In vivo efficacy of chicory silage against parasitic nematodes in cattle

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Gastrointestinal nematodes (GIN) of cattle

• Several species:
  Ostertagia ostertagi
  Cooperia oncophora

• Pasture-borne infections

• No multiplication in the host = infection level depends on number of ingested infective larvae (L3)

• Significant impact on animal health, welfare and productivity
Extensive use of anthelmintics to control GIN

Anthelmintic resistance in GIN of cattle

Wish to reduce reliance on anthelmintics e.g. Organic farming, low-input systems

Need for integrated parasite control methods:

- Grazing management
- Vaccines
- Breeding programs (selection of resistant animals)
- **Bioactive forages**
Chicory (*Cichorium intybus*)

- Perennial herb (Family *Asteraceae*)
- Used for feeding of livestock in some areas
- Different cultivars
- Some indications of antiparasitic effects in deer and sheep (abomasal nematodes)
- *In vitro* antiparasitic effect on cattle nematodes  (Poster EAAP 65th – 2014)

cv. Spadona

cv. Puna II
Objective of our study:

To assess the anti-parasitic effect of chicory silage on calves experimentally infected with *Ostertagia ostertagi* and *Cooperia oncophora*
Material and methods:

- **n = 15 calves** (2-4 months old, 90 KG BW)

- **n = 6 fed with hay (control)**
  - Hay (grass/clover)
  - Cr.Prot. = 84 g/kg DM;
  - Ene= 4.65 MJ/kg

- **n = 9 fed with chicory silage**
  - Chicory in silage = 50-60% DM
  - Cr.Prot. = 95 g/kg DM;
  - Ene=4.09 MJ/kg DM

Chicory cv. Spadona
Study design:

*Total infection dose = 10,000 *O. ostertagi* + 66,000 *C. oncophora* third-stage larvae

Results:

- Weight gains
- Faecal egg counts (FEC) adjusted to faecal DM
- Adult worm counts
Results: Weight gains

Weight gains were significantly higher in chicory-fed calves (+35%; p = 0.02) compared with hay-fed controls.
Results: Faecal egg counts (FEC\textsubscript{DM})

No significant differences in FEC adjusted for faecal DM between groups (p=0.14)
Results: *Ostertagia ostertagi* worm burdens

57% reduction in *O. ostertagia* adult worms in chicory silage group compared with control group (p<0.01)
Results: *Cooperia oncophora* worm burdens

**60% less** *C. oncophora* adult worms in control group compared to chicory-fed calves (p<0.01)

- Immune-mediated expulsion of *C. oncophora* in high responder animals at 35-42 days after infection (Kanobana et al., 2001, 2002)

- **Why some hay-fed control calves expelled *C. oncophora* and not chicory-fed calves?**

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Conclusions and future research:

• Feeding with chicory silage → Lower worm burden of *Ostertagia ostertagi*  
  Higher worm burden of *Cooperia oncophora*

• Expulsion commonly observed in *Cooperia* infections was delayed in chicory-fed calves – Why?

• *In vivo* anti-parasitic effects of chicory against cattle nematodes were confirmed, but seems to be:

  1) Species-specific or influenced by parasite location in the gut, or/and
  2) Concentration of active compounds
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Protein intake in diet

Energy intake in diet

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HPLC-MS: Sesquiterpene lactones-fraction detected in chicory silage used in the *in vivo* study (50-60 % DM chicory *Spadona* in silage)

HPLC-MS: Sesquiterpene lactones-fraction in original chicory *Spadona* leaves