



## USING PREDATORY MITES TO CONTROL RED MITE

**Red mites can have significant performance, health and welfare effects on laying hens. This month the Ranger investigates the use of biological control to address this pest. Three free range egg producers also share their experiences of trialling the strategy on their farms.**

### **The problem**

Red mites are notoriously difficult to control but are known to have a significant impact on egg production. Hiding in cracks and crevices during the day, these parasites come out at night to feed on the blood of hens. This causes them significant discomfort and in the case of large infestations can drive them out of nest boxes. They also irritate the skin of workers, whilst working in the house or handling eggs.

Red mites are present in poultry houses all year round, however summer is an especially problematic time for red mites as the warmth encourages breeding. During summer the mite's lifecycle is only 7-8 days long, so populations can explode very quickly. Two mites can become 16000 in just 60 days. Eggs are laid around the house, from which larvae emerge in 2-3 days. Following a series of larval stages, the nymphs start to feed on the hens as they develop into adults. A hen can



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lose up to three per cent of her blood volume in one night, the result of up to 50K mites feeding.

Blood loss can lead to anaemia and poor health status but the irritation caused can be just as serious. Hens may not be able to sleep and become stressed; the incidence of vices increases and egg production is affected. The feeding mites can also transmit bacterial and viral infections, increasing veterinary costs.

The severity of the infestation depends on the type of housing, age of buildings and the control methods used. Older wooden buildings are known to be particularly problematic as red mite colonies become established over time. There can also be significant issues in multi-tier units as there are many places for red mites to hide and it can be difficult to get rid of them.

#### **Current solutions**

There are a number of products to control red mites on the market. The number of insecticides available to use is diminishing as the chemicals are withdrawn from the market over safety concerns. Resistance is also a huge

problem, particularly if a farm has been treated regularly for a number of years. A shuttle programme is recommended, along with the use of alternative control measures. Certain products can be used as spot treatments during the cycle and others at turnaround.

Diatomeaceous earth or silica-based products are often used – they create a barrier, which the mites won't cross. The razor sharp edges of the diatom damage the exoskeleton of the mites, whereas silica causes death by dehydration. These products need to be applied with appropriate personal protection and according to the manufacturer's guidelines.

Cleaning at turnaround is also important as the mites can survive in an empty house for up to ten months. It is, however, almost impossible to entirely rid all cracks and crevices from all mites and their eggs. Strict biosecurity during the cycle will help to prevent the spread of the mites or their eggs between houses.

Due to their short lifecycle it is impossible to kill all the mites in one treatment. This is





Tarrus mite preying a red mite

where regular monitoring and a programme of different control measures come into their own. The use of natural products as mite repellents has been studied including; garlic, orange, neem and thyme essential oils; some of which are employed by small scale and organic producers. Other novel control methods being investigated are vaccination and destabilising the mite's symbiotic bacteria.

### Biological control

Biological control can be defined as the use of a natural enemy in order to control a pest population. Natural enemies of insect pests include, predators, parasitoids and pathogens. There are certain species of mite that feed on and kill red mites. These predatory mites however, do not feed on hens or cause them any problems. Since their development is slower and because they are not as resilient as red mites, mite predators will need to be reintroduced after turnaround and a few times during the flock.

APPI is a daughter company of The Netherlands based Koppert Biological Systems, which has been offering biological control solutions against pests of glasshouses

and soft fruit in the UK since the early 80's. Working for Koppert, Damien Morel, a French entomologist, started focusing on pest control for the companion and livestock animal market in 2012. Driven by his passion for animals and natural pest control, he identified and started experimenting with various candidate mites, that naturally predate the red mite.

The obvious and widely available *Hypoaspis* species was trialled, but two other species with greater effectiveness and resilience in the poultry house were identified soon after. This led to the commercial rearing of *Androlis* and *Taurus* mites. Both species are indigenous to the UK, being found in wild bird's nests. *Androlis* prefers a damp environment and can be found in the litter or manure. It kills both eggs and larvae, running and hunting the later for up to 1.5 metres. *Taurus* doesn't move very far from the release site and has a clear preference for adult and nymph stages. These mites like a drier environment and are usually spread in and on top of the nest boxes. Scientists at APPI have been researching how, where and when to release the predatory mites in order to achieve optimal control of red mites. This

has provides them with the knowledge to create release protocols for flat-deck and multi-tier systems.

Currently the company has over 250 clients in France, Switzerland, The Netherlands and Italy. Jeroen Koppert is the sales representative for the UK, "we introduced the concept at this years Pig and Poultry fair and are pleased to now be working with a number farmers in the UK as a result." He explained that the key to success with biological control was to use it as a preventative strategy.

"Often producers wait until they have a big problem before taking action," Jeroen said. "We would suggest formulating a control plan based on preventive action before the start of each flock since strategically applied biological control has the potential to permanently keep the red mite numbers down." He explained that the financial benefits of controlling red mite populations are somewhat underestimated, "an early drop in laying, caused by stress from red mite bites, has a ripple effect on production throughout the rest of the flock."

Predatory mites have a slower life cycle than red mites so it is important to introduce them into the flock early. "We recommended that they are released into multi-tier units a few days following placement," explained Jeroen. "For flat-deck houses we do the first treatment six to eight weeks after the hens go in." He highlighted the fact that even if you don't see red mites at the start, they are there. For a complete control strategy it's important not to use a residual or toxic chemical treatment, as it will also kill the predatory mites. "Silica products would also kill them but the amount of dust in the poultry house renders it ineffective after about eight weeks," Jeroen said.

"We approach biological control as part of an Integrated Pest Management (IPM) strategy," he went on. This incorporates multiple tools to achieve optimal control of red mite.

"Together with frequent release of predatory



Tarrus mite

mites, knock-down products such as Poultry Shield or APPI's organic black soap are good solutions for spot control of red mite clusters."

#### **Predatory mites**

The biological control agents ANDROLIS PRO® and TAURRUS PRO® are commercially available to poultry farmers. These two mites have different predatory behaviours, acting in a synergistic and complementary way to kill the parasites. "In a flat deck house, we would seed the nest boxes with the Taurrus mites and spread the Androlis mites in the manure," explained Jeroen. "There are lots of eggs in the manure for them to feed on as the red mites spread their eggs as they return from finishing a blood meal." Additionally Androlis

is supplied in sustained release bottles functioning as an 'attract and kill' system, to be attached to the aviary structure. By creating an attractive habitat with bran, the red mites enter the bottles, where the predatory mites are living, and are killed.

"This is the way we release Androlis in multi-tier units, as the muck is being removed regularly," he went on. "We place one bottle per 150 hens evenly distributed over the structure, targeting particular areas where red mite is found." They can also be positioned near perches or the egg belt. "Temperature and humidity have a big effects on development of the red mite," stated Jeroen. "We would recommend four to five releases per flock and some knock down treatments may be needed over the summer." A Taurus mite will survive for eight weeks and the Androlis a little less.

The effects of red mites are often underestimated, as it is difficult to accurately determine how many there are. However, visual monitoring remains an important part of the biological control strategy. The concept is particularly attractive to those with a historical red mite issue and is approved for organic systems.

**In order to familiarise the UK market with biological control, APPI is working with three BFREPA producers. "Every situation is different so we are learning from each farm we work on," Jeroen said. "We make a control plan specifically for each producer, working with them throughout the flock." Performance will be judged compared to other houses on each farm, in terms of red mite populations and the need to use insecticides.**

#### **Trevor Sellers**

Trevor has been producing free range eggs

since 1988 and bought his farm in Rutland in 2004. He has two Harlow wooden flat-deck houses, one holding 12,000 and the other 8,000 hens. "One house was built 20 years ago and the other 30," explained Trevor. "This means that resistance has built up to several



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chemicals, whilst others have been withdrawn from sale." For the last three years he has sprayed a diatomeaceous earth product at turnaround. "I find that this lasts for around 20 weeks, depending on the temperature of the house," said Trevor. "After that although the product is still there, the mites walk around it and we have to start spraying with insecticide."

Being previously involved in organic



production Trevor had heard of biological control. "Other producers had used parasitic wasps to control flies with success," he stated. "So when I talked to Jeroen at the Pig and Poultry fair I was very interested in their product for red mite." Trevor started a trial with predatory mites in June, the first introduction was carried out when the hens were 28 weeks old. "It is at this point that we would start to see signs of red mite in the house, meaning there are enough for the predatory mites to feed on," he explained.

Following the first release the predatory mites had pushed the red mites up above the nest boxes. "We were advised to carry out a corrective action by spraying these colonies with Poultry Shield," Trevor stated. "This reduced the population, enabling the predatory mites to control them more easily."

The next stage involved attaching sachets of the predatory mites near the nest boxes, allowing them to crawl out. "We have just carried out this second release at 40 weeks," Trevor said. "Depending on how this goes, we will decide if we need to carry out another treatment." He discussed how he was pleased to be involved in testing this new method but it would take at least six months to get a true picture. "For me the advantage is that it is safe for both humans and chickens," stated Trevor. "I've been happy with the results so far and am looking forward to seeing the outcome at the end of the flock."

#### **Charlie Stephenson**

"Everyone in the industry suffers with red mites," stated Charlie. "We endeavor to ensure that the problem does not get out of control because of the detrimental effect that a large mite population can have on bird welfare." He stressed the importance of terminal hygiene and pest control at turnaround. After placing Charlie regularly monitors the mite

populations and in order to maintain control, he sprays with insecticide when necessary. It is well understood that red mite populations can multiply rapidly in the right conditions. Charlie has five free range units on his farm in West Yorkshire, two of which are part of the trial. "The first release was carried out at 22 weeks, in one flat deck and one multi-tier house," Charlie said. "They carried out the second release a few weeks ago and the plan is for us to do three in total."

"The product has been easy to use and we've been pleased with the backup provided," he explained. "However, the results are under review and we will have to wait until the end of the flock before the outcome can be ascertained." Charlie hasn't had to use an insecticide yet but said that it wasn't a simple task to get the right balance between the red and predatory mite populations. "The principle of biological control is good but if the predators are too successful, then they don't have anything to feed on," he said. "This means repeat introductions, the cost of which could be prohibitive." Charlie plans to keep working with this method as long as it is keeping the red mite populations in check.

Charlie had a problem with flies over the summer but couldn't use a chemical solution, as it would have killed the predatory mites. "Instead we released parasitic wasps, supplied by APPI," he explained. "This worked very well!"

#### **Doug Wanstall**

Doug agreed with the other producers that everyone in the industry has an issue with red mite. "We have red mite on all our sites," he confirmed. "However, there are differences in the severity of infestation. I have seen production drop by 10-15% overnight due to an explosion in the red mite population." Doug explained that they had tried every

product on the market for red mite. "I was interested in testing biological control as it is a good fit with our business model," he stated. "We want to build resilience into our business and one thing to avoid, is building up resistance to chemicals. Reducing spraying also has benefits for staff."

"Currently we spray with Ficam W twice before the hens are placed in the houses," he explained. "Then we use diatomeaceous earth in the litter and silica products in red mite hot spots." Doug believes that a multi-pronged attack is necessary to control this pest. "Being based in Kent, there are a lot of glasshouses," he described. "Several of our neighbours use biological control products so I was aware of APPI."

Doug is testing biological control in four of his flat-deck houses, which are spread over three sites. The current trial was started mid-way through the flock. "Results were slow to see and we have had to do spot applications with Mite-Max," he explained. "However, once that was done and more predatory mites introduced, we seem to have got on top of the problem." Doug found the product was fairly easy to use, although attaching all the bottles took a while, "after that the predatory mites get on with their work while we do ours!"

Doug's confidence in the product means that he is about to start using biological control in two more units from the start of the flock. "This means that we won't be able to use Ficam," he cautioned. "The birds are going in next week and we'll do the first introduction two weeks later."

#### **A useful weapon**

Whilst the concept of biological control may seem alien to some, it is in fact a widely used

method in other areas of agriculture. As well as its application in glasshouses and orchards, it is also becoming a more common method for the control of flies.

The potential effect of red mites on bird welfare as well as a producer's bottom line should not be ignored. Breaking the cycle of re-infection is key to controlling red mite populations. Whilst it is impossible to eradicate them entirely, the aim should be to get numbers down to an acceptable level. "We would expect that the red mite pressure would decrease by using predatory mites over multiple flock cycles," enthused Jeroen. "The opposite is true with insecticides, with resistance building up following repeated use."

The trials described will run for one or more flocks with each of the producers. The Ranger will look forward to catching up on progress at these test farms in the New Year to find out how biological control fairs in a variety of free range production systems.

**Both Jeroen Koppert and entomologist Damien Morel will be present on the APPI stand at the BFREPA conference to answer any questions producers have about the biological control of red mites or flies.**