Pest and parasite project 2022 results

Key messages from the study:

- rotational grazing strategies reduced cattle parasitic worms,
- for pest fly control chemical treatments were the most effective followed by releasing 'fly predators' (parasitoid wasps) as biological control,
- some fly and worming chemical treatments reduced beneficial dung insects,
- beneficial dung insects helped to decrease pest flies and parasitic worms,
- management intensive rotational grazing improved some soil health indicators,
- tunneling dung beetles improved some soil health indicators.

Thank you for taking part in this study. If you have any questions or feedback please get in touch with Bryony Sands via email bosands@uvm.edu or phone 802-734-2196.

Internal parasites of cattle – gastrointestinal nematode worms

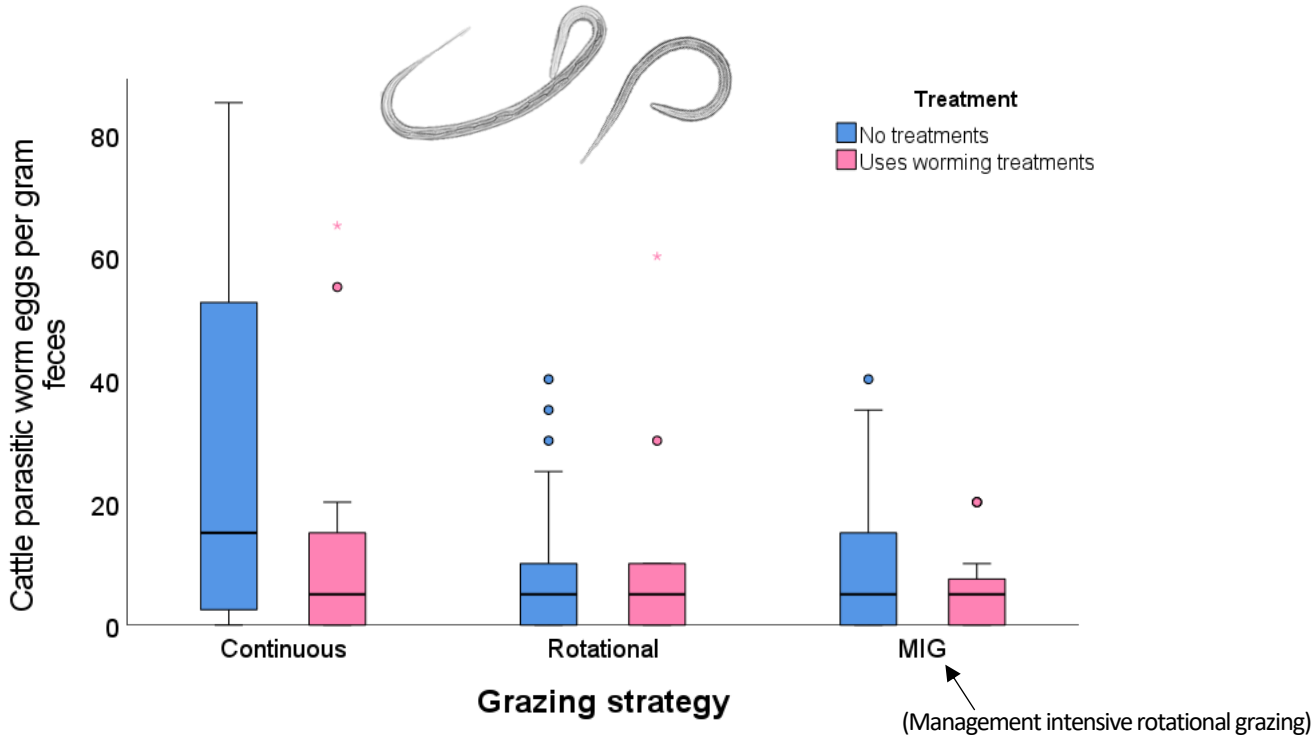

Fig. 1. The impact of grazing strategy and chemical worming treatments on gastrointestinal nematode parasites of cattle (includes heifers and milking cows).

- Rotational grazing strategies reduced internal parasites in cattle (worms and coccidia),
- continuously grazed cattle that did not receive any worming treatments were at higher risk of worms,
- heifers were more susceptible to internal parasites (worms and coccidia) than milking cows,

Pest flies

- We found face flies, horn flies, house flies, and blow flies breeding in cow pats,
- rotational grazing strategies did not reduce pest fly numbers (flies can easily travel and follow the herd).

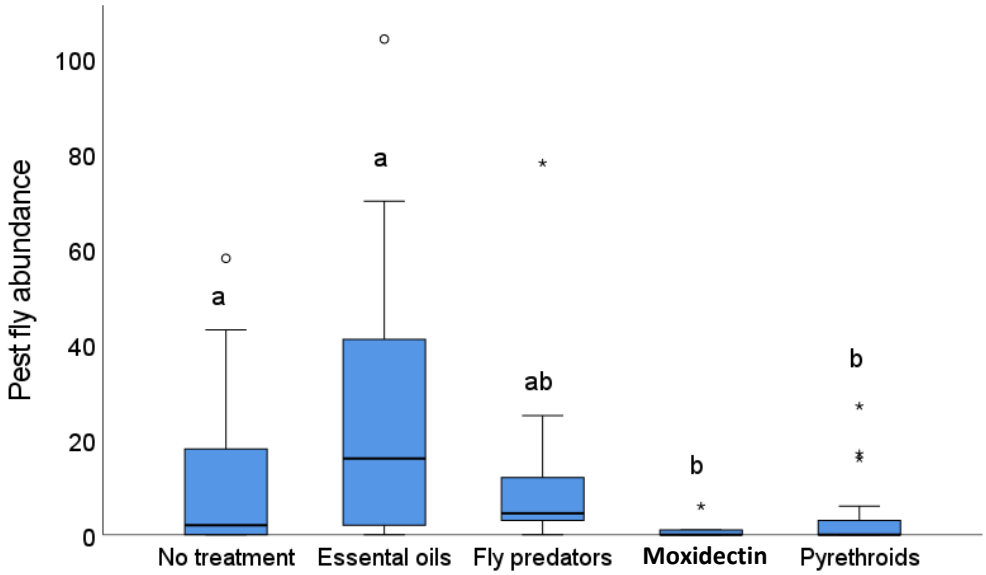

Fig. 2. The impact of different treatment strategies on pest fly abundances on pastures.

- Veterinary chemical treatments (moxidectin and pyrethroids) were most effective at controlling pest flies,
- farms who released 'fly predators' (parasitoid wasps) also had lower pest fly numbers.

Beneficial dung insects

- We found lots of beneficial dung insects on pastures including:
  - dung beetles (which decompose and recycle manure),
  - dung decomposing flies,
  - predatory flies and beetles (which eat other insects like pests and parasites in dung),
  - parasitoid wasps (which destroy pest flies by laying eggs in their pupae).

Dung beetle (*Aphodius pedellus*)

Dung beetle (*Onthophagus hecate*)

Dung beetle (*Geotrupes blackburnii*)

Predatory beetle (Staphylinidae)

Soldier fly *(Microchrysa polita)*

Scavenger fly (*Sepsis*)

Parasidoid wasp (or 'fly predator') (*Muscidifurax raptor*)

Predatory beetle (*Sphaeridium*)

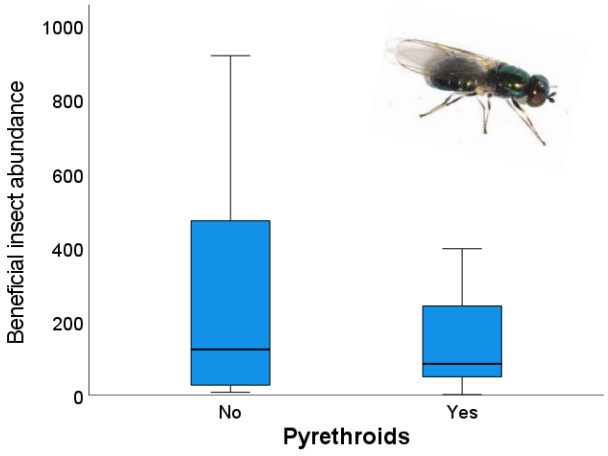

Fig. 3. Impact of pyrethroid use on beneficial insect abundance.

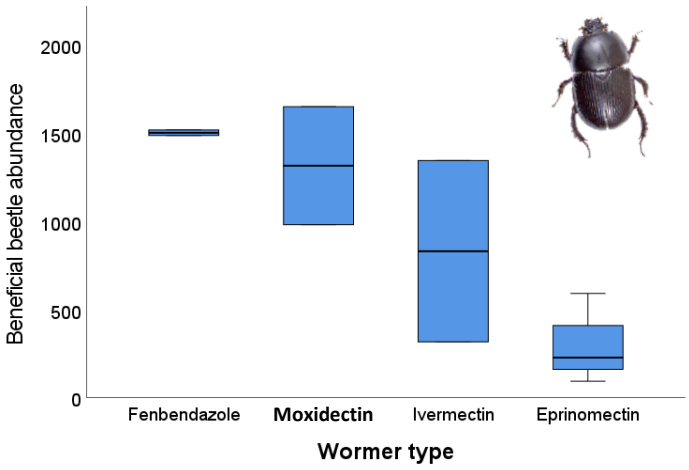

Fig. 4. Impact of worming treatments on beneficial insect abundance.

- Farms using pyrethroids had fewer beneficial dung insects (because the pesticides kill beneficial insects as well as pests),
- some chemical worming treatments (eprinomectin and ivermectin) had negative effects on beneficial insects, but others (moxidectin and fenbendazole) did not,
- on farms who were not using veterinary fly treatments, rotational grazing decreased some beneficial insect species compared to continuous grazing (probably because of manure availability),
- if farms were using chemical fly treatments, rotational grazing helped to reduce the negative impacts on beneficial insects.

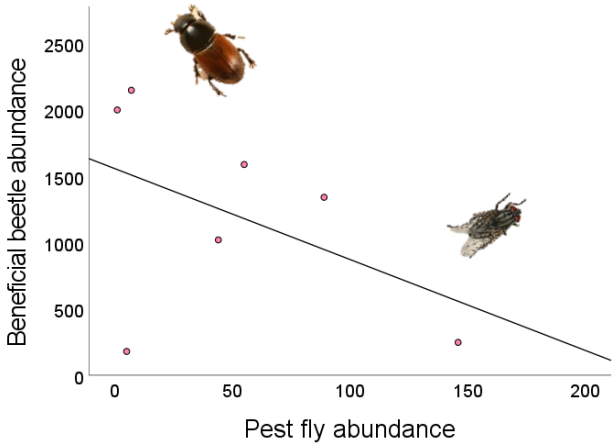

Fig. 5. Negative correlation between beneficial beetles and pest flies.

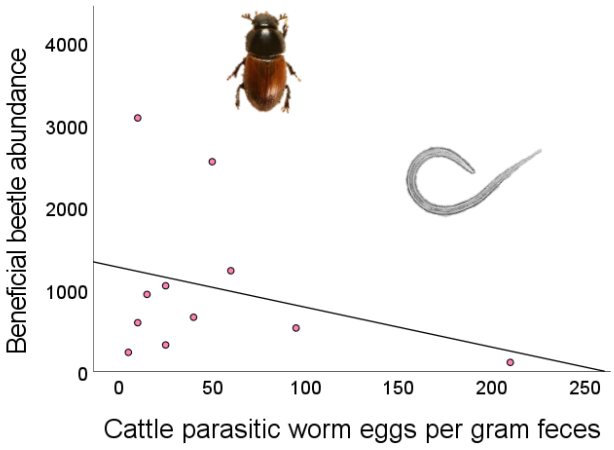

Fig. 6. Negative correlation between beneficial beetles and cattle parasitic worms.

- Finally, the more beneficial insects recorded on a farm the less pest flies and parasitic worms. Beneficial insects such as dung decomposing beetles and flies help to quickly remove dung from pastures which removes the breeding ground for pests and parasites, and predatory insects eat pest fly larvae.

Soil health scores

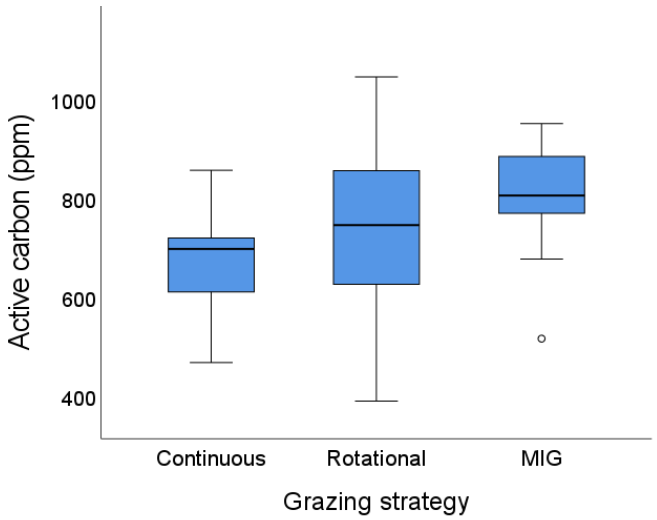

Fig. 7. Soil active carbon (ppm) for pastures managed under different grazing strategies.

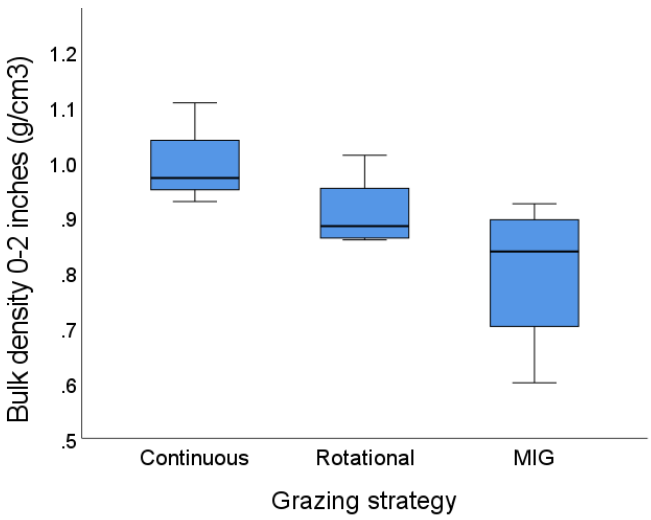

Fig. 8. Soil bulk density at 0-2 inches (g/cm3) for pastures managed under different grazing strategies.

- Many soil health indicators were not impacted by grazing strategy,
- active carbon (measure of newly added organic matter) in soil was higher on farms using management intensive rotational grazing (MIG),
- bulk density (measure of soil compaction) was lower on farms using MIG.

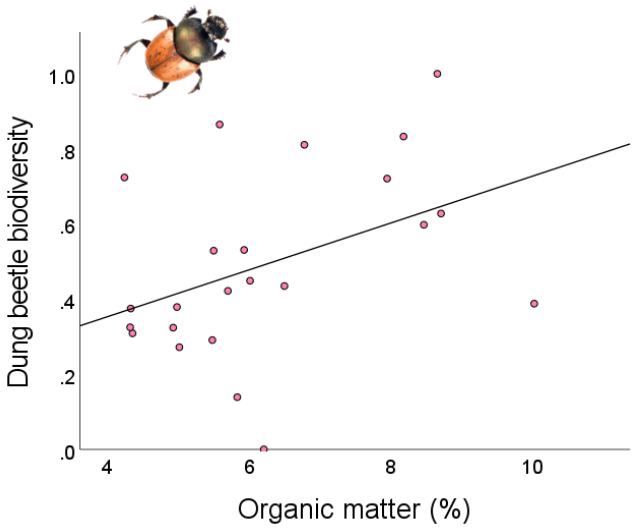

Fig. 9. Positive correlation between dung beetle biodiversity and soil organic matter (%).

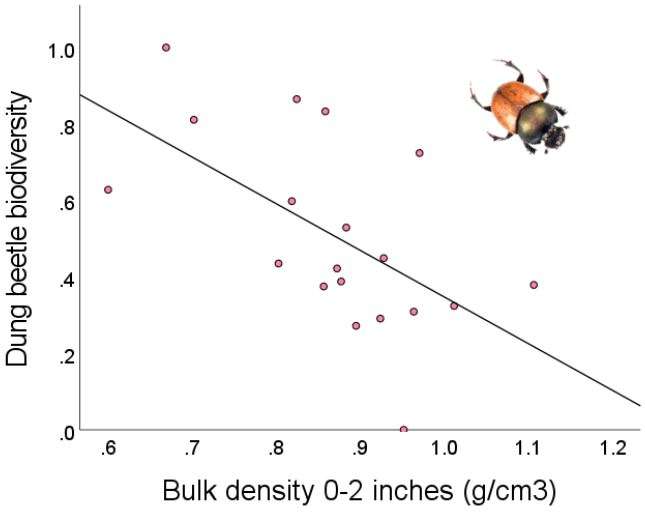

Fig. 10. Negative correlation between dung beetle biodiversity and bulk density at 0-2 inches (g/cm3).

- Dung beetle biodiversity, particularly the amount of tunneling dung beetles (which physically move dung down into underground tunnels), had a positive impact on soil health,
- these dung beetles were correlated with higher soil organic matter, carbon, nitrogen, phosphorus, and protein, as well as reduced bulk density (compaction),
- some other beneficial dung insects (e.g., beneficial flies) were correlated with lower soil health. This might be because they use up the dung on the surface of the pasture instead of bringing it down into the soil like the tunneling dung beetles do.