The effects of condensed tannins against cattle nematodes

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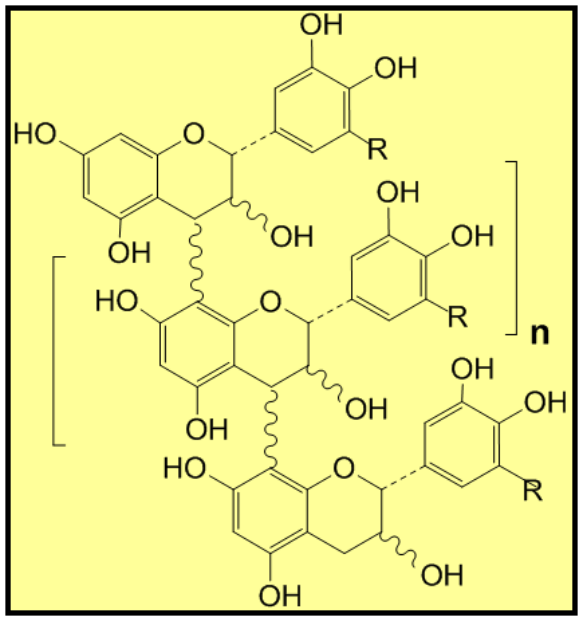
Anthelmintic plants as a novel approach for controlling parasitic nematodes in ruminants

Plant secondary metabolites (PSM): glycosides, saponins, lactones, polyphenols

the polyphenolic compounds group called



condensed tannins

Tannin-containing plants with anthelmintic activity against sheep and goat nematodes

Sulla
(*Hedysarum coronarium*)

Birdsfoot trefoil
(*Lotus corniculatus*)

Big trefoil
(*Lotus pedunculatus*)

Sainfoin
(*Onobrychis viciifolia*)

Sedicea lespedeza
(*Lespedeza cuneata*)

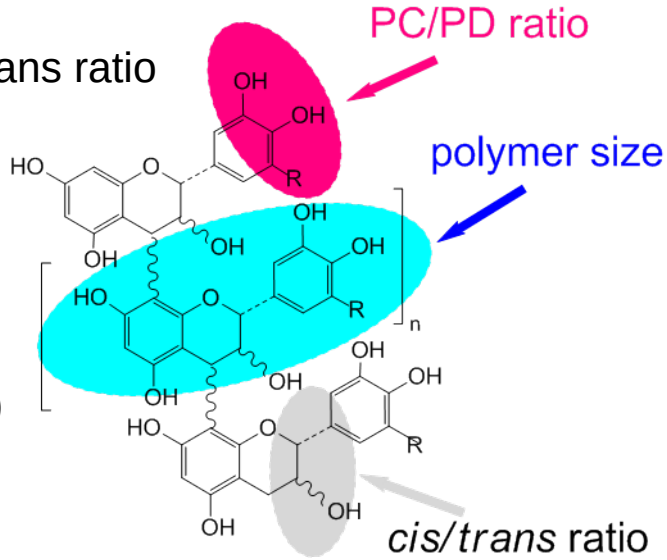
EU Marie Curie Project ”HealthyHay”

Onobrychis viciifolia

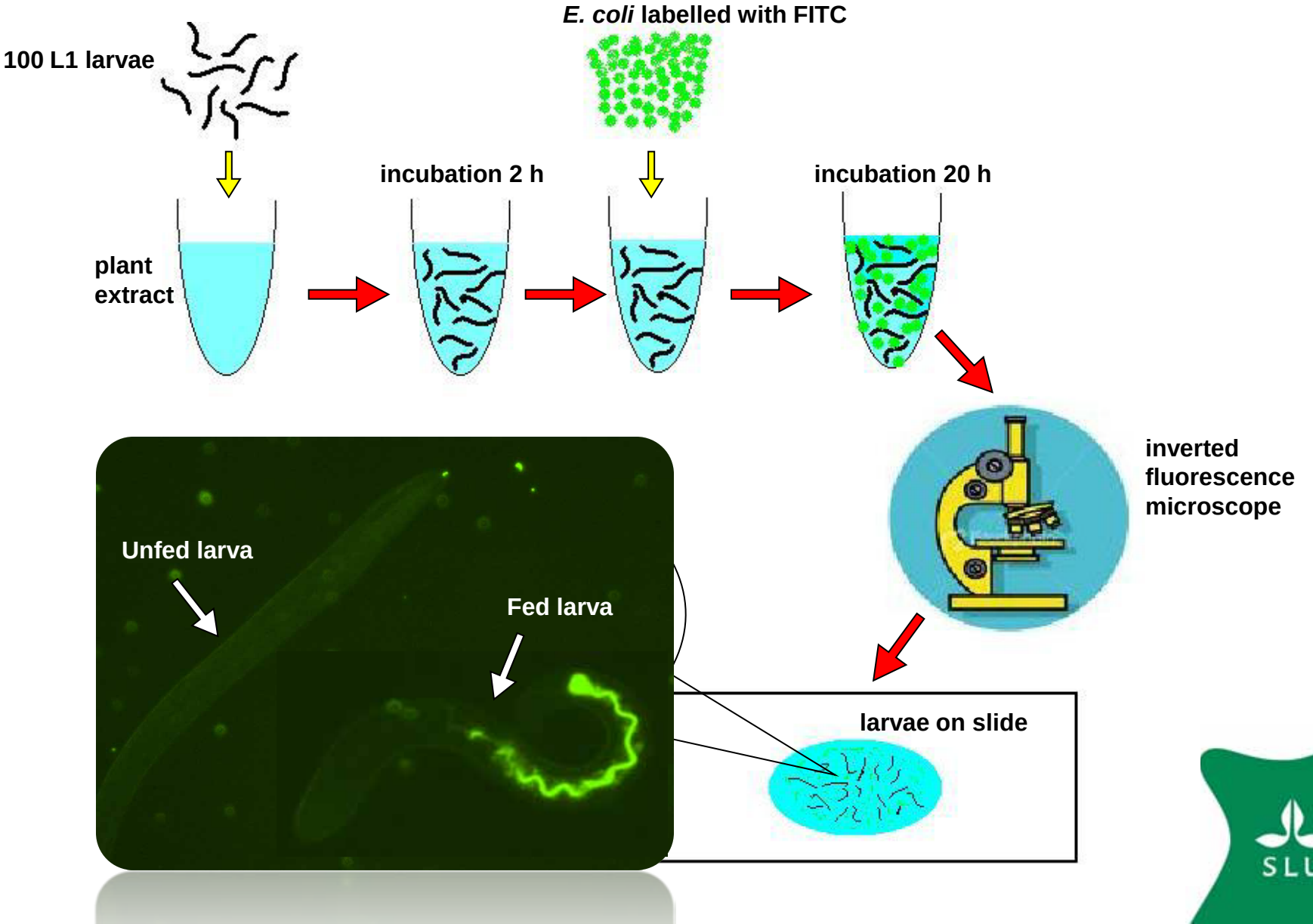
- Research of sainfoin (*Onobrychis viciifolia*) – improvement of breeding, investigation of chemical composition, nutritional, environmental and antiparasitic benefits of sainfoin
- Aim: *in vitro* effects of tannin-containing plant extracts against cattle nematodes

Material and Methods

- 3 plant extracts:
  - *Onobrychis viciifolia*
  - *Lotus pedunculatus*
  - *Lotus corniculatus*
- Chemical analysis of plant extracts:
  - PC/PD ratio, CT content, mDP, cis/trans ratio
- 2 cattle nematodes:
  - *Ostertagia ostertagi*
  - *Cooperia oncophora*
- 2 *in vitro* assays:
  - Larval feeding inhibition assay (LFIA)
  - Larval exsheathment assay (LEA)



Scheme of larval feeding inhibition assay



Scheme of larval exsheathment assay

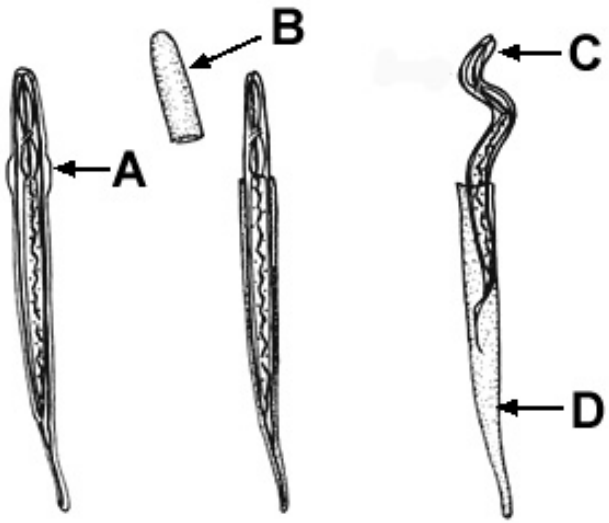
Incubation of ensheathed L3 in extract (3 h)

Washing with PBS

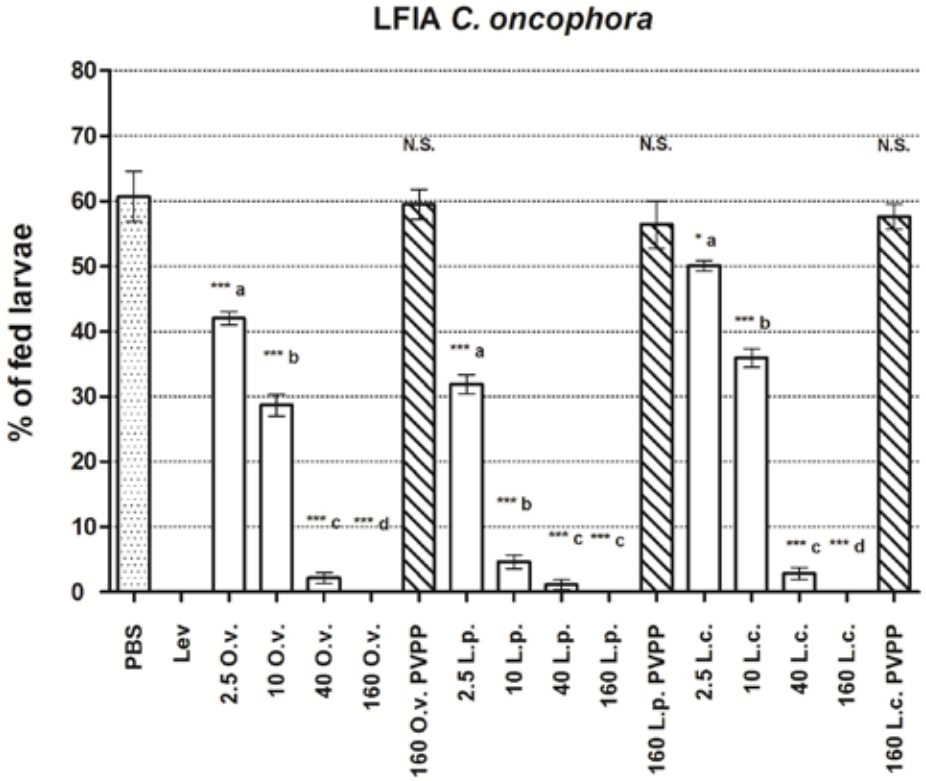
Transferring of larve into wells containing hypochlorite sodium

Stop reaction by adding Lugol solution after 15, 30, 45, and 60 min

Counting of exsheathed and ensheathed larvae under microscope

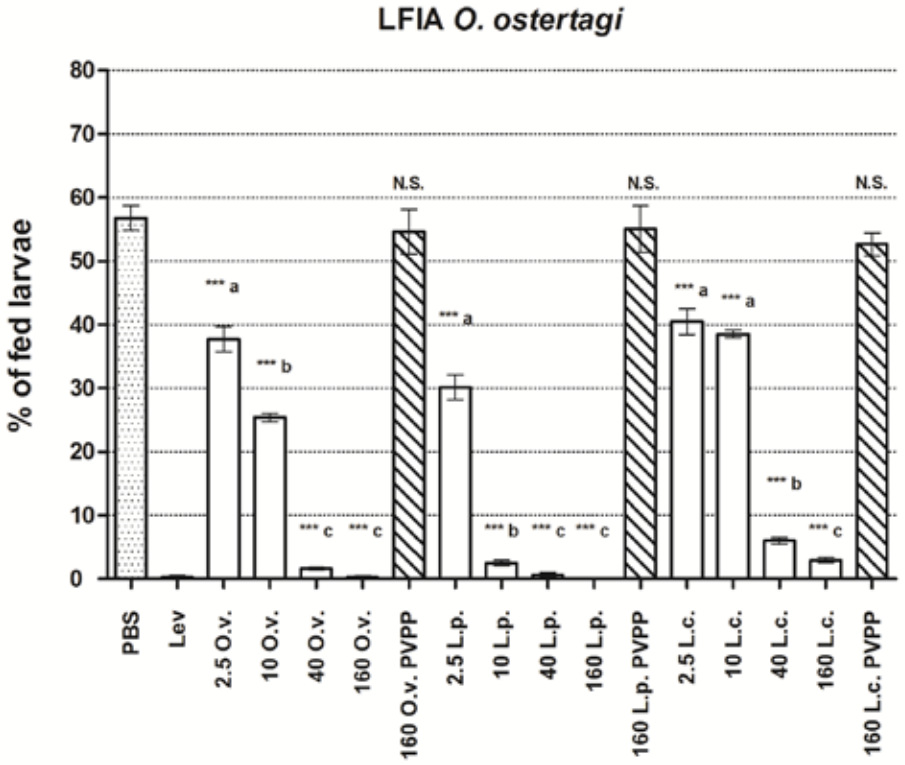


Results: LFIA



Concentrations of extract:
2.5, 10, 40, 160 µg/ml
Lev = Levamisole (40 µg/ml) as positive control
PBS as negative control
160 µg/ml of extract+PVPP (50 mg/ml)

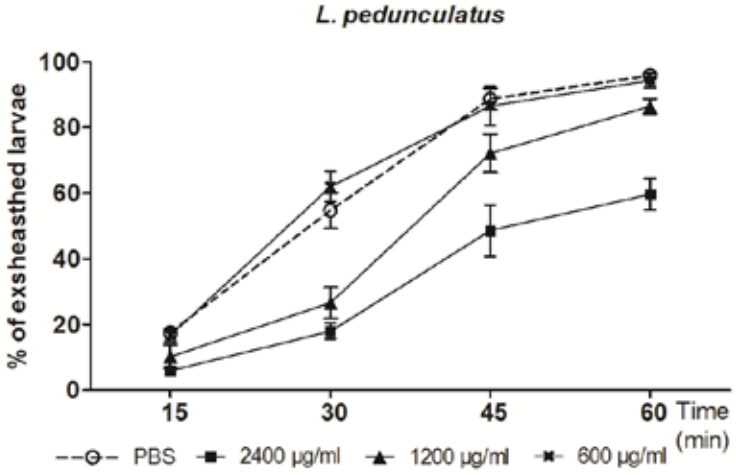
O.v.= *O. viciifolia*
L.p. = *L. pedunculatus*
L.c. = *L. corniculatus*

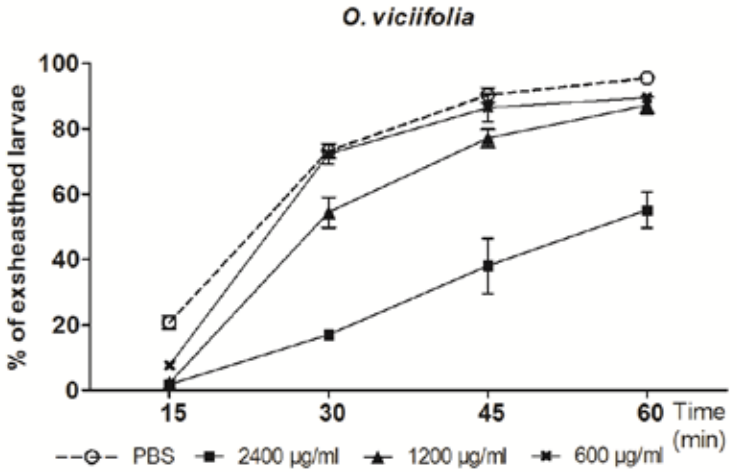


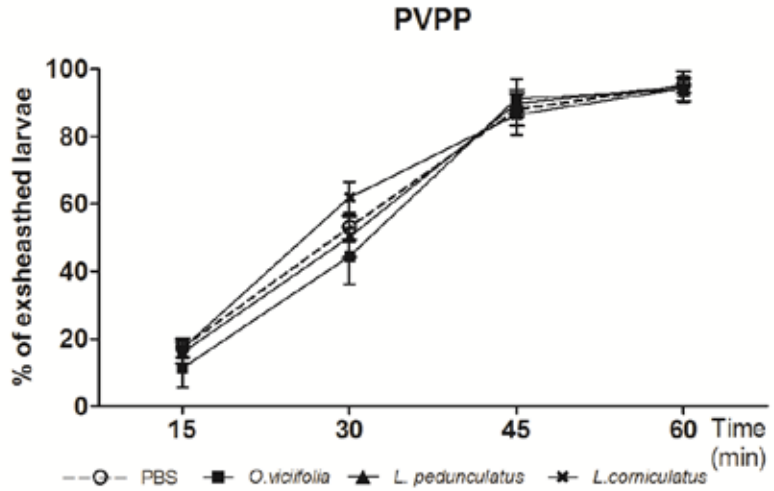
EC_{50} in LFIA and tannin content and composition of three plant extracts

Plant extract	*C. oncophora*	*O. ostertagi*	CT	mDP	PC/PD	*cis/trans* ratio
	EC_{50} (95% CI) (µg/ml)	EC_{50} (95% CI) (µg/ml)	mean g CT/100g ext.	mean	PC : PD mean (%)	*cis* : *trans* mean (%)
Onobrychis viciifolia	8.6 (5.17-14.43)	7.7 (4.83-12.05)	12.5	27.6	33.4 : 66.6	81.6 : 18.4
Lotus pedunculatus	2.6 (2.22-3.09)	2.6 (2.39-2.89)	19.4	26.4	19.3 : 80.7	79.1 : 20.9
Lotus corniculatus	12.8 (9.74-16.96)	16.1 (13.61-19.50)	9.4	18.2	61.4 : 38.6	62.4 : 37.6

Results: LEA


L. pedunculatus
% of exsheasthed larvae
100
80
60
40
20
0
15
30
45
60
Time (min)
PBS
2400 µg/ml
1200 µg/ml
600 µg/ml


O. viciifolia
% of exsheasthed larvae
100
80
60
40
20
0
15
30
45
60
Time (min)
PBS
2400 µg/ml
1200 µg/ml
600 µg/ml


PVPP
% of exsheasthed larvae
100
80
60
40
20
0
15
30
45
60
Time (min)
PBS
O.vicifolia
L. pedunculatus
L.corniculatus

Discussion

- all three plant CT extracts act aganist L1 and L3 of *O. ostertagi* and *C. oncophora*
- different sensitivity of LFIA and LEA
- ranking according to effect in LFIA:
    1. *L. pedunculatus*
    2. *O. viciifolia*
    3. *L. corniculatus*
- anthelmintic effect associeted with CT content and PC/PD ratio
- need of *in vivo* experiment in cattle
- combination of pasture management and plant anthelmitics or chemical anthelmintics = succesfull control of GIT nematodes in future

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