Varroa Resistance – Radio 4 Inside Science Isobel Grindrod 5th August 2021 (TRANSCRIPT)

Victoria Gill's interview with Isobel Grindrod, research student from the University of Salford

VG: There has been some positive pollinator news this week. The Varroa Destructor, a particularly nasty parasitic mite has been wreaking havoc on bee colonies throughout the world. The mites can live and feed on adults and on bee larvae, and the deformed wing virus that they pass on to the insects reduces the bee lifespan by a third. But some bee colonies it seems are fighting back. Isobel Grindrod from the University of Salford has been investigating how colonies around the world are developing resistance to infestations by the mites with some clever cleaning behaviour.

I started by asking Isobel just how destructive Varroa Destructor is?

IG: It is quite a big problem because for our bees it is a very new parasite evolutionary speaking. It only came around to western honey bees in the early 19th Century, so they haven't had it for very long, which is why it is causing such an effect, particularly in the northern hemisphere where our bees have to survive over winter. The reduced lifespan of the bees means that they are unable to survive through the winter because winter bees need to live for about 6 – 10 months and they can't do it, obviously, so the colony dies over winter.

VG: Right, right so that's when we get these colony collapses, the bees are so weakened by the parasite. You are looking at how the bees are coping to resist this parasite, so what exactly have you done in your study?

IG: For a long time there have been instances of bee colonies being able to resist the mite; that is, they can survive long term with having the mite without any chemical control methods used. So we first noticed this in South America this was following when varroa first went to Brazil in the 1970s. There has been a lot of studies looking at the behavioural traits of honey bees to control the mites, so when you observe one that is surviving long-term you can look at the traits that it has and compare it with to ones that do not survive and need treatment. That is what we did; we gathered data from about 60 papers over 40 years of research and we looked at how the traits are expressed in resistant colonies – those that had survived for 5 years or more without treatment - versus susceptible colonies which need treating at least annually.

VG: When you talk about behavioural traits, what are they doing to get rid of the mites?

IG: The three main traits we looked at were:

Varroa removal – i.e. removing the baby bees when they have the mites

Re-capping – which is when they open the cell which contains the baby bee, but then re-close it

Mite non-reproduction – which is when the mites themselves are incapable of reproducing

So, these are the 3 key traits that have come up time and time again. For example, brood removal actually is a response to other diseases as well, but usually diseases that kill the brood.

VG: So diseases they have lived with and evolved with for much longer, they would do that when the bees find a brood that has been infected with a particular disease they would remove that brood from the hive and clear out the source of the disease. Are they doing that with varroa as well?

IG: Yes, they have been able to repurpose the same behaviour. Obviously the cue, the smell, that they can detect is different but the behaviour is pretty much the same.

VG: You talked about the mites not reproducing, is that the bees preventing reproduction; what is happening there?

IG: When they remove a baby bee with a reproducing mite, the mother mite that entered the cell does not die, but all her babies die and it might affect her chances in the next cell she goes in because she has already started reproducing, it throws her reproductive cycle off kilter and can affect her reproduction. From modelling work that we did it seems that brood removal really affects the population growth of the mites, so it affects how many offspring they can produce.

VG: Amazing! You see these traits, clearing out the infected brood and the mites not being able to reproduce. Is this resistance increasing around the world?

IG: It does seem to be – we are finding this across many regions in South Africa, South America, Europe, and we have been getting increasing reports particularly in more places in the northern hemisphere which has been, arguably, the worst affected area. We were really struggling with more areas the northern hemisphere, but recently there has been a massive increase, and also an increase in beekeepers that are not treating for varroa mites, and are actually having a lot of success with that.

VG: So that is very good news because our pollinators need all the help they can get really. How important do you think it is that you are seeing this resistance to such a nasty and damaging parasite so widespread and also they are learning these traits relatively quickly?

IG: Yes, it is really important, because the chemical treatments we use often become ineffective because the mites can become resistant to chemicals and also, it is not very good to be putting chemicals into a hive generally speaking; so the fact it is happening is really, really encouraging. Because for example in South America and South Africa resistance came about really easily and quickly, and they don't have to treat at all with chemicals, and that would be really great to have in Europe and the UK as well.