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Published in:
25th International Conference of the World Association for the Advancement of Veterinary Parasitology

Publication date:
2015

Document Version
Publisher's PDF, also known as Version of record

Link back to DTU Orbit

Citation (APA):
Purified extracts from chicory (Cichorium intybus) inhibit Ascaris suum glutathione-S-transferase activity and reduce survival of larvae in vitro

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New feed-based control options for parasitic nematodes are urgently needed due to the threat of drug resistance and consumer demand for organic animal products. Chicory is a nutritious bioactive forage that can be used for grazing outdoor-reared pigs and ruminants, and may have direct anthelmintic effects due to high concentrations of sesquiterpene lactones (SL). Here, we investigated direct anti-parasitic effects of extracts from two chicory cultivars on survival and glutathione-S-transferase (GST) activity of Ascaris suum, the most prevalent nematode parasite of pigs.

Fresh chicory leaves (cv. Spadona and Puna II) were collected and extracted with methanol. Extracts were then purified by solid-phase extraction for selective recovery of SL. Resulting SL-extracts were analysed by liquid chromatography-mass spectrometry (LC-MS). A. suum third-stage larvae (L3) were produced by in vitro hatching of eggs, whilst L4 were collected from the gut of experimentally infected pigs. Larval survival was assessed by motility for up to 36 hours after incubation in two-fold dilutions of SL-extracts. Native GST was obtained by homogenisation of adult A. suum and purification using a commercial GST isolation kit. GST activity was assessed by the CNDB assay.

Preliminary LC-MS analyses demonstrated distinct SL profiles between the two cultivars. Incubation with SL-extracts dramatically reduced the in vitro survival of both L3 and L4 stages of A. suum, however the effect was cultivar-dependent, with cv. Spadona significantly more potent than cv. Puna II. Spadona extract also strongly inhibited the activity of A. suum GST, suggesting that the anthelmintic mechanism may involve accumulation of toxic reactive oxygen species within the parasite.

In conclusion, if in vivo efficacy can be demonstrated, chicory has potential to be used as an alternative or complementary option to control A. suum in outdoor pigs. However, our results suggest that the selection of appropriate cultivars will be important. On-going experiments are further investigating the mechanism of anthelmintic action.