Natural remedies to control *Haemonchus contortus* and *Fasciola hepatica* parasitic infections in ruminants in the Netherlands

Living with parasites

-- By ACT team 2649-A

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Problem statement

- Resistance development
- Production losses due to infections
- Potential effect on soil health
- Alternative methods
- -> Natural remedies

Research question

- Which **natural remedies** and practices for **internal parasites** in ruminants have the most potential, and how can these be **applied** by farmers in the Netherlands in the future?

Methods

- Interviews
- Literature study

Parasites of interest

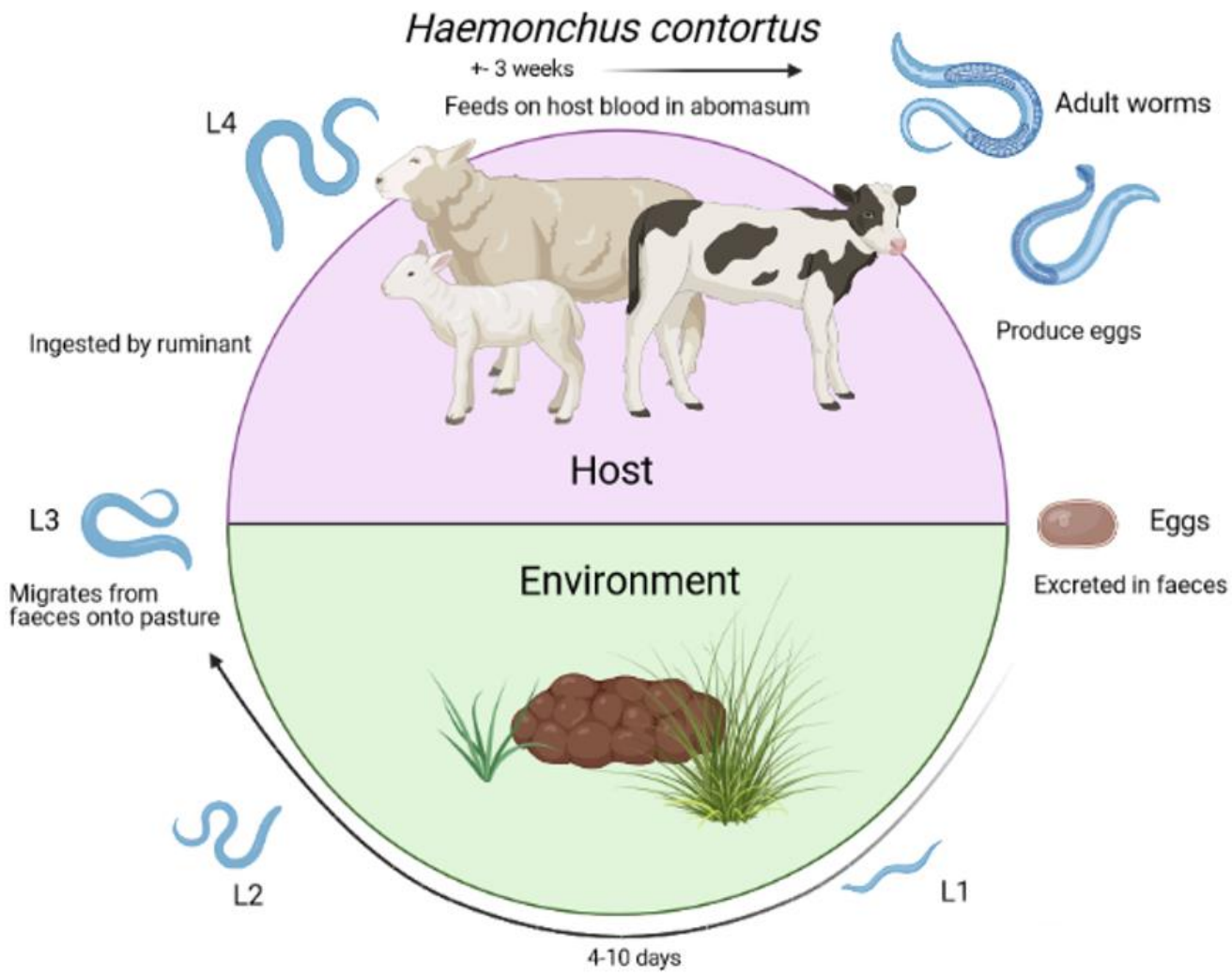
***Haemonchus contortus* (barber's pole worm)**

- Most economically important parasite in the Netherlands
- Blood-sucking parasite
- Common in June, July and August
- Adaptable to a wide range of environments
- Present in abomasum

***Fasciola hepatica* (liver fluke)**

- Causes health problems that have economic consequences
- Problem in wet areas worldwide
- Wide range of host species
- Present in the liver

Haemonchus contortus (barber's pole worm)



Cichorium intybus L. (chicory)

+ Literature: decreased faecal egg count*, decreased worm count (ns)

+ Application: in pasture or separate field (mowing)

- Broad leaves that take relatively a lot of space, which could hamper productivity of the pasture

(Heckendorn, Häring, Maurer, Senn, & Hertzberg, 2007)

Onobrychis viciifolia (sainfoin)

+ Literature: decreased faecal egg count[1*2*3*4*], decreased worm count[1*2(ns)3(ns)].

+ Application: In pasture or separate field (mowing)

- Persistence and establishment in pasture challenging

1 = (Heckendorn et al. 2006) 2 = (Valderrábano et al., 2010) 3 = (Heckendorn, Häring, et al., 2007) 4 = (Ploeger, Verkaik, Bokma-Bakker, & Antonis, 2021 in review)

Lotus corniculatus (birdsfoot trefoil)

+ Literature: decreased faecal egg count[1*] , decreased worm count[1(ns)2*] , less blood loss[2*]

+ Application: In pasture, mix with less competitive grasses and weeds

- Persistence and establishment in pasture are challenging

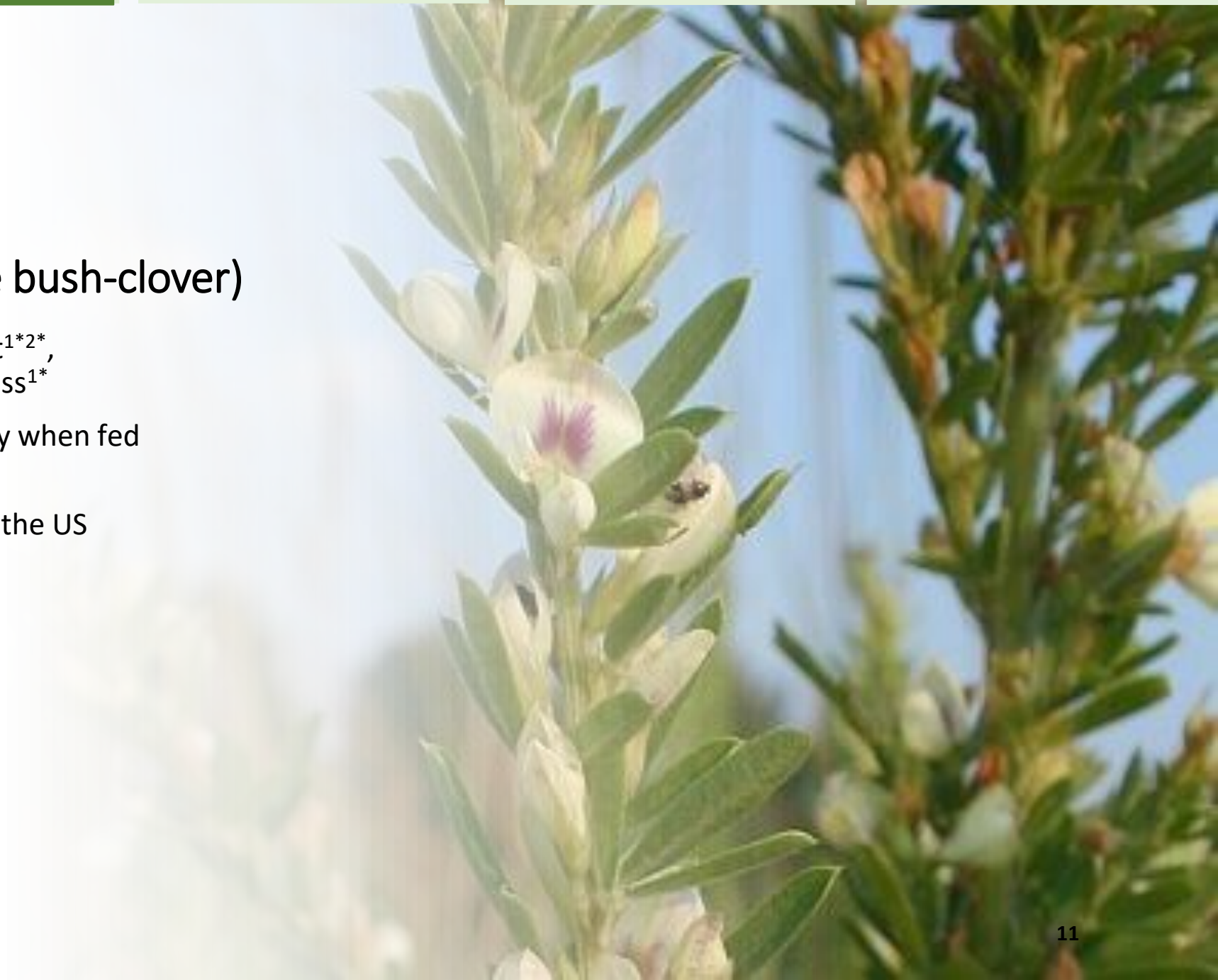
1 = (Heckendorn, Häring, et al., 2007) 2 = (Mata-Padrino et al., 2019)

Lespedeza cuneata (Chinese bush-clover)

+ Literature: decreased faecal egg count[1*2*], decreased worm count[1(ns)], less blood loss[1*]

+ Application: fed in hay, low palatability when fed fresh

- This herb is a noxious weed in parts of the US



1 = (Lange et al., 2006) 2 = (Erika et al., 2017)

Cymbopogon citratus (lemongrass)

+ Literature: essential oil, decreased faecal egg count$^{(ns)}$, decreased worm count*

+ Application: add in herb mixture, good palatability

+ Other comments: need study on pasture feasibility

(Macedo et al., 2019)

Promising herbs to control *Haemonchus contortus*

Implement in pasture


Chicory


Sainfoin


Birdsfoot trefoil

Implement in feed


Chinese bush-clover


Lemongrass essential oil

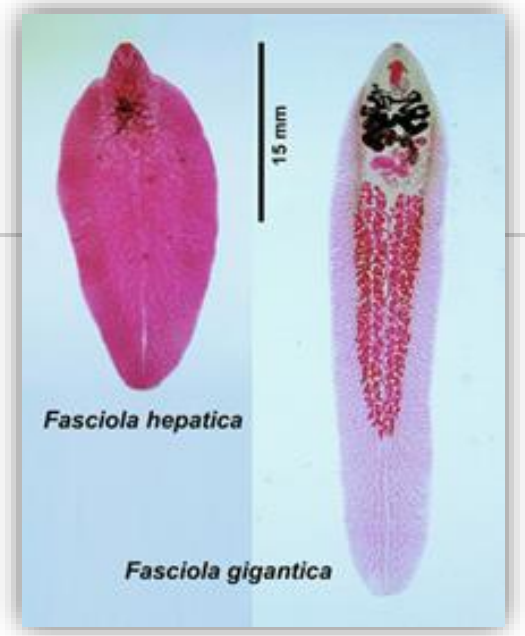
Harder to implement

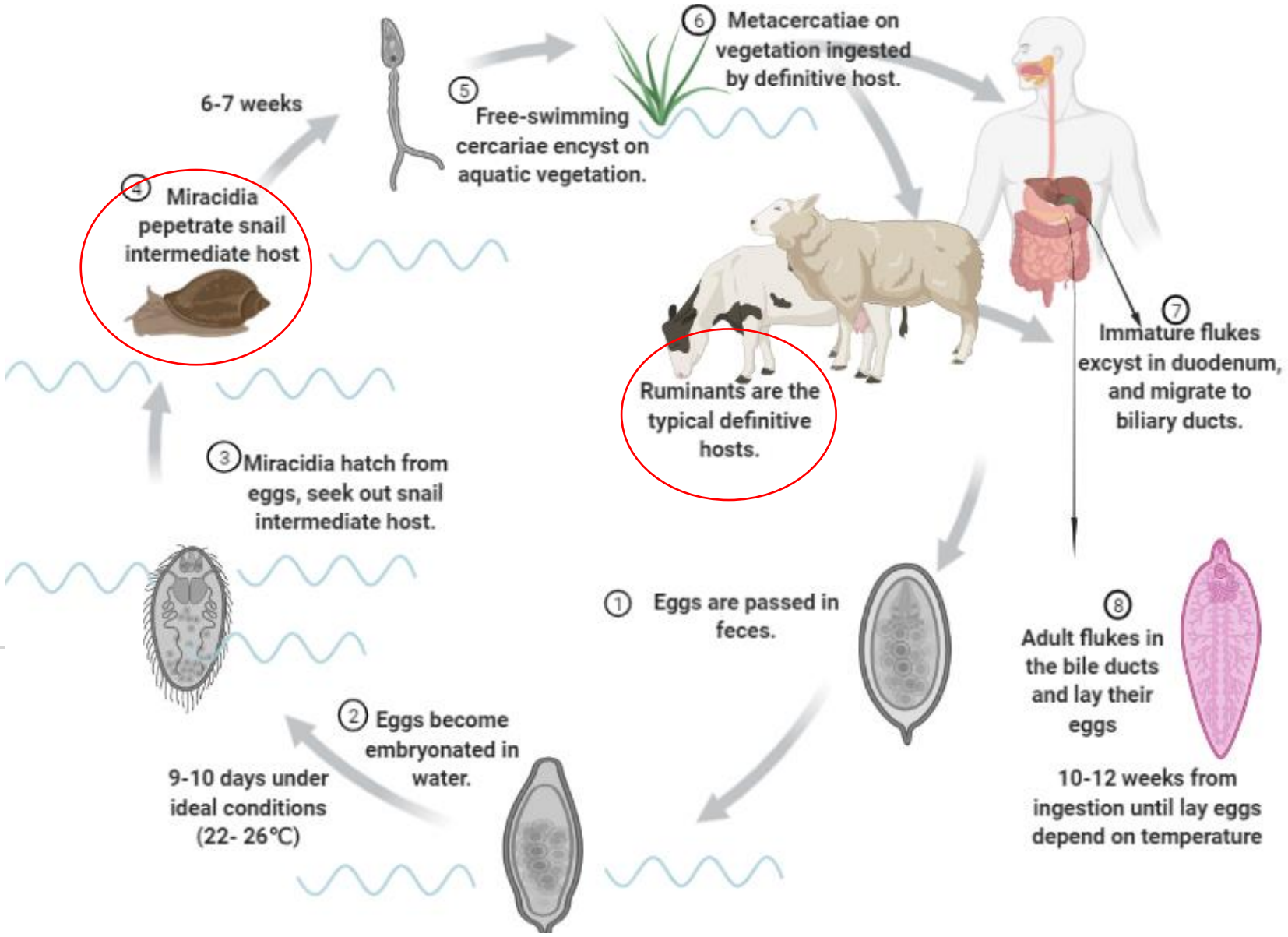

Hedera helix
(Hederae folium)[1]


Artemisia absinthium
(Wormwood)[2]

1 = (Eguale et al., 2007) 2 = (Valderrábano, Calvete, & Uriarte, 2010)

Fasciola hepatica (liver fluke)





Targeting the intermediate host

Snails:

- In the Netherlands: *Galba truncatula* (dwarf pond snail)

Promising herbs:

- *Allium sativum* (garlic)[1*]
- *Areca catechu* (betel nut)[2*]
- *Cuminum cyminum* (cumin)[3*]

1 = (Sunita & Singh, 2011) 2= (Jaiswal and Singh., 2008) 3= (Sousa et al., 2017)

Nigella sativa (black cumin)

+ Literature: decreased faecal egg count[1*2*]

+ Application: powdered seeds mixed with wheat bran and then fed to animals (drench)

+ Produced on large scale in other countries

- *In vivo* studies done on buffaloes

1 = (Kailani, Akhtar, & Ashraf, 1995) 2 = (Maqbool et al., 2004)

Moringa oleifera (drumstick tree)

+ Literature: decreased faecal egg count[1*2*] and adult flukes [2*] , improved body weight gain[1*] and liver condition [2*]

+ Application: leaf and seed extract added as supplemental feed

+ Produced on large scale in other countries

- Cannot be produced in the Netherlands

1 = (El Shanawany et al., 2019) 2 = (Kandil et al., 2018)

Fumaria parviflora (fineleaf fumitory)

+ Literature: decreased faecal egg count[1*2*3*] improved body condition [3]

+ Application: in pasture, or in powders mixed with wheat bran and then fed to animals

- Persistence and establishment in pasture are challenging.

1 = (Maqbool et al., 2004) 2 = (Mushtaq et al., 2015) 3 = (RANA, 2015)

Promising herbs to control *Fasciola hepatica*

Implement in pasture

Fineleaf fumitory

Implement in feed

Black cumin

Drumstick tree

Harder to implement

Albizia anthelmintica (worm-cure Albizia)[1]

Balanites aegyptiaca (desert date)[1]

Caesalpinia crista (crested fever nut/nicker nut)[2,3]

1= (Koko et al., 2000) 2= (Maqbool et al., 2004) 3= (Mushtaq et al., 2015)

Herbal mixtures

+ Each herb own mechanism[1]
+ Synergy[2]
+ Improve immunity[3]
- Dose needs to be obeyed[4]

1 = (Walkenhorst, 2021) 2 = (Mravčáková et al., 2019) 3 = (Mravčáková et al., 2021) 4 = (Wang, 2021)

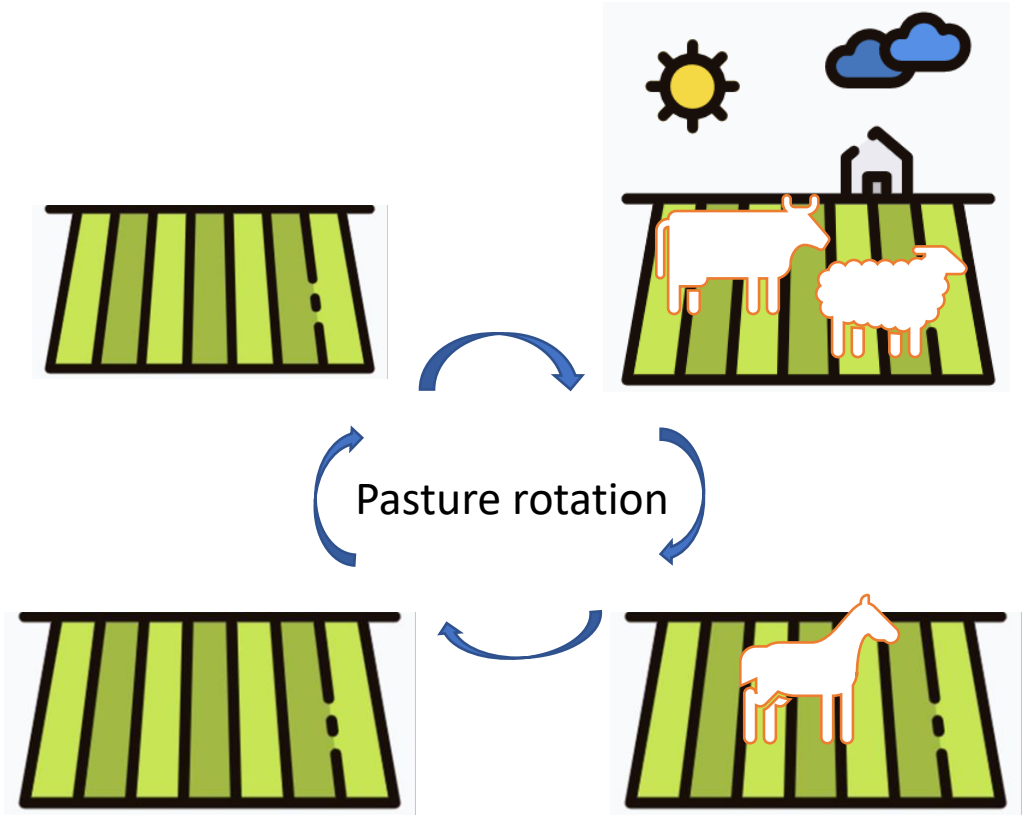
Alternative methods

a) Coexistence between parasite and host
   - Old friends hypothesis

b) Pasture rotation / mixed grazing

c) Grass management
   - Wet
   - Density
   - Fungi
   - Faecal egg count

d) Breeding
   - Resilience

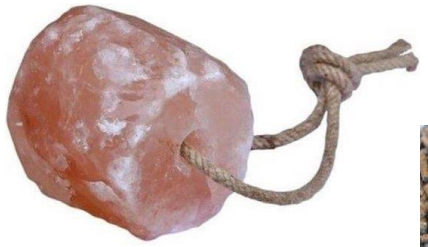


Research outcome

Herbs in pasture

- Chicory
- Sainfoin
- Birdsfoot trefoil
- Fineleaf fumitory

Silage and Hay



Herbs in feed

- Chinese bush-clover
- Lemongrass essential oil
- Black cumin
- Drumstick tree
- Hederae folium
- Wormwood

Herb mixtures & knowledge

- Chinese
- Indian
- Pakistani
- German

Recommendation for the future

- Research on **effectiveness**, **dosage** and **composition** of herb **mixtures**
- Research on **synergy** between herbs in **mixtures**
- Look **internationally** at herb mixtures & knowledge, how to import this to the Netherlands

Questions?

General information

Quchongsan --> general internal parasites

+ Literature: decreased faecal egg count[1*2*], decreased worm count[2*], increased liveweight gain

+ Application: general prevention/control

+ Widely available on the internet and traditional Chinese medicine shops

- Only half of the ingredients is known

1 = (F. Li et al., 2016) 2= (Liu et al., 2011)

General information

Ganzhisan

+ Literature: decreased faecal egg count[1*2*] worm count[1*], animal fully recovered

+ Application: specifically against liverfluke

+ Commercially available on the internet

+ All ingredients and percentage are known and available in traditional Chinese medicine shop

1 = (Zhong, 2012) 2 = (Zhou & Han, 2004)

General information

Bio-dewormer

+ Literature: decreased faecal egg count*, decreased worm count*, increased liveweight gain

+ Application:
for both *Haemonchus contortus* and *Fasciola hepatica*

- More research needed

- Availability of ingredients in the Netherlands unknown

(Abbas et al., 2020)

Fumaria parviflora

Implementation

- Could be feasible to grow this herb in the pasture, but the palatability still needs to be investigated.

Hedera helix (hederae folium)

+ Literature: decreased faecal egg count*, decreased worm count*, less blood loss

+ Application in feed pellets

- Whole plant application needs more research

- Can outcompete other plant species

(Eguale, Tilahun, Debella, Feleke, & Makonnen, 2007)

Artemisia absinthium (wormwood)

+ Literature: decreased faecal egg count*, decreased worm count*,

+ Application in feed pellets

- Dose needs to be strictly obeyed[1]

(Valderrábano, Calvete, & Uriarte, 2010), 1= (Tedje van Assoldonk)