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Dung Beetles – What Are They All About?

Dirk Philipp, Associate Professor – Forages

Dung beetles certainly don't invoke an immediate sense of appreciation, given the preferred habitat of this industrious insect of the order *Coleoptera*. However, there is some solid scientific evidence behind the benefits of having dung beetles on your pastures.

The main activity of dung beetles is to take on the fecal patties cattle leave behind. These patches decompose over time, releasing nutrients into the soil but also emitting ammonia, thereby reducing the amount of N added back to the pastures. Dung beetles are able to help decompose those patches much more quickly and distribute fecal material much more evenly.

> The main contribution of dung beetles is burying the dung into the ground and making nutrients available to plant roots.

The amount of feces put onto a pasture can indeed be large: during one day, a cow typically covers around 10 square feet with dung and urine. A pasture can be covered anywhere from 10 to 35 percent with patches, depending on stocking rate. Because the recycled nutrients are now concentrated on a small area, the forage below the patches doesn't take well the nutrient overload. Studies have shown that after 15 days, roughly 75 percent of plant tissue decomposed underneath the patches. The patches also affect grazing behavior. Cattle do not graze around the patches for some time, possibly due to smell and palatability. Although they return to graze around the fecal areas at a later time, forage growth there will not be as efficiently utilized as in between the patches. So, the challenge is how to get the cow patties incorporated into the soil as quickly as possible.

That's where the dung beetles come into play. Their main benefit is burying the dung into the ground, usually between 4 to 12 inches deep, and making the nutrients available to plant roots. As beneficial side effects, the burying and translocating of feces result in aeration of the soil and an increased water infiltration rate that helps keep rainwater on site and may reduce runoff from pastures. It has been estimated if patties remain unburied, N losses are substantial. Only 15 percent of the excreted N is then made available to plants in the mid-term, because the N will get lost through various pathways, including volatilization.

When it comes to phosphorus, the main mechanism of returning it to the soil is the physical breakdown of patches and less the leaching. Some researchers even suggested that when grazing pressure is high on patty-covered pastures, mineral imbalances could result from forced grazing of forage growth around these patties. The fly populations have also been shown to decline with increasing numbers of dung beetles. Horn flies and face flies lay their eggs in the patties, and the dung beetles compete with the larvae for food and sometimes physically damage them.

Keeping dung beetle populations high or even increasing them in a pasture ecosystem is not easy as they are sensitive to insecticides used to treat internal parasites and flies. If feasible, pesticides formulated in an ear tag are preferred and have minimal impact on dung beetles. Backrubber insecticides and sprays do not have large negative effects either on dung beetle populations. Animals can also be treated during the colder months of the year when beetle populations are low. If in doubt, producers can submit fecal samples to a veterinarian to determine if the observed symptoms are due to internal parasites.

Grazing management also affects dung beetles. If grazing is controlled over smaller areas, the number of patties will increase and should have a positive effect on the beetles by providing a food source without the need to roam further. To determine whether dung beetles make your pasture their home, check on the cow patties. Beetles move in literally within minutes during warm days once a fecal pat has been dropped. Look out for holes in the surface or open the patties with a spade to confirm the presence of these helpful insects.

Fall Planting Date Depends on Grazing Need

John Jennings, Professor – Extension Forages

It's been an odd year. Lots of rain produced lots of forage, but the haymaking season was terrible for most of the year. Much of the abundant forage grew past the optimum maturity stage before it could be harvested. Importing good quality hay is an option, but good quality forage can be grown and grazed this fall and winter to offset hay quality deficiencies. Winter annual pastures make great additions to a forage program. Winter annuals include cereal rye, wheat, triticale, oats, ryegrass and even forage brassica. Timing of planting is important to produce fall grazing. Here are some guidelines for planting winter annuals based on the anticipated period grazing need.

Initial Grazing Period: October/November

- Plant forage brassica in late August to the first week of September. Forage brassica include forage turnip, rape and several hybrids. Seeding rate is 5 pounds per acre or 3 pounds per acre when planted in mixtures with wheat or ryegrass. Light to moderate disking or herbicide suppression of the sod is needed for successful establishment of forage brassica. The seed is small, so don't plant too deep. Brassica can be planted after a summer silage crop (check herbicides used on silage crop for planting restrictions). Apply 50 to 60 pounds N per acre along with P and K by soil test. U of A tests show that forage brassica can produce 2,000 to 3,000 pounds of dry matter by late October and up to 5,000 pounds dry matter by December.
- Plant brassica/ryegrass mixtures. Forage brassica will produce excellent grazing in fall, and the ryegrass will produce excellent grazing in spring. Plant 2 to 3 pounds per acre brassica with 20 pounds per acre ryegrass. Apply 50 pounds N for the brassica at planting for fall grazing, and reapply 50 pounds N in late February for the spring ryegrass.
- Plant wheat or cereal rye the first of September on a tilled seedbed or no-till on a herbicide-suppressed sod. Seeding rate is 100 to 120 pounds per acre. Early planting can produce adequate grazing by early November. Apply 50 to 60 pounds N per acre along with P and K by soil test.

Initial Grazing Period: December

- Plant forage brassica as described earlier. Grazing of brassica can be delayed until December, but these forages must still be planted early – no later than September 15.
- Plant wheat or cereal rye by early October. Use the same planting and fertilizer rate as described earlier.
- Plant spring oats in late August to early September. Spring oats can produce up to 3,000 pounds of forage per acre when planted in early fall. Winter kill is likely, but the point is that a high yield of good quality forage can be produced for grazing or chopping before other winter annual forages are ready. Planting rate is 100 to 120 pounds per acre. A common variety of spring oats is "Jerry." Apply 50 to 70 pounds N per acre with P and K by soil test.

Initial Grazing Period: Late Spring to Winter

- Plant wheat or cereal rye mixed with annual ryegrass in late October to early November. The small grain can provide late winter grazing and the ryegrass persists better into spring providing excellent forage through April into early May. Plant the small grain at 100 pounds per acre and ryegrass at 20 to 25 pounds per acre. N fertilizer can be delayed until February.
- Plant ryegrass. Ryegrass planted alone produces much less fall and winter forage than small grains or brassica. But it is inexpensive, excellent quality spring forage. It is often planted with small grains or brassica to extend the spring grazing season. Planting rate is 20 to 25 pounds per acre. N fertilizer can be delayed until February.

Nitrogen is required for good fall/winter grazing. Spring fertilizer is often delayed until March, but that can be a mistake. March weather, like this past spring of 2015, is often too wet to allow field access for fertilizing. If fields are dry in late winter, select fields where early forage is needed and apply N during February to boost early spring growth and provide insurance against delayed field access during a wet March.

Stable Flies

Kelly M. Loftin, Extension Entomologist/Associate Professor

The stable fly, *Stomoxys calcitrans* (L.), is a nuisance and an economic pest in dairy operations. Studies have shown that stable flies can repress calf weight gains, yearling weight gains and milk production. This fly breeds in decaying organic matter, manure, spilled feed and wet hay or grass. The male and female both take blood and inflict painful bites to pets, livestock and humans. Stable flies are persistent feeders and continue to take a blood meal after being disturbed. Sunny outdoor areas are the preferred resting site for adult flies; however, they will enter structures such as dairy calf pens for breeding purposes. They also breed outside in decaying organic matter such as wasted hay mixed with urine and feces.

Typical outdoor stable fly breeding site. *(University of Missouri Extension Service)*

Stable flies usually feed on the lower regions of the body such as the lower half of cattle legs. Stable fly feeding is readily apparent by the stomping of animal's feet because of the painful bite being inflicted. Flies that do not move about on the animal, particularly on the legs, are very likely stable flies because they remain stationary when taking a blood meal.

Life Cycle and Identification

Adult stable flies are about the same size as the adult house fly, *Musca domestica* (L.) The stable fly proboscis (resembles a bayonet), which is used to take their blood meal, is very prominent and is a good characteristic to distinguish it

Adult stable fly, *Stomoxys calcitrans* (Linnaeus). *(Whitney Cranshaw, Colorado State University, Bugwood.org)*

from the housefly and other filth flies with spongelike mouth parts. The adult stable fly is gray in color with four dark stripes on the thorax and three dark spots on the abdomen creating a "checkerboard" pattern.

> The best method to reduce stable fly abundance is practicing good sanitation.

The adult female can lay eggs after taking several blood meals. The duration of the stable fly life cycle is temperature dependent; for example, in warm weather (75 to 85°F), the cycle from egg to adult can be completed in 13 to 18 days. At cooler temperatures, the stable fly can take several weeks to complete its life cycle. Stable flies overwinter as larvae and pupae in breeding material.

Control Methods

The best method to reduce stable fly abundance is practicing good sanitation. Good sanitation practices will reduce and/or eliminate habitat for larval development. Hay wastage that accumulates during the winter months often results in very high populations the following spring and summer. Removing manure, spilled feed and wet hay or straw at least once a week will help reduce stable fly breeding. Accumulated manure and wasted feed should be removed and/or spread thinly. Vegetation management in areas where manure, hay and dead organic matter accumulate will also help. Excess moisture around the barnyard should be reduced or eliminated. Without sanitation, other methods of fly control are much less effective.

Insecticides applied directly onto the animal are used to provide immediate relief for the animal. Animal insecticide treatments for stable flies are normally directed toward the lower regions of the body, primarily the legs. Stable fly abundance should be monitored by counting the number of stable flies present on the legs of each animal. Application of the animal sprays is necessary when stable flies reach an average of 10 flies per animal.

Another chemical method of stable fly control is applying residual sprays on surfaces where the flies rest, such as fences, walls and vegetation. These sprays can be effective for up to a week when temperatures are not too high or rainfall is limited. When using residual sprays, do not allow runoff to create a puddle beneath the application site and do not contaminate feed or water.

Area space sprays should be limited to areas where flies are congregating in abundance. Remember space sprays offer little residual activity, thus direct contact is necessary to kill the fly. Direct spraying of breeding sites should be minimized or avoided because of its damaging effect on beneficial natural enemies such as parasitic wasps, mites, ground beetles and earwigs.

Consult the Animal section of MP144, *2015 Insecticide Recommendations for Arkansas*, for a listing of insecticides labeled to control stable flies on dairy cattle and premises (http://www.uaex.edu/publications/mp-144.aspx).

Determining Feed Moisture for Accurate Mixing and Feeding

Shane Gadberry, Associate Professor

Knowing the accurate moisture content of high moisture ingredients is critical for ration formulation, making mixing adjustments and determining the right amount to feed. The microwave oven technique is one option for measuring moisture content of feed ingredients. To use the microwave technique, one needs:

1. Microwave oven.
2. Scales (must be able to weigh in grams for easy calculation, needs to be able to weigh in excess of 100 grams of fresh feed plus container, and a tare feature is a useful option).
   a. Scales don't have to be expensive. We've used a $20 scale from Harbor Freight; however, container weights will often need to be recorded with cheaper scales because they may not have a tare feature or, as with the Harbor Freight scale, it would auto shutoff during microwave drying cycles.
3. Microwave safe container (a plastic dish with deep sides will help with bulkier material).
4. Microwave safe glass filled ½ to ¾ full of water (many sequential drying cycles for wetter material can sometimes result in the water boiling out of the glass).
5. Oven mitts or welding gloves (if the glass and water need to be handled before cooling).

As far as the procedure, go ahead and weigh the empty container used for drying and record this weight just in case your scale shuts down during the process. Start with 100 grams of fresh material if the container size and initial moisture content of material permits. Using 100 grams will make the math simple. Place the glass of water and container with material in the microwave. Make sure the water and container are placed so that they can cycle without interference in the microwave. Wetter ingredients can be started with longer initial cook cycles than dryer ingredients. For high-moisture feedstuffs, run the first cycle on high for up to 3 minutes. Remove the container and weight at the end of the cycle and record the weight. For the second and third cycle, decrease the run time by 1 minute. For the remainder of the cycles, dry for 30-second intervals. Continue the drying and weight-recording process until the tare weight of the sample or weight of the sample plus container plateaus and no longer changes with further drying.

If you were able to start with 100 grams and take the container weight:

$$\text{Moisture \%} = 100 - \text{final dry weight}$$
AND
$$\text{Dry matter \%} = \text{final dry weight.}$$

If you were able to start with 100 grams but were not able to take the container weight:

$$\text{Moisture \%} = ((\text{combined container weight \& wet sample weight}) - (\text{combined container weight \& dry sample weight}))$$
AND
$$\text{Dry matter \%} = 100 - \text{\% moisture}$$

If you were unable to start with 100 grams or tare the drying container, use the following formula:

$$\text{Dry Matter \%} = \left(\frac{(\text{Final combined container and dry sample weight}) - \text{container weight}}{(\text{Initial combined container and wet sample weight}) - \text{container weight}}\right) \times 100$$

$$\text{Moisture \%} = 100 - \text{dry matter \%}$$

Failure to deduct container weight will result in erroneous estimates of moisture and dry matter.

In the event the sample begins to smoke, stop the heating cycle and discard the sample. Have water or a fire extinguisher available in case of fire.

As a final point, do not send oven dried samples to a laboratory for further chemical analysis. Samples submitted to the lab should be fresh samples, and always follow the handling and shipping recommendations of the lab for high moisture ingredients.