The Use of Food-Based Powder to Develop Latent Fingerprints

Researcher: Anna Albraccio

Henry C. Lee College of Criminal Justice and Forensic Sciences,
University of New Haven, West Haven, CT

INTRODUCTION:

Latent fingerprint impressions were placed on three different surfaces where they were enhanced with fourteen different food-based powders. Each developed latent fingerprint was photographed and lifted using tape and a backing card. The captured images were imported into the FBI's Universal Latent Workshop to record the image quality, image clarity, and number of minutiae which was automatically and then manually calculated. Each of the images were then given an image quality map that differentiates the ridge flow of the fingerprint. Areas of the fingerprint were assigned colors to show the rating of how well the ridge flow was in the image. This image quality map for each fingerprint image was enhanced and put through photo enhancing software to calculate the percentage values of the ridge flows that can be used to compare to the standard black powder data.

MATERIALS:

POWDERS: SURFACES: CAPTURING METHODS:

1. **Spirulina- Wood Lament - Canon DSLR**
2. **Chlorella - Tile**
3. **Red Beet - Plexiglass**
4. **Blue Chai**
5. **Charcoal Coconut**
6. **Carrot**
7. **Dragon fruit**
8. **Purple Potato**
9. **Goldenberry**
10. **Turmeric**
11. **Chili Powder**
12. **Paprika**
13. **Curry**
14. **Standard Black**

METHODS:

Twelve individuals placed their fingerprints on three different surfaces fourteen times for each surface. Each surface was visualized with the fourteen different food-based powders, a fingerprint for each powder. The fingerprint was photographed by a DSLR Canon camera [1] and imported to the ULW where the image quality, image clarity, and number of minutiae were recorded [2]. The images were enhanced with an image clarity map which analyzes the ridge flow in the fingerprint and assigns a color to the area. These colors ranged from red (questionable ridge flow present) to a teal blue (ridge flow and minutiae endings are certain). It was then darkened in the ULW and exported to GIMP where the colors are brightened [3].

COMMERCIAL POWDERS ARE STILL THE BEST!

Fig.1
Developed Latent Impression

Fig 2. Marked Minutiae

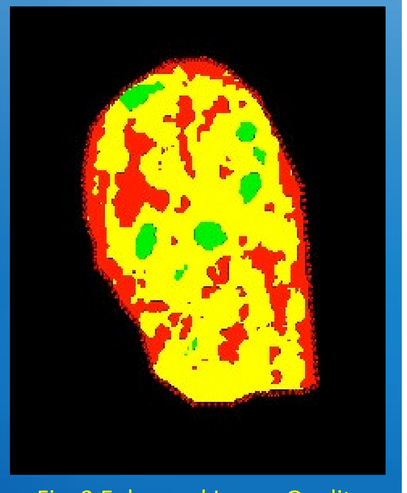

Fig. 3 Enhanced Image Quality Map

Take a picture to download the full paper

METHODS

The image is exported into Mathematica where a code generated a percentage of all the colors present in the image.
An ANOVA statistical test was utilized to compare each powder's color percentages to the standard black powder.

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Quality Score Standard	16	366	22.875	365.5833
Quality Score Charcoal	13	425	32.69231	700.2308

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	691.2739	1	691.2739	1.344066	0.256469	4.210008
Within Groups	13886.52	27	514.3155			
Total	14577.79	28				

RESULTS

Out of the fourteen powders tried, two were as effective as what is typically used. These were the charcoal coconut and spirulina. Statistically there was no significant difference when comparing latent quality, clarity score, minutiae, percentage of yellow IQM, percentage of green IQM, to the standard black powders and percentage of blue IQM. However, there was a statistical difference in the percentage of red IQM. This means that there was less red (questionable ridge flow) in the image quality map on the standard black powder compared to the charcoal and spirulina powders. While more work needs to be done on different substrates, and longer deposition times.

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
RQ%	13	845.5	65.03846	855.3609
RQ%	16	487.36	30.46	473.7015

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	8575.84	1	8575.84	13.33043	0.001105	4.210008
Within Groups	17369.85	27	643.3279			
Total	25945.69	28				

Acknowledgements

A big thank you to Peter Massey for his help and guidance as my mentor throughout the summer and to the SURF program for this opportunity!

University of New Haven
HENRY C. LEE COLLEGE OF CRIMINAL JUSTICE AND FORENSIC SCIENCES
Department of Forensic Science