The Effect of Burning On Cadaver Decomposition and Insect Succession

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Abstract: Factors contributing to decomposing rates and insect succession include: wrapping, burying, or burning the corpse. The purpose of this study was to determine whether the burning of a body would alter where insects would colonize the body and whether it would delay decomposition. One test chicken was blackened and charred on both sides and was compared to a control chicken. The control chicken was found in a late stage of active decay, while the test chicken was found skeletonized. Little to no fly activity was observed on the day of collection, however one *Sarcophagidae* adult was found on the control chicken and three fly species (*Piophilidae* (2 & 3rd instar larvae), *Lucilia cuprina* (1 adult), *Ophyra* (1 adult)) were identified from the test chicken. Numerous beetles were found on both control and test chickens. On the control chicken, adult *Staphylinidae* (14), adult *Siliphidae* (1), and adult *Histeridae* (12) were found. On the test chicken, there were: adult *Staphylinidae (3)*, adult *Siliphidae* (7), and adult *Histeridae* (9). The burning of the test chicken caused it to decompose faster, affecting succession of insects on the bodies. This explains the abundance of beetles on the test subject as compared to the control.

Keywords: Succession, burning, Calliphoridae, Histeridae

Introduction

Insects and larvae collected from a corpse can be used to determine the post mortem interval (PMI), or the time since the body became available for colonization. This is important in determining time of death in forensically important investigations.

There are many factors that can affect decomposition rates and insect succession, including wrapping, burying, or burning of the corpse. Researchers examined the differences of decomposition and faunal succession of a partially burnt pig and a control pig (Chin *et al*, 2008). Results of this study found that there was no significant difference in the rates of decomposition or faunal succession between the treatment and control pigs. The only difference between the two carcasses was that more flies were observed on the control pig than the treatment pig. This study concluded that PMI could still be successfully calculated from insects on a burnt body.

In a second study (Gruenthal *et al* 2012), researchers obtained a total of 48 pigs (24 control and 24 charred). The limbs and heads of the pigs were charred to a level 1 on the Crow-Glassman scale. The torsos were charred to a level 2 on the same scale. The hypothesis of this experiment was that burning of a body would delay decomposition and alter where insects colonized in the body. Our null hypothesis was that burning the body of the chicken would not affect insect colonization or decomposition.

Materials & Methods

Two frozen chickens (one test, one control) were thawed on April 9th, 2013. The next day, on April 10th, 2013, the test chicken was burned on an outdoor grill using Kingsford Charcoal (Kingsford Products Co., Oakland, CA, USA) and Kingsford Lighter Fluid (Kingsford Products Co., Oakland, CA, USA). The chicken was allowed to blacken and char on both sides of the body; the dorsal and ventral. When burning was complete, the chicken was allowed to cool for ten minutes, bagged, and placed in a refrigerator. The following day, April 11th, 2013, both the test and control chickens were transported in a cooler to the TAMU Rangeland Science Facility behind Easterwood Airport in College Station, Texas. The chickens were placed on the ground in a shaded area (Fig.1).

Fig. 1 – treatment (right) and control (left) chickens before placement of exclusion cage.

They were, then, covered with a metal wire exclusion cage (TWP Inc., Berkeley, CA, USA) and left there for nine days until April 20th, 2013 (Fig.2).

On the ninth day, or April 20th starting at around 3:00pm (14:51 hours), adult fly samples were collected with a sweep net (EISCO Scientific LLC, Mahesh Nagar, Haryana, INDIA) and samples of beetles and larvae were collected with forceps (Walco, Utica, NY, USA) and a spoon (Walco, Utica, NY, USA), respectively. The larvae were preserved in 70% ethanol (Decon Labs Inc., King of Prussia, PA, USA), adult flies were kept in a kill-jar (Ball Corporation, Daleville, IN, USA) and beetle samples were bagged. All specimen collected were identified.

Fig. 2 – treatment (left) and control (right) chickens after placement of exclusion cage.

Results

At the time of collection, temperature was recorded to be about 70˚F (21.1°C) with a wind speed of 16.1mph, and 26% humidity,

Fig. 3 – treatment (right) and control (left) remains on the day of collection.

according to weather data collected from Easterwood Airport (Fig.4). The bodies were shaded throughout the collection process. In addition, methods were used to prevent scavenging in order to prevent outside stimulus from altering the experiment. The control chicken was in a late stage of active decay, while the test chicken was skeletonized. No maggot masses were found on or near the bodies, which is explained by the late stages of decomposition. However, pupae were found underneath the soil next to both the control and test chickens.

Discussion

There was little to no fly activity observed on the day of collection, although one *Sarcophagidae* adult was found on the control chicken and three fly species were identified from the test chicken: *Piophilidae* (2 & 3rd instar larvae), *Lucilia cuprina* (1 adult), *Ophyra* (1 adult). A large number of beetles were found on both the control and test chickens. These included 14 adult *Staphylinidae*, one adult *Siliphidae*, and 12 adult *Histeridae* on the control chicken. On the test chicken there were three adult *Staphylinidae,* seven adult *Siliphidae*, and nine adult *Histeridae* that were found. The *Siliphidae* samples were each taken from inside the bodies of their respective subjects.

The burning of the test chicken caused it to decompose faster, affecting succession of insects on the bodies. This explains the abundance of beetles on the test subject as compared to the control. The results indicate that burning of the chicken remains slightly sped up the decomposition process, which caused us to reject the null hypothesis. This slight change in decomposition rate did not significantly alter insect activity, since the same species were present on both the control and test subjects. Although both subjects being tested resulted in similar activity, they varied in different quantities.

The conclusion of this study was that there was no difference in the rate of decomposition between the control and burnt remains of the chickens being tested

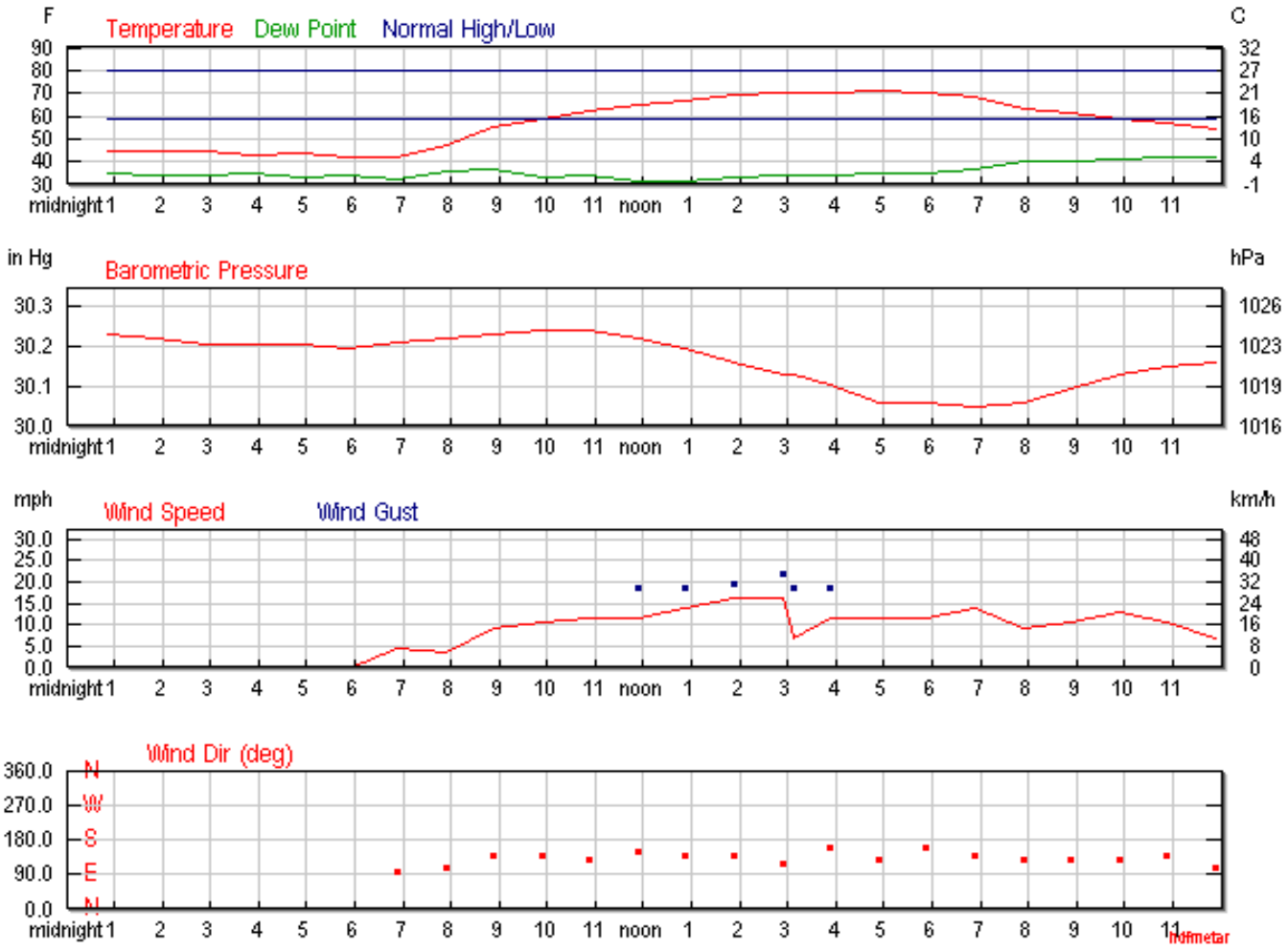

Fig. 4 – weather data for April 20th, 2013

References

Arnett, Jr., R.H., N. M. Downie and H.E. Jaques. 1980. "Adult Key to the Families of Beetles (Coleoptera) that are Most Commonly Represented in the Carrion Community." *How to Know the Beetles*, 2nd Ed. WCB/ McGraw- Hill: Boston.

Chin, H., M. Marwi, A. Salleh, J. Jeffery,
H. Kurahashi, and B. Omar. 2008. "Study of insect succession and rate of decomposition on a partially burned pig carcass in an oil palm plantation in Malaysia". Tropical Biomedicine 25 (3): p g 202-208.

Gruenthal, A., C. Moffatt, and T. Simmons. 2012. "Differential Decomposition Patterns in Charred Versus Un-Charred Remains". J Forensic Sci 57 (1): 12-18.

"History for College Station, TX."
***History*. N.p., n.d. Web. 1 May 2013.**
<http://www.wunderground.com/history/air port/KCLL/2013/4/20/DailyHistory.html?M R=1>.

Stojanovich, Chester J., Harry D. Pratt, Elwin E. Bennington. "Fly Larvae: Key to Some Species of Public Health Importance." p g 125-133.

Whitworth, Terry. 2006. "Keys to the Genera and Species of Blow Flies (Diptera: Calliphoridae) of America North of Mexico." *Proc. Entomol. Soc. Wash*. 108 (3): 689-72