

Comparison of two methods with the use of essential oils in the control of *Dermanyssus gallinae*

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Dermanyssus gallinae is one of the most dangerous external parasites in domestic and wild birds. Through skin pricking, blood suction and salivation, it causes anaemia, pruritus, anxiety and insomnia of birds. The result of the invasion is a decrease in laying hens, exposure to constant stress, immunosuppression, anaemia and more frequent falls of birds. In contrast, human symptoms include urticarial lesions, skin nodules causing human dermatitis (gamasidosis), often found in urban environments associated with pigeons. In addition, *D. gallinae* can be a vector and reservoir of pathogens dangerous for humans and animals, including *Coxiella burnetii*, *Borrelia afzelii*, *Salmonella gallinarum*, influenza virus A (Raele *et al.,* 2018, Pugliese *et al.,* 2018, Sommer *et al.,* 2016). Increasing evidence suggests that *D. gallinae* populations have significant genetic resistance to commonly used drug classes, including many synthetic pyrethroids (Piskorski *et al.,* 2011; Fiddes *et al.,*2005). It is therefore necessary to look for alternative methods of controlling and limiting these ectoparasites. In addition, there is an increase in consumer demand for safe and food-free residues. Consumers need alternative and natural means. Many plant species produce toxic secondary metabolites that limit the attacks of insects and can thus limit the spread of insects on new hosts (Piskorski *et al.,* 2011).

The aim of the study was to examine acaricial activity of lavender and clove essential oil against poultry house-collected adult *Dermanyssus gallinae* using direct contact and direct contact with fumigation methods.

The research is based on the method according to Zdybel *at al.* 2011 in modification. The mites were collected from cages into tightly closed plastic containers (volume 150 ml) using Volkmann spoon. The special plexiglass plates with a veneer disc were used in order to imitate natural conditions. All movable mites were used regardless of the stage of their development. In the first experiment, the mites (minimum 100) were put directly on the plexiglass plates with a veneer disc previously spread with essential oil. In a separate experiment, the plexiglass plates with a veneer disc were additionally put into a plastic chamber which was covered with stretch foil from the top, with openings providing air access. Two essential oils, derived from lavender and clove, were tested for the acaricidal activity. The following concentrations were tested: 20%, 50%, 80%, 100% at a dose 0.28 mg/cm2. The mortality of the exposed mites was measured after 48 h. The experiment was repeated twice. Positive and negative controls were used. Data were corrected for control mortality using the Abbott's (1925) formula.

All the oils reduced *D. gallinae* survival. In the second experiment (direct contact with the fumigation method) essential oils showed greater efficacy. The best results were observed for 100% clove oil (86,8% mortality), 80% clove oil (56% mortality), 100% lavender oil (56,31% mortality). Essential oils described herein, have the potential to be used as alternative insecticides and acaricides for controlling ectoparasites as *Dermanyssus gallinae*.