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Characterization of anthelmintic properties of the lupine seed, *Lupinus spp.*

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Digestive strongyles are a serious handicap for sheep farming, due to production losses or associated veterinary costs. Meanwhile, the molecules currently available to control these parasites are no longer appropriate due to the emergence of resistant parasite populations but also because of the environmental impact of these molecules. The use of nutraceuticals, plants simultaneously presenting nutritional and medicinal qualities, could be an alternative solution to sustainable pest management. Lupine seed, *Lupinus spp.*, is a protein crop used in animal farming. This plant also contains alkaloids that target nicotinic receptors [1], targets for anthelmintic drugs. These alkaloids provide toxic properties to the bitter ecotypes. The varieties used in animal feed legally contain less than 1.5% bitter seeds. Our study aims at validating and quantifying these properties through in vitro testing of seed extracts from alkaloid-rich or -poor varieties. Five varieties of sweet lupine (3 *L. albus*, 1 *L. angustifolius*, 1 *L. luteus*) and six bitter ecotypes (3 *L. albus*, 1 *L. angustifolius*, 1 *L. luteus*, 1 *L. mutabilis*), richer in alkaloids, were tested against *H. contortus*. Two *L. albus* varieties, a sweet-one ENERGY and a bitter-one E063, exhibited the higher activity on *H. contortus* mobility. Chemical analyses revealed a higher alkaloid content in the alkaloid-rich (E063) (3.3% vs 0.04% in the alkaloid-poor) but a lower diversity than in the alkaloid-poor variety (ENERGY) (n=3 vs 5 respectively). Aqueous extracts of both varieties could significantly control infective larval stages and inhibited egg development. Extracted alkaloid fractions exhibited a stronger inhibitory effect, corroborating the working hypothesis, and could also control a multi-resistant isolate. These results are in favor of nutraceutical properties of lupine seed. Alkaloids of ENERGY variety exhibited original mechanism of action against cholinergic receptors, with low EC₅₀.

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Keywords: lupine seed, alkaloid, anthelmintic

References:

- [1] Green BT, Welch KD, Panter KE, Lee ST. Plant toxins that affect nicotinic acetylcholine receptors: A review. *Chem Res Toxicol* 2013; 26: 1129–1138

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