STM JOURNALS

Research & Reviews: A Journal of
Life Sciences

https://journals.stmjournals.com/rrjols

ISSN: 2249–8656 (Online)
ISSN: 2348–9545 (Print)
Volume 15, Issue 3, 2025
September–December
DOI (Journal): 10.37591/RRJoLS

Research RRJoLS

# Efficacy and Efficiency of Fingerprint Powder Derived from Natural Flowers – Development and Evaluation of Sustainable Fingerprint Powders

Qurratul Ain Kausar Ansari[1], Pratiksha Parihar[2], Shrutika Chincholkar[2], Karuna Dohare[2], Mangesh S. Dhore[3,*]

***Abstract***

*Fingerprints are crucial elements in forensic investigations. Latent or invisible fingerprints are commonly recovered from the scene of crime and hence require an attention for which visualization methods are needed. Conventional methods are relatively expensive, which may cause harmful threats and health hazards due to presence of chemical content. This study offers a cheap and sustainable fingerprint powder sourced from natural materials. In this study the powders were prepared from the dried petals of Bahunia purpurea, Bougainvillea, Amaranthus cruentus, Hibiscus rosa-sinensis, and Hibiscus grandiflorus. The petals were dried in sunlight for six days in the summer and then a mechanical method was used to prepare powder, i.e., motor and pastel and it was sieved by using a 40-mesh size. The dried petals were grinded and kept in oven at 110°C for about four hours. The ash powder was also prepared by using similar petals in muffle furnace for about 400°C for five hours. The grain size of prepared fingerprint powders was also determined. The durability of these novel powders was evaluated on non-porous surfaces including mobile screens, window glass, doors, keyboards, and glass bottles for the development and visualization of fingerprint impressions. All powders were efficient in window glass and door which is having more than 90% visualization. This research provides the efficacy and durability of natural powders in investigation and discovering new, safer and more affordable fingerprint powder alternatives.*

**Keywords:** Fingerprint powder, latent fingerprints, natural flowers, colored powder, ash powder

***Author for Correspondence**
Mangesh S. Dhore
E-mail: mangeshdhore2@gmail.com

[1]Assistant Professor, Department of Forensic Science, G.H. Raisoni University, Anjangaon Bari Road, Amravati, Maharashtra, India
[2]Student, Department of Forensic Science, G.H. Raisoni University, Anjangaon Bari Road, Amravati, Maharashtra, India
[3]HOD, Department of Forensic Science, G.H. Raisoni University, Anjangaon Bari Road, Amravati, Maharashtra, India

Received Date: July 10, 2025
Accepted Date: July 26, 2025
Published Date: July 28, 2025

**Citation:** Qurratul Ain Kausar Ansari, Pratiksha Parihar, Shrutika Chincholkar, Karuna Dohare, Mangesh S. Dhore. Efficacy and Efficiency of Fingerprint Powder Derived from Natural Flowers – Development and Evaluation of Sustainable Fingerprint Powders. Research Reviews: Journal of Life Sciences. 2025; 15(3): 6–17p.

## INTRODUCTION

Fingerprints are unique patterns on an individual's fingertips used for identification. They are classified into three main types: Arches (5%), Loops (60%), and Whorls (35%). At a crime scene, forensic investigators detect fingerprints by using dusting methods with contrast-colored powders that adhere to the prints. If they locate, they can lift the prints with tape lifting method. While this can help investigators in determining whether a suspect was present at the crime scene. Modern fingerprint powders represent considerable health issues because they are composed of chemical content. Traditional powders, such as fluorescent powders, charcoal powder are more dangerous and can reach and settle deep into the lungs. Natural fingerprint powders made from plant-based compounds or minerals provide an environmentally safe and reliable alternative than chemical powders [1, 2].

Fingerprints are most widely used and accepted evidence in the criminal justice system and are important trace evidence to disclose person's identity. The basic principles of fingerprints are uniqueness, permanence, universality, simplicity of recording and classification. Fingerprints unintentionally left by a culprit at the crime scene are known as chance prints. The fingerprints are classified as patent, plastic and latent fingerprints [3–7]. Latent fingerprints are most probably found at the crime scene. Fingerprint powders are used to visualize and enhance latent prints formed by sweat residue which are commonly found at crime scenes and can be developed using various powder dusting methods. This study focuses on preparation of fingerprint powders from flowers like *Bauhinia purpurea*, *Bougainvillea*, and *Hibiscus rosa-sinensis*, *Hibiscus grandiflorus*, *Amaranthus cruentus*.

## METHODOLOGY

In this research, certain naturally available materials, such as *Bahunia purpurea*, *Bougainvillea*, *Hibiscus rosa-sinensis*, *Hibiscus grandiflorus*, and *Amaranthus cruentus*, were utilized for the preparation of fingerprint powder, which aided in the development of latent fingerprints. The effectiveness of the powders had been evaluated on non-porous surfaces, including phone screen, window glass, doors, keyboard, glass bottle yielded both positive and negative results. The samples were retrieved using the tape lifting method, as the fingerprints may have faded over time. The fingerprints were preserved by photography using a smartphone equipped with a 5MP close-up shot micro camera [8–15]. The above flowers were collected at their anthesis stage. The petals were separated from the flowers by removing the pistil, sepal, and stamen. The petals were dried in sunlight for six days at 30℃ for the preparation of color powders and its dry products, as shown in Figure 1A. The petals were subjected to an oven for about four hours at 110°C and projected to mechanical crushing, to obtain a fine powder [16]. The powder was sieved using a tea strainer and flour sifter.

For the preparation of Ash powder and its dry products, as shown in Figure 1B, dried petals were heated in a muffle furnace at 400°C for five hours to create ash powder, which were then crushed and used along with color powder to develop latent fingerprints. Both colored and ash powders were sieved using mesh fabric and had found the grain size of the powders to be 40-mesh size shown in Figure 1C. The powders were applied to non-porous surfaces on which latent fingerprints were either intentionally placed or unintentionally present.


**Figure 1.** A, B, and C show the color powder, ash powder, and mesh for powder sieving of *Bahunia purpurea*, *Bougainvillea*, *Amaranthus cruentus*, *Hibiscus rosa-sinensis*, and *Hibiscus grandifloras*, respectively.

Gently tapped the brush to release the powder over the surface using a soft ostrich feather brush and camel hairbrush in one direction to produce a clear fingerprint, ensured that the powder was evenly coated and avoided over-powdering. The powder had been allowed to adhere on the latent print.

The fingerprints were developed on non-porous surfaces and observed whether the fingerprint powders were capable to visualize the latent fingerprints even after intervals of 1 day, 5 days, 6 days, 9 days, and 15 days, as shown in Table 1 and Figures 1–10. For that, fingerprints were given randomly on different surfaces mentioned above without cleaning the surface. Capabilities of powders were measured in scale of 0 to 5 based on how well the fingerprints visualized. Value 5 was assigned for fingerprints that were crystal clear and had excellent visualizing effect [8, 9]. A 4-value indicated very clear fingerprint, while value 3 meant the print was still good but not as sharp. If only one or two ridges were visible, value 2 was assigned. If no ridges could be seen, the value 1 was assigned and if the print was really poor quality and shows no visualizing effect, 0 value was given [10–12].

## OBSERVATION

### *Bahunia Purpurea*

As you can see in Figures 2 and 3, both colored powder and ash powder were the best at showing fingerprints on all surfaces on Day 1. They had the best clarity and ridge features. On smooth, reflective surfaces like window glass, doors, and glass bottles, colored powder always left stronger images that could be seen even after 5–6 days. Ashes powder, on the other hand, worked better on phone glass and keys, especially on Days 1 and 5, but it lost its clarity more quickly over time than colored powder. After Day 9 and Day 15, fingerprints were much harder to see on both powders, and only faint marks could be seen on some surfaces. As a result, colored powder is better for long-term visibility on glass surfaces, while ash powder works well for short-term visibility, especially on computer and phone glass.

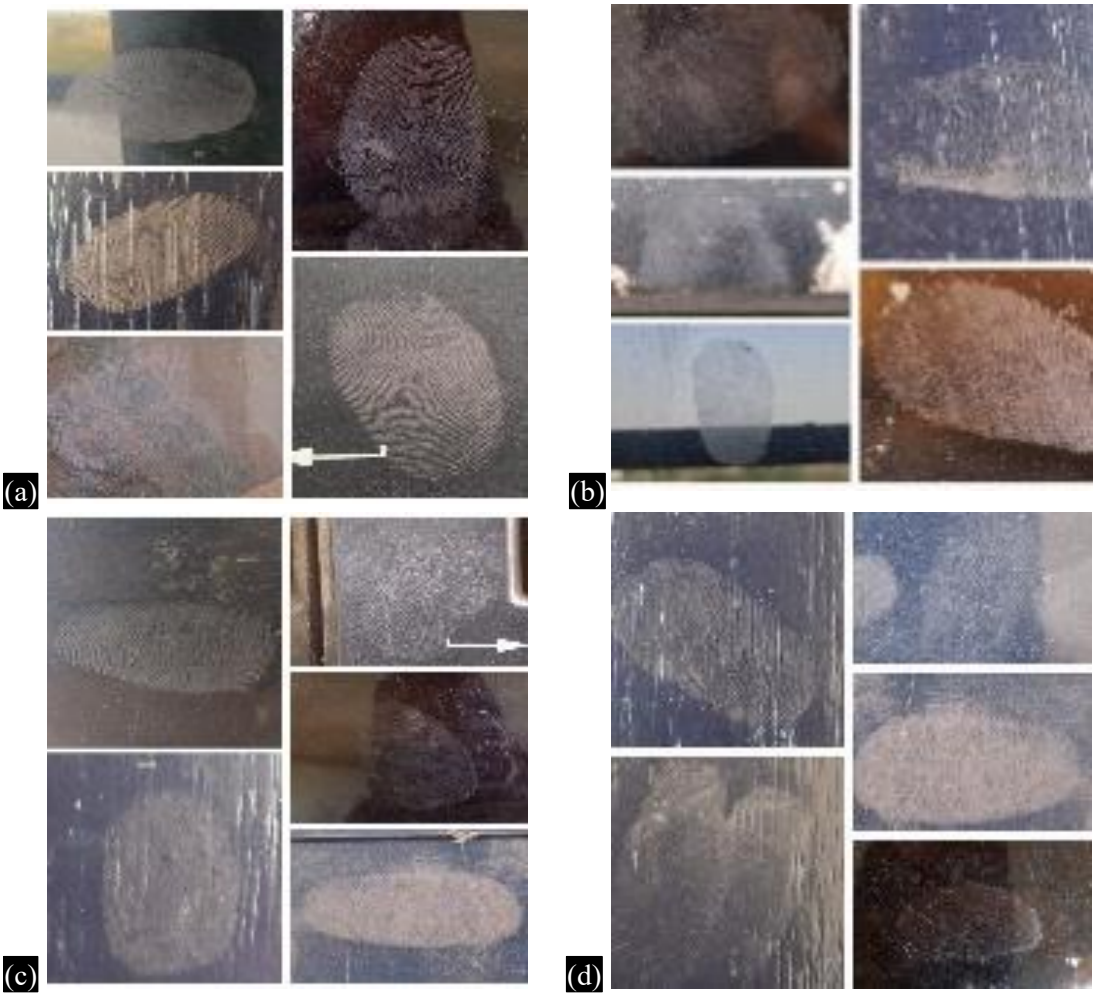



**Figure 2.** A, B and C, D show the developed latent fingerprint of color powder, ash powder of *Bahunia purpurea*, respectively.

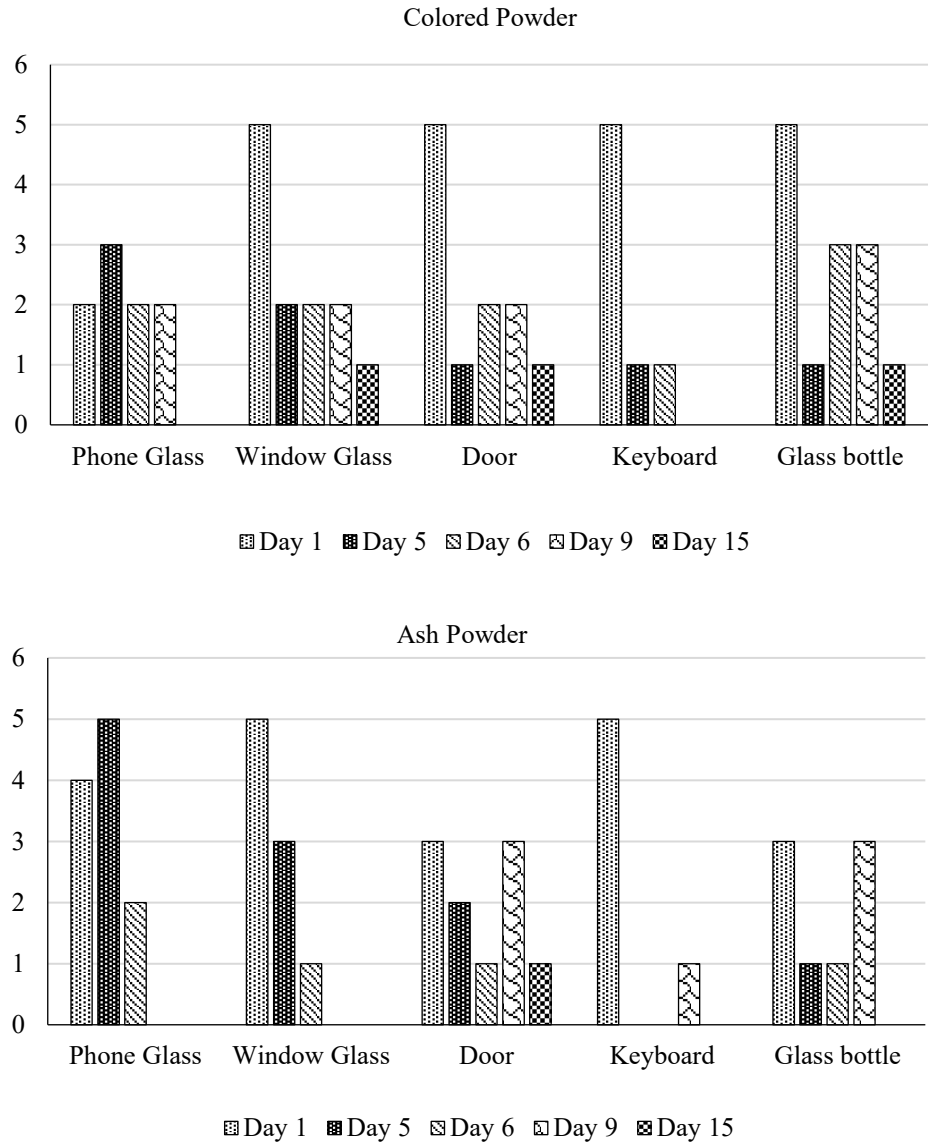



**Figure 3.** Visualization of latent fingerprint by color and ash powder at specific interval on various surfaces of flower *Bahunia purpurea*.

***Bougainvillea***

The results shown in Figures 4 and 5 show that colored powder made it easiest to see fingerprints on all surfaces on Day 1, especially on phone glass, doors, and glass bottles. It showed the most sharpness and ridge details. Over time, prints became less and less visible. On some surfaces, weak impressions could still be seen on Day 9, but by Day 15, there were no or very few clear impressions. The images were easier to see on the glass bottle and phone glass than on the keyboard and window glass, which lost their clarity more quickly. Because of this, we can say that colored powder works best on smooth, non-porous surfaces and for new latent prints (Days 1–5). However, it loses a lot of its power over time.

***Hibiscus Rosa-Sinensis***

Figures 6 and 7 shows that compared to ash powder, colored powder made it easier to see fingerprints on all surfaces. On Day 1, fingerprints made with colored powder were clear, but by Day 15, they were getting less noticeable. On the other hand, fingerprints made with ash powder were less clear and stable, especially on the computer and glass bottle. Overall, colored powder worked better than white powder at finding hidden fingerprints on the surfaces that were tried.

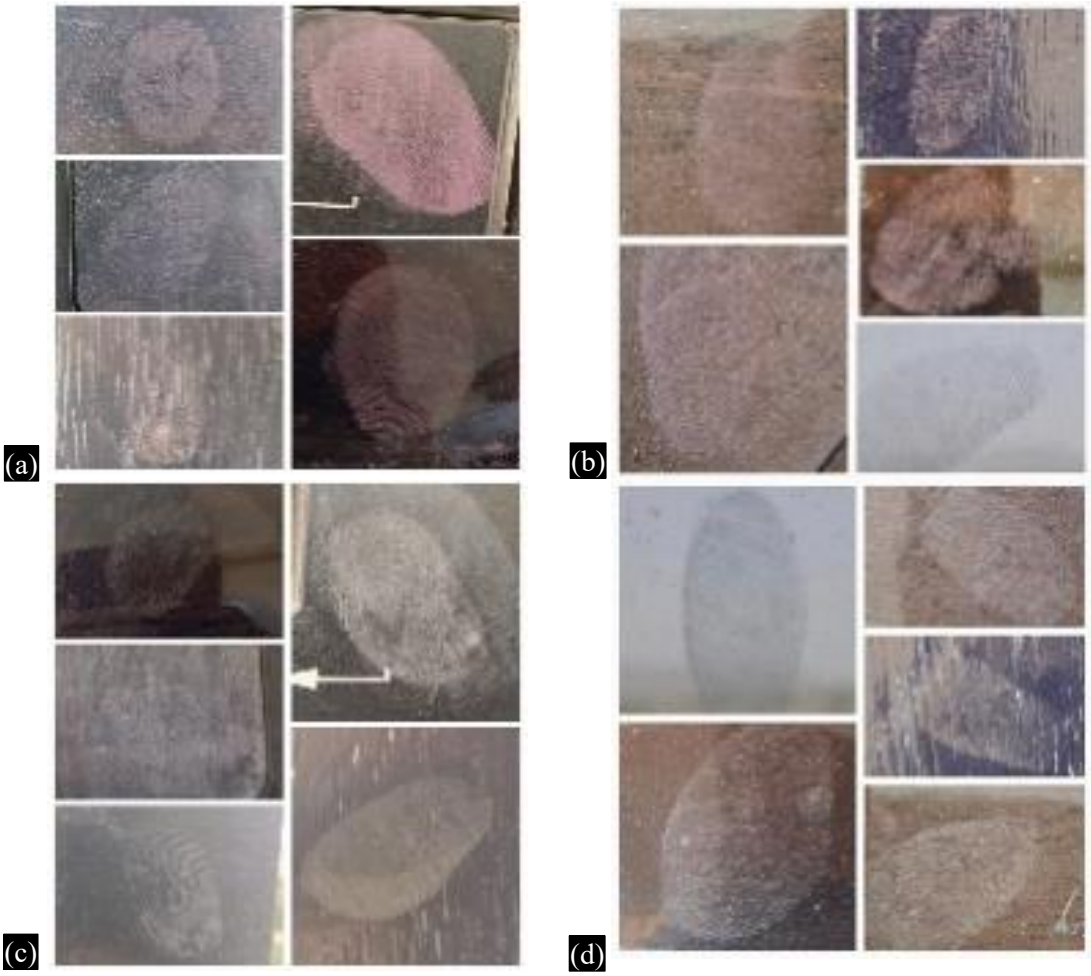
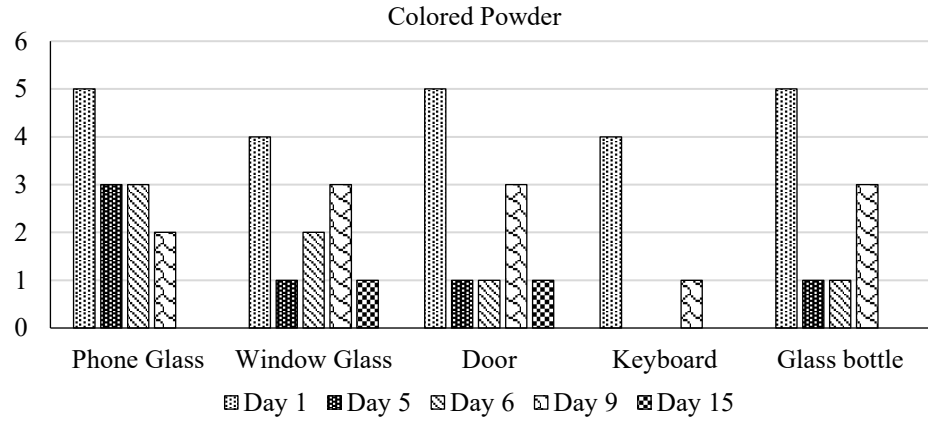



**Figure 4.** A, B and C, D show the developed latent fingerprint of color powder, ash powder of *Bougainvillea*, respectively.

***Hibiscus Grandiflorus***

Figures 8 and 9 shows that the colored powder made it possible to see fingerprints clearly on all of the Hibiscus grandiflorus surfaces that were tried on the first day. The most clear images were seen on the phone glass, window glass, door, and keyboard. However, fingerprints became less noticeable over time, and by Day 15, only tiny marks could be seen on some surfaces. Door and glass bottle surfaces held up better than other surfaces, but phone and window glass faded more quickly. Overall, colored powder worked well for short-term perception but became less clear over longer periods of time.



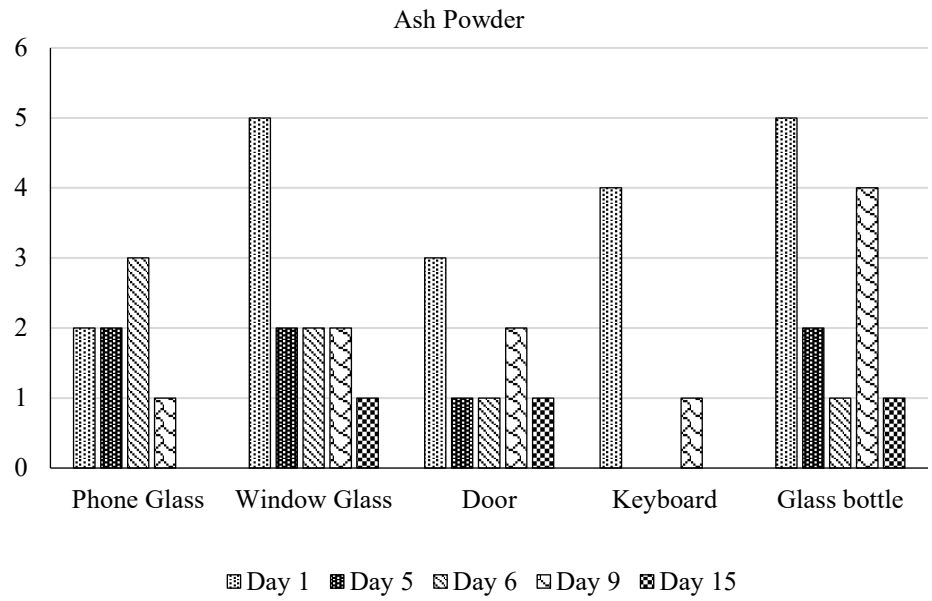



**Figure 5.** Visualization of latent fingerprint by color and ash powder at specific interval, on various surfaces of flower *Bougainvillea*.

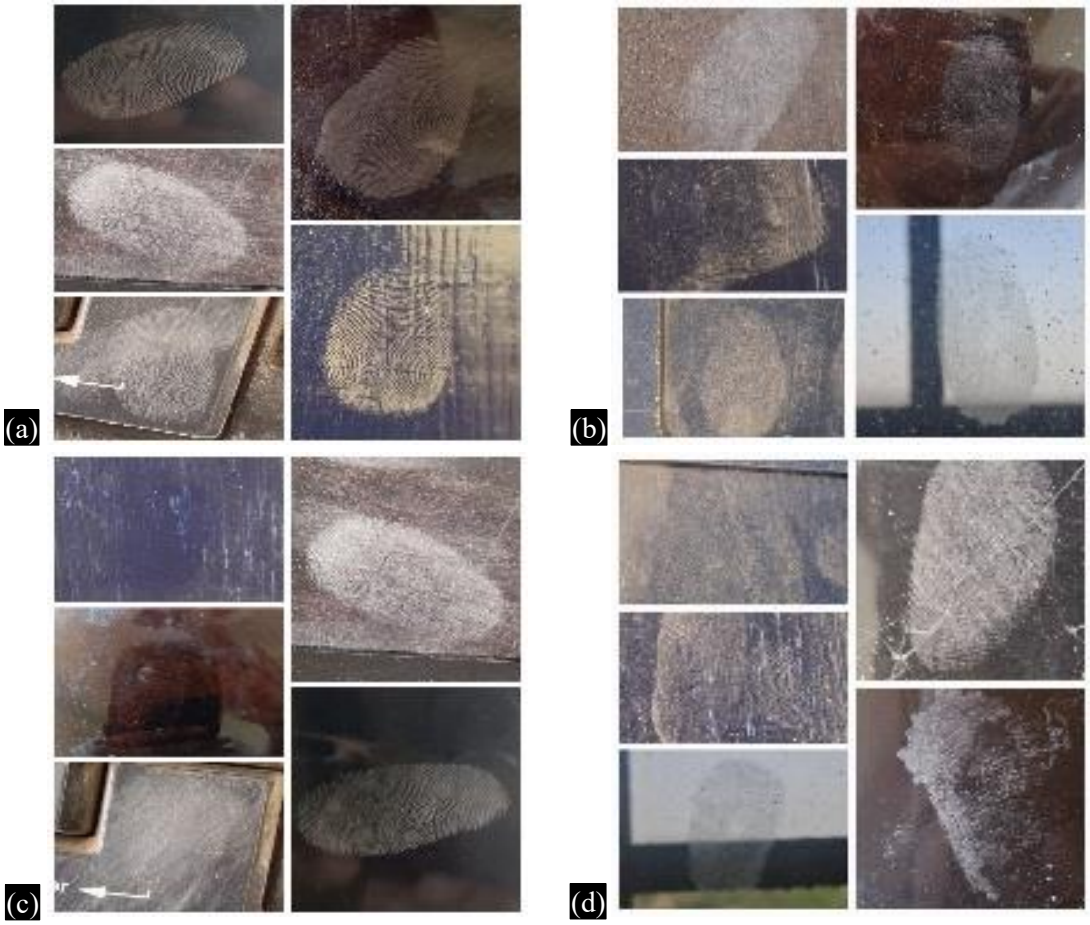



**Figure 6.** A, B and C, D show the developed latent fingerprint of color powder, ash powder of *Hibiscus rosa-sinensis*, respectively.

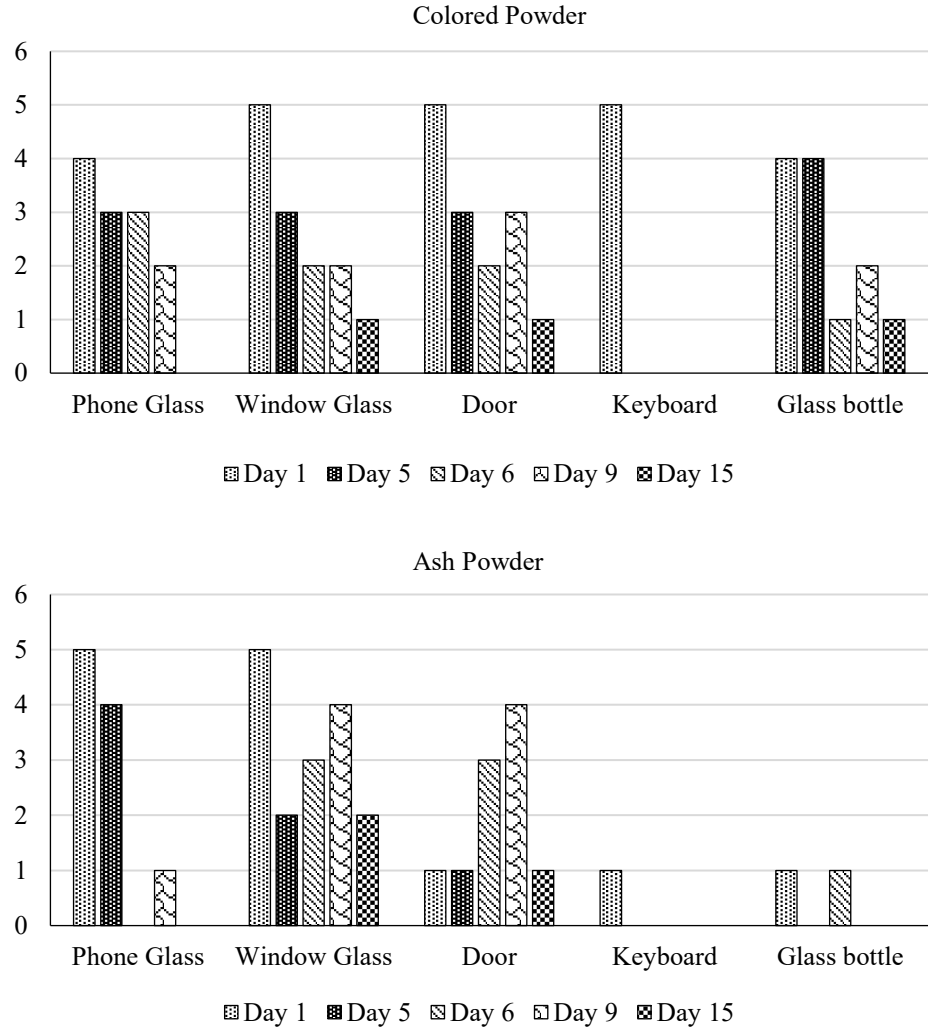
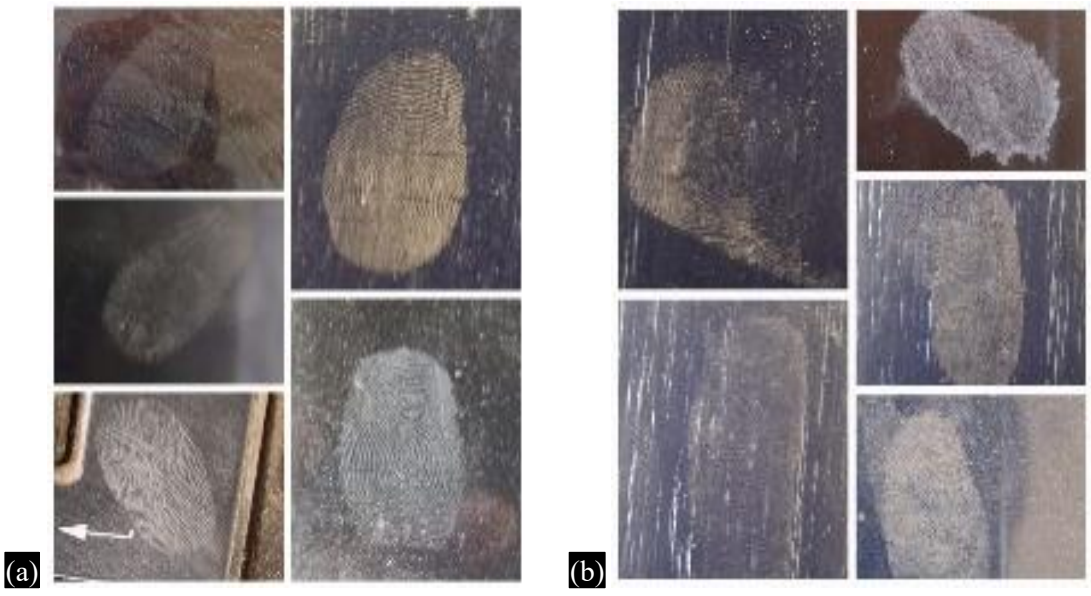



**Figure 7.** Visualization of latent fingerprint by color and ash powder at specific interval on various surfaces of flower *Hibiscus rosa-sinensis*.



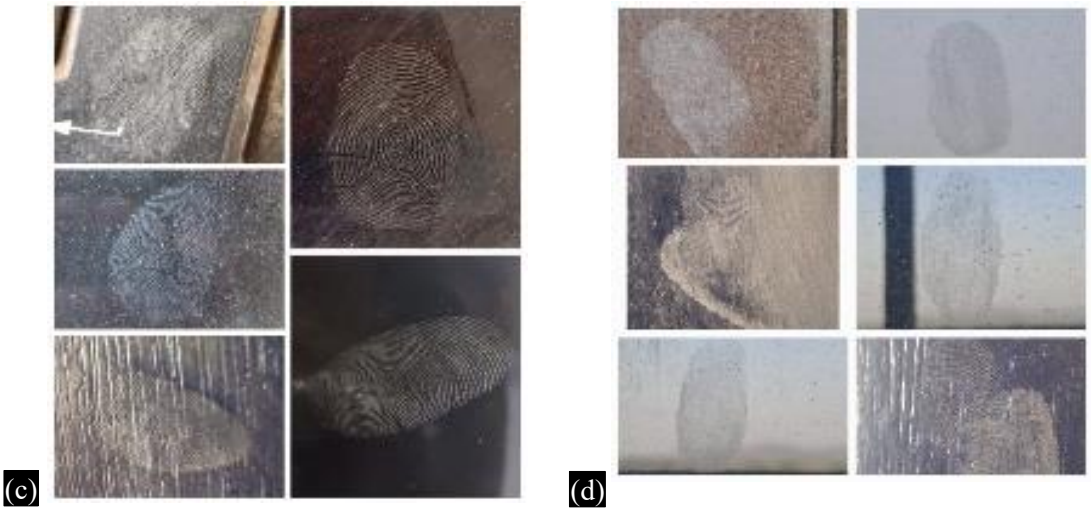



**Figure 8.** A, B and C, D show the developed latent fingerprint of color powder, ash powder of *Hibiscus grandifloras*, respectively.

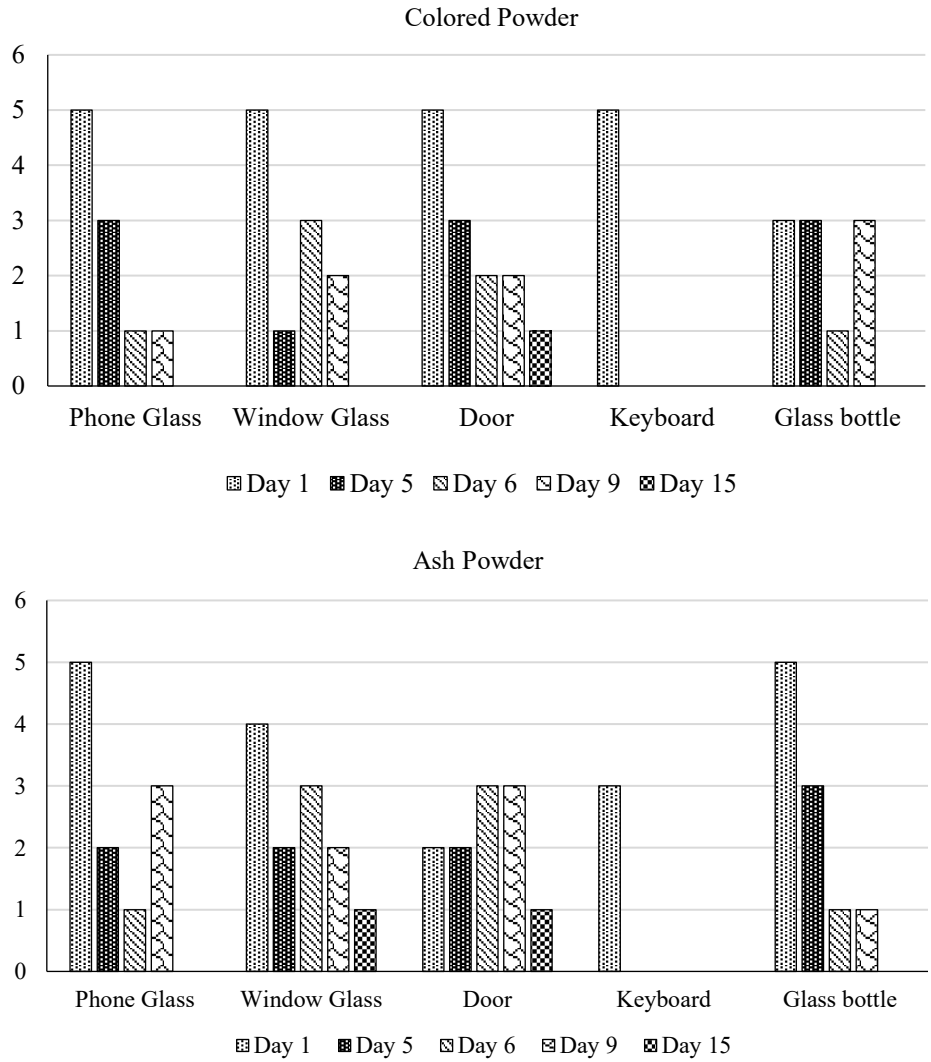



**Figure 9.** Visualization of latent fingerprint by color and ash powder at specific interval on various surfaces of flower *Hibiscus grandiflorus*.

Figures 10 and 11 shows how the surface and time-dependence of the clarity of latent fingerprints on Amaranthus cruentus change when colored powder is used to see them. Smooth, non-porous surfaces like glass bottles, window glass, and phone glass showed fingerprints more clearly for longer periods of time (up to Day 15), with the clearest marks seen on Day 1. After a few days, surfaces like the computer and door had weaker fingerprint visibility and didn't hold fingerprints as well. Overall, colored powder worked well at revealing hidden fingerprints, especially on smooth glass surfaces. However, the prints got worse over time and didn't last as long.

***Amaranthus Cruentus***

Figures 9 and 10 shows that the colored powder made it possible to see fingerprints clearly on all of the Hibiscus grandiflorus surfaces that were tried on the first day. The most clear images were seen on the phone glass, window glass, door, and keyboard. However, fingerprints became less noticeable over time, and by Day 15, only tiny marks could be seen on some surfaces. Door and glass bottle surfaces held up better than other surfaces, but phone and window glass faded more quickly. Overall, colored powder worked well for short-term perception but became less clear over longer periods of time.

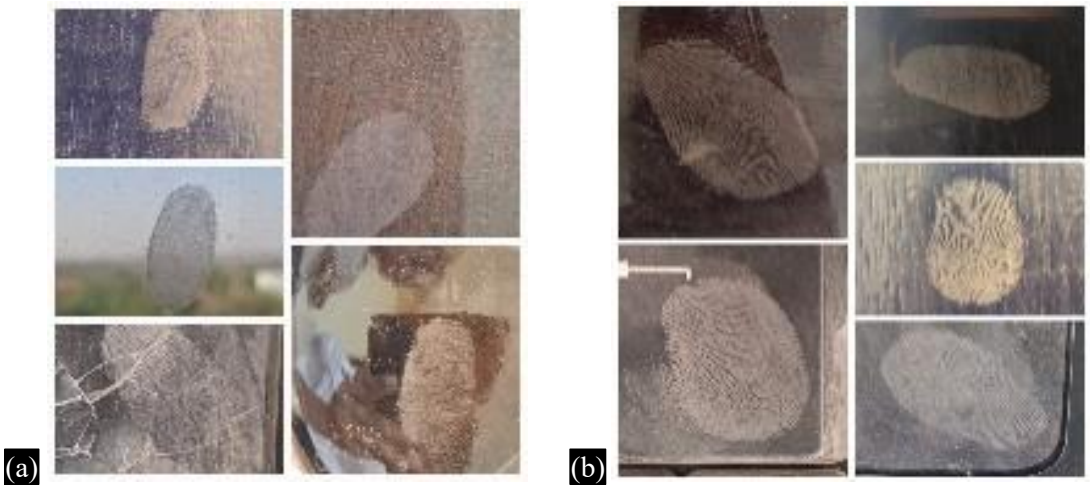



**Figure 10.** A and B show the developed latent fingerprint of color powder, ash powder of *Amaranthus cruentus*, respectively.

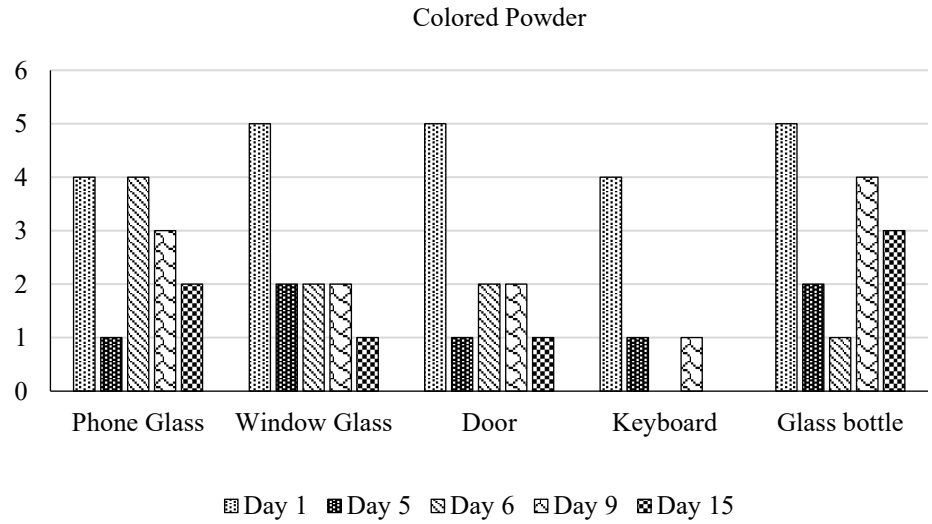



**Figure 11.** Visualization of latent fingerprint by color powder at specific interval on various surfaces of flower *Amaranthus cruentus*.

## RESULT AND DISCUSSION

Following Tables 1 and Pie Graph (Figure 12) show the percentage visualization of colour powder & ash powder of Bahunia purpurea, Bougainvillea, Amaranthus cruentus, Hibiscus rosa-sinensis, and Hibiscus grandifloras.

**Table 1.** Percentage visualization of color powder and ash powder of *Bahunia purpurea*, *Bougainvillea*, *Amaranthus cruentus*, *Hibiscus rosa-sinensis*, and *Hibiscus grandiflorus*.

| Powders | Name of Powder | Efficacy | Percentage Visualization [%] |
|---|---|---|---|
| Colored powder | *Bahunia purpurea* | All powders were efficient in window glass and door. | 90.86% |
| | *Bougainvillea* | | 80.75% |
| | *Hibiscus rosa-sinesis* | | 66.58% |
| | *Hibiscus grandiflorus* | | 91.39% |
| | *Amaranthus cruentus* | | 90.56% |
| Ash Powder | *Bahunia purpurea* | | 85.60% |
| | *Bougainvillea* | | 79.80% |
| | *Hibiscus rosa-sinesis* | | 60.50% |
| | *Hibiscus grandiflorus* | | 55.30% |

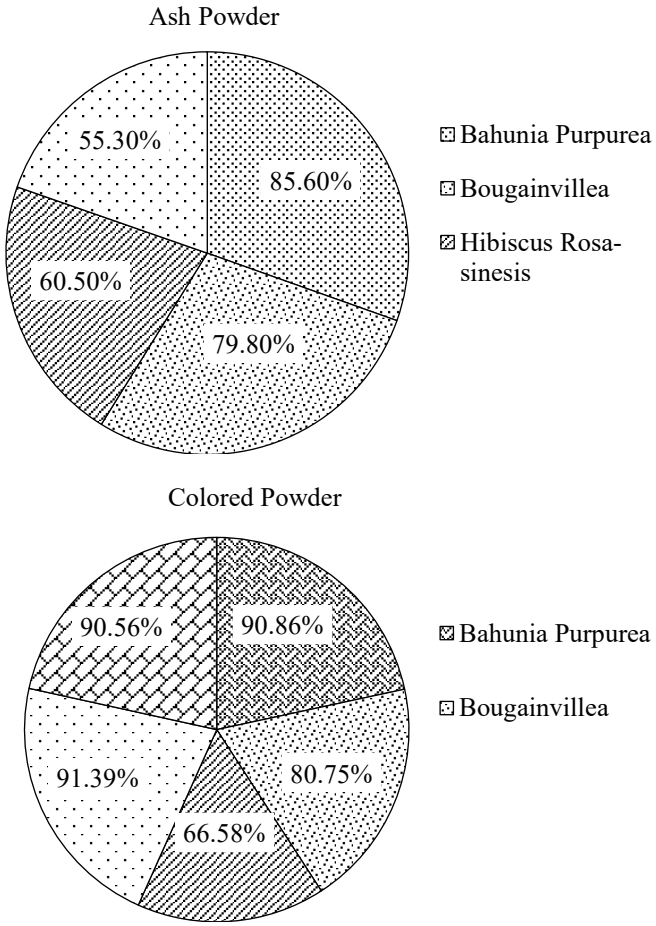



**Figure 12.** Percentage visualization of latent fingerprint of color powder and ash powder of *Bahunia purpurea*, *Bougainvillea*, *Amaranthus cruentus*, *Hibiscus rosa-sinensis*, and *Hibiscus grandiflorus*.

In our study the latent fingerprints were examined successfully on non-porous surfaces, such as phone screens, windows, doors, keyboards, and glass bottles using powders derived from *Bahunia purpurea*, *Bougainvillea*, *Hibiscus rosa-sinensis*, *Hibiscus grandiflorus*, and *Amaranthus cruentus*. The development of the latent fingerprints is shown in Figures 2, 4, 6, 8, 10 and their percent visualization from different powders on various surface is shown in Figures 3, 5, 7, 9 and 11. The powders gave more efficient results on contrasting surfaces. This study focused on surfaces where unintentional fingerprints are most found, whereas researcher Gupta et al. examined only two surfaces, such as mobile screens and white ceramic plates [1]. While some research papers had used powders prepared from Gambir plants, which are found in Sri Lanka, Indonesia, and Malaysia but are rare in India [2]. In contrast, this experiment used flowering plants which are easily available in nearby premises.

The methodology of Seerat Vaibhav Saran and his co researcher was referred to in this research work. They used a muffle furnace to carbonize petals at 550°C for 15–20 minutes [3]. However, in this research, a muffle furnace was used to prepare ash powders at 400 °C for 5 hours. The primary objective of this research is to explore the use of naturally available resources for development latent fingerprint which minimize the use of chemically prepared hazardous powders. This technique is simple and does not require specialized training.

Electromagnetic sieve vibrator is an instrument which is commonly used to determine the grain size of very fine powders in micrometers, but here the objective was to use conventional methods. It was observed that some of the prepared fingerprint powders did not show a visualizing effect, while others could enhance fingerprint visibility on various surfaces. The size, adherence, and interaction of the powder with fingerprint residue are the important factors. This research suggests that the effectiveness of naturally available resources on various surfaces needs to be evaluated [13–15].

## CONCLUSIONS

This research shows that natural resources that are easy to find, safe to use, and non-toxic can work well for visualizing fingerprints on non-porous surfaces. Compared to chemical powders, it might be in limited supply, however, these natural source fingerprint powders can be used for latent fingerprint development and visualization. If this method is found to be trustworthy, it could help the criminal justice system solve crimes by using fingerprint identification. This research used powders prepared from the petals of *Bahunia purpurea*, *Bougainvillea*, *Hibiscus rosa-sinensis*, *Hibiscus grandiflorus*, and *Amaranthus cruentus* flowers to visualize latent fingerprints on non-porous (smooth) surfaces. To accomplish the research objective, the grain size of our powders was determined and was found consistent. It was discovered that smaller grains help the powder to adhere to fingerprints. There are many ways to improve fingerprint powders made from natural materials. This includes choosing better materials, better formulation, finding new ways for application, and ensuring that they work well on different surfaces.

## REFERENCES

1. R I, Gupta P, S M, R D. A study on development of fingerprint powders using natural sources for latent fingerprint visualization on non-porous surfaces. Int J Forensic Med. 2024;6(1):49–52. doi:10.33545/27074447.2024.v6.i1a.80.
2. Natural extracts for fingerprint development. Int J Emerg Technol Innov Res. 2024;11(4):m1–m2. Available from: http://www.jetir.org/papers/JETIR2404C01.pdf.
3. Godara V, Aseri V, Lohar S, Kumari P, Mavry B, Nagar V, et al. Comparative study of rose and hibiscus petals powders in latent friction ridge analysis. Probl Forensic Sci. 2022;130–131:145–55. doi:10.4467/12307483pfs.22.008.16817.
4. Mia R, Panchal V, Dangi P, Kamle C, Tripathi A. Latent fingerprint development by brick powder. Austin J Forensic Sci Criminol. 2023;10(1). doi:10.26420/austinjforensicscicriminol.2023.1091.
5. J N, K D, Kulkarni SG, S NS, K N, S BM. Development of latent fingerprints on indoor plant leaves using powder methods. South East Eur J Public Health. 2025:1121–9. doi:10.70135/seejph.vi.4876.

6. Kamble D, Pandey S, Kumari A, Sharma K. A new powder method for development of latent fingerprint. In: All India Forensic Science Conference; 2018.
7. Mia R, Panchal V, Dangi P, Kamle C, Tripathi A. Latent fingerprint development by brick powder. Austin J Forensic Sci Criminol. 2023;10(1). doi:10.26420/austinjforensicscicriminol.2023.1091.
8. Said NFN, Anuar SN, Zakaria Y, Rajan R, Shukri NM, Hassan NFNN. Recycling potential of natural waste products in the development of fingerprint powders for forensic application. Malays J Med Health Sci. 2021;17(4):196–204.
9. Dhunna A, Anand S, Aggarwal A, Agarwal A, Verma P, Singh U. New visualization agents to reveal the hidden secrets of latent fingerprints. Egypt J Forensic Sci. 2018;8(1). doi:10.1186/s41935-018-0063-9.
10. Kim E, Lee D, Park S, Seo K, Choi S. A pilot study of a new fingerprint powder application method for the reduction of health risk. Anal Sci Technol. 2019;32(5):196–209. doi:10.5806/ast.2019.32.5.196.
11. Madkour S, Sheta NA, Dine FBE, Elwakeel Y, AbdAllah N. Development of latent fingerprints on non-porous surfaces recovered from fresh and sea water. Egypt J Forensic Sci. 2017;7(1). doi:10.1186/s41935-017-0008-8.
12. Darshan RS, Sharma V, Sharma A, Rai AR, Kumari P, Gautam A, et al. Pomegranate peel powder: An effective and environmentally friendly tool for developing latent fingerprints on nonporous surfaces. J Forensic Sci Med. 2025;11(1):38–44. doi:10.4103/jfsm.jfsm_103_23.
13. Bisht S. Peels to prints – exploring natural peels for development of latent fingerprints: A review. Acad J Forensic Sci. 2024;7(2):1–5.
14. Nugroho D, Chanthai S, Oh W, Benchawattananon R. Fluorophores-rich natural powder from selected medicinal plants for detection latent fingerprints and cyanide. Sci Prog. 2023;106(1). doi:10.1177/00368504231156217.
15. Dalwale CG. Babul tree peels new powder development of latent fingerprint. Int J Forensic Res. 2024;5(1):1–3. doi:10.33140/ijfr.05.01.04.
16. Dhore M. S, Butoliya S.S., Zade A.B., Removal of toxic metal ions from water using chelating terpolymer resin as a function of different concentration time and pH, J. Chem., 2014 (2014) 873520. https://doi.org/10.1155/2014/873520.