Investigation of the effect of alternative mite control in laying hen husbandry - distribution of the mite population

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Introduction

The red chicken mite (*Dermanyssus gallinae*) is widespread in poultry houses and is one of the biggest animal welfare and economic problems in laying hen housing. In addition to restlessness, cannibalism and loss of performance due to constant blood loss, a severe outbreak of infestation can also lead to anaemia and death of the animals (SCHNIEDER et al. 2006; HIEPE et al. 2006). The control of the red chicken mite is often difficult due to the lack of approved chemicals. The difficult legal situation regarding the approval of chemical products in the occupied barn, but not on the animal, is disconcerting for poultry farmers. Silicates have long been used as an alternative and drug-free method. The amorphous silicon dioxide, as it is present in diatomaceous earths (Kieselgur), is not classified as harmful to health. Crystalline silicates and their modifications, on the other hand, can reach the alveoli if the particle size is sufficiently small (< 5µm) and cause silicosis (quartz dust lung) in humans during prolonged exposure. Quartz fine dust can also cause lung damage in laying hens (ZENNER et al. 2009).

An alternative to an active substance-free and also less lung-damaging control method could be offered by Witteler with their Cumbasil® Mite dust bath. The dust bath should encourage not only the natural behaviour of the animals, but also reduce the infestation pressure by the red chicken mite.

This study investigated the effects of the application of the dust bath with the product Cumasil® Mite on the mite population with regard to the distribution of the development stages.

Material & Methods

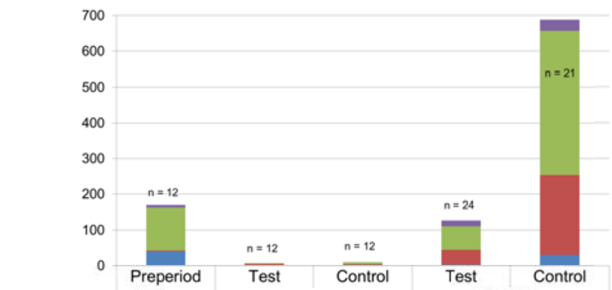
A trial was conducted from October 2016 to August 2017 at a "Naturland" laying hen farm in North Rhine Westphalia (Germany) with an existing bird mite infestation in order to test the effectiveness of the prophylactic control with Cumbasil® Mite. The stable had four compartments with 3,000 animals each, so that two compartments each could be used as experimental and control groups. In order to record a possible mite reduction, mite traps were set up at regular intervals and the mites trapped in them, but still mobile, were evaluated with regard to their number and stage of development. Furthermore, 20 hens per compartment were weighed on two dates (cf. FIEGE & BOELHAUVE 2019).

During the study, three dust baths were additionally installed in each of the two experimental compartments, which were filled once a week with 25 kg Cumbasil® Mite each. This corresponds to the application rate of 1.3 kg cumbasil per hen per year declared by the producer.

Results

A total of 18 traps were set at seven frequencies per compartment and the maximum countable number of mites per date was significantly higher in the control compartments than in the test compartments, especially in the summer months (see FIEGE & BOELHAUVE 2019). The maximum number of mites with 208 animals in one trap was detected during the experiment in the control compartments.

The counting of the mite traps showed an increase in mite pressure as temperatures rose in summer. As can be seen in Fig. 1, the increase in the untreated control compartments is significantly higher than in the test compartments.



	Preperiod	Test	Control	Test	Control
	Winter	Spring		Sommer	
Adult	7	0	0	17	31
Deutonymph	121	2	6	66	404
Protonymph	3	5	3	42	223
Larvae	40	0	1	2	30

Fig. 1: **Distribution of captured mites according to development stages and season of the year**

It should be noted that adult mites, both nymph stages and larvae can be detected in both groups. The development and distribution of the individual stadiums corresponds to the expected development.

Discussion

A jointly agreed termination of the experiment by the farmer and the South Westfalia University of Applied Sciences (SWUAS) took place after the mite count in the control group had increased very rapidly in the last six weeks and the external appearance of the control animals had already suffered as a result of itching. As a result, the control compartments were also equipped with the Cumbasil® Mite product.

The preliminary experiment (winter months) showed a high percentage of larvae and only a few protonymphs. This can be explained by the colder temperatures, as the development cycle then slows down and the non-blood-sucking larvae can remain for up to five months (SCHNIEDER et al. 2006). According to the stabling, i.e. the absence of the host animal, and the cold spring, very few mites could be detected in the following months. A development of the population could be registered in the summer again. It can be assumed that the "overwintered" larvae have developed further at that time, which also led to an increase in the number of proto- and deutonymphs. In addition, new larvae were detected in both groups, with a significantly higher number in the control compartments. This shows that even when Cumbasil® Mite is used as a dust-bath, the development cycle runs smoothly, but is significantly reduced by the immobilization of the mites (cf. GARMEISTER & BOELHAUVE 2019).

The explosive increase of the bird mite in the control compartments during the last four weeks of the examination shows the explosive nature of the infection. In addition, the fact that interactions with active substances against the red chicken mite in the occupied barn are hardly possible, makes the keeping of laying hens more difficult. A continuous interaction is desirable which keeps the infestation with the chicken mite at a moderate level and thus enables stable animal health over the entire laying period. The product Cumbasil® Mite showed this potential in this initial trial, as the trial group also showed an increase in the mite population, but this was distinctly more moderate. However, it is not possible to make a statement about a total stall occupancy phase. Fortunately, the reproduction rate of the mites remained quite low even in the high-risk months. The lower counts of chicken mites may also be due to the mechanical inhibition of walking activity (cf. GARMEISTER et al. 2019).

As the influence on animal performance in the control group was already detectable, it can be assumed that the mechanical inhibition of the movements of the red chicken mite may have led to a lower number of sucking acts and subsequently the propagation rate in the experimental group may have decreased accordingly.

In the context of the two research notes (cf. GARMEISTER et al. 2019; GARMEISTER & BOELHAUVE 2019), which could not demonstrate the initial suspicion of a biocidal effect, it should be noted that the use of Cumbasil® Mite as a dust bath leads to a control of the red chicken mite population. Elimination of the population does not take place, as there is still detection of all stages of development of the chicken mite in the traps. The interpretation of the individual results on the effects of Cumbasil® Mite on the red chicken mite leads to the conclusion that the mites are only mechanically prevented from moving along the feathers to the body of the laying hens in order to perform the bloodsucking act. This also implies that after the laying hens have been housed, the retreats of the red chicken mite must be treated. However, it can be assumed that the number of chicken mites will be lower at this time than in the control group.

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