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**Dung-beetle friendly parasite control**

Dung beetles are the most famous of the coprophagous (dung-eating) insects; they have received much attention in the United States in the last five years. Dung beetles come in a few different flavors (dwellers, tunnelers, and tumblers) and sizes (0.1-2.5 inches). Dwellers live in manure pats but don't do much digging. Tunnelers bury relatively large balls of manure under the manure pat. Tumblers or rollers build a manure ball, roll it away from the manure pile, and then bury it. Significant burial and breakdown of manure are accomplished primarily by tunnelers and tumblers, collectively referred to as nesters. Dwelllers break the dung pats down in a few weeks; in contrast, tunnelers and tumblers can break down dung within hours or days. All dung beetles use the liquid portion of manure for their nourishment, but not all bury substantial amounts of dung. The larger species that are rollers are more abundant in sub-tropical climates with a prolonged warm season and relatively short periods of very cold soil in winter. Dung beetles do not do well in dry soils. However, irrigated pastures common in eastern Washington provide warm, wet conditions and high-moisture manure that is attractive to dung beetles.

Dung beetles provide more benefit than just reducing manure volume on pastures, even though this alone improves soil fertility, water infiltration rates, and water quality. The feeding activity of dung beetles damages the larvae of horn flies and face flies that live in the manure as well. They also have been reported to significantly reduce internal parasites of livestock the eggs of which are shed in feces and hatch into larvae to grow in the manure pat.

Dung beetles are very abundant in the southern states from California to North Carolina. While there are not large populations of dung-burying species in the Northwest, there are numerous dweller beetles present throughout the season. A survey of dung-associated beetles was conducted in seven counties of Washington State during the summers of 2006 to 2008, using pitfall traps, sticky traps, and aged dung samples (see picture below, left). Several dung beetle species were noted: seven dweller species (aphodiines) and one tunneler species (*Onthophagus nuchicornis*) (see picture below, right).

Having the spotlight on dung beetles reminds us to consider all non-target organisms when using animal health products and the potential for unintended negative effects of these chemicals. The larvae of dung beetles are sensitive to some insecticides used for controlling external and internal parasites of cattle. These products include endectocides, anthelmintics, and ectocides. There is debate over the extent to which these products have contributed to the decline in dung beetle populations in the last half century, but we know that larval survival may be affected for 1 to 3 weeks after application. Parasiticides administered as a bolus and intended to last for several months have predictably more harmful effects on dung beetle populations. Adults are typically not affected. Last month, research results were published indicating that methoprene (an insect growth regulator, the active ingredient in feed-through fly control supplements), used at the rate sufficient to kill horn flies, would likely not negatively impact *Onthophagus* beetle populations in North Carolina cattle pastures.

The toxic impact of insecticides passed in the dung on dung beetles depends on how these chemicals are metabolized in the animal's body. An animal's metabolism breaks down these compounds over time, some more than others (Table 1). For example, once consumed by cattle, roughly 40% of the total dose of methoprene in the feed-through supplement passes out in the feces unmetabolized. In contrast, fenbendazole breaks down in the animal's body to metabolites excreted in the feces and urine that are harmless to beetles.

**TABLE 1. Commonly used parasiticides/insecticides and the relative rates of degradation in animals.**

| **Extensively metabolized (less active ingredient excreted)** | **Moderately metabolized** |
|---|---|
| Fenbendazole, morantel, closantel, levamisole, diazinon, cypermethrin, deltamethrin | Ivermectin, pyrantel, netobimin, methoprene |

To enhance dung degradation which, in turn, improves fly control, nester dung beetles have been successfully introduced into regions of the southern states to augment the native populations. The irrigated pastures of eastern Washington should be suitable for colonization by nester species that are adapted to cooler climates. We would like to make dung beetle introductions in Washington State, using a species that would be able to survive the cold winters. If you have an interest in this project, please contact either Tip Hudson (509-962-7507) or Holly Ferguson (509-786-9233).

**Recommendations for preserving/conserving dung beetles**

1. Treat livestock strategically based on regular fecal float analyses of internal parasites.
2. Treat cattle during cooler months when insects are less active.
3. Rotate pastures often to minimize trampling of the manure pats.
4. For external parasites, consider backrubbers, eartags, and occasional dusts or sprays to minimize insecticide concentration in the manure.
5. Avoid using slow-release products like boluses.
6. Consider establishing a quarantine pasture to place your livestock in for a 1-2 week period after application of a wormer/parasiticide. This avoids spreading contaminated manure. Although dung

beetles are active flyers and will follow the animals, the negative impact should be minimal, as the eggs deposited during the quarantine period will only be a small portion of the total population.

**For more information:**

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