Acaricidal activity of plant-derived essential oil components against *Psoroptes ovis in vitro* and *in vivo*

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Psoroptes ovis is a major health problem in beef cattle. Treatment is limited to local administration of amitraz or pyrethroids or systemic administration of macrocyclic lactones. Treatment failures with macrocyclic lactones have been reported in recent years. To investigate potential alternative treatments, the acaricidal activity of four plant-derived essential oil components, i.e. geraniol, eugenol, 1,8-cineol and carvacrol against *P. ovis* was assessed *in vitro* and *in vivo*. Three components showed a concentration-dependent acaricidal activity in a contact assay, with LC_{50} of 0.56 %, 0.38 % and 0.26 % at 24 h for geraniol, eugenol, and carvacrol, respectively. In a fumigation bioassay, carvacrol demonstrated the best efficacy as it killed all mites within 50 min after treatment, whereas geraniol, eugenol, and 1,8-cineol needed 90 min, 150 min, and 90 min, respectively. Following a 72 h incubation period in a residual bioassay, eugenol and carvacrol killed all mites after 4 h of exposure to LC_{50} and $LC_{90,}$ while geraniol killed all mites only after 8 h exposure at LC_{50}. Topical treatment with 2 % carvacrol in Tween-80 of six calves with experimental *P. ovis* infestations, reduced mean mite counts by 98.48±2.36 % at 6 weeks post treatment. In the control group which was treated with Tween-80 only, the mite population increased with similar kinetics as a typical experimental mite infestation. Topical application of carvacrol on shaved skin caused mild and transient erythema 20 min after treatment. No other side effects were observed. Considering the strong acaricidal activity of carvacrol *in vitro* and *in vivo* and the mild and transient local side effects after topical treatment, carvacrol shows potential as an acaricidal agent in the treatment of *P. ovis* in cattle.

Keywords: *Psoroptes ovis*, cattle, natural compounds, *in vitro*, *in vivo*.