

TANNINS: AN ANTHELMINTIC ALTERNATIVE FOR HERBIVORES

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Is there a plausible **alternative** to **common anthelmintics**, which are becoming less effective to fight against parasites?

HYPOTHESIS

Tannins have **suppression effects** on parasites in herbivores

INTRODUCTION

Secondary metabolites perform **non-essential functions** but they can promote **adaptation** to **unfavourable environments** and under **stressful conditions**, such as high temperatures, light or water stress and poor soil quality, which regulate the **phenological** development of the plant, thus increasing the **synthesis of tannins**

TANNINS

Present in trees, shrubs and herbaceous plants. They are a **heterogeneous** group of **phenolic compounds** with high molecular weight which are able to bind proteins, polysaccharides, alkaloids, nucleic acids and some minerals



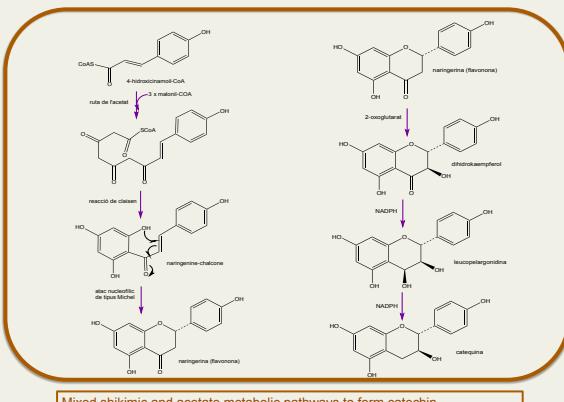
HYDROLYSABLE TANNINS (HT)

Formed by **carbonilic core (D-glucose)** linked to **phenolic groups** such as Gallic or Ellagic acid.

These compounds metabolized by *Eubacterium oxidoreducens*, *Streptococcus bovis*, *Syntrophococcus sucromutans* and *Coprococcus spp* form **pyrogallol**, which is **toxic** for herbivores

CONDENSED TANNINS (CT)

Non-branched polymers of **flavonoids** such as 3-flavanols (catechin or epicatechin), precursors of procyanidins and epigallocatechin, which can condense to form prodelfinidinas



Affecting

PATHOLOGY OF NEMATODES IN HERBIVORES

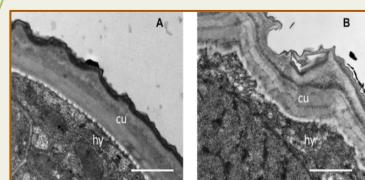
Reduction of **food intake**, **absorption** and **retention of minerals** (especially phosphorus), causing significant **losses in protein absorption** and **hormonal changes** that disrupt the normal functioning of the digestive system

PATHOGEN

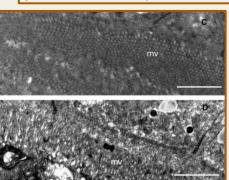
The CT damage **external tissues** such as the **cuticle** and **hypodermis**, and **internal tissues** like the **microvilli** in intestinal tissue



Light microscopy of *A. suum* larvae (Williams et al., 2014).



Ultrastructural changes in *Ascaris suum* L4 exposed to condensed tannins (B and D) (Williams et al., 2014)



HERBIVORES

High concentrations of CT reduce voluntary feed intake in animals, explained by three factors: **decreased taste**, **slowing digestion** and **conditioned aversion**.

Moderate concentrations of CT increase protein absorption in **abomasum** due to a decrease in **ruminal degradation**

SELF-MEDICATION OF HERBIVORES

Herbivores show self-medication prophylactic and therapeutic behaviours. There are some studies by Lisonbee et al. (2009) or Villalba et al., (2014) demonstrating these behaviours in goats, sheep and cows

CONCLUSIONS

CT are a useful potential **alternative anthelmintic** in herbivores considering the recent appearance of resistance to conventional anthelmintics.

Animals treated with condensed tannins **reduce the population of nematodes** and their **reproduction**. This effect is produced by acting on the **cuticle** and **hypodermis larvae**, as well as the effect on **microvilli**, causing intestinal damage in these parasites.

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