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Research Article
Assessing Scavenger Activity at Delmarva Broiler Farm Composters

[1]J.R. Moyle, [2]L.A. Brooks and [3]B.A. McCrea

[1]University of Maryland Extension, College Park, MD, Maryland
[2]Poultry Science Department, Auburn University, Auburn, AL, Maryland
[3]4-H Youth Development, Alabama Cooperative Extension System, Auburn, AL, Maryland

Abstract

Background and Objective: A major component of biosecurity on commercial broiler farms is limiting movement of individuals, animals, or other fomites between farms. Scavengers, particularly vultures and other animals, can travel back and forth between farms, carrying diseases and parasites with them as they search for food such as poultry mortalities. Of particular concern are the avian scavengers, Turkey Vultures (*Cathartes aura*) and Black Vultures (*Coragyps atratus*), because of their ability to travel long distances and visit multiple farms in a single day. As a result of farmer concern regarding increases in avian scavengers, this study was conducted to assess activity at commercial poultry operations. **Materials and Methods:** This was an observational study based on 318 days of viewing on four farms. Game cameras were placed on four commercial broiler farms pointed at the composters and farmer surveys were filled out on several other farms. **Results:** Based on 318 days' worth of data, Turkey Vultures were seen on 59% (n = 187) of the days and Black Vultures were seen on 14% (n = 44) of the days. On 28% (n = 89) of the camera days, the species of vulture could not be distinguished and for 21% (n = 66) of the days, no vultures were present at the broiler farm composter. The largest groups of vultures were seen in the morning and then again, less frequently, in the afternoon hours. **Conclusion:** Based on the farmer scouting results, the majority of the time (27.7% of instances), vultures were seen on the manure structure, which was often located near the composter. Other animals seen while using the game cameras included cats, eagles, hawks, dogs, raccoons and foxes.

Key words: Poultry, broiler, vulture, biosecurity, scavenger, composting, manure management

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Corresponding Author: J.R. Moyle, University of Maryland Extension, College Park, MD, Maryland

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Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

One of the by-products of commercial broiler producers is bird mortality. In many locations, commercial broiler producers use composting as the preferred method of disposing of mortalities because it is environmentally sound and low cost[1]. When done properly, the high temperatures that are achieved during the composting process kills pathogenic organisms and little odor is produced. The resulting compost can then be safely used on farms as fertilizer. However, if composting procedures are not followed, these facilities can generate strong odors which attract avian and mammalian scavengers.

Wild birds are vectors of disease which has been well-documented[2-4]. Scavengers, including avian scavengers, can remove carcasses from composters and can then spread them onto neighboring fields and farms. Even on some well managed farms where good composting is taking place, scavengers, particularly vultures, have been seen digging into compost piles (with temperatures up to 65°C) to remove birds for consumption.

Farmers on Delmarva (a region in the eastern United States composed of Delaware and the Eastern shores of Maryland and Virginia) have steadily noted an increase in the number of vultures seen in the region. During grower committee meetings, it appeared that certain farmers were having greater problems with vultures than others. Conversations with farmers also indicated that although initially tolerant of the vulture presence, they were having greater problems with vultures becoming bolder or even defiant in the presence of humans. Additionally, depending on where vultures were roosting, fecal material accumulations made maintaining clean equipment more of a challenge. Conversations with growers in addition to farm visits revealed the presence of dropped feathers in and around the composter, digging of holes by scavengers, partially eaten carcasses removed from the composter and deep holes seen in the compost piles.

Vultures consume carrion and have, on some farms, been repeatedly witnessed by farmers digging through the composting piles, pulling out broiler mortality and fighting over composter contents. Black Vulture (*Coragyps atratus*) and Turkey Vulture (*Cathartesaura*) are the two most common scavengers observed by farmers on Delmarva broiler farms. The number of Black Vultures have been on the rise on the east coast of the United States. These two species are protected under the Migratory Bird Treaty Act[5-7] (U. S. Fish and Wildlife Service, 2019) so farmers have limited options when dealing with them.

Our observational study objective was two-fold: (1) Using game cameras, determine the prevalence of vultures and other species, that visit composters on broiler farms. (2) Use farmer scouting data to determine the times of day that vultures are most often seen on the farm.

MATERIALS AND METHODS

Game cameras (Moultrie M880)[8] were placed on four farms. The cameras were mounted on 1.8 m posts facing the composters and/or the manure structure. Cameras were set to take a photo every 5 min during daylight hours and at night to take photos of anything that triggered the motion detection system. The photos were then reviewed to determine the average number of vultures seen on the farm for each hour. The presence of other animals was recorded as well to document species and number of scavengers visiting the farms.

Additionally, scouting sheets were created and given to farmers to fill out to help better understand where on the farm the vultures were visiting. The farmers were asked to fill the sheets out three times a week for approximately 9 months. These sheets contained information about when and where the scavengers were seen on the farms along with information about whether they were presenting problems at the mortality composter (Fig. 1). Once completed, the sheets were then mailed back to the university monthly using pre-paid envelopes. Statistical analysis was not performed on this observational study as per the two objectives of prevalence of species and time of day.

RESULTS AND DISCUSSION

Based on 318 days of viewing on the four farms, Turkey Vultures were seen more often (59% of days; n = 187) than Black Vultures (14% of days; n = 44). These results were similar for both game camera and farmer scouting report data. This data is in contrast with the increase in Black Vulture numbers in the US since the 1960's noted in Zimmerman *et al.*[9]. Our study was not designed to elucidate why one species appeared at composters and manure structures more than others, rather is an observation of which species do come to these structures on poultry farms. Additionally, 28% (n = 89 days) of the days, game cameras yielded unrecognizable vulture species, while 21% (n = 66) of the days yielded no vulture sightings. Vultures were seen in their largest numbers in the morning hours from sunrise to 9 am followed by the afternoon hours of 2-5 pm. Alternatively, a study using game cameras on a variety of poultry farms found that wild birds were found between the hours of 6 am and 6 pm[10].

Date__/__/____ Time_____am pm
Weather Conditions: Sunny Cloudy Rain Snow Windy
What is the current temperature outside?_____°F
How many of each type of vulture do you see at each area of your farm?

	Turkey vulture	Black Vulture	Unidentified
On roof of composter	_____	_____	_____
On the compost pile	_____	_____	_____
On roof of manure shed	_____	_____	_____
Inside the manure shed	_____	_____	_____
On feed tanks	_____	_____	_____
On broiler houses	_____	_____	_____
On the ground	_____	_____	_____
On tractors	_____	_____	_____
On other equipment	_____	_____	_____

Please list the types of other equipment on which the vultures were seen:
_____
_____

Are carcasses pulled out of the compost pile? Yes No
Are removed carcasses present in high traffic areas? Yes No
Can you see vulture droppings in/on equipment or housing? Yes No
Do you see any other birds or animals in or around the composter? Yes No
If yes, please list the types of birds or animals:
_____
_____
_____

Comments:
_____
_____
_____

Fig. 1: Example of a scouting sheet completed by the farmers

The comparison of averages from both Black and Turkey Vultures indicated that Turkey Vultures arrived more frequently. This may be due to their tendency toward being a more solitary vulture species. The olfactory capacity of the Turkey Vulture is superior to that of the Black Vulture[11] and its prevalence on game camera photographs indicates it is more likely to locate composters with mortality. Farmer scouts occasionally found it difficult to discern between the two vulture species and utilized the unidentified column on the scouting sheet despite being provided with vulture identification cards. Similarly, a study done in Britain used farmers surveys to indicate predation rates, albeit for foxes[12]. Our study focused on avian predators and foxes were only seen via game cameras at night.

During the various times of the day, it was more likely to see vultures, regardless of species, in the morning between the hours of 6-9 am (Fig. 2). At this time, the vultures were usually sunning on top of the manure structure roof in preparations to leave the roost for the day. It was also likely to see vultures in the afternoon between the hours of 2-5 pm. At this time, they were usually preparing to roost for the night.

The farmer scouting surveys indicated that vultures were most often seen atop the manure structure (27.7%). Participating farmers with game cameras also indicated that vultures were most often seen on top of manure structures. As these were most often located next to or were part of the composter structure, the vultures usually landed there prior to approaching the compost structure. The composter facility had the next highest rate of vulture activity and the birds were either inside the composter or on top of the composter.

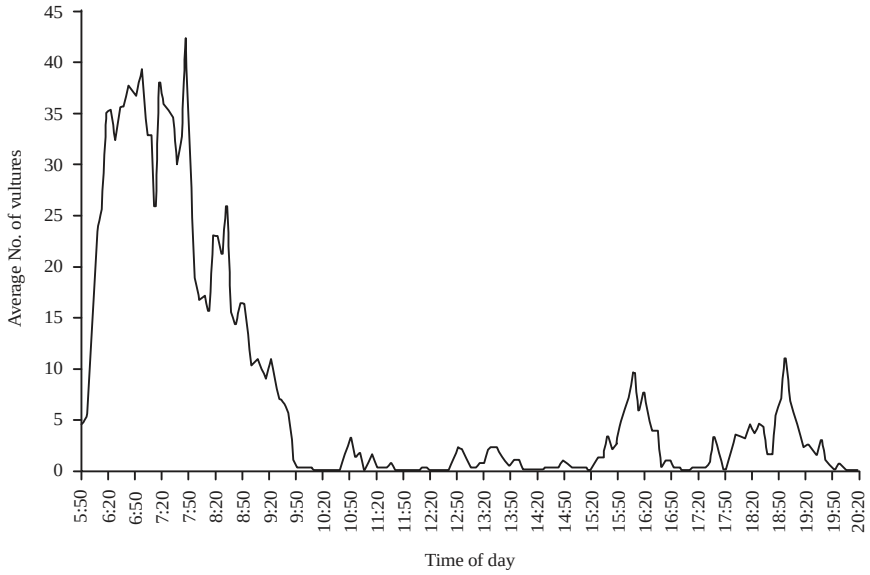

Fig. 2: Average number of vultures seen at different times of day in summer

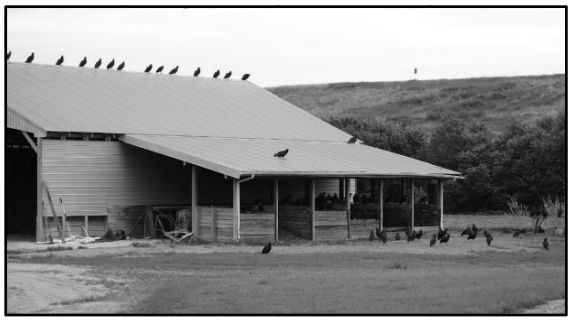

Photo 1: Photo of vultures on a poultry farm manure shed and composting structure

Photo 2: Photo of lids on composters used to exclude vultures and wildlife

The most common mammalian species to visit the compost pile were felines, all of which were identified as feral by the farmers. Almost 1/3 of the game camera days identified cats, whereas farmers noted only occasionally seeing cats on the farm. Other species identified included hawks, eagles, deer, raccoons, foxes and domestic dogs. The dogs captured on camera either belonged to the farmers themselves or farmers identified them as belonging to neighbors. The dogs were not disturbing the contents of the composters or manure buildings but, according to the farmers, the dogs occasionally chase off other animals that they heard, saw or smelled at the structures. It should be noted that the deer observed near the composters were browsing on forages or just passing by and not interacting with the composters.

Once the vultures started visiting composters, they continued to return even when composting problems were corrected. On one farm, vultures would dig as far as 0.4m into active composters that had temperatures of over 65°C to gain

Photo 3: Fox visiting farm manure shed at night, composter can be seen attached to the right side of the manure shed

access to the compositing birds. Additionally, farms located near landfills often had problems even when mortality was properly composted. Because of the continual return of the birds, wire lids (Photo 2) were constructed to cover the composters and prevent the scavengers from gaining access to the carcasses. Over time, these lids reduced the number of vultures that visited the farms.

Like raptors, wildlife (Photo 3) and cats are free to roam from farm to farm, potentially spreading disease, biologically and mechanically, as they move from one food source to the other. Mammals have the potential to carry organisms both mechanically and biologically from farm to farm.

There, as of yet, remains little data collected on the biosecurity risks from composting unit scavengers. Given the variability seen on individual farms, it stands to reason that more research will help to elucidate the risk associated with either avian or mammalian scavengers at composters or near manure sheds.

CONCLUSION AND APPLICATIONS

Turkey Vultures were seen more often than Black Vultures on commercial poultry farms. Vultures were seen in their largest numbers in the morning hours of sunrise to 9 am followed by the afternoon hours of 2-5 pm. Vultures were mostly observed around the manure structures and composters but were also seen roosting on feed bins. Controlling/preventing vultures and other scavengers from accessing farms is an important biosecurity protocol. In addition to proper composting, lids can be used to discourage scavengers on problem farms.

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