Hockley International Ltd

Mostyn Duo CS: Efficacy Trial Results

Simulated Use Trials: Spray Application*

Populations of adult red poultry mites (*Dermanysus gallinae*) and litter beetles (*Alphitobius diaperinus*) were each separately placed in four 12m³ test chambers. The dimensions of which were 3m x 2m x 2m (L x W x H). Environmental conditions emulated that of commercial poultry production. Similarly, floor panels consisted of porous and non-porous material to again simulate conditions of field use.

The floor panels were sprayed with Mostyn Duo CS using a handheld GLORIA 8L sprayer with an anti-drop nozzle. The concentrated insecticide was diluted at a rate of 100ml to 5 litres of water. The diluted mixture was applied at a rate of 5 litres per 100m².

The trials were conducted as a choice test, for only 50% of the chambers floor surface was treated with insecticide and both test species were able to access food, water and harbourages without coming into contact with insecticide.

Sample populations were of mixed sex and consisted of 100 adults and 100 larvae (litter beetles) and 50 adults and 50 nymphs (red mites) per replicate. Five replicates were performed for each species. Mortality was recorded 24 hours after treatment. In separate chambers the treated panels were then introduced after 12 weeks to evaluate the residual efficacy.

Examination at the end of the trials revealed complete elimination of red poultry mites and litter beetles in the experimental conditions.

**T.E.C. Laboratory Simulated Use Trial of the Efficacy of an Insecticidal Product, (Report No. 1937-BF-4b+5b+6b+9b/0515), 1-18, 2005*

Simulated Use Trials: Thermal and Cold Fogging Applications*

Red poultry mite and litter beetle samples were placed in separate 500m³ chambers (100m² floor; 5m high space). Climatic conditions were controlled in an effort to recreate the field conditions for the area of use (food storage areas, breeder units, and production sheds). Cardboard boxes and polystyrene blocks were set within the chamber to represent structures expected in the field. These surfaces, in turn, acting as harbourages for the respective pests.

Litter beetle samples were sourced from laboratories. Whereas the red mite population used for the trial had been sourced from a pre-existing infestation at a commercial unit. The ‘wild’ population was introduced with manure from the commercial building and they were allowed to acclimatise within the chambers for seven days prior to the insecticide treatment.

For both litter beetle and red mite treatments, 25 adults and 100 larvae/nymphs of different development stages were used as a representative experimental sample during each replicate. Within the chambers, colonies of litter beetles/red mites were separated into four containers, two of which were at ground level and two of which were at 50cm height.

The target species was treated with Mostyn Duo CS applied through either a cold fogging apparatus (Hurricane Dynafog) or a thermal fogging apparatus (IGEBA TF 34). Mostyn Duo CS was diluted at a rate of 100ml per 4.9 litres of water for cold fogging application. Thermal fogging required no dilution. The insecticidal dose for both methods of application were the same, with 100ml of Mostyn Duo CS being used to treat one 500m³ chamber. The chambers had been sealed prior to application to contain the insecticide.

The test species were removed after an hour of exposure and mortality was recorded after 24 hours. Mostyn Duo CS produced a 100% mortality for both litter beetles and field-strain red poultry mites.

The results of the two simulated use trials indicate Mostyn Duo CS is an effective treatment when applied both residually (pre-emptively) and curatively.

**T.E.C., Simulated Use Trial (hot/cold fogging), (Report No. 1937-BF-8/0515), 1-28, 2015*

Field Trial: Infestation of Litter Beetles in Commercial Broiler Housing

A collaborative field trial was established between several partners to take place in Hungary. The location was a commercial poultry farm, totalling three production sheds for broiler production. The total area of the sheds was 4,128m², the cubic areas was 11,558m³. The three buildings had a combined production capacity of 70,000 birds per cycle.

Production Shed Dimensions

- Building A – 100 x 12 x 2.8m. Capacity: 15,000 birds.
- Building B – 102 x 12 x 2.8m. Capacity 15,000 birds.
- Building C – Double-layered house, 72 x 12 x 2.8m per level. Capacity: 40,000 birds.

The field trial began on the 27th June 2019 and was completed on the 24th October of the same year. Litter beetle population monitoring and treatment spanned two full production cycles. Monitoring of the base litter beetle population was recorded on June 27th immediately following the removal of the previous batch and was subsequently performed on three more occasions, the last occasion being in the final week of the second production cycle.

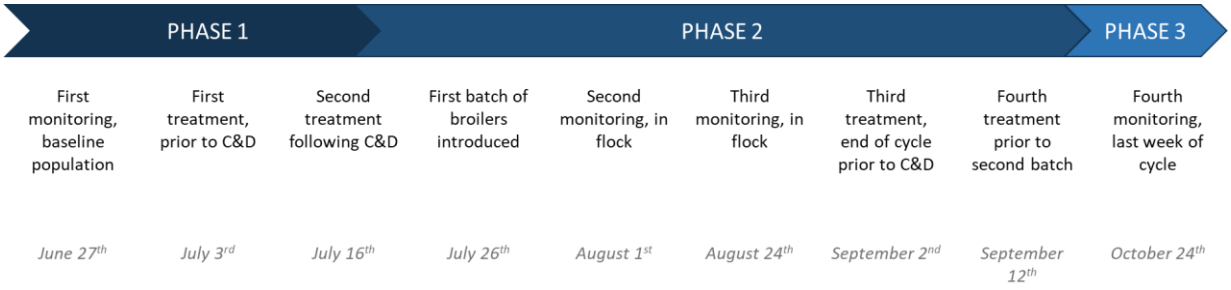

Fig. 1. Monitoring and treatment timeline over the two production cycles. The varying size and thickness of the capsules allow the actives to be released in a controlled manner. Thicker membranes allow for a controlled release, meaning product can remain effective for up to 3 months.

Monitoring was recorded by evenly spacing ten 'Arend' traps across each of the three production sheds. The traps consisted of rolled cardboard contained in a PVC pipe; the gaps between the cardboard layers act as ideal harbourages and pupation sites. The theory being that, once left in situ for several days, the larvae and beetles that have entered the traps will provide a good indication of the number of adults and juvenile individuals within the production sheds.

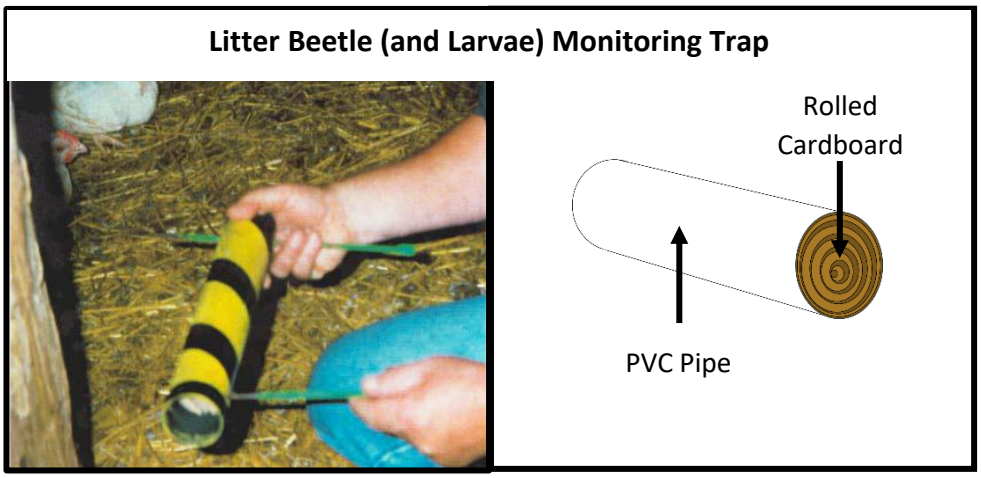

Fig. 2. 'Arend' monitoring trap being positioned and a graphic example of the trap's structure.

Once a baseline measure had been established, the researchers began treatments of Mostyn Duo CS in line with the next production cycle. The first application of Mostyn Duo CS took place after the birds had been removed but before the cleaning and disinfection regime had begun. Without regular food sources and as the production sheds begin to cool, litter beetles migrate between production cycles, finding harbourage in the roof and walls of the building. The beetles will then return to the litter once the next batch has been introduced. The application procedure therefore aimed to intercept the movement of litter beetles between cycles to ensure maximum contact with the insecticide.

Table 1. No. of litter beetles and larvae caught within the monitoring traps at the beginning of the trial.

Trap Number	No. of Adult Beetles	No. of Larvae	No. of Pupae
1	1,592	1,086	0
2	817	171	0
3	2,379	111	2
4	2,253	385	1
5	1,288	235	0
6	1,565	251	2
7	3,045	93	0
8	2,871	89	0
9	1,149	863	4
10	1,576	118	4

Life Stage	Total No. (27/06/19)
Adult Beetle	18,535
Larvae	3,402
Pupae	13

The treatment protocol prior to cleaning and disinfection involved Mostyn Duo CS being applied to the interior and exterior walls from the floor to a one metre height. Particular attention was paid to doors, windows and ventilation points to contact any beetles exiting the building and/or re-entering at the beginning of the next cycle. After cleaning and disinfection had occurred and the relevant treatments were allowed to dry, Mostyn Duo CS was again applied to the interior walls, but on this occasion the entire wall from floor to ceiling was treated. For exterior walls, a one metre high band was again sprayed as well as a strip directly beneath the roof overhang.

Application was performed with a hand-held sprayer, producing a medium-coarse spray. It was recommended that the researchers spray lower rates of the insecticide solution on non-porous surfaces and then reapply after the surface had dried. Other surface types were treated with the appropriate dose rates and sprayed until runoff. Application rates are provided in Table 2.

Table 2. Mostyn Duo CS Dose Rates for Surface Spray Application.

	Dose Rate /ml	Water /ml	Treatment Area /m²
Low infestation level	75	4,925	100
High infestation level or application to highly absorbent surfaces	100	4,900	100

The two treatments described above were repeated between the first and second production cycles, approximately six weeks after the previous treatments. At the end of each production cycle, both adult litter beetle and the larvae, were present in significantly lower numbers in comparison to pre-treatment population monitoring. The first treatment led to a greater reduction of adult beetles, however larvae reduction improved with each consecutive treatment.

Table 3. Litter Beetle, Larvae and Pupae Monitoring Results before and after 1 and 2 Broiler Production Cycles.

	27-Jun	24-Aug	21-Oct
Adult beetle	18535	170	493
Larvae	3402	1173	729
Pupae	13	15	1

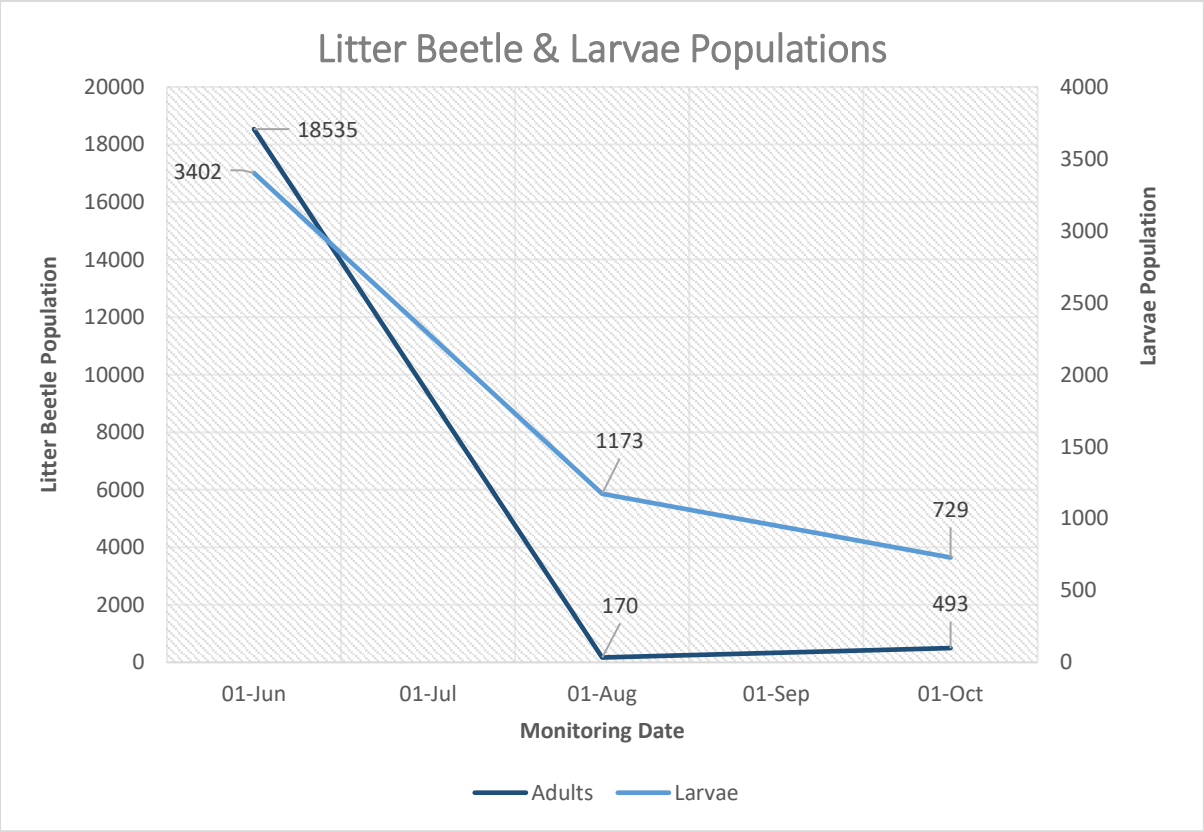

Fig. 2. Left axis – The number of litter beetles present on the 27/06 (before treatment), 24/08 (after the first production cycle), and the 21/10 (after the second production cycle. Right axis – The number of larvae recorded on the same dates.