

Conventional Methods of Latent Fingerprint Development

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Abstract:Development of latent fingerprint is done and reviewed extensively. Commercially available powders are extremely beneficial when it comes to enhancing the prints but they have health hazards attached with them. There are times when powders are not readily available at the crime scene, in such cases how can household materials be utilised for the development of latent fingerprints is the approach of this paper. Beetroot, turmeric and broccoli powder were produced at home, with no added chemicals or additives, that are extremely pure and of good quality. Apart from being good in quality, they produced extremely fine and clear quality print that can be further studied for individualization.

Key Words:Fingerprints, Broccoli Powder, Talc, Beetroot Powder, Turmeric.

Introduction

The study of fingerprints is not the product of 19th Century; they have been studied extensively for thousands of years. The history dates back to 300 B.C., they were used by the Chinese as means of identification similarly by the Japanese in 702 A.D. In A.D. 1637, when Shahuji Bhosle's camp was invaded by Shah Jahan and Adil Khan under the command of Khan Zaman Bahadur, the treaty for allegiance to the crown was stamped with the impression of the hand thus they were also used for authenticating a document. They prominently came into light in the 17th Century when, Italian physiologist Marcello Malphigi studied them under microscope. A number of experts gave their contribution in adding their findings to the domain. The credit for studying the persistence of friction ridges goes to Sir William Herschel. Henry Faulds in 1880 published his work that he conducted on both Monkeys and Humans ridge details[1]. He stated the use of fingerprints for individualization and how they hold important evidentiary value. Sir Francis Galton published a book on fingerprints thereby establishing the uniqueness, permanence and persistence of fingerprint ridges, which he stated as Dalton ridges [6].

The anatomy of human hand is such that it is covered with fine ridges throughout the surface of the skin. These depressions or ridges are produced due to pressure casted by the movement of amniotic fluid on the fingers of the foetus. They are formed completely when the foetus is 6 months in age. These formed ridges are extremely unique that even the identical twins don't share the same patterns on their fingers. Locard's Principle of Mutual Exchange states, with every contact there is mutual exchange of matter which implies strictly to fingerprints. Our skin has pores that are present along the length of the friction ridges, these pores are opening of the

eccrine glands that secrete sweat. Approximately 99% of sweat is water, along with minerals, salts and urea that comprise of the remaining 1%. The reason impressions are produced on the surface is due to these secretions of the fingers. Depending on the type of the surface and the material present on the surface of the skin, impressions are produced [5]. They are classified as: latent, patent and plastic impressions. Latent prints are not visible to the naked eye, thus they need alternate sources to be visible. Patent prints are those that are visible on surface they are present such as dusty prints, blood stained prints, prints produced due to any coloured material on them. Lastly the plastic impressions, they have a 3D appearance as they are made by pressing on a softer surface such as soap, paint, tar, wax or clay. The latter two prints are readily visible thus photography is the ideal method of their analysis. The main difficulty lies with the latent prints and their visualization. Fingerprints have extremely great evidentiary value, especially when are present at the crime scene. Over the years extensive studies have been accomplished on latent fingerprints and their development. Powders that have extreme fine pore size are readily available in the market. Whenever investigators proceed to a crime scene they carry all the equipments that are necessary for collection, packaging and preserving of evidences. It could be possible that they are out of the fingerprint development powders at certain instances. Thus there always has to be an alternative approach for collection latent print present at the crime scene.

Materials present in the household especially the kitchen are extremely beneficial when it comes to development of latent fingerprints. Turmeric powder develops good quality latent prints[2]; additional benefit of it is the ability to show fluorescence under UV light. Thus they can be used to enhance prints taken from multiple coloured backgrounds. Other ingredients include beetroot and broccoli powder. They too can be utilized in developing latent fingerprints. Talcum powder or Talc can also be utilized in developing latent prints, particle size of talc ranges between 0.399 μ m to 110.237 μ m [2].

Broccoli scientifically termed as *Brassica oleracea* L. belongs to the cruciferous vegetable family. It is an extremely rich form of food that contains, iron, calcium, Vitamins and is also a source of electrolytes [7]. Beetroot, scientifically termed as *Beta vulgaris* belongs to the *Chenopodiaceae* family. It is another food that is power packed with nutrients[4]. Apart from being extremely healthy foods they can be utilized in developing extremely good latent prints both from non-porous and semi porous surfaces.

Material and Methodology

Turmeric, Broccoli and beetroot were cut into small portions for better grinding in order to achieve powder as the end product. This is followed by extracting the juice of the grinded mesh of each of them separately. The extracted juice was then left to dry in air away from direct sunlight. Once the extract was dried, it was again grinded into fine powder. The powder was then placed in air tight containers, so that moisture would not clump up the particles together. Talcum powder used was Johnson's Baby powder.

All the ingredients were taken in a petri dish; brushes made up of ostrich hair were taken for the development of latent prints. Prints were taken, on marble slab, back of petri dishes and beakers.

Results

Different surfaces namely: marble slab, glassware and paper were marked with prints. The latter is semi porous and the former two being non porous in nature. The prints were then enhanced by using the variety of powders available. Figures mentioned below depict different powders and the surfaces that were visualized. The best prints were developed using Broccoli powder. The particles size was extremely fine, and showed remarked feature on all three surfaces. The colour of the powder is light to lime green. Thus it shows its presence on majority of the backgrounds due to its contrasting feature. Talcum powder does create better prints, but due to the white colour, it is preferred for darker background. Turmeric Powder grains were not of very fine size, but they did create good prints on glass and paper surface. Beetroot powder also had the same problem; the size of the particle was larger as compared to talc and broccoli powder. Thus a conclusion can be drawn that the best development of prints was achieved by talc and broccoli powder.

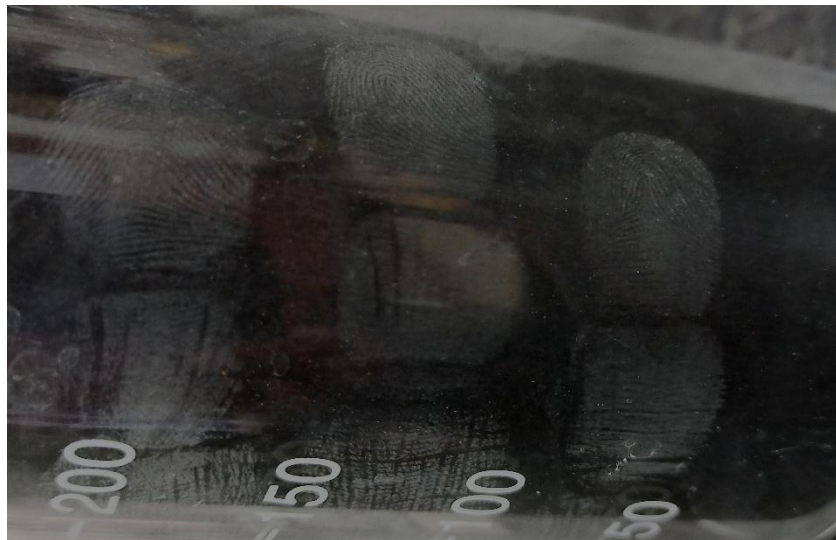


Figure 1: Prints developed using Talc on a Beaker



Figure 2: Developed prints using Beetroot powder on Petri dish surface



Figure 3: Prints developed using Broccoli Powder on Petri dish

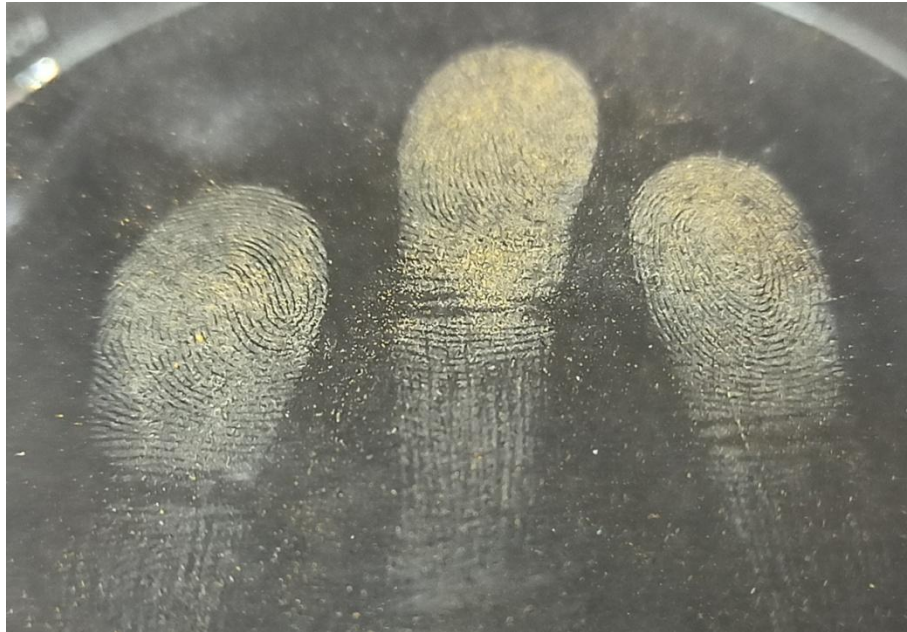


Figure 4: Prints developed using Turmeric Powder on Petri dish



Figure 5: Prints developed on Marble slab using Broccoli Powder

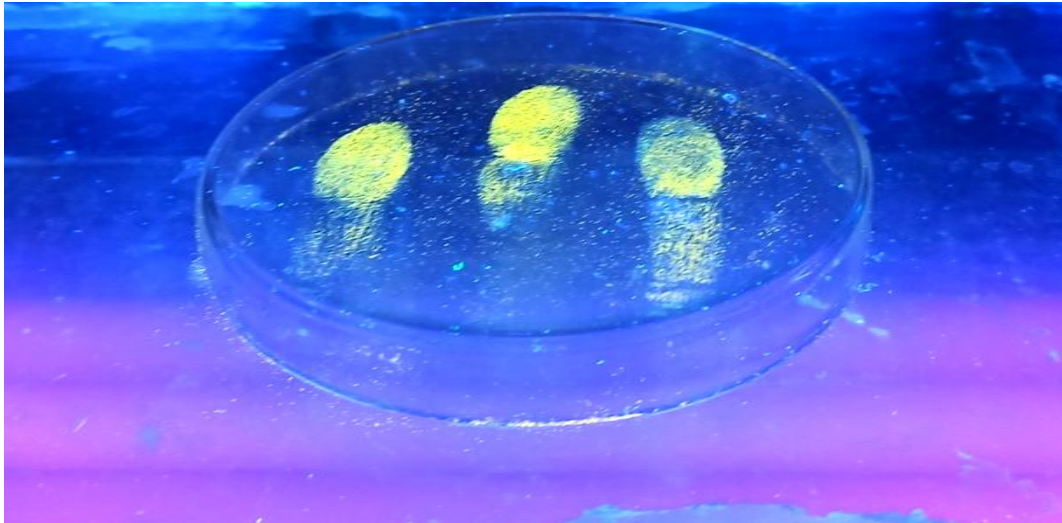


Figure 6: Prints showing fluorescence using Turmeric Powder



Figure 7: Prints developed on paper surface using Beetroot powder

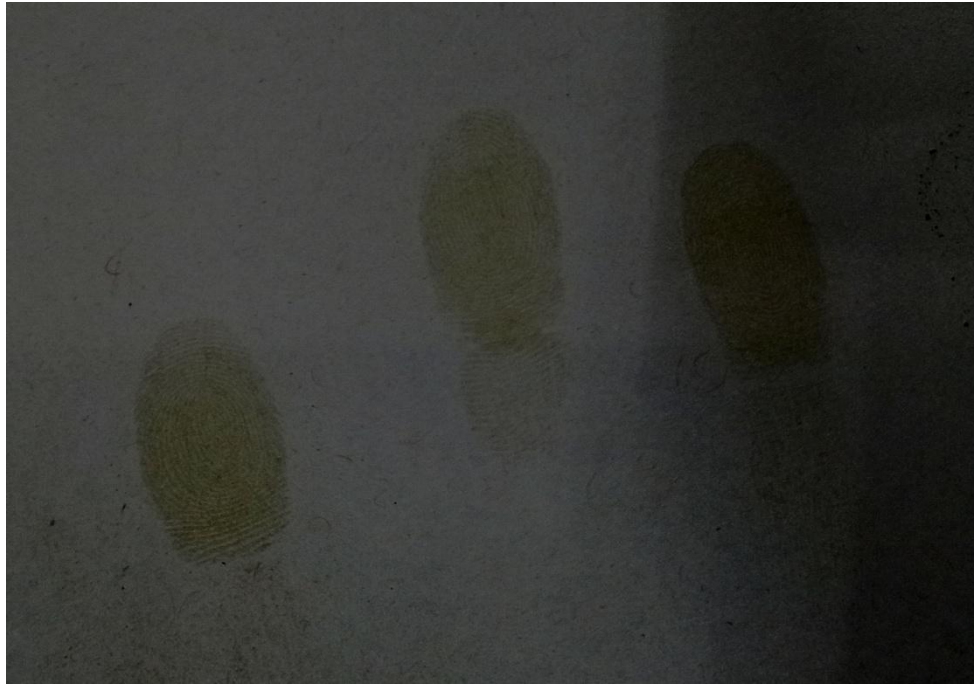


Figure 8: Developed prints using Broccoli powder on paper surface

Discussion

As observed in the images, the prints developed are of extremely good visual quality. An effort can be made by organizations to develop fingerprint developing powders that have a organic origin rather than having chemical background. The particle size of latent fingerprint development powder has to be kept small as they need to adhere to the micro size minutiae of the impressions left behind by the fingers. When they have a chemical origin they will adhere to the nasal tract and cause irritation. But with pure organic background this obstacle can be bypassed. Apart from safety perspective, the adherence of these particles is extremely great on both non-porous and semi porous surfaces.

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