Antiparasitic activity of chicory (Cichorium intybus) and its natural bioactive compounds in livestock: a review

Increasing drug resistance in gastrointestinal (GI) parasites of livestock and concerns about chemical residues in animal products and the environment are driving the development of alternative control strategies that are less reliant on the use of synthetic drugs. An increasingly investigated approach is the use of bioactive forages with antiparasitic properties as part of the animal's diet (nutraceuticals) or as potential sources of novel, natural parasiticides. Chicory (Cichorium intybus) is a multi-purpose crop and one of the most promising bioactive forages in temperate regions, and numerous in vivo trials have explored its potential against parasitic nematodes in livestock. However, it is unclear whether chicory can induce a direct and broad activity against various GI parasites in different livestock species, and the levels of chicory in the diet that are required to exert an efficient antiparasitic effect. Moreover, the mechanisms leading to the reported parasiticidal activity of chicory are still largely unknown, and its bioactive phytochemicals have only recently been investigated. In this review, we summarise the progress in the study of the antiparasitic activity of chicory and its natural bioactive compounds against GI parasites in livestock, through examination of the published literature. The available evidence indicates that feeding chicory can reduce faecal egg counts and/or worm burdens of abomasal nematodes, but not infections with intestinal worms, in ruminants. Highly chicory-rich diets (>= 70% of chicory dry matter in the diet) may be necessary to directly affect abomasal parasitism. Chicory is known to synthesise several bioactive compounds with potential antiparasitic activity, but most research has been devoted to the role of sesquiterpene lactones (SL). Recent in vitro studies have confirmed direct and potent activity of SL-rich extracts from chicory against different GI helminths of livestock. Chicory SL have also been reported to exhibit antimalarial properties and its potential antiprotozoal activity in livestock remains to be evaluated. Furthermore, the detailed identification of the main antiparasitic metabolites of chicory and their pharmacokinetics need further confirmation. Research gaps and perspectives on the potential use of chicory as a nutraceutical forage and a source of bioactive compounds for parasite control in livestock are discussed.