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Investigation of the influence of Cumbasil® Mite on the migration activity of the red chicken mite (*Dermanyssus gallinae*)

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Introduction

At the Department of Agriculture of the South Westphalia University of Applied Sciences (SWUAS), a series of investigations was carried out on the effect of a compound of microminerals of natural origin (Cumbasil® Mite, Witteler, Germany) on the red chicken mite.

The first studies focused on the investigation of an initial suspicion of a biocidal effect. The electron microscopic analyses of untreated bird mites and those treated with Cumbasil® Mite showed that the product was only found on the surface of the chicken mites. No particles were found that penetrated the exoskeleton of the mites (GARMEISTER et al. 2019). The studies on the movement behaviour of the untreated and Cumbasil® Mite treated chicken mites showed a significantly less safe and slower movement of the mites. None of the mites, not even the untreated mites, managed to climb over a bird feather pollinated with Cumbasil® Mite (GARMEISTER & BOELHAUVE 2019).

In the present study, the influence of Cumbasil® Mite on the migratory activity of chicken mites was to be investigated in order to evaluate the initial suspicion of a biocidal effect.

Material & Methods

For testing the effectiveness of Cumbasil® Mite prophylactic control, a laying hen farm ("Bioland", NRW, Germany) collected red chicken mites from nocturnal, non-invasive mite traps, which were further investigated on the same day. Subsequently, the red chicken mite was determined with the corresponding development stages.

To investigate the influence of Cumbasil® Mite, mites in a Petri dish were artificially sprinkled with the product and absorbed with a piece of filter paper after excavation. The movement behaviour of the mites in the control and experimental groups was recorded. Afterwards the mites of the Cumbasil group were sprinkled with water and after drying in the air for two hours the movement behaviour in comparison to the control group was observed again.

After the natural death of the animals (after three days) from the control and experimental group, the legs were examined by light microscopy. In addition, all mites were examined by light microscopy for changes and specific findings.

Results

The movement behaviour of the mites directly after sprinkling is reduced compared to that of the animals in the control group. The movement behaviour of the test animals is to be assessed as unsafe and slower. After simplified cleaning with water and subsequent drying, the movement behaviour of the test group is comparable to that of the control group.

The light microscopic images show particle adhesion on the legs of the mites from the experimental group at 400 to 1000 times magnification (Figs. 1 and 3).

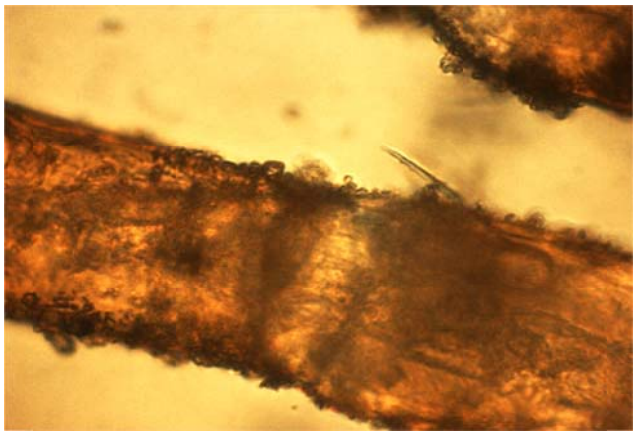

Fig. 1: Light microscope image of a mite leg at 1000x magnification. Experimental group.

These adhesions are not found in the animals of the control group (Fig. 2).

The simplified cleaning with water of the Cumbasil® Mite mites showed clearly that the adherences were no longer detectable in animals in comparison to those without a cleaning step (Fig. 1 and Fig. 3). The extremities of the animals from the experimental and control group could no longer be distinguished after the cleaning step.

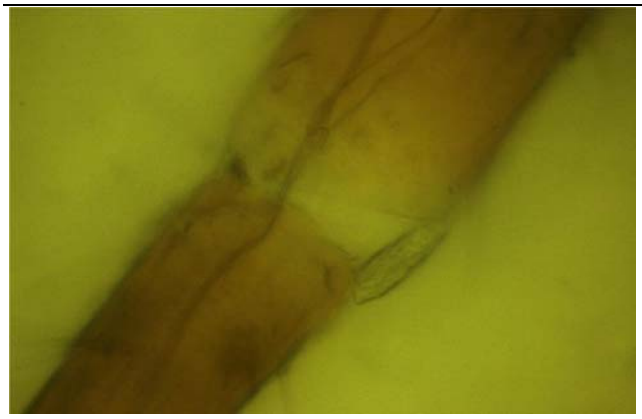

Fig. 2: Light microscope image of a mite leg at 1000x magnification. Control group.

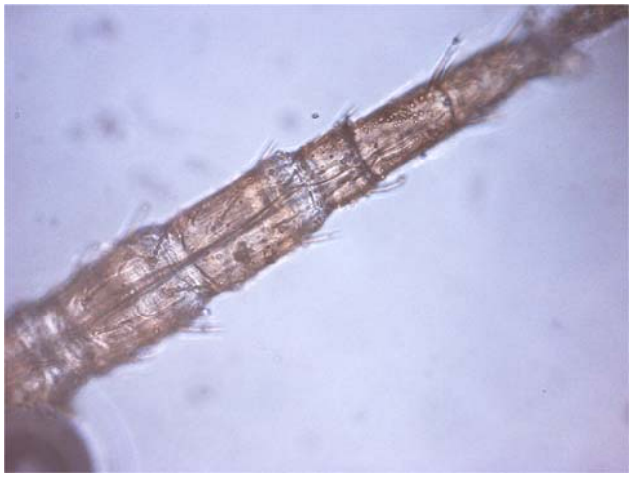

Fig. 3: Light microscope image of a mite leg after simplified washing of Cumbasil® Mite and subsequent drying. 400x magnification.

A blockade of the joints by Cumbasil® Mite as well as an injury of the cuticle of the extremities could not be detected by light microscopy.

Fig. 4: Treated mite at 40x magnification. The high density of particles around the mouthparts is clearly visible.

Discussion

The movement behaviour of the animals from the Cumbasil group after the simple cleaning step was comparable to the untreated control group (see GARMEISTER & BOELHAUVE 2019).

MEWIS und ULRICHS (1999) reported that the Kieselgur particles were difficult to remove when washing or brushing off their experimental animals (grain and flour beetles). In the present study, however, the high Cumbasil particle loading could be almost completely removed by carefully dripping on the animals and without further mechanical action (cf. Fig. 3).

A blockage of the joints by firmly embedded Cumbasil particles could not be detected by light microscopy after the simple cleaning step. However, there was a strong attachment to the musculoskeletal system, in particular to the Tarsi, which are important for the ability to move and climb and sit on the distal limb of each leg. The treated variants also showed a strong pollination around the mouthparts (Fig. 4).

The adhesion of the Cumbasil particles to the integument is therefore much less pronounced than with diatom soils.

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References

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