

The Forensic Examination of Commercially Available Dried Blood Products

Matthew Noedel, Noedel Scientific, Puyallup, WA and
Amy Jagmin, Washington State Patrol Crime Laboratory, Seattle, WA

Abstract: A variety of organic and man-made products are marketed for gardening and pest control to the consumer. The use of dried blood as a rich source of nitrogen has been shown to be an excellent organic plant food and when mixed with other components may be a deterrent to animal infestation. Dried blood is a by-product recovered from animal rendering plants and is readily available and inexpensive. This research was conducted to characterize the properties and potential forensic implications that such products can possess.

Keywords: dried blood products, mole repellent, gopher repellent

Received: 05.07.2009
Accepted: 06.12.2009

Copyright: © 2009 Matthew Noedel and Amy Jagmin. Copyright for this article is retained by the authors, with publication rights granted to the Association for Crime Scene Reconstruction. This is an Open Access article distributed under the terms of the Creative Commons Attribution-Noncommercial-No Derivatives License (<http://creativecommons.org/licenses/by-nc-nd/3.0/>) which permits unrestricted noncommercial use, distribution, and reproduction, provided the original work is properly cited and not changed in any way.

Citation: Noedel, Matthew and Jagmin, Amy. "The Forensic Examination of Commercially Available Dried Blood Products." *Journal of the Association for Crime Scene Reconstruction*, Volume 15, Issue 2, Summer 2009: pages 23-28.

Introduction

Dried blood is marketed primarily as a slow release source of nitrogen for gardens. Nitrogen is an essential nutrient for all plants and assuring sufficient nitrogen is in the soil can dramatically assist in growing healthy plants or greening up a lawn. Typical concentrations for application are up to 4 pounds per 100 square feet of soil. Dried blood has also been shown to be a deterrent to varmint infestation by repelling moles, deer, or other pests from a garden.

Blood collected from cows, pigs, and chickens at animal processing plants is heated, sterilized, and dried. The United States Environmental Protection Agency (EPA) registered the use of dried blood (and mixtures that once included tobacco dust) as an animal repellent as early as 1958. Because the blood products are heated and flash dried at high temperatures (denatur-

ing the proteins), the EPA considers them safe from pathogens and therefore exercises limited restriction of their use.

The experiments conducted here were initiated to characterize if applications of dried blood could be detected in the context of processing a crime scene. The general properties of dried blood, the detection of dried blood using common field tests, and the potential for dried blood applications to mimic real crime scene observations were considered during the series of test presented. The persistence of dried blood to remain detectable in the field was also investigated.

Materials

- Espoma® Organic Traditions™ 100% dried blood
- Hoffman® 100% dried blood
- Uncle Ian's Mole and Gopher Repellent



- Phenolphthalin reagent
- Leuco Crystal Violet (LCV)
- Luminol (prepared from Bluestar® training kits)
- Known Blood
- 5% Acetic Acid

Three different sources of dried blood (see figure 1) were obtained: Espoma® “Organic Traditions™” brand 100% dried blood, Hoffman® 100% dried blood and Uncle Ian’s Mole, and Gopher Repellant (89% dried blood and 11% bone meal with dried chili powder). Phenolphthalin, Leuco Crystal Violet, and Luminol reagents were used for blood detection during the various exercises attempted.

Field Application and Testing

Because both Espoma and Hoffman were 100% dried blood, only the Espoma was applied in the field tests. Patches of lightly raked soil with little or no vegetation were leveled and a generous layer of Espoma dried blood was placed on the surface to cover an area approximately 18 inches square. Adjacent to the Espoma patch, a similar layer of the Uncle Ian product was also generously applied. These patches of applied product were covered with an arc of mesh screen to allow exposure to the weather while keeping out leaves, debris, or other unwanted materials (see figure 2). Periodically over approximately one year, the patches were tested with phenolphthalin to

Figure 1: Uncle Ian, Espoma, and Hoffman dried blood products.



Methods

Microscopic

A small, representative sample of each dried blood product was examined visually and microscopically at magnifications up to approximately 30x.

Solubility

Each product was introduced into water, ethanol, and 5% Acetic Acid (vinegar) at a ratio of approximately 0.1 g to 100 ml of reagent.

see if the blood could still be detected. Approximately one year later, the patches were sprayed with Luminol and the reaction recorded.

An additional examination involved “seeding” an area with dried blood, moistening the area with water and then walking through the blood onto white poster board. The poster board was then processed with LCV and the results recorded.



◀ Figure 2: Two patches of dried blood “planted”. A mesh screen was placed over the area to protect it from animals and debris.



Observations/Results

Microscopic assessment of the products revealed primarily the presence of irregular shaped granules of blood (see figure 3). Additional products observed included small particles of white material (consistent with

None of the tested blood products were freely soluble in water and they exhibited limited solubility in alcohol and 5% acetic acid (vinegar). This lack of solubility assists the dried blood in possessing a “slow release” property for the garden (see figure

Figure 3: Microscopic appearance: Uncle Ians with 11% chili powder (upper left); 100% dried blood with bone (upper right); feather in the product (lower left); single hair recovered (lower right).



Figure 4: Dried blood was tested for solubility. After three hours, the dried blood remained mostly insoluble in water.

bone fragments), hair, and feathers. The blood granules from the Uncle Ian product (containing 11% chili powder) could easily be separated and isolated from the chili powder granules by particle picking.

4). This also means that without mechanical removal, dried blood will remain in soil for a long time. This observation raised the question as to whether these products, when applied to the soil outdoors, would have the potential to transfer if one were to step through a patch of this material.

Direct testing of each of the three products gave a strong positive reaction with both phenolphthalin and LCV reagents (see figure 5). Despite the poor solubility in aqueous solutions, drops of the prepared solutions were applied to a white tile and allowed to dry. The perimeter of these test drops did reveal a faint skeletonized appearance that tested positive with phenolphthalein and LCV. Finally, patches of dried blood products slightly moistened with water were stepped through with the subsequent step continuing onto white poster board. The direct shoe print transfer was visible in bright light and blood transferred from the sole of the shoe reacted very



strongly with LCV to reveal potentially identifiable foot wear transfers in blood (see figure 6).

The seeded patches of Espoma and Uncle Ian dried blood were spot tested with phenolphthalein at 1 month, 6 months, and 1 year. Each time, the treated ground tested positive for blood and the applied area remained darker in color than the surrounding area. The weather conditions that these patches were exposed to included temperature ranges from approximately 10 degree Fahrenheit (F) up to approximately 90 degrees F and approximately 20+ inches of rain (over the course of a year). At the end of approximately one year, the patches were sprayed with Blustar® (Luminol) and reacted very strongly despite the continued exposure to the environment (see figure 7).

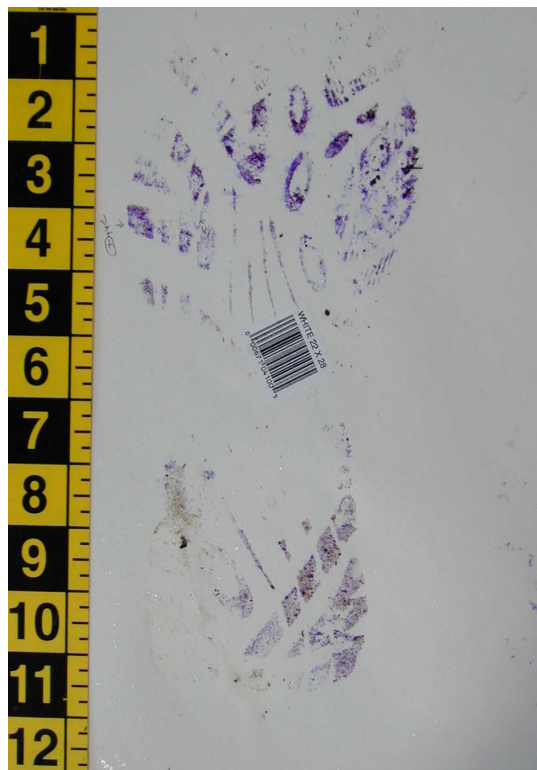
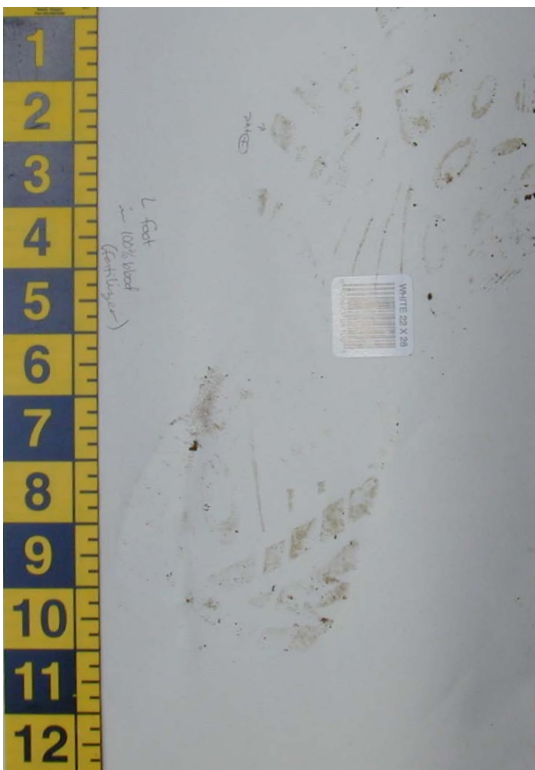


Conclusions

Dried blood products are readily available to any consumer who wishes to purchase them. With primary uses as a source of nitrogen for gardens or pest repellent, their application to a large outdoor lawn or garden is completely feasible. Because these products are easily detectable for at least a year after ap-

plication, one should be aware when processing a scene for the presence of blood that these products not only exist, but could be the source of a transfer. As these products are exclusively (hopefully) non-human sources of blood, the importance of follow up DNA examinations on evidence containing field tested positive blood is exemplified.

◀ Figure 5: Phenolphthalein tests were positive throughout every level of testing and during the entire year.



◀ Figure 6: After stepping into a “patch” of dried blood and onto a poster board sheet (left), a strong positive reaction with Leuco Crystal Violet was observed (right).



Figure 7: After one year, the planted areas were sprayed with Luminol and still gave a strong positive reaction.



References

1. United States Environmental Protection Agency (7508W); 738-F-91-102; "Pesticides And Environmental Protection Toxic Substances" September 1991. Accessed through: <http://www.epa.gov/oppsrrd1/REDs/factsheets/4030fact.pdf>