Visualisation of Latent Fingerprint on Different Surfaces By Using Cement And Beetroot Powder

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Abstract- *Earlier, numerous methods for the synthesis of latent fingerprints on numerous surfaces were documented. This research describes a simple and non-toxic. The powder dusting approach is the most practical approach to develop latent fingerprints at a crime scene. latent fingerprint is prone to damage and destruction because of their fragile nature. There are so many powders present in the market for lifting a fingerprint which are toxic and expensive. Such chemical methods are not impermeable and permanent on surface. Replacing old methods, we have formulated a new powder with the help of cement and beetroot which is non- toxic and easily available. This novel formulation is efficient to make latent fingerprint permanent and Water resistant on different surface which benefits at outdoor crime. We have tested this on surfaces like wall, aluminium, wood, plastic, foil-paper, leather, glass, paper etc.*

Keywords: Beetroot, Cement, Development, Forensic science, Latent fingerprint, Powder Dusting, Surfaces.

I. INTRODUCTION

1.1 Fingerprint –

In Greek, the term biometric refers to the measurement of one's life[22,25]. Biometrics refers to methods of measuring biological data with the purpose of identification. Fingerprint, Face, Speaker/Voice, Infrared thermogram (facial, hand, or hand vein), Gait, Keystroke, Odor, Ear, Hand geometry, Retina, Iris, Palmprint, Signature, DNA, Knuckle crease, Brain/EEG, Heart sound/ECG. Biometrics can be used to identify persons in a number of ways, including physiological and behavioural biometrics. The difference in them is that behavioural biometrics, like signature, gait, speech, and typing, can change over time, whereas physiological biometrics stay unchanged throughout a person's life. Physiological biometrics involve fingerprints, face, iris, and palmprints[23]. A biometric system is trustworthy because, unlike a password or identification card, it cannot be stolen, borrowed, purchased, or forgotten[24]. A biometric aspect is a fingerprint.Because each fingerprint is unique, it is used to validate a person's identification[2].It is impossible for two people could have the same fingerprint. A fingerprint, on the other hand, is irreversible throughout time and could be easily identified throughout a person's life.Moreover, fingerprints are eternal and do not degrade with time.

They are valuable evidence at a crime scene because of their properties. By use of fingerprints in criminal investigations has been documented for over a decade[11,12]. Ridge density is defined as the number of ridges per unit distance. The ridge density feature is particularly helpful for incomplete fingerprints, which are sometimes the only fingerprints available at crime scenes. In fragmentary fingerprints, the pattern class is clearly undecided, and in noisy fingerprints, it is indefinite. Furthermore, some publications indicate that fingerprint ridge density can be used to identify a person's gender[20,21,28].The fingerprint can also be used to extract chemical information such as narcotic[29,30] or explosive[31,32] information.In Babylon, for example, contracts signed by fingerprints around 200 BC[13]. "Nadi Astrology" is an ancient Indian art that uses fingerprint characteristics to foretell one's past, present, and future[14].

The ridges of the finger or palm deposit a complex mixture of natural secretions and contaminants from the surroundings, forming latent fingerprints[6]. Three types of glands produce natural skin secretions: udoriferous eccrine, Apocrine, and Sebaceous glands[16]. The actions of these three types of glands are well-defined, and as a result, the content of their secretions varies[17]. Sudoriferous glands can be found all over the body, and they produce sweat from glands that are more than 90% water[4].A fingerprint is a representation of the ribs and valleys at the top of a person's fingers.

Visible print, impression print, and latent print are the three types of fingerprint evidence that can be discovered at a crime scene[1]. Latent prints are invisible to the human eye and must be visualised by some sort of enchantment.Detecting, developing, and lifting the latent fingerprints detecting in a crime scene is a challenging task for a forensic examiner[15]. Despite the development of new techniques for latent fingerprint identification, the powdering method is still the most widely used method for treating latent prints. When fingerprint powder is dusted on an impacted surface, it adheres to the oil, sweat, and other residues left behind in a fingerprint[18]. Powdering has been used to make cosmetics since the early 1900s. Over the years, many other fingerprints powder methods have been created[19].The goal of developing

latent fingerprints found at a crime scene into visible fingerprints is to make them visible to the human eye. Latent fingerprints can be created using a variety of methods. However, the available processes are heavily influenced by the nature of the surface on which the print must be created[26,27]. Fingerprint powders are divided into four categories: normal, luminous, metallic, and thermoplastic[3]. Most of the synthetic chemicals in fingerprint powders are hazardous and can affect human health. We attempted to solve this disadvantage by using beetroot and cement powder for producing latent fingerprints that is readily available and non-toxic and help to make fingerprint permanent and water-resistant on different surface.

1.2 Cement

The term "cement" comes from the Asian Roman term opus caementicium, which was used to describe masonry that resembled modern concrete and was made from crushed rock with a binder of burnt lime. A binder is an inorganic material that sets pardons and binds to other materials in order to bind them together. Construction materials such as lime or calcium silicate are often utilised and can be classed as non-hydraulic or hydraulic based on their ability to sit in water.

- Non-hydraulic cement –

In moist or humid environments, it does not set[8].

- Hydraulic cement –

A chemical interaction between dry Materials add water causes them to set and become solid[9]. Mineral hydrates are created as a result of a chemical reaction, and because they are not particularly water soluble, they are quite durable in water and chemically resistant. This permits the hardened material to be set in damp Environment or other water while also protecting it from chemical attack Asian Romans discovered the chemical technique from hydrated cement by mixing volcanic ash with lime.

The essential ingredients in Portland cement are Silicone, Calcium, Aluminium, Iron, and a limited number of other materials in a tightly controlled chemical combination. In the final grinding step, limestone is added to manage the concrete's resting duration. Lime and silica make up about 85% of the bulk[10].

Table 1: component of cement

Ingredient	Chemical Formula	Proportion
Lime	CaO	62 – 67%
Silica	SiO2	17-25%

1.3 Beetroot

Beta vulgaris L. is the scientific name for beetroot. Beta vulgaris L. is a good source of betalains, a red pigment. Betacyanins make up betalains (red). Beetroot contains between 75 – 95% betacyanins[5].The red colour pigment of beetroot never lost in isothermal and non-isothermal condition[7].

II. MATERIALS AND METHODS

Powder dusting is the technique used to create latent fingerprints. It's a method of creating latent fingerprints that relies on the mechanical attachment of powder particles to the oily components of skin ridge deposits. Brushing powder onto the fingerprint is simple and straightforward, but it has some negatives because the brush damages the print by destroying some of the ridge characteristics when it makes contact with the fingerprint surface. With the use ofcement and beetroot powder, you may make a latent fingerprint. Cement is easily available in the market but for beetroot powder, we dried in sunlight andgrind to a finepowder. For the new technique, we mixed beetroot powderand cement with the help of a motor pistol.Mixture will be in 40:60 ratio 40% off cement and 60% of beetroot so that the beetroot rad colour will be visible in mixture.The powder waskept in close container because of moisture present in in air can react with the cement and get solidify. The Powder particle sizecan be very fine so it can look like talcum powder. To develop a visual print, the powder is sprinkled over a surface and then excess powder is removed by tapping.To test the effectiveness of the cement and beetroot powder, theywere appliedto porous and non-porous surfaces. The surface that has been used in these investigations are follows: Paper, leather, wall, foil paper, marbles, wood, aluminium, glass, steel, paper etc.

III. RESULT AND DISCUSSION

Latent fingerprint is developed with the help of beetroot and cement powder. It is shows water resistant property on different surfaces. As shown in figure below.

Figure 1: On glass

(a) before water spray (b) after water spray

Figure 2: On wall

(a) before water spray (b) after water spray

Figure 3: On fresh leaf

(a) before water spray (b) after water spray

Figure 4: On plastic

(a) before water spray (b) after water spray

Figure 5: On polymer

(a) before water spray (b) after water spray

Figure 6: On dry leaf

(a) before water spray (b) after water spray

- Score of Ridges:

Figure number	Ridges
1	Best Ridge Observed
2	Best Ridge Observed
3	Part of Ridge clear
4	Visible
5	Best Ridge Observed
6	Partial visible

IV. CONCLUSION

It has been determined that cement and beetroot powder, which are both available, non-toxic, and simple, can be used successfully on a various surface to develop prints and make it permanent and water resistant in forensic evidence. The decipherment of ancient latent fingerprints is still being worked on.

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