ALABAMA A&M AND AUBURN UNIVERSITIES

ALABAMA COOPERATIVE Extension SYSTEM

ANR-2083

Fly Control for Alabama Cattle Operations

Introduction

Recent estimates indicate that flies cost the beef cattle industry between 500 million and 1 billion dollars yearly. These costs, or losses in revenue, are associated with decreased milk production of brood cows, lowered gains in growing animals, lost grazing time due to cattle being bothered by fly feeding, losses of blood, and infection caused by fly-transmitted diseases. Fly-control programs can greatly improve cattle production and profitability, and such programs should be planned to control the fly species most commonly associated with decreased productivity on a particular farm, the biology of the offending flies, the seasonal association of those flies, the most efficient and cost-effective control methods, and the correct timing.

The most common fly-associated losses in Alabama cattle operations are due to horn flies and face flies. Filth flies, such as house and stable flies, and the water/woodland-associated flies, such as the large horse fly and the deer fly, though less prevalent are still linked with production losses in cattle and may play a major role in lowered cattle productivity on certain farms and in some locales.

The purpose of this publication is to help cattle producers, cooperative Extension agents, and veterinarians identify the types of flies causing production losses, understand the lifecycle of flies to most efficiently control them, and determine when and if to begin a fly-control program and then implement that program.

The flies covered in this bulletin are horn, face, house, stable, horse, and deer flies, all of which are insects of the order Diptera. They have only one pair of flight front wings and bristlelike antennae, and their hind wings are reduced to club-shaped organs. Flies undergo complex metamorphosis, with distinct egg, larval (maggot), pupal, and adult stages.

Figure 1. Adult horn fly (Credit to Kurt Schaefer)

Figure 2. Horn flies on cattle (Credit to Alan Walker)

Horn Fly

In Alabama, the horn fly *(Haematobia irritans)* is the most economically important external parasitic fly.

Identification: Adult horn flies resemble house flies but are half as large (about 5 millimeters long) and have blood-sucking mouthparts. The horn fly is charcoal gray in color, with two dark stripes on the thorax and some spots on the abdomen (Figure 1). Their sucking mouthparts have a long, piercing, bayonetlike proboscis used by both the male and female for blood feeding. Each fly feeds intermittently at a rate of 10 to 40 times per day for 10 to 25 minutes at a time. Cattle are the most common target, but occasionally, horn flies are found feeding on horses. An easy way to identify horn flies in the field is by their habit of clustering

around the cattle's horn bases or shoulders and back (Figure 2) and on the belly on hot days or during rain storms. The cattle's panniculus reflex (skin twitching on the back) causes an immediate dispersal and returning of flies.

Biology: The adult horn fly spends most of its life on the cow. Females leave only to lay their eggs around the edges of fresh, undisturbed cattle manure. This requirement of fresh manure leads to an interesting egg-laying behavior. After mating and feeding, the female moves to the rear of the animal and waits for the host animal to defecate. As excretion occurs, the female flies toward the ground and lays up to 500 reddish-brown-colored eggs. Yellowish larvae (maggots) hatch in a few hours and undergo three developmental (instars) stages before forming dull, reddish, 3- to 4-millimeter-long pupae in the manure pile or in dry soil around the fecal pile edges. Horn fly maggots develop best in grass-type manure from pasture cattle and poorly on manure from cattle on concentrated feed. Maggots mature in 10 to 14 days, and the entire lifecycle takes 2 to 4 weeks to complete, depending on weather conditions. Many Alabama cattle operations will have three or four generations of horn flies each summer. Horn flies overwinter in the pupal stage and emerge in the spring as adults.

Pest status: The horn fly is a blood-feeder that causes painful bites. Severe horn fly infestations result in less grazing time, depressed milk yield in brood cows, hide damage, and decreased potential weaning weight gains of nearly 12 percent. Growth rates of yearling stocker cattle may be decreased by as much as 15 to 16 percent. Horn flies may also serve as a carrier for the nematode parasite *Stephanofilaria stilesi*. Stephanofilariasis can cause a granular dermatitis on the abdomen, scrotum, prepuce, or udder. It is more common in the western portions of the United States, but can be seen occasionally in Alabama. Horn flies are more of a problem in the spring (April to June/early July) and the fall (late August to late October). Peak summer temperatures are associated with a drop in horn fly population.

Economic threshold: Horn flies are monitored by the number of flies on the head, back, and shoulders of at least 10 cattle. An average of more than 100 flies per side or 200 flies per animal is considered the treatment threshold, or the number above which control measures may be required. The generally agreed economic injury level is an average of 500 flies per animal because many experts estimate that fewer than this will not result in measurable economic loss. An exception to this recommendation would be for the use of fly tags, which should be placed when 50 flies per side are counted.

Management: Horn fly management should be designed to integrate programs that reduce the numbers of feeding adults and manure management (where possible) to minimize larval survival. Manure management is difficult in many Alabama cattle operations; nonetheless, excessive manure accumulation on pastures due to overstocking, poor pasture management, improper placement of feeders, and other poor management practices should be avoided. Most good management practices that emphasize forage production and internal parasite control, such as pasture rotation, will also help reduce manure accumulation. In most well-managed pastures, insects such as predatory wasps, mites, and dung beetles may help reduce horn fly populations by feeding on the fly larvae. The excessive and inappropriate application of some deworming agents and insecticides may compromise the effect of natural fly enemies.

Because the horn fly lives much of its life on the cow, insecticide use may be an effective tool in horn fly control. Young cows, replacement heifers, or other growing stock may experience decreases in growth or weight loss; therefore, young cattle may require closer observation and more treatment than nonproducing or fully grown cattle will. Insecticide methods effective for horn fly control include ear tags, residual livestock sprays, pour-ons, dust bags, back rubbers, oilers, or wipe-ons. Ear tags that have been impregnated with pyrethroids, abamectin, or organophospates may be useful in horn fly control. The insecticides are gradually released from the tag into the body oils of the cow. Cattle producers can improve ear tag effectiveness by 1) following manufacturers' recommendations (for example, using one tag in each ear when suggested); 2) applying the tags when approximately 50 flies per side of the cow are first observed; 3) removing and properly disposing of ear tags at the end of the fly season, and 4) rotating chemical classes yearly. Horn flies become resistant to pyrethroid (fenvalerate, permethrin, cyfluthrin, lambda-cyhalathrin, zeta-cypermethrin) much more quickly than they do to abamectin or organophosphates (diazanon,

fenthion, pirimiphosmetyl, diazanon+chloryrifos); thus, herd records detailing the type, manufacturer, time of application, and results from year to year help the producer make better decisions on future ear tag purchases. Note: Always wear protective gloves when applying and removing ear tags.

Residual fly sprays, pour-ons, and wipe-ons can be used to supplement other forms of fly control when more than 200 flies are estimated per side. Pyrethroids, organophosphates, spinosad, and avermectins are the most commonly used chemical classes. Accurate records should be kept and resistance, or lack of efficacy, noted so that the chemical class can be avoided in future treatments.

Self-treatment devices such as dustbags, oilers, face mops, and back rubbers can be very effective in some cattle operations. Placement sites for self-medicating devices are critical to their usefulness, as frequent contact is imperative. Installing these devices in alleyways, chutes, and entrance areas for trace-mineral dispensers and feed-supplement feeders will ensure contact with the animal's back or sides. Again, as with other forms of insecticides, keep detailed records in order to maximize the effectiveness and avoid overuse of insecticides where some resistance appears to already exist.

Walk-through fly traps may be very useful in reducing horn fly numbers. Cows enter one end of the trap, usually a 10-foot-long structure that is positioned on the entrance or exit of a feed or mineral source, similar to the placement of self-medicators. The cow's back and sides touch a series of canvas or carpetlike strips as the cow walks through the enclosed trap. As the cow moves, these strips dislodge the horn flies from the cow. Horn flies are attracted to light and will fly, upon being moved off the cow, toward the trap's perimeter sides, which are covered with a fly-proof screen. The cow walks out of the fly trap with fewer flies than when it entered. There are several designs used for trapping and disposing of the flies caught in the fly trap. A good description of a usable walk-through fly trap for horn fly control can be found at http://extension.missouri.edu/p/G1195.

Feed supplements: Products containing diflubenzuron and methoprene (insect-growth regulators) or tetrachlorvinphos (an organophosphate) are available to be mixed with feed or minerals to prevent development of immature stages of the fly in manure of treated cattle. These products have value, but they require feed bunks, are labor intensive, and their cost may be prohibitive for many cattle operations.

Biological control methods: On some farms, the use of environmentally friendly biological control methods, such as wasps that are parasitic to fly larvae, may be both useful and cost effective, particularly for cattle operations attempting to fill niche markets ("green" or organic beef). Parasitic wasps lay their eggs into the fly pupa, and the wasp larvae feed upon and kill the fly larvae in the feces. Release of the parasitoid wasps during the fly season can help reduce fly numbers. The cost of parasitoid wasps and the labor associated with their use preclude their incorporation into control programs on many traditional beef cattle operations in Alabama. Still, they remain a viable option for fly control.

Management of pyrethroid resistance: Horn flies in most cattle-raising areas have developed pyrethroid resistance, whether it be to a spray, dust, or ear tag treatment. If a herd is treated with a proper dosage of a pyrethroid but within days of its use more flies are observed than before the treatment, then pyrethroid resistance is likely. The following strategies are recommended to reduce or slow insecticide resistance.

- Do not begin treatment until flies exceed the threshold level except for on show cattle or other special animals that require intensive treatment.
- Separate mature cows from calves and calves treated to optimize weight gain. With cow-calf pairs, it is more effective to tag cows than calves.
- Use a 4-year tag rotation system to prolong the effectiveness of insecticide-impregnated ear tags. With this strategy, a different class of insecticide with a different mode of action is used each year.
- Use organophosphate insecticide periodically to achieve high levels of immediate control, followed by a period of no control.
- Apply treatment late in the season to reduce the number of flies that overwinter.
- Remove ear tags in the fall to eliminate the flies' exposure to low insecticide concentrations.

Figure 3. Adult face fly (Credit to Tiia Monto)

Face Fly

Identification: The adult face fly *(Musca autumnalis)* resembles the house fly. It is 7 to 8 millimeters long (twice the size of the horn fly) and is dull gray in color with four dark stripes on its thorax (Figure 3). The female has a patterned abdomen with yellow-orange sides. The fly has sponging mouthparts that secrete saliva onto food and sponge it back up again. This feature makes the face fly a disease-carrying insect.

Biology: The face fly is a "vomit drop feeder" and does not bite. Female flies light on animals for short periods of time during the day and mostly on the head around the eyes, mouth, and muzzle. Female flies feed mainly on the secretions from the eyes and nostrils and on blood and purulent discharges from wounds and fecal fluids. By contrast, male flies feed only on plant nectar and dung and spend much of their time resting on branches and fences and attempting to catch and copulate with females as they move about. Female flies lay eggs in fresh feces. The yellow-white, 10- to 12-millimeter-long larvae, or maggot, will hatch from the egg and undergo three stages of metamorphosis over a period of 1 to 2 weeks before forming a pupa in the soil around the cow fecal pile. The adult emerges from the pupae in 1 to 2 weeks, depending on weather conditions. The entire lifecycle usually takes less than 3 weeks during ideal weather conditions. In much of Alabama, face flies are capable of 7 to 12 generations per year. Face flies are usually seen from midspring to summer and possibly into early fall. The adults will overwinter in clusters in harborage areas such as empty spaces in walls, attics, and barns.

Pest status: Face flies do not significantly affect growth or milk production but can cause animals to graze less due to their annoyance. Perhaps the most significant problem associated with the face fly in Alabama cattle operations is that this fly serves as a vector for pinkeye and other diseases and can also damage the cornea, allowing for entry of the bacterium *Morexella bovis*. If only one eye is infected, a calf can expect to sustain 15 to 20 pounds, but those with both eyes affected may suffer a reduced gain of 30 to 65 pounds.

Management: Because the face fly moves from cow to cow and spends short periods of time on the animal, it is much more difficult to control than the horn fly. The naturally occurring predaceous arthropods and parasitic organisms that attack horn flies also attack face flies. Ear tags, dust bags, and insecticide sprays may prove useful on some farms. Ear tags containing organophosphates usually have moderate efficacy for face flies as compared to horn flies. Ear tags will usually not stay effective throughout the face fly season, which is slightly longer in Alabama than that of the horn fly. Insecticide spray can produce immediate relief for heavily infested cows, particularly when applied around the eyes, nose, and mouth, but this relief is usually short lived. Spreading fecal piles or removing fresh feces may aid in face fly control.

Stable and House Flies

The house fly *(Musca domestica)* and the stable fly *(Stomoxys calcitrans)* cause less production losses to most Alabama cattle operations, but can be a contribute to production losses on farms where abundant organic material is available for breeding sites.

Identification: The house fly (Figure 4) has sponging mouth parts and ingests only liquid food. It is dull gray, approximately 6 to 9 millimeters long, with four black stripes on the thorax, and a pale abdomen with yellowish sides and underside. The stable fly (Figure 5) is a blood-sucking filth fly with bayonetlike mouthparts for piercing skin. It is only 4 to 7 millimeters long, smaller than house and face flies, and has a checkerboard of dark and light spots on its dorsal abdomen.

Biology: Female house and stable flies lay eggs in wet, decaying organic materials where the larvae feed and develop after hatching. House flies use fresh to well-aged manure, in addition to other unsanitary organic media. Stable flies seldom lay eggs on manure until it

is 2 or 3 weeks old. Stable fly larvae also develop in compost piles, piles of grass clippings or weeds that are moist enough to begin fermenting, and urine-soaked straw or hay, such as manure or poultry litter, rotting vegetables, or other forms of organic waste. Round bales of hay are common winter sites for stable fly development. House fly larvae overwinter in or under livestock manure and can complete their lifecycle in 10 to 42 days, depending on weather conditions. Stable flies complete their lifecycle in 3 to 9 weeks.

The house fly is commonly found in hot summer months, and stable flies are usually seen from midspring until early fall. House flies rest on nearly any surface but tend to be more abundant high on walls, rafters, or strings (or sticky fly coils) or on light bulbs projecting or hanging from the ceiling. Stable flies rest mostly on surfaces within 3 feet of the ground and feed more frequently near structures that provide shade. Stable flies bite cows on the lower parts of their legs and ventral abdomen. At night, the inactive adult stable flies are found in areas that may be protected from the wind, such as in buildings or tall grass.

Figure 4. Adult house fly (Credit to Cladson Machado)

Figure 5. Adult stable fly (Credit to Fir0002)

Pest status: The house fly is a nonbiting nuisance fly that feeds on its host's eye secretions, nasal discharges, blood, and other fluid from wounds. The stable fly is a blood feeder and may feed throughout the day; however, its peak feeding activity is in early morning and late afternoon. In large numbers, stable flies can cause significant blood loss and skin irritation. Occasionally, flies may lay eggs on contaminated or very exudative wounds, resulting in myiasis, or fly strike. Both stable and house flies irritate cattle, causing them to graze less and therefore grow or produce at a less-than-optimal rate.

Adult house flies normally have a flight range of ½ to 2 miles but may fly up to 30 miles under certain windy conditions. The stable fly can travel 5 to 6 miles in a 48-hour period but is capable of traveling farther. Neither spend much of their time on animals but do spend some time at harborage sites; therefore, control programs should emphasize reducing breeding sites and effectively reducing harborage or resting places.

Management: Both house and stable flies appear to be more problematic for Alabama cattle producers on or near farms where other agricultural practices result in large amounts of fresh organic material used by the fly for breeding areas. Therefore, control at breeding sites is critical through proper waste management and sanitation. Waste and other organic materials should be buried or spread in a thin layer on open fields or aerobically composted. Eliminating the breeding habitats is the most effective method of fly control. Feeders should be designed and used to minimize waste accumulation and to quickly and easily remove all potential fly-breeding places.

Mowing or removing plants from harborage areas may also reduce fly activity, and placing devices such as ultraviolet light traps, pheromone traps, sticky fly paper, and insecticidal baits near barns, sheds, and poultry house entrances may also help reduce house and stable fly numbers.

Applying insecticides on cattle will provide only marginal long-term control of stable and house flies. However, as insecticides might be used for horn fly control, their use may produce immediate relief for animals heavily infested by stable and house flies. Sprays

Figure 6. Adult horse fly (Credit to Alves Gaspar)

Figure 7. Adult deer fly (Credit to Bruce Marlin)

are more effective for stable flies if applied to the cow's abdomen and legs. Permethrin resistance by the house fly and the stable fly has been documented. If insecticides are used, alternating synthetic pyrethroid with organophosphates will yield better long-term results.

Whenever house or stable flies are found to be a major contributor to reduced productivity in Alabama cattle operations, attention should be paid to identifying their breeding places, cleaning up and removing organic debris, and reducing the adult population by removing the larva's ability to grow.

Horse and Deer Flies

Identification: The horse fly *(Tabanus* spp., Figure 6) and the deer fly *(Chrysops* spp., Figure 7) are both part of a large group of flies referred to as tabanids. They are fairly large, aggressively biting flies. The adult horse fly is 10 to 30 millimeters long, while the deer fly adults are 6 to 10 millimeters long. Adult horse flies are stout-bodied and have prominent antennae, brightly patterned, large eyes, and a large head. The adult deer fly, although slightly smaller, has a similar body and is yellow to brown in color with patterned wings. They both have large mouthparts that consist of scissorlike jaws with a scalpellike structure that allows them to cut and tear cow skin and then drink the pool of blood. Only the females will bite, as the males feed on plant nectar.

Biology: Tabanids are attracted to dark, moving objects and will attack cattle, take a large blood meal, and then lay egg masses in specific locations. The female horse fly lays eggs on rocks or vegetation near water, such as a marsh, pond, or creekside. The deer fly lays eggs on organic material near moving water. Large, whitish, spindle-shaped larvae hatch from the eggs and grow in wet environments. The larvae are predacious, feeding on other insect larvae, snails, and other small creatures. Winter is spent as partially grown larvae that pupate and begin emerging as adults in spring. One generation per year occurs for most species.

Pest status: Horse flies typically bite cattle (and horses) on the body and legs, sometimes on the head. In contrast to horse flies, deer flies prefer to feed on moving hosts and usually bite on the head and shoulders. Only the tabanid female can be found on the horse, and then only when feeding. Unlike most blood feeders, horse fly females slash a deep and painful cut, then lap up the flowing blood with a spongelike mouth part. Flies interrupted while feeding may resume feeding on a different animal, a behavior that makes them efficient vectors of anaplasmosis in cattle and equine infectious anemia in horses. Both tabanids are a serious nuisance to livestock because they are persistent, painful biters, can cause significant blood loss in large numbers, and can transmit certain diseases. On farms or areas where their numbers are excessive, horse and deer flies can cause reduced weight gains, lowered milk production, less grazing time, and hide damage.

Management: It is difficult to control horse and deer flies. Both stay on the cow only long enough to take a blood meal and may not return for 3 or 4 days. Some of the residual sprays that are used to control the horn fly may have some effect, but insecticide spraying to target the horse or deer fly will not be very effective. Several traps, such as malaise traps baited with a

source of carbon dioxide (dry ice) and visual-attracting objects (such as a black plastic sheet or sphere) have been developed for horse and deer fly control but may be less effective for cattle than for horses. Eliminating breeding ground would be most effective; however, it is almost impossible in most Alabama cattle operations.

Summary

This bulletin provides cattle producers, Extension agents, and veterinarians with information about the identification, biology, and management strategies and tactics intending to help develop environmentally sound, cost-efficient, proactive, and effective management programs targeting the six common fly species. Correct identification of the pest species is always the first step before management program development. Understanding fly biology is essential in determining the optimal time and methods for the problem flies. Executing preventive practices is necessary before seeking pesticide use against fly pests. Selecting the most proper and effective pesticide products is critical for control result. Always read product labels carefully for target pest information and for precautions to avoid contaminating milk and meat and for safety.

References

Hewitt, CG. 1914. The house fly, *Muscae domestica* L: a study of its structure, development, bionomics and economy. General Books LLC.

Krafsue, ES and Moon, RD. 1997. Bionomics of the face fly, *Muscae autumnalis*. Annu. Rev. Entomol. 42: 503-523.

Moon, RD. 2002. Muscid flies (Muscidae). In: Mullen, G. and Durden L. (eds.) Medial and veterinary entomology. Academic Press. Pp: 279-301.

Broce AB, J Hogsette, S Paisley. 2005. Winter feeding sites of hay in round bales as a major developmental site of *Stomoxys calcitrans* (Diptera: Muscidae) in pastures in spring and summer. J Econ Entomol. 98:2307-2312.

Pitzer JB, PE Kaufman, JA Hogsette, CJ Geden, SH Tenbroek. 2011. Seasonal abundance of stable flies and filth fly pupal parasitoids (Hymenoptera: Pteromalidae) at Florida equine facilities. J Econ Entomol 104:1108-1115.

Hoelscher CE, CD Patrick, JV Robinson. Managing external parasites of Texas livestock and poultry. Texas Agricultural Extension Service: TAMU: B-1306

Meyer, JA, Mullens, BA, Cyr, TL and Stokes, C. 1990. Commercial and naturally occurring fly parasitoids (Hymenoptera: Pteromalidae) as biological control agents of stable flies and house flies (Diptera: Muscidae) on California dairies. Journal of Economic Entomology 83: 799-806.

Jones, CJ and Weinzierl, RA. 1997. Geographical and temporal variation in Pteromalid (Hymenoptera: Pteromalidae) parasitism of Stable Fly and House Fly (Diptera: Muscidae) pupae collected from Illinois cattle feedlots. Environmental Entomology 26: 421-432.

Acevedo GR, M Zapater, AC Toloza. 2009. Insecticide resistance of house fly, Muscae domestica (L) from Argentina. Parasitol. Res. 105:489-493.

Olafson PU, JB Pitzer, PE Kaufman. 2011. Identification of a mutation associated with permethrin resistance in the para-type sodium channel of the stable fly (Diptera: Muscidae. J Econ Entomol 104:250-257.

Whittier, WD. Summer Fly Control on Cattle. Va Coop Ext Service Publication. http://pubs.ext.vt.edu/news/livestock/2009/07/APS_07-10-09_03.html

Livestock Veterinary Entomology, Texas A&M Agrilife Extension http://livestockvetento.tamu.edu/

David G. Pugh, *Clinical Research Fellow,* Auburn University, and **Xing Ping Hu,** *Extension Specialist* and Professor, Entomology and Plant Pathology, Auburn University.

For more information, call your county Extension office. Look in your telephone directory under your county's name to find the number.

Use pesticides only according to the directions on the label. Follow all directions, precautions, and restrictions that are listed. Do not use pesticides on plants that are not listed on the label.

Published by the Alabama Cooperative Extension System (Alabama A&M University and Auburn University), an equal opportunity educator and employer.

New Nov 2013, ANR-2083

www.aces.edu

ALABAMA COOPERATIVE Extension SYSTEM

ANR-2083