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Comparative Study of Developing Reagents in Case of Submerged Fingerprint at Different Time Interval

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Abstract:

Criminal offenders Has basic goal not to be detected after committing crime, Criminals try to hide the evidences by throwing in water bodies, as they think that valuable evidences get easily destroyed but now days, fingerprint visualization is possible from submerge water. In the study three different reagents were used for comparison i.e, Black powder, Cyanoacrylate Fuming and Fluorescent powder, at different time intermission (day 1, 10, 20, 30, 40 and day 50). After comparing different reagent it was found that Fluorescent Powder gives best result followed by Cyanoacrylate then Black powder.

Keywords: *Fingerprint Forensic Science, Nonporous surface, Submerge*

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Introduction

Finger print is an impression left by the friction ridges of a human finger. It is key evidence in forensic science for purpose of criminal identification. Fingerprint is produce by secretion of natural substance which is present in the ridges of epidermal, it is the unique impression which is left by human friction ridges when come upon touch with any object, it is often found on crime scene which help to link with the criminal. Various substance such as 99% water, organic and inorganic content are the part of natural fingerprint residue (Girod *et al*., 2012). Fingerprint deposition in surfaces due to secretion of the following type of gland from the human body i.e. eccrine, apocrine and sebaceous gland (Knowles, 1978). This type of evidence is hardly visible and therefore visualization techniques have to be called into action. Fingerprints may be classified as latent (invisible), visible and plastic prints (Lee and Gaennslen, 2001). To detect latent print visualization technique is needed because it's very hard to detect (Badiye and Kapoor, 2015). Formed the chance fingerprint when the sweat pores of the papillary ridges leave a deposition of secretion on a surface with which the finger has been brought into contact (Thomas, 1978).

Criminal offenders have a fundamental goal not to leave any traces at the crime scene. It It is believe by the criminal that evidence recovered from underwater have no forensic value therefore, they have intention to destroyed items by throwing underwater (Trapecar, 2012). Therefore, they have intention to destroyed items by throwing underwater (Trapecar, 2012). So there is need have examine evidences which is recovered from underwater by forensic science authorities. For latent print development choice of visualization depend on type of surface, effectiveness, efficiency ease of use and health safety factor (Bramble and Brennan, 2000).

Moisture is not absorbed by Non-porous surface, latent print deposited on this surface may get easily destroyed due to environmental factor (Yamashita and French, 2014; Almog *et al.*, 2004). Factor which influence quality of developed latent print are its composition and the type of surface, deposition over time, environmental factor such as light, dust, humidity, temperature, Ultravoilet ray and several visualazation technique which affect the quality of developed latent print (Girod *et al*., 2012; Archer *et al*., 2005; Croxton *et al.*, 2010).

The reagent used for developmnt of fingerprint on non-porous surface from submerged water are Black water, cyanoacrylate fuming and fluorescent powder method which are effective for latent print.

Black Powder: Black powder method for detecting fingerprint has been universally used to reveal fingerprint on non-porous surface. It is a physical method of enhancement that relies on the mechanical adherence of fingerprint powder particles to the moisture and oily components of skin ridge deposits (Lee and Gaensslen, 2001).

Cyanoacrylate Fuming: it is ester which react with the organic part of fingerprint after reacting it get polymerized and form hard white solid in the finger print ridges (Keough, 2008).

Fluorescent Powder Method: As early as 1933, Fluorescence examination with UV light was suggested as a method of visualizing latent prints (Inbau, 1934). Fluorescent powder used for multicolored surface which phosphorescence when exposed to UV or laser light. This is very fine powder and is effective on multicolored surface which would otherwise present a contrast problem.

Table 3.1: Finger mark quality scale (Castelló *et al.* 2013; Rohatgi and Kapoor 2016)

Grade	Description
0	No visible prints
1	Poor quality, very few visible ridges

2	Poor quality, some ridge details visible or partial mark with limited characteristics
3	Reasonable quality, ridge-details and some characteristics visible, identification possible
4	Good quality prints, ridge-details and characteristics visible,probable identification
5	Excellent quality, very clear prints, identification assured

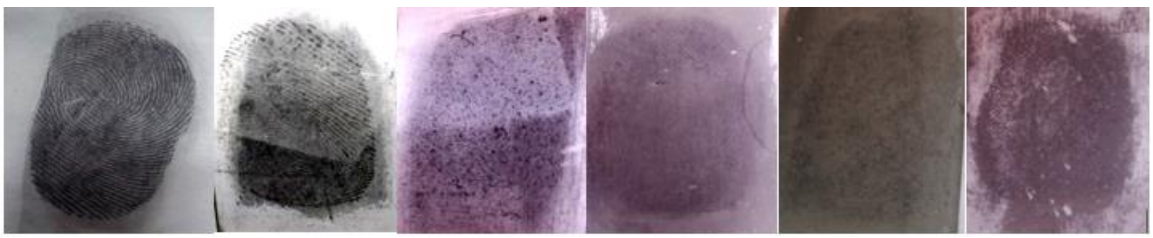
METHODLOGY

For fingerprint development 108 glass slides were used and it was kept inside Tub which was filled with Tap water. Randomly fingerprint deposited glass slide were taken out from Tub and then left it in vertical position to air dry for 2 hour then following technique were followed:-

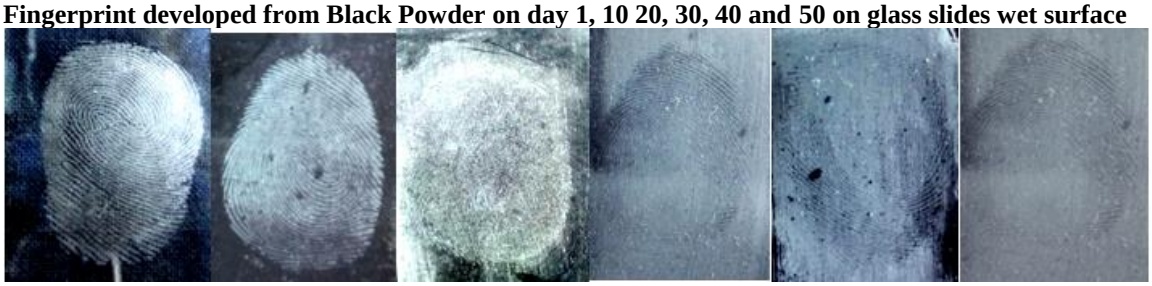
Black Powder Method: Black powder is one of the oldest carbon based powder with binder added for stability Madkour et al., 2017. It is a physical method of enhancement that relies on the mechanical adherence of fingerprint powder particles to the moisture and oily components of skin ridge deposits (Lee and Gaensslen, 2001). Dusting technique was used for fingerprint development.

Cyanoacrylate Fuming: Four to five drops of Cyanoacrylate Glue were taken in china dish. The glass surfaces were placed in the closed chamber. The electric plate was put on for 5 min for developing the latent prints. The procedure was repeated for every experiment under the same conditions, temperature and degree of humidity; Gloves were used during handling of objects in the whole previous steps except at time of donor fingerprint deposition to avoid unwanted prints Madkour *et al.*, 2017.

Fluorescent Powder: For visualizing fingerprint small amount of powder was dusted over it and carefully hair brush was applied over it to remove excess of fluorescent powder then it was treated with UV light, this process follow each time. The colorant found in fluorescent powder is treated dye which reacts with UV and purple/blue band visible in visible light spectrum. The glow come from powder crystal and 'fingerprint residue'—including protein, peptide, fatty acid and salt which leave a high quality fingerprint on the surface.



Fingerprint developed from Black Powder on day 1, 10 20, 30, 40 and 50 on glass slides wet surface



Fingerprint developed from Cyanoacrylate Glue on day 1, 10 20, 30, 40 and 50 on glass slides wet surface

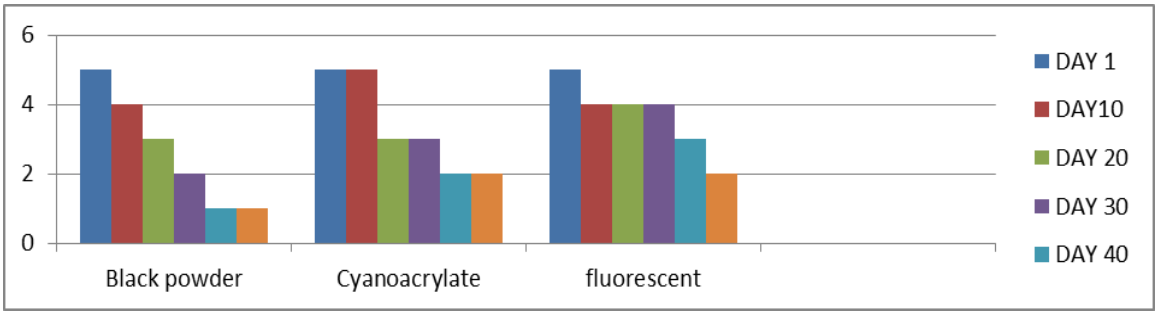
Fingerprint developed from Fluorescent Powder on day 1, 10 20, 30, 40 and 50 on glass slides wet

Result and Discussion

Fingerprint developed from black powder on day 1st and 10th were of excellent quality, very clear prints, identification assured, on day 20th reasonable quality ridge-details and some characteristics were visible, and identification was possible. Visibility was possible up to day 10 then it decrease with time. Fingerprint developed from Cyanoacrylate fuming method on day 1st and 10th excellent quality, very clear prints, identification assured, on day 20th and 30th reasonable quality, ridge-details and some characteristics visible. Fingerprint quality is good and visible up to day 30 after that few ridges visible and identification is decreases. Fluorescent powder give excellent quality result on day 1, very clear prints identification assured, on day 10th, 20th, 30th, Good quality prints , ridge-details and characteristics visible , probable identification, on day 40th , reasonable quality , ridge- details and some characteristics visible, identification possible. Quality of fingerprint was good and visible up to day 40, on day 50 few ridges were visualized.

Quality (grades) of developed fingerprints on glass slides from submerged water (Black powder, Cyanoacrylate fuming, and Fluorescent powder) at different interval of time (day1, 10,20,30,40 and day 50).

Immersion period (in days)	1	10	20	30	40	50
Black Powder method	5	4	3	2	1	1
Cyanoacrylate Fuming method	5	5	3	3	2	2
Fluorescent Powder method	5	4	4	4	3	2



For Forensic researcher, it have been always dare to developed latent print from submerged water because water have destructive effect on fingerprint and affect the evidential value of latent print. Consequently criminals have always intention to hide evidential value and destroyed evidence inside

water bodies so after long time finger print will get destroyed and they were not get caught. The Study revealed that; successful recovery of good and excellent quality of latent print is possible from different reagent in tap water in day 1 and 10 later it shows that different reagent have different grade and visualization, but best visualization of latent print is possible from Fluorescent followed by Cyanoacrylate then Black Powder. The result concluded that it is still possible to develop latent finger prints from non-porous substances like glass and plastics by using black powder and cyanoacrylate (Kallumpurat and Kudtarkar, 2018; Madkour et al., 2017; Trapecar, 2012).

Conclusion

108 submerged glass slide were examine result obtained from all the submerged latent fingerprint were developed by black powder, Cyanoacrylate Fuming Method and Fluorescent Powder method up to day 50 but visualization quality was different from each reagent and it was decreases with time. Fluorescent powder was best in all three reagents because it give good visualization up to day 40, followed by Cyanoacrylate Fuming then Black Powder.

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