

The Presence of Insects on Decomposing Material Covered in Scented Skin Products

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Abstract. Insects are a key component of the decomposition of organic material (Losey, 2006). Investigators will use the time of colonization of the insects to determine how long the human body has been exposed to the elements and the time between death and discovery of the corpse, or the postmortem interval (Amendt, 2011). The postmortem interval can be a crucial part of solving a case. However, scented products can change how and what insects are attracted to. This is because the products could encourage the insects to delay colonization on a body. If colonization is delayed, it becomes harder for investigators to determine an accurate postmortem interval. In order to conduct this experiment, chicken thighs were used as a model organism with various body scented products and a control to figure out if insects would be attracted or deterred. It was noticed that not all of the decomposing material was inhabited by the end of the fifth day.

Key words. *Maggot, Decomposition, Chicken, Spray*

Invertebrates are a major component of determining the time of death in decomposing material because not only do they increase the rate, but they are also used to figure out how long the body has been exposed to natural elements (Wallman, 2020). Insects will increase the rate of decomposition by eating or laying eggs in the decomposing material. They also bring other microbes and bacteria that increase the rate of decomposition (Vass, 2001). Seeing as how the absence of insects decreases the rate of decomposition, it can cause confusion amongst investigators as it is

more difficult to accurately determine the time of death.

Due to modern technology, there has been an increase in the manufacturing and accessibility of scented products. According to a study conducted, in an average population of 4435, 20.1% wear scented products (Steinemann, 2019). In an American population of 1137, 23.6% wear products, an Australian population size of 1098, 19.4% wear products, British population size of 1100, 13.7% wear products, and a Swedish population size of

1100, 23.5% wear scented products (Steinemann, 2019). Therefore, there is an increased chance that a body being dumped is wearing a scented skin product.

The purpose of this experiment was to determine how insects would interact with decomposing material that had certain scents on it. In order to conduct this experiment, a model organism, chicken, was used. While other organisms may not accurately model human decomposition rate (Dautartas, 2018), chicken has been proven to stimulate larvae development (Byrd, 2020). It was noticed that the decomposing material wasn't immediately colonized, and that only half of the trials were colonized by the end of the study

Materials and Methods

To conduct the study, six trials were run on the chicken thighs. One of these trials was the control, and the other five were done with the chicken coated in the chemicals being studied. Each chemical was applied by hand, completely coating the chicken thigh. New vinyl gloves (Equate, Bentonville, AR) were used for each application. The experimental groups were coated in one of the following chemicals: essential oils body spray (Axe, Mexico), aluminum free deodorant spray (Old Spice, Cincinnati, OH), fragrance spray (Bath and Body Works, New Albany, OH), SPF-50 Sunscreen spray (H-E-B, San Antonio, TX), or hydration body cream (Bath and Body Works, New Albany, OH).

Once coated, the chicken thighs were placed onto the ground and covered using small

storage baskets (Starplast, Houston, TX). The storage baskets were placed so that the chicken thighs were at the far end of each. To secure the small baskets, plant stakes (Gardener's Blue Ribbon, Vietnam) were placed on top. Three larger baskets (Target, Minneapolis, MN) were placed over the smaller baskets. They were arranged in a way that allowed for two smaller baskets to be underneath each larger one. To prevent animals from interfering with the experiment, two plant stakes were hooked into each handle of the larger baskets.

The experiment was monitored over the course of five days, and each basket was re-staked daily after monitoring. The types of insects present on each chicken thigh were recorded each day. The chicken was viewed from the top for days one through four, and then was flipped over and cut open on the final day.

Results

There was a presence of insects on the chicken thighs covered in body spray containing essential oils, aluminum free deodorant spray, and control specimen. The control had ants on the fourth and fifth day, and also had the presence of maggots on the fifth day. The essential oil spray and the aluminum free spray both had maggots on the final day, but no ants. The fragrance spray, body lotion, and sunscreen did not have insects on them.

	Control	Body Spray with Essential Oils	Aluminum Free Deodorant Spray	Fragrance Spray	SPF-50 Sunscreen Spray	Scented Body Lotion
Day 1	Absent	Absent	Absent	Absent	Absent	Absent
Day 2	Absent	Absent	Absent	Absent	Absent	Absent
Day 3	Absent	Absent	Absent	Absent	Absent	Absent
Day 4	Present	Absent	Absent	Absent	Absent	Absent
Day 5	Present	Present	Present	Absent	Absent	Absent

Table 1. Daily presence/absence of insects on chicken thighs coated in different scented products

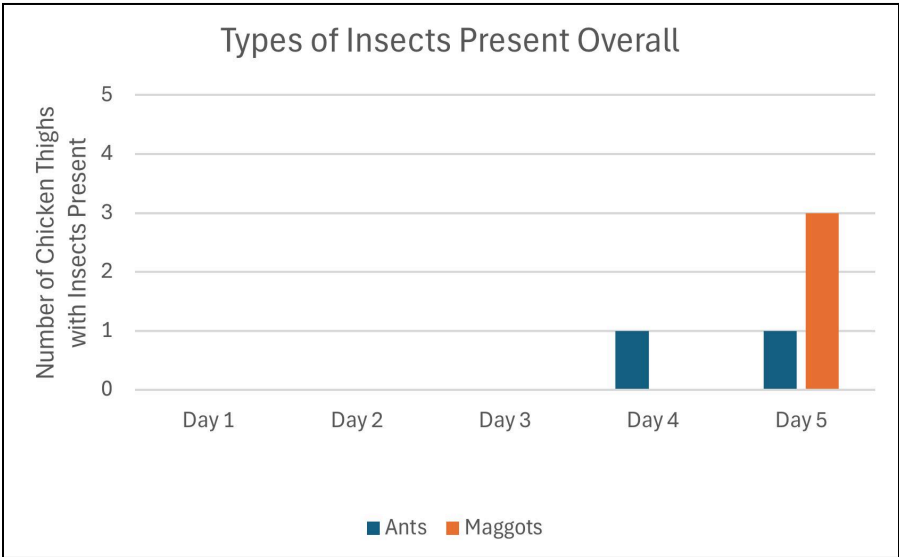


Figure 1. Types of insects present in the chicken thighs each day.

Discussion:

The first days of decomposition are crucial because it tells investigators how long a person has been dead for. From there, officers can use that information to identify the body if no other personal identification is available. The rate of decomposition can change depending on the temperature, weather, presence/absence of insects,

microorganisms, and other various contributing factors. A major insect that is attracted to decomposing material are members of the family Calliphoridae, commonly known as blow flies. These flies will appear in decomposing matter within minutes to eat and lay eggs which take about 1-2 days to hatch (Janaway, 1970). In addition to flies, ants are also a factor in

decomposition. Ants can significantly change the rate of decomposition as they are carrion feeders, and thus reduce the rate of decomposition if they show up at the beginning stages (Campobasso, 2009).

One of the possible explanations is that the floral scents used confused the decomposers. Insects are able to detect molecules in the air using the olfactory sensilla present in the antennae (Murlis, 1992). These sensilla, a structural unit composed of mechanoreceptors and chemoreceptors, pick up chemical signals from the environment such as smell and taste. This sensory information is used to direct insects towards a food source (Bell, 1990). Pollinators are attracted to floral scents to gather nectar, while decomposers such as blow flies are attracted to rotting tissues. If the floral scents used in this experiment brought pollinators to the chicken thighs, there wouldn't be any signs of the visit. This is because the pollinating insects would leave the chicken, as it is not a flower to gather nectar from. The floral scent could also prevent the attraction of insects that colonize flesh, as the chicken used did not smell like it was rotting.

The other explanation would be looking at the chemical breakdown of the substances. The body spray contains hydroxycitronellal and the lotion contains citronellol. Both of these chemicals are derivatives of citronella oil. Citronella is a well known biting insect repellent, specifically for mosquitoes (Sakulku, 2009). The citronella oil derivative molecules could have masked the scent of the decomposing material for the ants and blow flies. The same goes for

sunscreen. If the chemicals present in the body spray and lotion blocked the sensilla on an insect's antennae, then it is possible that chemicals in the sunscreen did as well. Therefore, it was more difficult for the insects to locate the chicken covered in these substances.

There was a decrease in the rate of colonization in the trials that had maggots as well. Considering the maggots were in the earliest stages of development, the body sprays containing essential oils and lacking aluminum may have masked the scents of the decomposing material for the first couple days. The maggots found were still very small and there were no pupae. It takes flies anywhere from 4-21 days to go through all 3 instars to pupate (Brundage, 2023). Therefore, it is likely that the maggots hatched a day or two after the Old Spice and Axe scent had dissipated a little bit. The ants were not observed until day four on the control chicken, but this is likely because it was by the Old Spice specimen which masked the scent of the decomposition from ants as well as the flies.

In conclusion, from the data collected, there is a visible difference in the rate of decomposition between the chicken specimens because of the presence or absence of insects. The chicken covered in sunscreen, fragrance spray, and lotion visually were less decomposed and did not smell nearly as strongly as the chicken thighs with the presence of insects. From this study, it was concluded that strongly scented skin products slow the rate of decomposition in chicken. To confirm that

these results can be projected onto humans,
more research is needed.

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