SPICES AND BEEF CATTLE

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Beef Systems Specialist

INTRODUCTION

• Essential oils name derived from *Quinta essential*, of the fragrance (essence) of that plant
• EO considered safe for human and animal consumption and categorized as GRAS (FDA, 2004)
• Results of EO in livestock studies have been vary variable possibly because
  • Composition of EO can vary among different parts of the plant
  • Plant species changes EO composition
  • Age and environmental growing conditions of plant
**INTRODUCTION**

- Across all studies – there is not clear cut mode of action, gain or production effects observed
  - % composition of active oil ingredients are often not reported or analyzed
  - Within controlled in vitro studies – results WIDELY variable
    - Several studies show that rumen adaptation occurs and benefits of EO diminish within 6 days in several studies
- Most consistent results are that some EO can alter rumen VFA to more propionate and less acetate and an increase in butyrate
  - Want to say a similar mode of action as ionophore, but it is not

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**EO AND FEEDLOT**

<table>
<thead>
<tr>
<th>EO</th>
<th>Feeding amt</th>
<th>DOF</th>
<th>Location</th>
<th>Effects</th>
<th>Citation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carvacrol (oregano) – cinnamaldehyde (cinnamon) - eugenol (clove) – capsain (pepper plants)</td>
<td>75 g/d</td>
<td>112</td>
<td>Canada</td>
<td>No difference in any measures of performance as compared to control, addition of encapsulate NO3</td>
<td>Alemu et al. 2019. Animals. 9(21)</td>
</tr>
<tr>
<td>Encapsulated blend EO</td>
<td>150 mg/kg</td>
<td>208</td>
<td>Brazil</td>
<td>EO = Monension performance and carcass characteristics. Mon+EO tended to improve carcass-adjusted performance as compared to Mon. Tylan was successfully replaced with EO+Mon. increase performance without changes in liver abscess</td>
<td>Araujo et al. 2019. App. Anim. Sci. 35(2)</td>
</tr>
<tr>
<td>CRINA Ruminants (blended essential oils cresol, resorcinol, thymol, guaiacol, eugenol)</td>
<td>90 mg/kg</td>
<td>93</td>
<td>Brazil</td>
<td>EO=Mon for gains CP total digestibility increased EO as compared to Mon.</td>
<td>Meschiattti et al. 2019. J. Anim. Sci. 97(1)</td>
</tr>
<tr>
<td>Clove or cinnamon</td>
<td>3.5 or 7 g/d</td>
<td>187</td>
<td>Brazil</td>
<td>Clove or cinnamon EO increased ADG, DMI, and final BW with higher level having greater effect. No changes in carcass, digestibility of nutrients, temperament, or animal feeding behavior.</td>
<td>Ornaghi et al. 2017. Anim. Feed Sci. Tech. 234</td>
</tr>
<tr>
<td>Control Rosemary EO Protected blend eugenol+thymol+vanillin Clove+blend Clove+Rosemary+blend</td>
<td>4 g/hd/d 2 g/hd/d 2+2 1.33+1.33+1.33</td>
<td></td>
<td></td>
<td>ADG and feed efficiency: Tied for #1: Clove+blend and Clove+rosemary+blend Same as #1 and #2 : protected blend #2 : Control diet #3 : Rosemary No impacts on carcass measures</td>
<td>Souza et al., 2019. Livestock Sci. 220</td>
</tr>
</tbody>
</table>
SPICES AND GRAZING

• CinnaGar (Provimi North America Inc.) 1.6 g/kg of mineral (SPER) wheat pasture
• CinnaGar 2.4 g/kg mineral Sand Sagebrush rangeland
• 200 mg/d hand fed daily (NextEnhance, Novus International) oat-ryegrass or rye-ryegrass pastures.
• No difference in gain as compared to control for EO or monensin or the blend (cool-season annuals or on sand sagebrush rangeland) no difference in EO or monensin on wheat pasture (Beck et al., 2016)

SPICES AND INSECTS – POUR-ON

Fig. 7. Reduction of lice after various treatments.
Fig. 8. Repellent effect of various materials.
Khater et al., 2009. Vet. Parasite. 164(2/4)
**Spices and Intake - Insects**

- Garlic in dairy cows
  - Reduced ticks up to 11 days after ingestion
  - No effect on flies

- Other studies shown some effect on ticks

- Some effect on flies
  - Not been replicated

**K-State Projects**
2018 – TALL GRASS NATIVE RANGE

- 281 steers were assigned to 8 pastures at Bressner research pastures in Yates Center
- Calves were weighed on April 30 and August 1 (2018)
- 4 pastures were offered a free choice mineral that included 50% organic zinc, copper, magnesium, and manganese (CONTROL)
- 4 pastures were offered a free choice mineral that was the same base as control with addition of ThinkFly (ThinkAnimal™, DeSoto, KS; SPICE)
2018 – TALL GRASS NATIVE

• 266 steers were used in analysis
  • 9 were not captured at weigh date
  • 6 were removed because they were in wrong pasture at one point in the study
• Weekly 33% of calves in the pasture were photographed between 8 am and 10 am
  • Photos were used to count the number of flies

2018 RESULTS

<table>
<thead>
<tr>
<th>ADG, lb/d</th>
<th>CONTROL</th>
<th>SPICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.56</td>
<td></td>
<td>2.8</td>
</tr>
</tbody>
</table>

P = 0.001
**ECONOMIC FEASIBILITY**

- ThinkFly added $800/ton to mineral cost
  - $0.10 per head per day more for the ThinkFly on top of $0.10/hd per day base mineral (essentially double cost of other stocker mineral)
- Resulted in 21 pounds more per calf
- $112 average price in August
- $23.52 increased revenue per calf
- Extra cost of ThinkFly = $9 per calf for 90 days
- Difference in cost was $14.52 per calf added revenue above control mineral
Figure 5: Average number of flies on one side of steer, by week and mineral treatment

Treatment: \( P = 0.78 \)
Con: 162 flies vs SPICE: 142 flies

* Indicates treatment different in that week with \( P < 0.05 \). Control treatment was typical stocker mineral provided free-choice to cattle. Spice treatment was the same mineral that had the addition of spices (ThinkFly™).

Figure 6: Average number of flies based on hair coat color

Hair coat color was based on the main body color. Hair coat had a significant effect on the number of flies \( (P < 0.001) \) where black had more than red and white hair coats were in the middle.
SPICE AND BURN 2019-2021

• Same 8 pastures as previous study with 281 head randomly assigned to pastures

• 2 x 2 factorial design to be replicated 4 years
  • Burn – March and April
  • Mineral – Control or Spice

SPICE AND BURN

• Free choice mineral with 25% chelated magnesium, copper, zinc, and managenese formulated for 4 oz/hd/d intake (CONTROL)

• Free choice mineral with 25% chelated for 4 oz/hd/d intake with addition of 3 pounds per ton of garlic oil product and 18 pounds per ton of Solus® (blend of 4 proprietary spices; SPICE)
<table>
<thead>
<tr>
<th>Pasture 1</th>
<th>Treatment 3</th>
<th>March burn</th>
<th>Spice mineral</th>
<th>Pasture 2</th>
<th>Treatment 2</th>
<th>March burn</th>
<th>Control mineral</th>
<th>Pasture 3</th>
<th>Treatment 3</th>
<th>March burn</th>
<th>Spice mineral</th>
<th>Pasture 4</th>
<th>Treatment 2</th>
<th>March burn</th>
<th>Control mineral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pasture 5</td>
<td>Treatment 1</td>
<td>April burn</td>
<td>Control mineral</td>
<td>Pasture 6</td>
<td>Treatment 4</td>
<td>April burn</td>
<td>Spice mineral</td>
<td>Pasture 7</td>
<td>Treatment 1</td>
<td>April burn</td>
<td>Control mineral</td>
<td>Pasture 8</td>
<td>Treatment 4</td>
<td>April burn</td>
<td>Spice mineral</td>
</tr>
</tbody>
</table>

**ADG all years Burn x Mineral**

![Graph showing ADG (lb/d) for different treatments and years](image)

- **P = 0.68**
- **P < 0.001**
- **P = 0.61**
ADG ALL YEARS BURN DATE

ADG ALL YEARS MINERAL
**FLY NUMBERS - 2019**

Burn x week: \( P = 0.04 \)

- March
- April

Week x mineral: \( P = 0.07 \)

**FLY COUNTS - 2019**

Treatment: \( P = 0.16 \)

Week x mineral: \( P = 0.07 \)
FLIES - 2020

Week x burn x mineral : $P < 0.001$

FLIES - 2021

Week on mineral

Average # of flies
**Talk about money**

- Spice added $200 per ton to mineral mix
  - Intake was 20% higher than formulated
  - Daily cost of mineral was $0.105/hd/d
  - Cost for 90 days was $9.45/hd

- Control mineral costs
  - Intake was 20% higher than formulated
  - Daily cost was $0.075/hd/d
  - Cost for 90 days was $6.75

- Spice cattle
  - 20.5 pounds more gain off of grass
  - At $135.87 cwt sold for $27.85 more per head
  - Cost $2.70 more for spice mineral
  - Netted $25.15 more
BROME AND SPICE STUDY

• 8 pastures of bromegrass at the Parsons station used the same minerals as Bressner pasture but hand-fed through daily DDG supplement (0.5% of BW on DM basis)
  • 4/9/2019 to October
• Weights every 28 days
• Counted ticks weekly for 10 weeks
• Weekly fly photos

BROME AND SPICE GAINS

\[ P = 0.04; \quad \text{SEM}=10.7 \]

\[ P = 0.04; \quad \text{SEM}=0.05 \]
### Tick counts

<table>
<thead>
<tr>
<th>Week</th>
<th># head w/ticks</th>
<th>Total # ticks</th>
<th># Ticks engorged</th>
<th># of ticks/heifer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Con Spice</td>
<td>Con Spice</td>
<td>Con Spice</td>
<td>Con Spice</td>
</tr>
<tr>
<td>1</td>
<td>2 2</td>
<td>2 2</td>
<td>0 1</td>
<td>1.00 1.00</td>
</tr>
<tr>
<td>2</td>
<td>2 6</td>
<td>3 11</td>
<td>0 0</td>
<td>1.50 1.83</td>
</tr>
<tr>
<td>3</td>
<td>2 7</td>
<td>2 10</td>
<td>0 0</td>
<td>1.00 1.43</td>
</tr>
<tr>
<td>4</td>
<td>7 8</td>
<td>20 32</td>
<td>9 4</td>
<td>2.86 4.00</td>
</tr>
<tr>
<td>5</td>
<td>7 7</td>
<td>12 9</td>
<td>2 1</td>
<td>1.71 1.29</td>
</tr>
<tr>
<td>6</td>
<td>5 7</td>
<td>8 8</td>
<td>3 1</td>
<td>1.60 1.14</td>
</tr>
<tr>
<td>8</td>
<td>4 1</td>
<td>9 1</td>
<td>0 0</td>
<td>2.25 1.00</td>
</tr>
<tr>
<td>10</td>
<td>3 0</td>
<td>8 0</td>
<td>0 0</td>
<td>2.67 0.00</td>
</tr>
<tr>
<td>Totals</td>
<td>32 38</td>
<td>64 73</td>
<td>14 7</td>
<td>2.00 1.92</td>
</tr>
</tbody>
</table>
FLIES BY WEEK
SUMMARY

• Spice on brome and heifers resulted in 0.15 lb/d improvement in ADG
  • 33 more pounds of heifer over grazing period (198 days)
• Spice did not appear to work on total tick numbers until after consuming for a month
• Number of engorged ticks were lower with Spice mineral
• Variable response to spice for fly repellency

SUMMARY

• Essential oils/spices in mineral
  • Overall on grass increased gain
• Ingestion of essential oils/spices does not consistently reduce fly populations on cattle
• Spices show promise for tick control
QUESTIONS?

A.  

B.  

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