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Efficacy of Geraniol for the control of Horn Fly when Applied to Cattle using the Waterbury Backrubber.

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Site Locations: The primary research site will be the Center for Environmental Farming Systems (CEFS) located at the Cherry Research Farm in Goldsboro, NC, we have access to three pastures, each approximately 5 acres and supporting 6-10 dairy steers on a rotational grazing regime.

Introduction:

The horn fly is an obligate blood-sucking parasite of cattle and is considered the most important pest of pastured cattle in the US (Drummond 1988). Horn fly feeding habits cause cattle annoyance, alteration of grazing habits, and decrease both milk production and weight gains (Bruce 1964). Horn fly numbers as high as 10,000 per animal have been reported and they feed 10 to 12 times per day (Figure 1). Horn flies also have been incriminated in the transmission of bovine mastitis.



Figure 1. More than 10,000 horn flies feeding on a pastured cow in NC.

Economic Damage. Biting and nuisance flies adversely affect animal health and reduce farm profitability (Drummond 1988, Jones 2002). Sixty eight percent of respondents to a 1997 survey of Georgia beef producers selected horn flies on pastured cattle as causing economic losses exceeding \$3.9 million (Sheppard and Noblet 1997). Dairy farmers reported using insecticides two to three times per month to manage flies on pastured cattle. The economic threshold for horn fly is 200 flies per animal

Current Control Technologies and Practices. Pasture fly management in NC is largely accomplished using broad-spectrum pesticides applied as pour-ons, insecticide-impregnated ear tags, and feed throughs. Insecticide resistance is widespread resulting in poor performance. Self applying devices, like the backrubber continue to be an effective means of treating cattle on pastures and in feed yards.

Geraniol, also known as Palmarosa oil, is steam distilled from the flowers from *Cymbopogon martini stapf* var. Motia, a grass common to Nepal and India. This product has been submitted for registration with the Organic Materials Review Institute. We have tested geraniol mixed in soybean oil for its repellent/antifeedant activity to manage horn flies on calves. We evaluated two geraniol concentrations, 0.5 and 1.9 % mixed in soybean oil and applied to cattle (120cc/animal) as a pour on. Test material was applied to the cattle every 14 days for 4 weeks. Mean horn fly densities on the control group (433 ± 77.5) was significantly greater than the two treatment groups (0.5% = 42.1 ± 16.0 , 1.0% = 36.5 ± 10.4 , $F = 18.32$, $df = 2, 18$, $P \leq 0.0001$). Cattle were treated only after horn fly populations were established. Reductions in horn fly densities were most evident one day following treatment. As the geraniol repellency dissipated over the 14-day interval, emerging flies seeking new hosts gradually increased in number on the cattle until the next treatment. The new formulation of geraniol effectively repelled or killed flies in laboratory tests. We propose to field test the new formulation of geraniol administered to cattle using the Waterbury backrubber.

Methods:

This study will be conducted at the Center for Environmental Farming Systems using Holstein cattle. Cattle will be held on four separate pastures with at least 5 animals each.

Treatments

1. Untreated control
2. Geraniol mixed in mineral oil at 0.10% ai
3. Geraniol mixed in mineral oil at 0.25% ai
4. Geraniol mixed in mineral oil at 0.50% ai

Horn flies will be monitored on cattle by visual inspection from approximately 1 meter distance. Horn flies will be counted on both sides of the animals, the number recorded and means calculated. Count days, -1, 0, 3, 7, and weekly there after for 12 weeks. Treatments will be applied using the Waterbury backrubber. The device will be examined on each count date to assure its proper operation. The quantity of material in the reservoir will be measured using the dip stick method and the reservoir will be filled to capacity.

Budget: \$10,000

Temporary field worker to assist with the project. \$4000

Technician to oversee the field project. \$4000

Travel to the field site (150 miles round trip) \$2000.

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