Investigating anti-parasitic effects of plant secondary metabolites: effects on swine nematodes

Organic and outdoor animal production presents challenges to animal health and productivity. In organic pig production, animals must have access to outdoor pastures which increases exposure to pathogens such as gastrointestinal nematodes. Moreover, the routine use of synthetic anti-parasitic drugs is not allowed. Thus, novel parasite-control options are required. We present here results from a comprehensive in vitro screen of plant secondary metabolites (PSM) from diverse plant sources on the economically important pig parasites Ascaris suum and Oesophagostomum dentatum. We focused on two classes of PSM commonly found in natural dietary sources – condensed tannins (CT) and sesquiterpene lactones (SL). Different CT were purified from a range of different plant sources to reflect the diversity of this group of PSM; SL were purified from forage chicory. The purified compounds were then tested in assays that measured inhibition of worm motility and migratory ability.

Condensed tannins had potent activity against A. suum, with substantial inhibition of migratory ability of in vitro hatched larvae (EC50 values ranging from 40 to 120 μg/mL). In contrast, migratory ability of O. dentatum larvae was not significantly affected. However, the motility of adult O. dentatum recovered from pigs was reduced after in vitro incubation with CT. The purified chicory extract showed potent inhibition of A. suum larval migration (EC50 value of 42 μg/mL) and was also active against larval and adult stages of O. denatum. Electron microscopy confirmed direct structural damage in nematodes exposed to the purified molecules. Therefore, plants rich in PSM such as CT and SL show promise as natural anthelmintics against two highly prevalent swine parasites. Experiments to determine in vivo efficacy and the mechanisms of the nematocidal action are ongoing.

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