerprints on black clothing fabrics using lumicyano. This method incorporates a fluorescent staining dye powder 3-chloro-6-ethoxy-1,2,4,5-tetrazine ($C_4H_5ClN_4O$) and liquid ethyl CA into a solution. Therefore, Lumicyano can develop fluorescent fingerprints in a one-stage fuming process without the need for an additional visualisation method apart from Forensic Light Source (FLS). The integration of fluorescent dye and CA into a mixture suggests that the fluorescent dye would selectively adhere to the polycyanoacrylate formed on the friction ridges of fingerprints. The readily visible fingerprints and the removal of the post-processing method indicate that Lumicyano could potentially be used on fabrics. Thus, this preliminary study aimed at assessing the efficacy of Lumicyano on recovering fresh latent fingerprints on black clothing fabrics. This was achieved by developing fresh latent fingerprints deposited on four different types of black clothing fabric materials; polyester, cotton, poly cotton, and nylon. The results showed that Lumicyano is an effective method to develop fresh latent fingerprints on black clothing fabrics. Furthermore, an indirect comparison between Lumicyano and silver VMD results obtained from another study was performed. The results suggest that Lumicyano is a better enhancement method to enhance fingerprints on black polyester and poly cotton fabrics than silver VMD. The fibre material, thread count, weave pattern of the clothing fabrics, and the fingerprint donor were proven to be important in determining the quality of the developed prints.

CHAPTER: III

AIM AND OBJECTIVES

3.1. AIM:-

To develop latent fingerprints on various surfaces by Tapioca powder, Green gram, Wooden ashes.

3.2. OBJECTIVES:-

1. To identify a new technique for development of latent fingerprints.
2. To develop an organic and chemical free fingerprint powder unlike the presently used chemical powders.
3. These powders are easily available, non-toxic, less expensive comparatively existing powder.
4. To test the powders on various surfaces like – Glass, Granite, Steel, Ceramic, Plastics and other non-porous surfaces.

CHAPTER: IV

MATERIALS AND METHODOLOGY

4.1 MATERIALS REQUIRED:

SURFACES:

1. Mirror surface
2. Top and writing surfaces of the CD
3. Tile
4. Steel glass
5. Plastic bottle
6. Granite
7. Glass
8. Wooden surfaces
9. TV surface
10. Phone screen card
11. Lap keyboard surfaces
12. Helmet
13. Aluminum surface
14. Switch board

POWDERS:

15. Tapioca powder
16. Green gram
17. Wooden ashes

OTHER MATERIAL

18. Camera
19. Mask
20. Gloves
21. Lens
22. Brush (Camel hair brush, Ostrich feather brush)

4.2 METHODOLOGY

The surfaces (non -porous) were selected first where the impression of fingerprint is to be left and then developed by using Tapioca powder, Green gram, wooden ashes. Firstly, the subject is asked to wash and dry their hands clean, to eliminate the possibility of contamination by any extraneous substance, dirt or dust for taking the impression of fingerprint. Then take the impression of the subject on to the given surfaces. The impressions of the subjects were taken on different surfaces then the latent fingerprint is developed by powder method.

The method used in the development of latent fingerprint is powder dusting. It is a physical method of enhancement of latent prints and work on the mechanical adherence of the fingerprint powder particle to the oily components of the skin ridge deposit. The application of powder to the print by brushing is a simple and easy method but it also has disadvantages that the brush on coming in contact with the surface having the print destroy the print and hence the ridge characteristics get destroy. After deposition, the print were left in the room condition. The experiment was conducted in the month of January—February. The temperature during the experimental work varied from 24 to 30 degree Celsius and 70% relative humidity.

The development of latent prints is done after taking impressions of the subject on various surfaces (non-porous) by powdering method using Tapioca powder, Green gram & wooden ashes. The commercially available powders are prepared by drying and grinding to get a very fine powder to the level of talcum powder. The powder was then kept in a sterile glass bottle and sealed. The powdering method has been used a suitable brush such as Ostrich feather brush and Camel hair brush. The powder sprinkled over the surface where the latent fingerprints was present. The excess powder was removed by gentle tapping and by slowly using the brush over the prints and to get a clear print. These powders has been applied on both

the porous and non-porous surfaces. After developing the latent print, it was photographed.

This method was applied on the surface of laptop keyboard surfaces, mobile screen, TV screens, Plastic Switch board, Nonporous Wooden furniture, Plastic helmet surface, Granite, Ceramic, Glass, Steel material etc where the subjects fingerprint impression has been taken. Before approaching this method, we should confirm that wearing of mask, gloves and other material to avoid the contamination of latent fingerprint.

Comparison between visualization of latent fingerprint by using (A) Black powder, (B) Tapioca powder, (C) Wooden ashes, (D) Green gram, are given below.



Figure 4.1. Developed Fingerprint by Chemical Black Powder



Figure 4.2. Developed Fingerprint by Wooden Ash (Black)



Figure 4.4. Developed Fingerprint by Tapioca powder



Figure 4.3. Developed Fingerprint by Green gram powder

CHAPTER: V

RESULT AND CONCLUSION

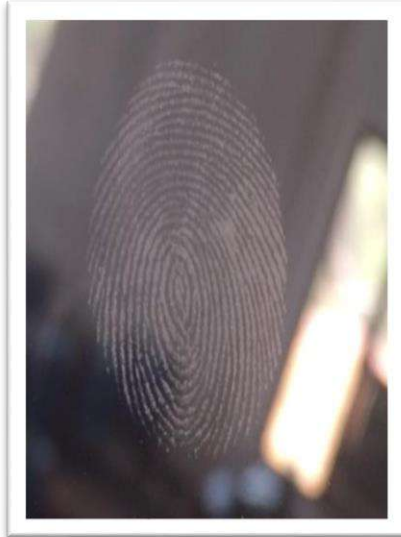
5.1 RESULT

Latent fingerprints were developed by using Tapioca powder, Green gram & Wooden ashes. Compared to the other development techniques used for the enhancement of latent fingerprints, this powders are easily available and it will give good result. Wooden ashes will give clear prints but it not clear more than remaining powders. But it will give result on white surfaces.

The comparative analysis of different surfaces with this powders will give good result on contrast surfaces. And this prints are similar of usually used developing fingerprints. Every surfaces will give good result with clear ridge, the investigators can use this powder for developing latent fingerprint from the scene of crime.

The tapioca powder will give good result on the surfaces of Window Surface, Aluminum Surface, Granite, Mobile Surface, Water Bottle Surface, Steel Glass, Helmet, in CD Surface the fingerprint was developed partially, Tile, Wooden Surface, Glass. Green Gram powder will give good result on the Window Surface, Mobile Surface, Granite, Tile, Steel Glass, and the Wooden Ashes powder will give good result on the Steel Glass, Switch Board, Window Glass.

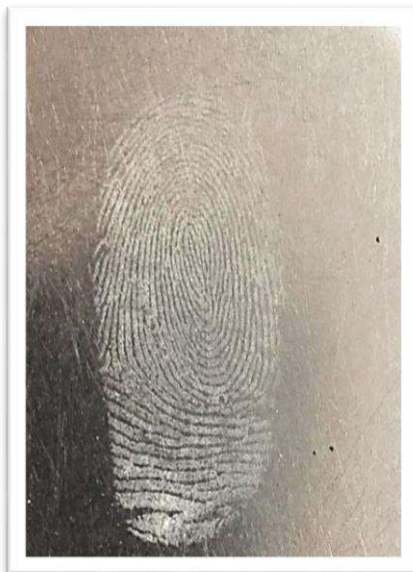
- **Visualization of Latent Fingerprints by using Tapioca powder**



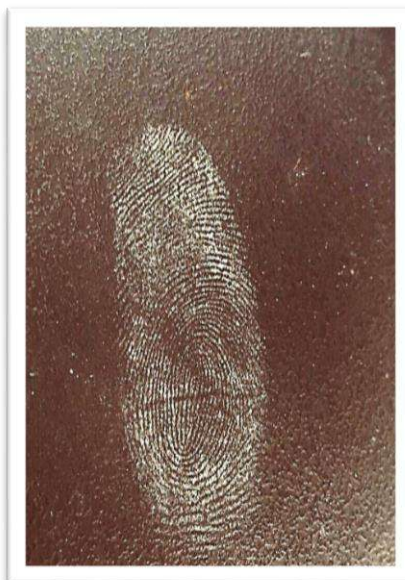
*Figure 5.1. Developed
Fingerprint on Window
Glass*



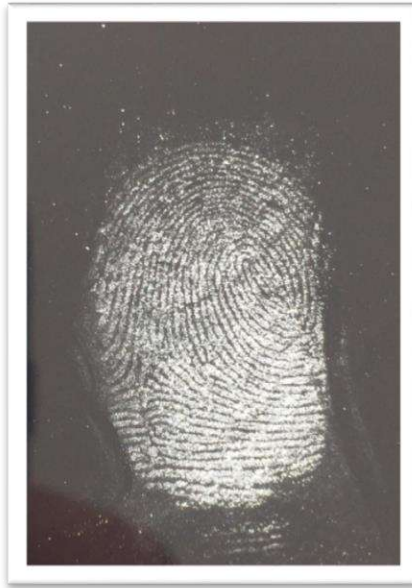
Figure 5.2. Developed
Fingerprint on Aluminum
Surface



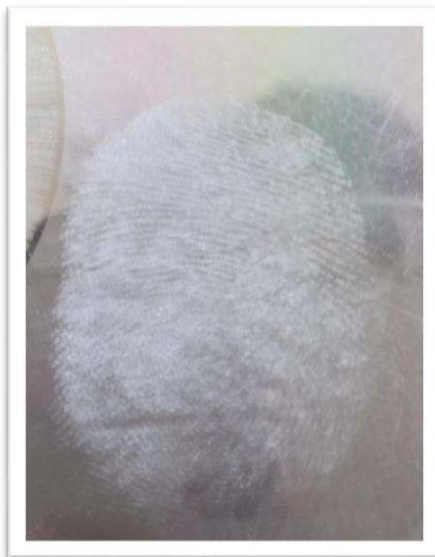
*Figure 5.3. Developed
Fingerprint on Steel Glass*



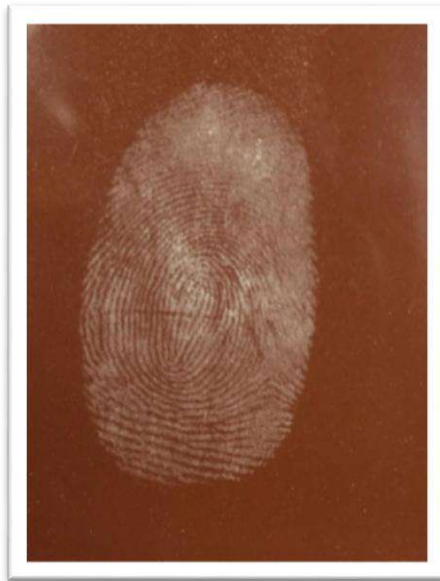
*Figure 5.4. Developed
Fingerprint on Helmet*



*Figure 5.5. Developed
Fingerprint on Mobile
Screen Card*



*Figure 5.7. Developed
Fingerprint on CD Surface*



*Figure 5.6. Developed
Fingerprint on Tile Surface*



*Figure 5.8. Developed
Fingerprint on Granite
Surface*

- **Visualization of Latent Fingerprints by using Green Gram**

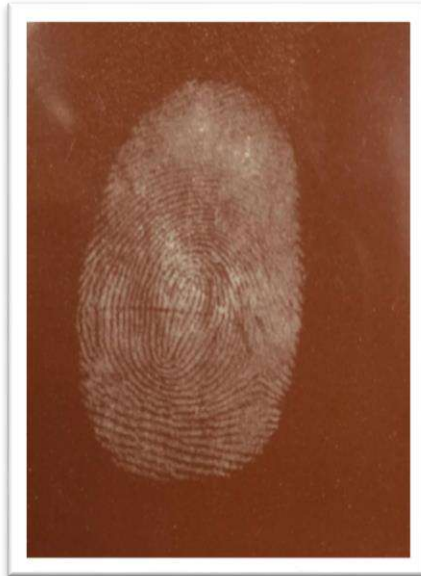


Figure 5.9. Developed Fingerprint on Tile Surface

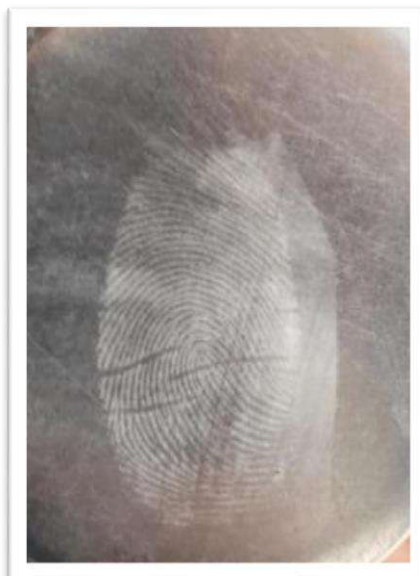


Figure 5.10. Developed Fingerprint on Steel Glass Surface



*Figure 5.11. Developed
Fingerprint on Window
Surface*



*Figure 5.13. Developed
Fingerprint on granite
Surface*

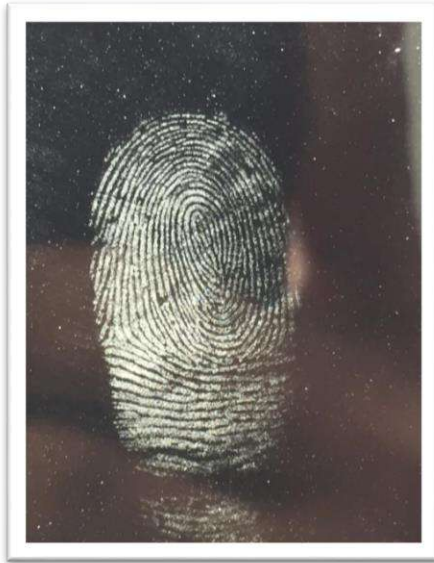


Figure 5.12. Developed Fingerprint on Mobile Screen Card Surface

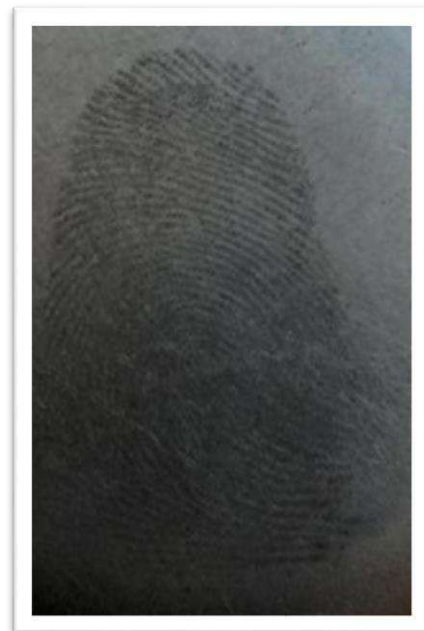
- **Visualization of Latent Fingerprints by using Wooden Ashes**



Figure 5.14. Developed Fingerprint on Plastic Switch Board



*Figure 5.15. Developed
Fingerprint on Window Surface*



*Figure 5.16. Developed
Fingerprint on Steel Glass
Surface*

5.2 CONCLUSION

In the present study, the fingerprints are visualized by using the powders which are easily available and not harmful compared to the other powders available in the market.

Further work on the decipherment of fingerprints under various conditions such as temperature variation, relative humidity from the surface of human skin and other variant surfaces can be done.

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