

DISEASE RESEARCH

Honeybee genetics fight pathogens

Scientists look at how to use insect's antiviral response to control viruses and parasites in crops and bee colonies

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Honeybees use different sets of genes to fight different viruses, bacteria and pathogens.

According to researchers at Pennsylvania State University, these genes are regulated by two distinct mechanisms. Understanding how they work could help scientists develop treatments designed for specific infections.

"Honeybees, as with many other organisms, have specific molecules that will recognize individual pathogens," said David Galbraith, a graduate student in entomology.

"Once these molecules identify the type of pathogen, a set of genes will then be turned on, resulting in an appropriate response, whether that be antiviral, antibacterial, etc."

Pests, parasites, and weather conditions continually challenge honeybees. The insects face more than 20 different kinds of viruses. Several of them, such as the varroa virus, are linked to colony collapses.

According to Christina Grozinger, director of the Penn State Center for Pollinator Research, beekeepers lose an average of 30 percent of their colonies every winter and an average of 25 percent in the summer.

To understand viral infections, researchers wanted to know which genes increased or decreased their activity in response to a pathogen.

Viruses are microscopic organisms that consist of genetic material (RNA) contained in a protein coat. Unable to live independently, they multiply inside a living host, like a bee.

In bees, the virus goes through its life cycle, but at a critical stage the bee's genes recognize the invader.

Its immune system destroys the virus by interfering with the virus's RNA and fragmenting it into pieces.

"The RNA interference (RNAi) pathway is a primitive antiviral response that has also been exploited as a laboratory technique to control gene expression in a wide variety of organisms," said Galbraith.

According to Grozinger, scientists and beekeepers are interested in finding ways to use RNAi to control viruses and parasites in agricultural crops and in honeybee colonies.

Honeybees are genetically equal at birth, but as they take on specific roles in life their behaviour and physical makeup are changed. These modifications include the addition of chemical "tags" in the form of methyl molecules that alter the way a gene is expressed.

"DNA methylation can change expression of genes and it used to be thought that it was a "permanent" change that would be maintained as cells divide," said Galbraith.

"But there is increasing evidence that DNA methylation can change rapidly in response to environmental and physiological changes."

She said researchers found there may be two genomic response pathways to viral infection.

Galbraith said that current technology to alter DNA methylation patterns is spotty and it will take further investigation.

"The next phase of our research is to figure out if we can safely alter DNA methylation in a manner that makes the bees more resistant to viruses," he said. "There has been some research into using RNAi technology to treat honeybees to reduce viral infections, but this technology needs more research before it can be used commercially."



Researchers hope that by studying bee genetics they can find ways to control viruses and parasites in a range of crops. | FILE PHOTO

FINANCIAL RESULTS

Oilseeds send ADM profits up

CHICAGO, Ill. (Reuters) — Archer Daniels Midland has reported higher-than-expected quarterly profit on strong oilseed crushing margins and robust global demand for soybean meal.

However, revenue fell 15 percent because the strong dollar limited U.S. grain exports, and corn processing profit fell on weak ethanol margins and lower biofuel production volumes.

ADM's first-quarter net profit rose to US\$493 million from \$267 million a year earlier.

Revenue dropped to \$17.51 billion from \$20.70 billion a year earlier. Analysts, on average, expected revenue of \$20.58 billion.

ADM's agricultural services business, its largest in terms of revenue, posted a net profit of \$194 million, up from \$142 million a year earlier.

Higher global merchandising volumes and margins boosted results for the unit, which buys, sells, stores and transports grain and other agricultural products.

Oilseeds processing profit surged 58 percent to \$469 million from \$297 million a year earlier on record soy crushing volumes in Europe and North America and rising volumes in South America, where farmers are harvesting a bumper crop.

Poor ethanol margins and lower production in the quarter dragged down results at ADM's corn processing segment.

The unit earned a net \$113 million, down 39 percent from \$186 million a year earlier.

ADM's new ingredients segment's quarterly profit jumped 17 percent to \$68 million from \$58 million a year earlier.



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