

Development Of Latent Fingerprints On Indoor Plant Leaves Using Powder Methods

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KEYWORDS

Indoor plants, Powder methods, Latent fingerprint, Plant leaves, Crime

ABSTRACT

Fingerprints are the unique patterns observed in mankind and plays an important role in personal identification. It is used as an infallible means of identification. Fingerprints are left on many surfaces depending on type of crime. Plant leaves of common household indoor plants may also be a potential source of latent prints. In this study, the development of latent fingerprints on indoor plant leaves was conducted. It is important to look after the plants present at crime scenes for the chance prints. The method is conducted by placing fingerprints on 10 different indoor plant leaves that are commonly seen in places of Northern Kerala . The powder dusting method was used for the development of latent fingerprints. The persistence of latent fingerprints was also analyzed by taking time interval as a criterion. The method being used is by placing fingerprints on different leaves of the same plant and developing them at different time intervals. This study showed that a forensic investigator is able to identify and develop the latent fingerprints on indoor plants.

INTRODUCTION

Fingerprints are one of the most common physical evidence used for personal identification. The science of identification through the examination of fingerprints is known as Dactyloscopy. The skin of human fingertips consists of ridges and valleys which together form particular patterns. These patterns are fully developed during pregnancy and are persistent throughout their whole life time. These permanent patterns form distinctive prints called fingerprints. Fingerprints are unique to every individual, which means no two people have the same fingerprints.

Fingerprints are the most widely used and accepted evidence in the criminal justice system and are important forensic evidence to prove the personal identity or alibi of an offender. The basic principles of fingerprint science are uniqueness, permanence, universality, simplicity of recording and simplicity of classification.

Fingerprints left by a culprit at the crime scene are known as chance prints. The fingerprints are classified as Patent, Plastic and Latent fingerprints. The visible prints formed by blood, paint or other visible material are called as patent print. The 3dimensional prints formed on pliable surfaces like clay, wax etc. are called plastic prints and the invisible fingerprints formed by sweat residue are known as latent finger prints. The most common print discovered from a scene of crime is latent fingerprint. These prints have less visibility, they can be made visible through different development methods and these latent prints are formed by the deposition of sweat, dirt and oily matter.

Fingerprints can be deposited on different surfaces. They are classified as porous, non-porous and semi-porous. Porous surfaces are absorbent whereas nonporous are characteristically nonabsorbent. Here the fingerprint residues are more prone to be disturbed. Semi-porous are characterized by their nature to both resist and absorb fingerprint residue.

There are different types of development techniques specific to porous or non-porous substrates. The two general methods for developing latent fingerprint are physical and chemical methods. The physical method includes powder development techniques and Iodine fuming. Chemical techniques change the components of

perspiration and give it a certain color. The most common chemical methods are Ninhydrin and Silver nitrate.

PHYSICAL METHOD

Powder Method

The powder method is the oldest means of visualizing fingerprints. The powder selected should be fine grained and contrasted with the background. Black powder is used for light surfaces and white or gray powder is suitable for dark surfaces. The powder has an adhesive character. The powder consisted of resinous polymeric material for adhesion and a colorant for developing contrast. In the powder method, development consists of applying powders using a Camel or Squirrel hair brush or Ostrich feather brush. Firstly, a brush will be dipped in the powder container and powder tapped on the developing surface. The powder adhered to greasy deposits and ridge patterns became visible.

1 Black Powder: It consists of lampblack, graphite and charcoal. Good results are obtained with this powder when applied on various surfaces.





2 White Powder: It consists of mercury and chalk. Good results obtained on glassware, painted wares etc.






3 Fluorescent Powder: It gives good results on multi-coloured surfaces. The developed prints are then exposed to UV lights. The latent impressions fluoresce and can be photographed. Rhodamine and Anthracene are some of the fluorescent powders.


4 Red Powder: It is also known as dragon's blood and gives good results on fresh prints on paper.

5 Silver Powder: It consists of fine aluminium dust. It is used on hard surfaces and on objects like feathers, cellophane etc

INDOOR PLANTS

SI No	Plant Name	Scientific Name	Specification	Picture
1	Snake Plant	Sansevieria trifasciata	sword shaped leaves	
2	Painted leaf Begonia	Begonia picta	Wing-shaped leaves	
3	Aglaonema creta	Aglaonema	wide oval shape leaves	
4	Hoya carnosa	Hoya carnosa	Deep green leathery leaves	

5	Red anthurium	Anthurium	Heart-shaped glossy green leaves	
6	Heart leaf philodendron	Philodendron	Fast growing, heart shaped leaves	
7	Dracaena Trifasciata	Dracaena trifasciata	Linear pointed leaves	
8	Dracaena Fragrans	Dracaena fragrans	Leaves are linear lanceolate	
9	Aloe vera	Aloe barbadensis	Long, thick fleshy leaves with serrated edges	

10	Money plant	Epipremnum aureum	Leaves are green in colour and shiny in appearance	
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OBJECTIVES

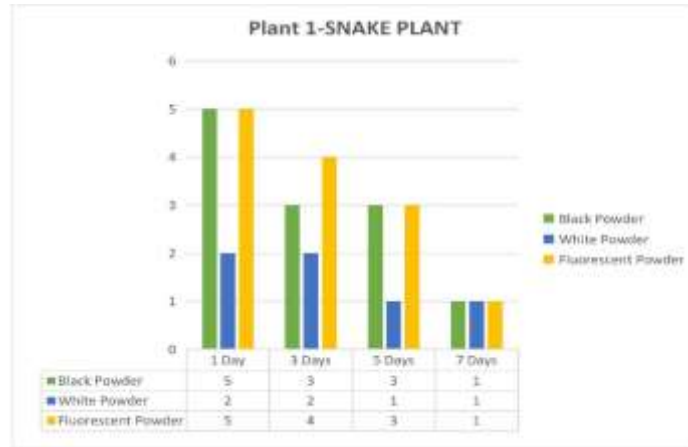
- To study the development of latent fingerprints on indoor plant leaves by powder method.
- To study the persistence of latent fingerprints on indoor plant leaves in different time intervals.
- To find out the best suitable powder method of fingerprint development on leaves.

METHODOLOGY

Particulars	Methods
Signification of Study	
Universe of the study	<p>Thenhipalam, Chelari and Malappuram (Reason of this universe is because the population of identical twins are very high in this area) These are the plants which collected for study:</p> <ul style="list-style-type: none"> • Snake Plant • Painted leaf Begonia • Aglaonema Creta • Hoya carnosa • Red anthurium • Heart leaf philodendron • Dracaena Trifasicata • Dracaena Fragrans • Aloe vera • Money plant
Sample Collection	<p>Study included with 10 samples; those are most commonly using indoor plants which have the ability to involve in a crime scene. Like 10 samples were collected for the study.</p> <p>Appropriate amount of powder applied on leaves of each pant and fingerprints developed using various powders</p> <p>The developed latent prints using the powder method were examined and photographed. All developed prints were analyzed according to finger print quality assessment scale.</p>
Research Design	Explorative and Descriptive
Tools of the Study	Black powder, White Powder, Fluorescent powder, Fingerprint brush, magnifying lens
Limitations	Plant with rough texture leaves give better result.

RESULT & DISCUSSION

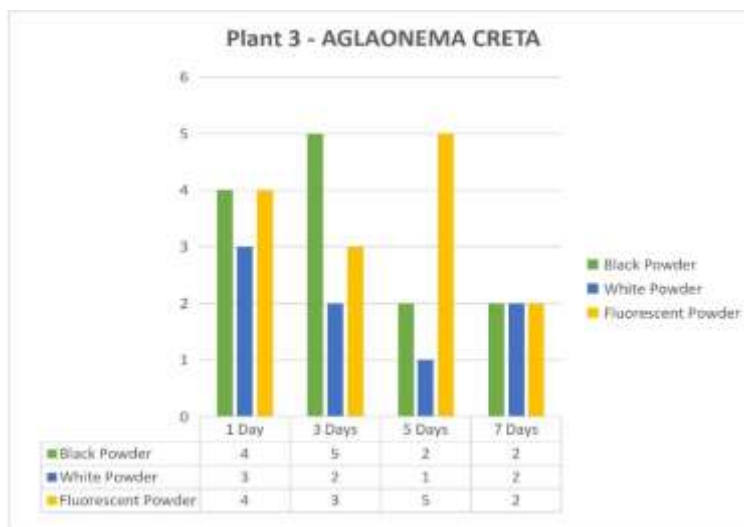
In snake plant, fluorescent powder gave the enhanced print and it shows gradual decrease in clarity. Black powder also gave good results but white powder gave the poor result.



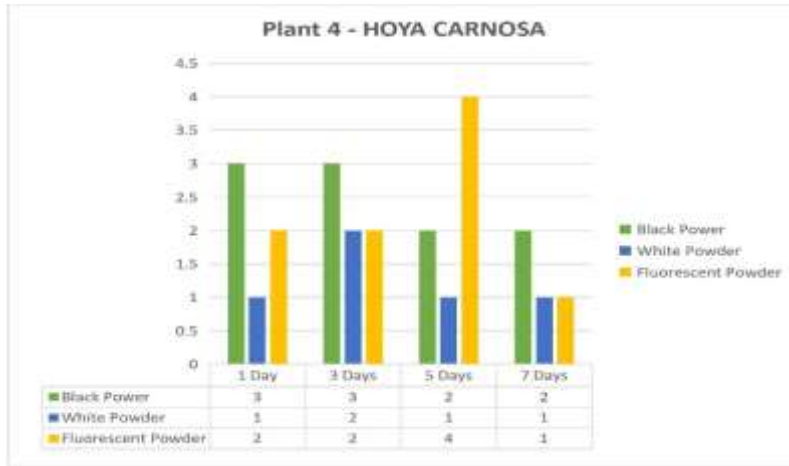
In painted leaf begonia, fluorescent powder gave highest mean score and the ridges are clear. Black powder also gave much more quality print when compared to white powder. The print developed by white powder is not visible.



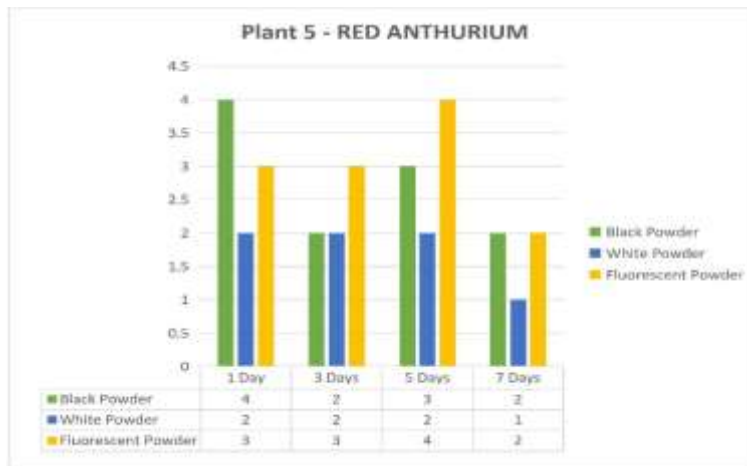
In aglaonema Creta, black powder and fluorescent powder gave quality print and the print developed by white powder is less visible.



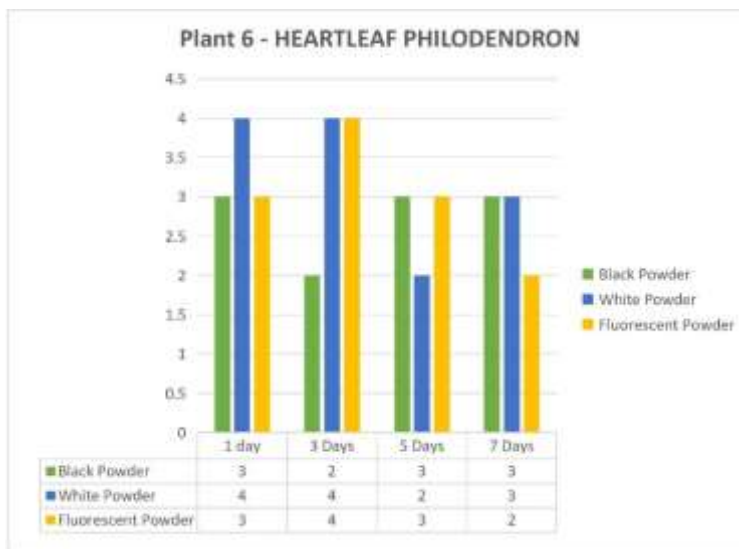
In plant hoya carnosa, black powder gave quality print after 1 day and 3 days of deposition. After 5 days, fluorescent powder shows good visibility of print.



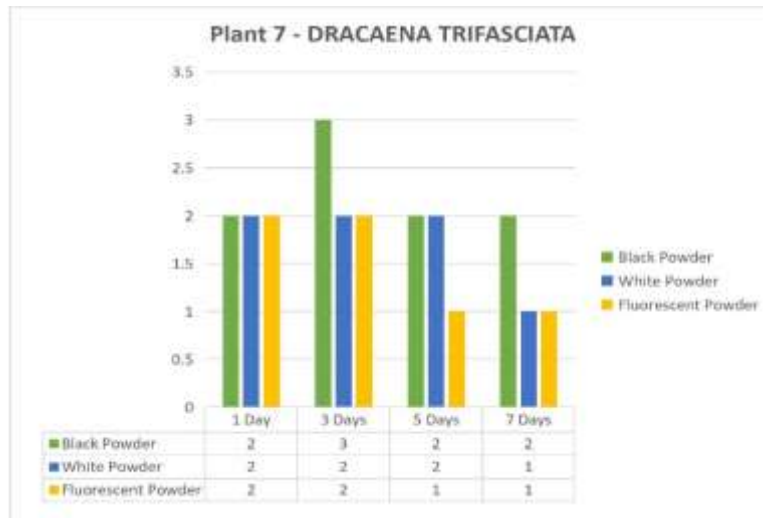
In red anthurium, black powder and fluorescent powder gave highest mean score and white powder gave poor result.



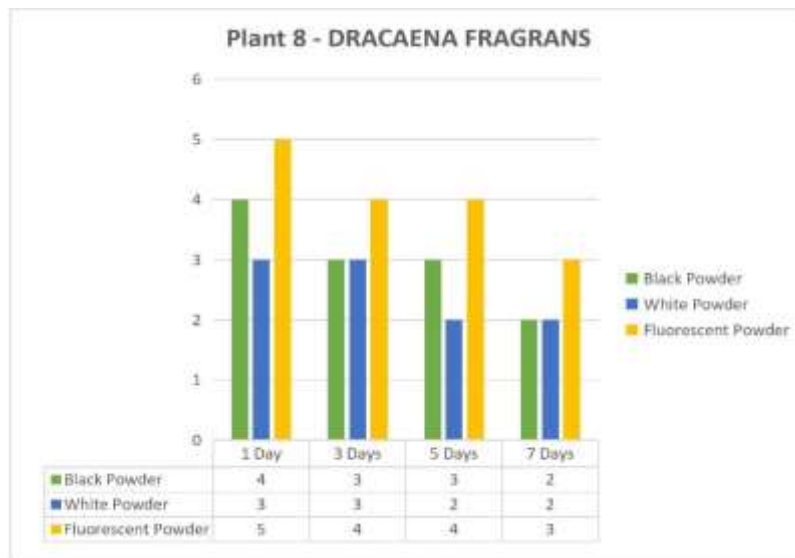
In heart leaf philodendron, black powder, white powder and fluorescent powder gave good result. Comparing with other plants, white powder shows a higher mean score.



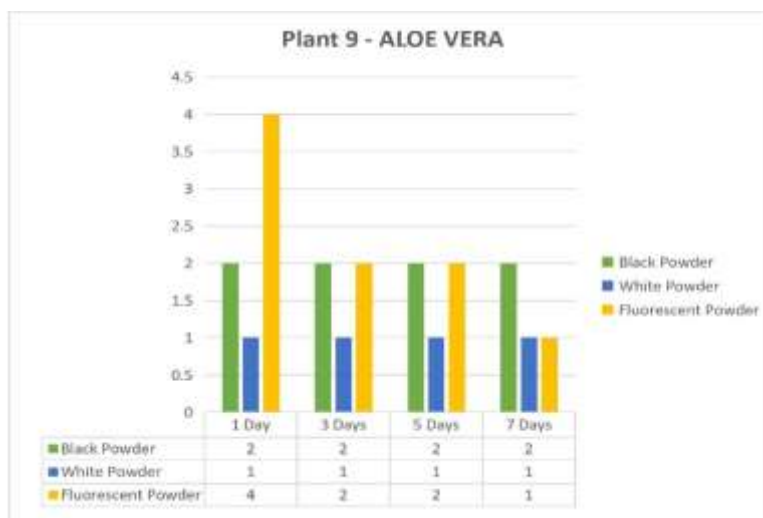
In dracaena Trifasicata, black powder gave good quality print. White and fluorescent powder gave almost equal mean score of visibility.



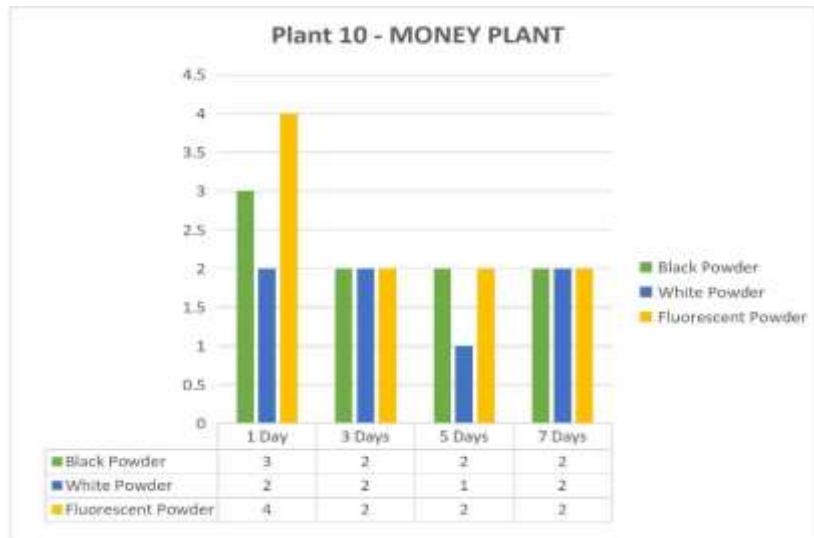
In dracaena fragrans, fluorescent powder gave highest mean score as compared with black and white powders.



In aloe vera plant, the print developed by using fluorescent powder after 1 day of deposition gave good contrasted print. In remaining time intervals the print developed by using 3 powders gave poor results.



In money plants, fluorescent powder gave good results after 1 day of deposition and the remaining time intervals showed an almost equal mean score of visibility.



The quality of developed prints was graded as :

- 1 **Score 5: Very good visibility** – Clearly defined friction ridges across entire print.
- 2 **Score 4: Good visibility**, clearly defined friction ridges are visible across the majority of print.
- 3 **Score 3: Poor visibility**, Friction ridges are only visible on portion of print. Prints may be smudged.
- 4 **Score 2: Bad visibility**, no friction ridges are clearly defined. Print is almost completely smudged.
- 5 **Score 1: Blur/No print**, no print is visible or only the outline of print is visible.

The present study proved that latent fingerprints can be developed by using different fingerprint powders. Black powder, white powder and fluorescent powder were used and the print was easily developed. The fluorescent powder gave better results on each plant and the white powder showed less results for development of latent fingerprints on indoor plant leaves. The study showed that Snake plant, Aglaonema Creta, Heartleaf philodendron and Dracaena fragrans gave more clarity prints as compared to remaining plants. At the same time Aloe vera shows poor results.

The study also focused on the aging of fingerprints. The fingerprints were developed after certain time intervals, that is after 1 day, 3 days, 5 days, 7 days of deposition and better results were achieved. The latent print quality has declined as there was an increase in days. In the aging study the fluorescent powder gives more contrast fingerprint ridges on development. The indoor plant leaves having a glossy, smooth appearance give better results when compared to hard or rough surfaced leaf.

One of the major challenges faced during the project period was some of the leaves with rough surfaces couldn't give better results. For future studies this can be done for longer time period and using different plants. This can be done for outdoor plants too.

CONCLUSION

This study concluded that fingerprints can be developed on indoor plant leaves by using traditional powder methods. The black powder and fluorescent powder gave better results when compared to white powder. The fluorescent powder is the most suitable method because it gives more contrast fingerprint in the majority of plants. The plant Heartleaf philodendron gave better results when compared to other plants. The quality of fingerprints declined as time increases. It shows faded or blurred visibility of fingerprints after 1 week. But some plants also show much more clarity print after 1 week. The study can be extended to other development procedures and increased time interval. It may be valuable evidence in future crimes because the presence of indoor plants in houses is increasing day by day.

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