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DEVELOPMENT OF LATENT FINGERPRINTS ON WET NON-POROUS SURFACES WITH MORINGA AND INCENSE STICK POWDER ASH

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ABSTRACT

Background: Powder methods are quick and easy approach to the development of latent fingerprints on both porous and non-porous surfaces. Moringa powder is rich in nutrition can withstand in both severe drought and mild frost conditions and hence widely cultivated across the world. Incense sticks ash is one of the most unexplored by product generated at religious place and houses in India. The utilization of Moringa oleifera and incense stick ash could revolutionize current fingerprint enhancement techniques, offering sustainable alternatives for Forensic practices.

Methodology: The powders were applied by the use of brush to the latent fingerprints present on wet and moist non-porous surfaces like glass, steel and ceramic tile submerged in tap and pond water for up to 10 days in two different conditions.

Results: It was found that Moringa powder and Incense stick ash develop clear, sharp and detailed fingerprint on non-porous surfaces immerged in tap water present in indoor condition for up to 3 days.

Conclusion: The fingerprints produced are suitable for tape-lifting and subsequent comparison through photography. This method is best due to its accessibility, affordability, and efficacy.

Keywords: Heavy metal, Soil, Contamination, Health, AAS. etc.

INTRODUCTION

Powder dusting method has been the universal method of intensifying fingerprints on non-porous surfaces since the early days of fingerprint development technique. The technique relies on electrostatics attraction between sweat residue and fingerprint powder, resulting due to frictional charge, play an important role in adhesion of powder. Powdering is relatively simple and cost-effective method on non-porous surfaces [1]. Criminals often take precautions to avoid leaving evidence at the crime scene, posing challenges for investigators tasked with detecting and developing fingerprints. Some offenders try to destroy traces by throwing items such as glass items, firearms, plastics, metals, etc., in nearby water bodies [2]. Consequently, there is a necessity to identify them on various surfaces, even after exposure to atmospheric conditions or when present on items immersed in water containing various impurities and sediments [3]. Hundreds of fingerprint powder formulas have been developed over the years. In past, SPR were the commonly used method for visualizing latent fingerprint on non-porous wet surfaces s based upon the reaction between the fatty-acid residuals present in the traces and hydrophobic tails of the specific reagents [4,5,6]. Moringa powder will remain ever beneficial from nutritional, social, cultural, religious, environmental and human's health etc [7]. It is also used to make an efficient fuel, fertilizer and livestock

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feed. Moringa is an edible and extremely safe plant [8]. The burning of incense stick in home use is a widespread practice. The burned incense powder is a novel material found at every household [9,10]. Not only is this formulation non-hazardous as compared to the conventional one, but it is cost-effective as well. This follows our interest in development of latent fingerprint on wet non-porous surfaces.

MATERIALS AND METHODS

Materials

Moringa Oleifera powder (Organic Moringa powder by, Saptamveda) was purchased from Pune, Maharashtra while Incense sticks (Devika, ATM Premium 21 by Devi Industries) were purchased from Jhansi, India and a Marabou Ostrich Feather brush was used for visualization of latent fingerprints. Total 10 individuals, both males and females, were asked for their consented groomed fingerprints for the study. The fingerprints were impinged on selected non-porous surfaces such as glass slide, steel and ceramic tile. These were immersed in tap and pond water for 10 days in both indoor and outdoor environment and their development through Moringa powder and Incense stick ash was done after 1st, 3rd and 10th day. The experiment was conducted in the month of June, when the temperature was 44–46°C and relative humidity was 24–46%. Moringa Oleifera powder and Incense sticks were combusted to acquire the initial ash, which was then refined and smoothed by sieving through cotton cloth. In the current study, this ash powder was employed for the development of latent fingerprints on nonporous surfaces, including steel, glass slides, and ceramic tiles.

METHODS

The primary focus of this study was on two crucial factors: the impact of temperature and the influence of water quality. The samples were subjected to two distinct conditions during the investigation: indoor condition with normal room temperature 27-29° C and outdoor condition with direct sunlight 44-46°C temperature exposed to both day and night. The present research was conducted in June 2023. Two sets of tap water and pond water were collected and placed into four distinct glass chambers. The first set of chambers contained tap water, while the second set contained pond water. Two glass chambers, each containing tap and pond water, were placed outdoors, while the remaining chambers were kept indoors. The glass containers with sample prints laid over three different surfaces were immersed in both containers for 10 days. After each respective time period (1, 3, and 10 days), the submerged surfaces impinged with latent fingerprint were carefully recovered and dry at room temperature. One set of three surfaces submerged in both tap water and pond water placed in indoor and outdoor was taken out and developed with both Moringa Oleifera powder and Incense stick ash separately on first day. So based on the principal [11-16], both powders have very fine particles to put on suspected area and used Marabou Ostrich Feather Brush to develop the latent fingerprint sample. Following the successful development of prints after the third day, subsequent efforts were made to develop prints after the tenth day. Finally, all the developed prints were photographed. Clear and sharp fingerprints could be observed as in pictures.

To determine the quality level of fingerprint development a Finger print Quality Scale assessment was used Table 1.

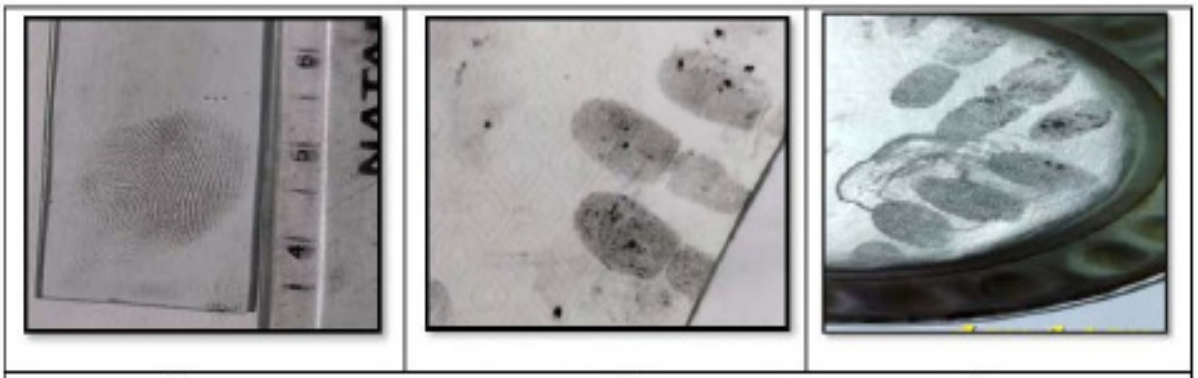
Table 1: Finger mark Quality Scale

Grade	Description
0	No visible prints
1	Poor quality prints, very few visible ridges
2	Poor quality prints, some visible ridges with limited characteristics
3	Reasonable quality prints, some visible ridge characteristics, identification possible
4	Good quality prints, probable identification
5	Excellent quality prints, very clear ridges characteristics, identification assured

RESULTS AND DISCUSSION

Moringa Oleifera powder and Incense stick ash both has proved its worth in detecting fingerprints on moist, non-porous smooth surfaces. In the present experimental study both powder ash provides evidence of clear, sharp and good contrast results on glass, steel and ceramic tile. The results shown after the first days have been excellent by both powder ash on all three surfaces. Thereafter a considerable decrease in the quality of prints developed by both was observed. Pond water contain impurities which affect the quality of print over time. Mahida et. al experimented that agarbatti (incense stick) ash is novel material to develop latent fingerprint on both porous and non-porous surfaces. Developed fingerprint were

comprehensible and identifiable. Because of their high contrast, black or grey-coloured powder could be easily seen on a colourful background. The developed fingerprints are suitable for tape-lifting and comparison after photography. This method is preferred for its easy accessibility, affordability, and effectiveness. Additionally, it aligns with an approach to environmental waste management.



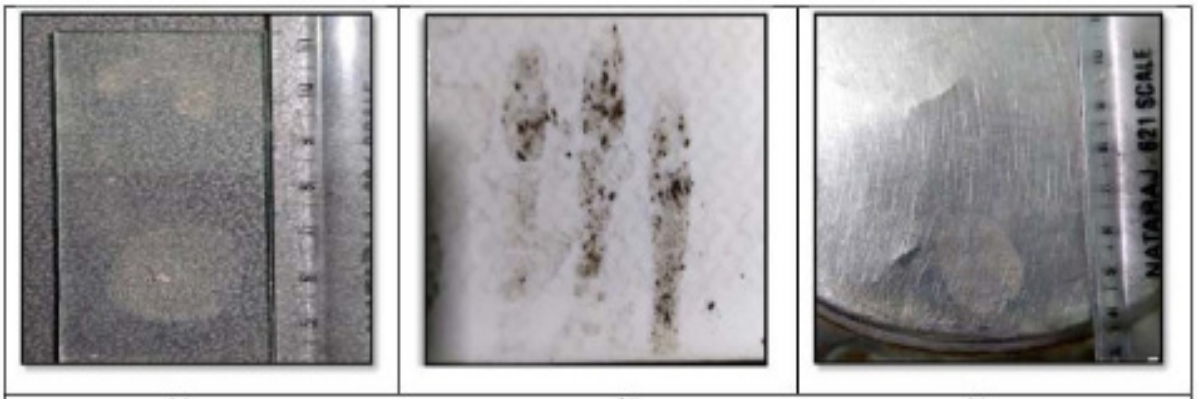
(a) (b) (c)

Picture 1: Fingerprints developed by Moringa Oleifera Powder Ash after first day submerged in tap water placed in Indoor environment (a) glass surface (b) ceramic tile (c) steel



(a) (b) (c)

Picture 2: Fingerprints developed by Moringa Oleifera Powder Ash after first day submerged in pond water placed in Indoor environment (a) glass surface (b) ceramic tile (c) steel



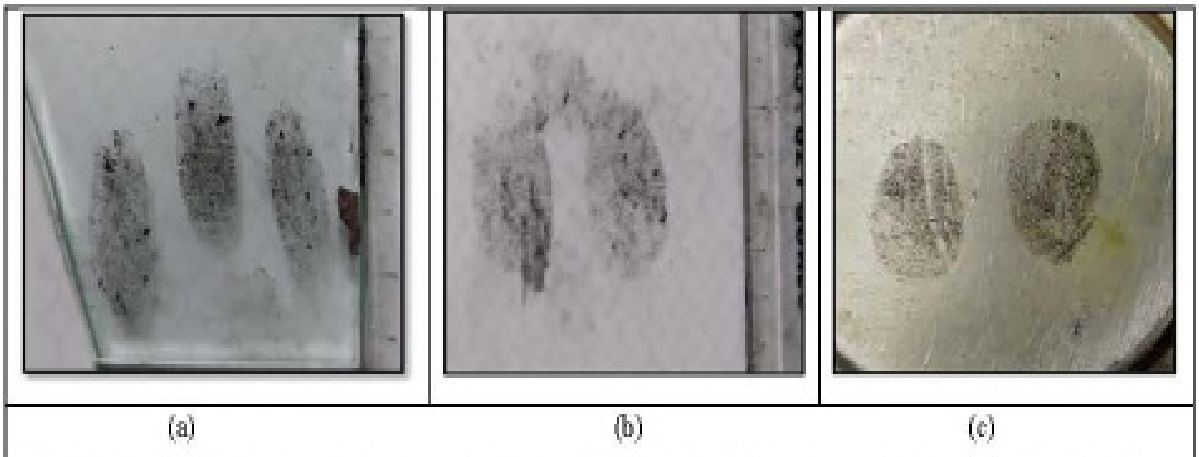
(a) (b) (c)

Picture 3: Fingerprints developed by Incense stick Ash after first day submerged in tap water placed in Indoor environment (a) glass surface (b) ceramic tile (c) steel



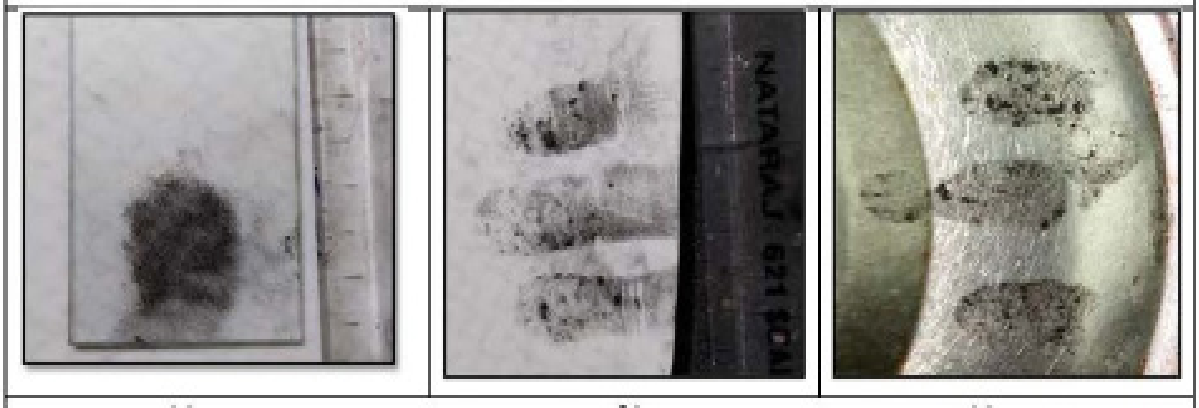
(a) (b) (c)

Picture 4: Fingerprints developed by Incense stick Ash after first day submerged in pond water placed in Indoor environment (a) glass surface (b) ceramic tile (c) steel



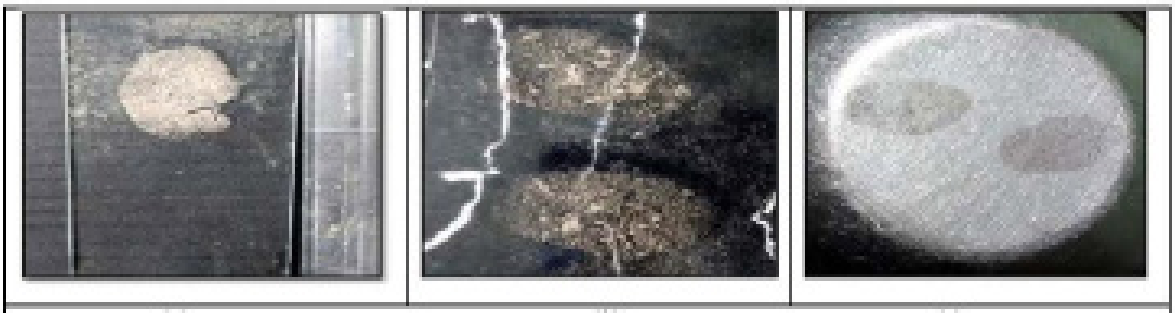
(a) (b) (c)

Picture 5: Fingerprints developed by Moringa Oleifera Powder Ash after first day submerged in tap water placed in Outdoor environment (a) glass surface (b) ceramic tile (c) steel



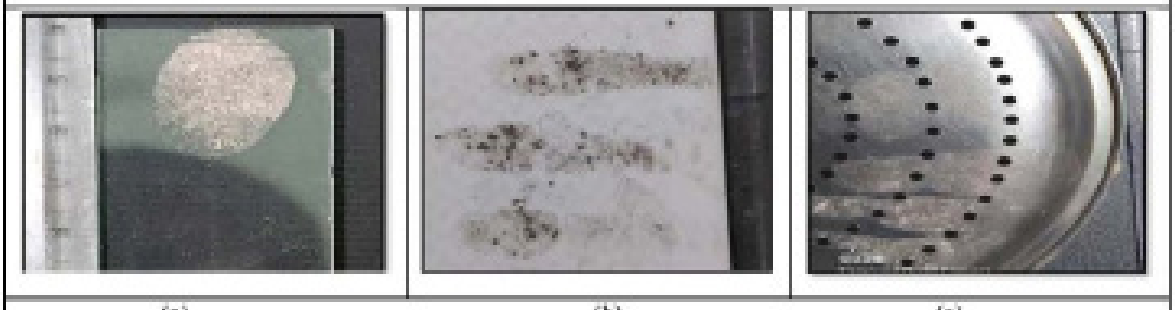
(a) (b) (c)

Picture 6: Fingerprints developed by Moringa Oleifera Powder Ash after first day submerged in pond water placed in Outdoor environment (a) glass surface (b) ceramic tile (c) steel



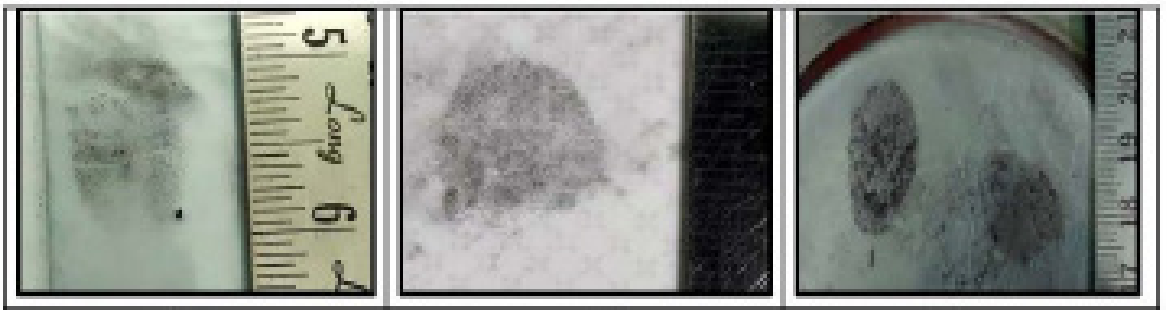
(a) (b) (c)

Picture 7: Fingerprints developed by Incense stick Ash after first day submerged in tap water placed in Outdoor environment (a) glass surface (b) ceramic tile (c) steel



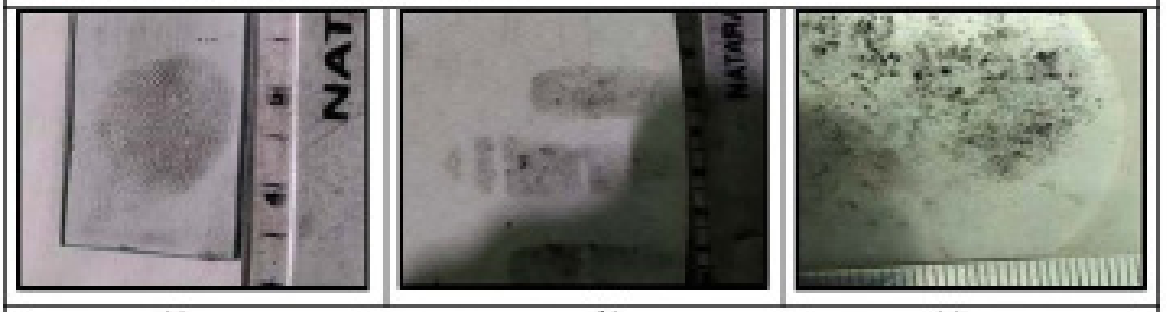
(a) (b) (c)

Picture 8: Fingerprints developed by Incense stick Ash after first day submerged in pond water placed in Outdoor environment (a) glass surface (b) ceramic tile (c) steel



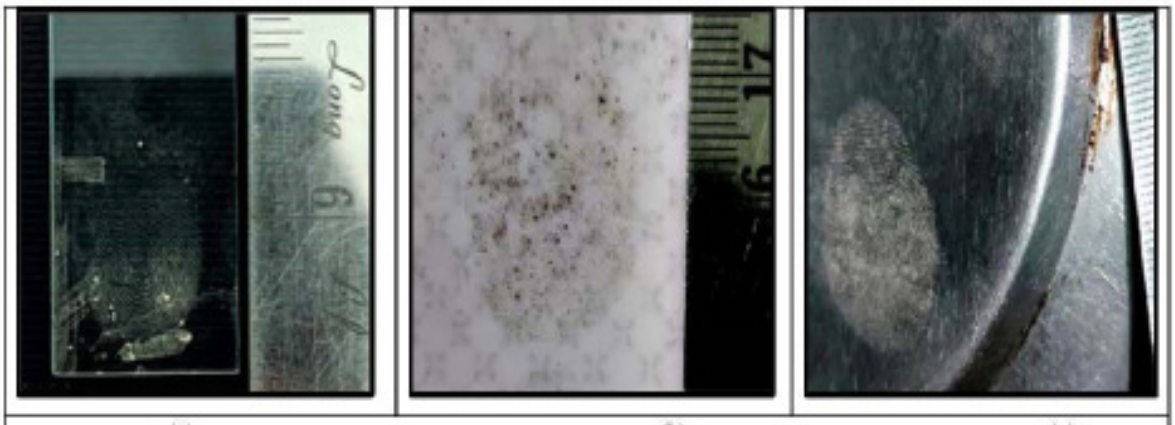
(a) (b) (c)

Picture 9: Fingerprints developed by Moringa Oleifera Powder Ash after third day submerged in tap water placed in Indoor environment (a) glass surface (b) ceramic tile (c) steel



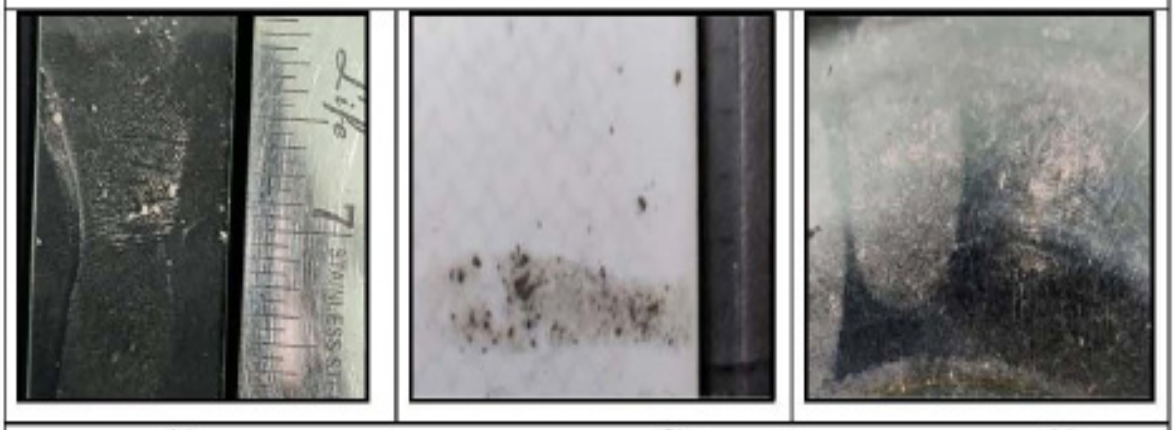
(a) (b) (c)

Picture 10: Fingerprints developed by Moringa Oleifera Powder Ash after third day submerged in pond water placed in Indoor environment (a) glass surface (b) ceramic tile (c) steel



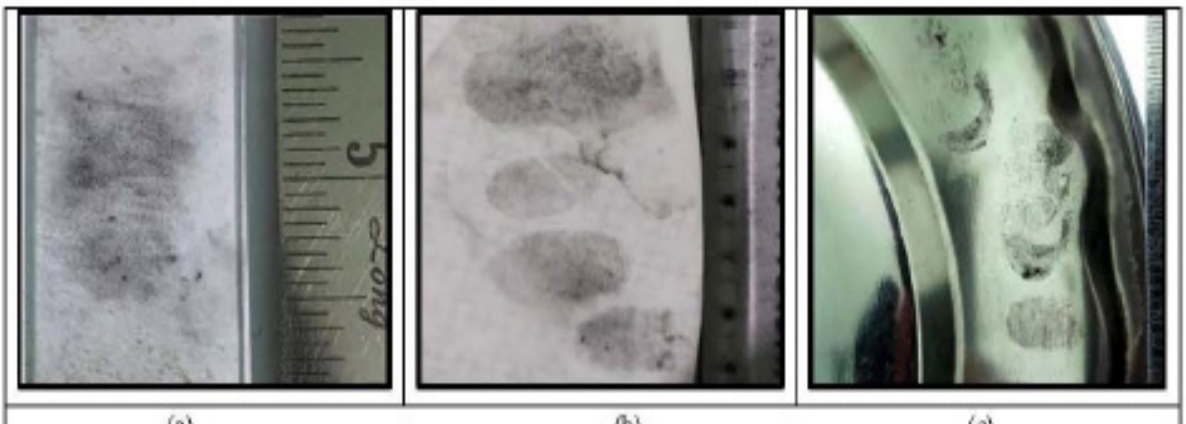
(a) (b) (c)

Picture 11: Fingerprints developed by Incense stick Ash after third day submerged in tap water placed in Indoor environment (a) glass surface (b) ceramic tile (c) steel



(a) (b) (c)

Picture 12: Fingerprints developed by Incense stick Ash after third day submerged in pond water placed in Indoor environment (a) glass surface (b) ceramic tile (c) steel



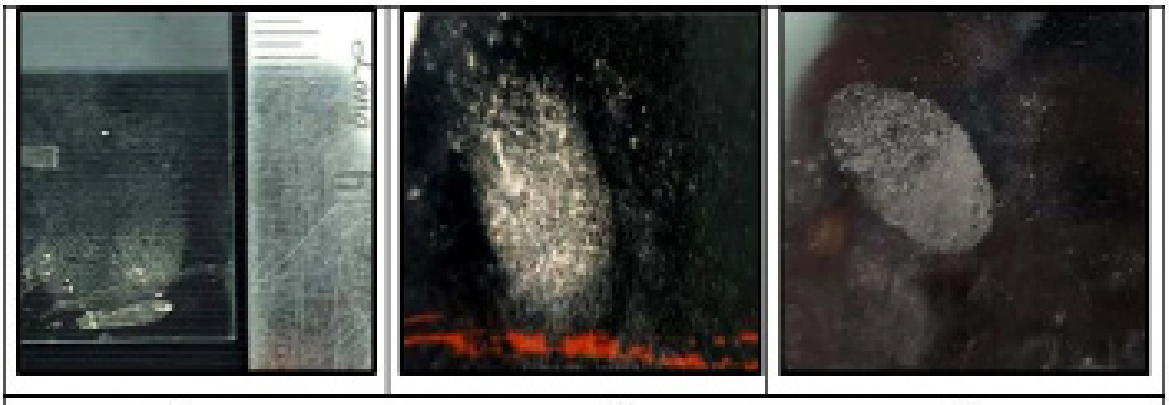
(a) (b) (c)

Picture 13: Fingerprints developed by Moringa Oleifera Powder Ash after third day submerged in tap water placed in Outdoor environment (a) glass surface (b) ceramic tile (c) steel



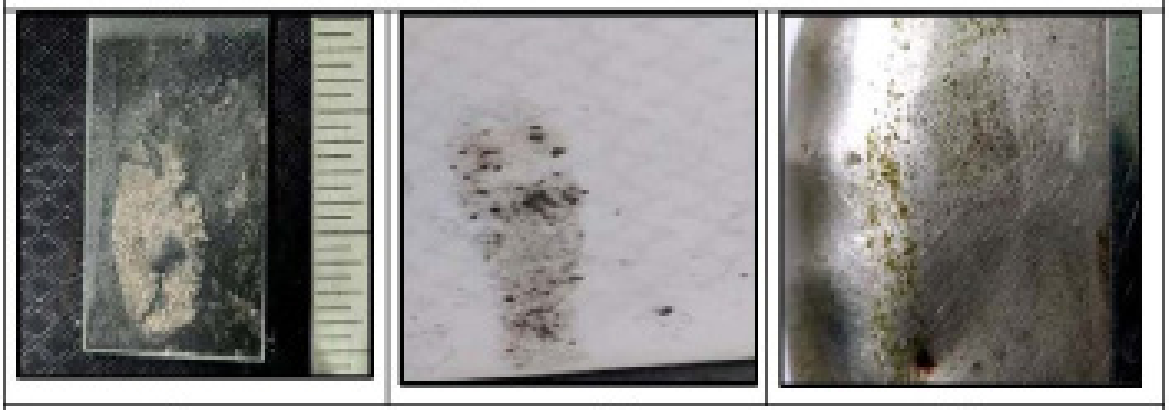
(a) (b) (c)

Picture 14: Fingerprints developed by Moringa Oleifera Powder Ash after third day submerged in pond water placed in Outdoor environment (a) glass surface (b) ceramic tile (c) steel



(a) (b) (c)

Picture 15: Fingerprints developed by Incense stick Ash after third day submerged in tap water placed in Outdoor environment (a) glass surface (b) ceramic tile (c) steel



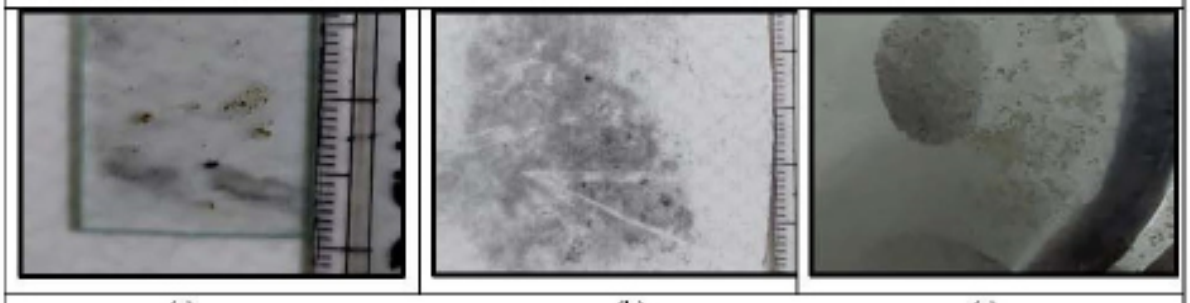
(a) (b) (c)

Picture 16: Fingerprints developed by Incense stick Ash after third day submerged in pond water placed in Outdoor environment (a) glass surface (b) ceramic tile (c) steel



(a) (b) (c)

Picture 17: Fingerprints developed by Moringa Oleifera Powder Ash after tenth day submerged in tap water placed in Indoor environment (a) glass surface (b) ceramic tile (c) steel



(a) (b) (c)

Picture 18: Fingerprints developed by Moringa Oleifera Powder Ash after tenth day submerged in pond water placed in Indoor environment (a) glass surface (b) ceramic tile (c) steel



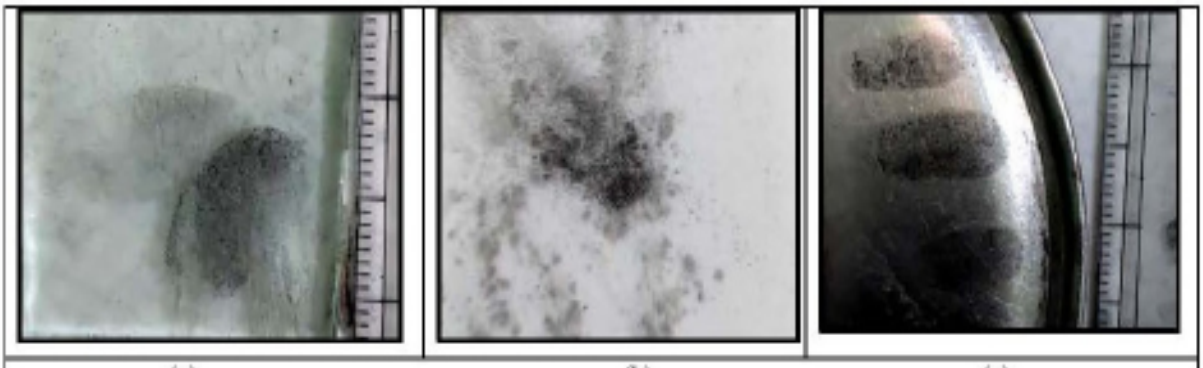
(a) (b) (c)

Picture 19: Fingerprints developed by Incense stick Ash after tenth day submerged in tap water placed in Indoor environment (a) glass surface (b) ceramic tile (c) steel



(a) (b) (c)

Picture 20: Fingerprints developed by Incense stick Ash after tenth day submerged in pond water placed in Indoor environment (a) glass surface (b) ceramic tile (c) steel



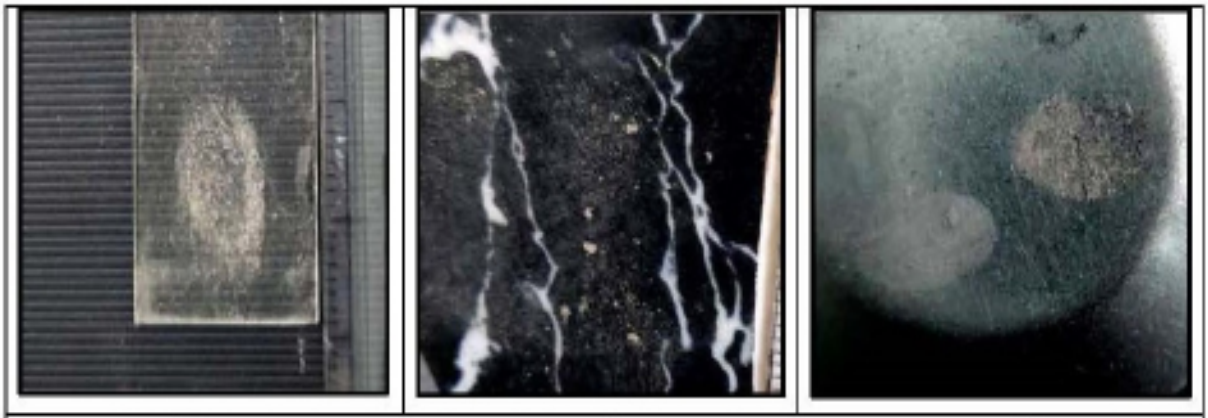
(a) (b) (c)

Picture 21: Fingerprints developed by Moringa Oleifera Powder Ash after tenth day submerged in tap water placed in Outdoor environment (a) glass surface (b) ceramic tile (c) steel



(a) (b) (c)

Picture 22: Fingerprints developed by Moringa Oleifera Powder Ash after tenth day submerged in pond water placed in Outdoor environment (a) glass surface (b) ceramic tile (c) steel



(a) (b) (c)

Picture 23: Fingerprints developed by Incense stick Ash after tenth day submerged in tap water placed in Outdoor environment (a) glass surface (b) ceramic tile (c) steel



(a) (b) (c)

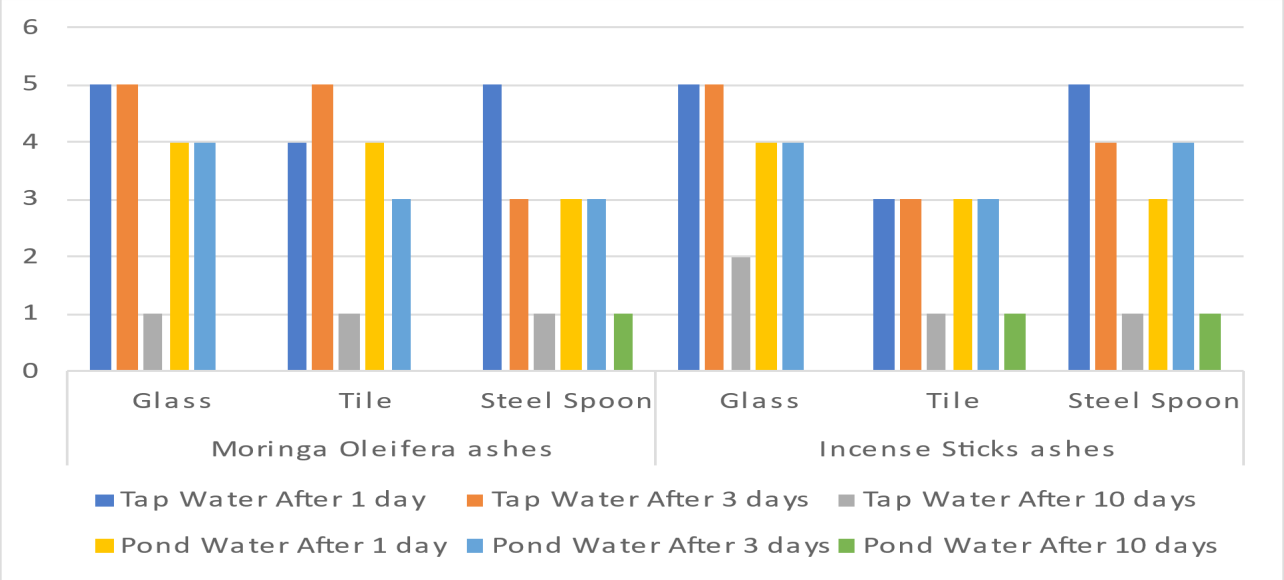
Picture 24: Fingerprints developed by Incense stick Ash after tenth day submerged in pond water placed in Outdoor environment (a) glass surface (b) ceramic tile (c) steel

Table 2: Quality grade of developed fingerprint on different types of surfaces submerged in tap and pond water present in Indoor condition.

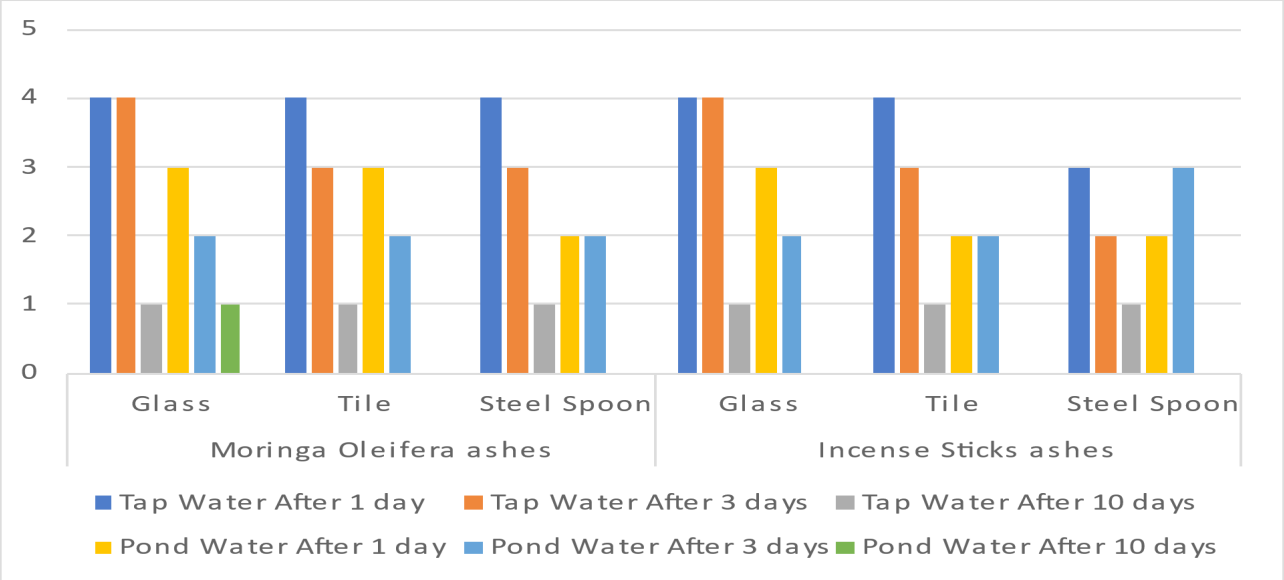
		Tap Water			Pond Water		
After 1 day		**After 3 days**	**After 10 days**	**After 1 day**	**After 3 days**	**After 10 days**	
Moringa Oleifera ashes	Glass	5	5	1	4	4	0
	Tile	4	5	1	4	3	0
	Steel	5	3	1	3	3	1
Incense Sticks ashes	Glass	5	5	2	4	4	0
	Tile	3	3	1	3	3	1
	Steel	5	4	1	3	4	1

Table 3: Quality grade of developed fingerprint on different types of surfaces submerged in tap and pond water present in Outdoor condition.

		Tap Water			Pond Water		
After 1 day		**After 3 days**	**After 10 days**	**After 1 day**	**After 3 days**	**After 10 days**	
Moringa Oleifera ashes	Glass	4	4	1	3	2	1
	Tile	4	3	1	3	2	0
	Steel	4	3	1	2	2	0
Incense Sticks ashes	Glass	4	4	1	3	2	0
	Tile	4	3	1	2	2	0
	Steel	3	2	1	2	3	0



Graph 1: Shows the comparative of two powder ash on different surfaces w.r.t. immersion period present in Indoor condition.



Graph 2: Shows the comparative of two powder ash on different surfaces w.r.t. immersion period present in Outdoor condition.

CONCLUSION

The utilization of fingerprints in criminal investigation is widely acknowledged as a modern and precise method for confirming human identity. The aim of this study was to evaluate the possibility of developing fingerprints with easily available and cost-effective powder ash on surfaces submerged in water. These pose no occupational hazard to the user. Poor results were obtained from both powder ash in pond water present outdoor condition due to huge number of impurities.

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