

June 20, 2026

N ° 84

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**Magnetic
field
against
Spodoptera**

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Magnetic field affects Spodoptera

The study evaluated the exposure of larvae, pupae, and adults to 180 milliteslas for 20, 40, and 60 minutes.

19.06.2026 | 15:03 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Biologische Bundesanstalt für Land und Forstwirtschaft - Bugwood

Exposure of *Spodoptera littoralis* to a magnetic field of 180 milliteslas increased

mortality, deformities, developmental delay, and genetic alterations in different stages of the insect. The effect increased with exposure time. Researchers evaluated intervals of 20, 40, and 60 minutes in larvae, pupae, and adults. The study also recorded a reduction in adult emergence, female fecundity, and egg hatching (DOI: 10.3390/insects17060637).

This study aimed to evaluate the potential of magnetic fields as a complementary tool in integrated pest management.

Tests with larvae

In tests with third-instar larvae, exposure to the magnetic field prolonged the larval period. Larvae treated for 20, 40, and 60

minutes had average durations of 15,9, 16,8, and 18,1 days, respectively. The control group recorded 14,6 days. The pre-pupal stage also increased, reaching 3,3 days after 60 minutes of exposure, compared to 2,3 days in the control group.

Larval mortality increased with the exposure period. Values ??reached 11 percent, 13 percent, and 21 percent in the 20, 40, and 60-minute treatments, respectively. The control group registered 4 percent. The proportion of deformed larvae followed the same pattern, reaching 9 percent, 11 percent, and 18 percent in the three exposure times. In the control group, the rate was 3 percent.

Pupae originating from exposed larvae also suffered effects. Pupal mortality

reached 4 percent, 7 percent, and 9 percent in the 20, 40, and 60-minute treatments, compared to 2 percent in the control. Pupal deformation reached 7 percent, 12 percent, and 16 percent, respectively. The control recorded 4 percent.

One-day pupae

When researchers exposed one-day-old pupae to a magnetic field, the duration of the pupal stage increased. The period went from 8,6 days in the control group to 9,4 days with 20 minutes, 11,3 days with 40 minutes, and 14,5 days with 60 minutes. The longest treatment extended this stage by 5,9 days.

Mortality of treated pupae also increased. It reached 17 percent, 26 percent, and 32 percent at 20, 40, and 60 minutes, respectively. The control group showed 4 percent mortality. Adult emergence fell from 96 percent in the control group to 83 percent, 74 percent, and 68 percent at the same exposure times.

Deformity in adults

Deformity in adults emerging from exposed pupae increased with longer treatments. The rate reached 8 percent after 40 minutes and 11 percent after 60 minutes. The control group registered 3 percent. The 20-minute treatment showed 2 percent.

In adults, the magnetic field affected reproductive parameters. The pre-oviposition period increased from 2,6 days in the control group to 2,9, 3,1, and 4,9 days in the 20, 40, and 60-minute treatments. The oviposition period decreased from 9,3 days in the control group to 9,0, 6,6, and 4,0 days.

Longevity of females

The longevity of the females decreased with longer exposure times. The control group showed a lifespan of 14,3 days. Females exposed for 40 and 60 minutes lived 12,7 and 10,2 days, respectively. The 20-minute treatment resulted in a lifespan of 14,5 days.

Fecundity also decreased. Control females produced eight to 13 egg masses.

Exposed females produced seven to ten masses after 20 minutes, six to ten after 40 minutes, and three to eight after 60 minutes. Egg hatching decreased from 91 percent in the control group to 77 percent, 60 percent, and 53 percent, respectively.

The researchers assessed DNA alterations using ISSR markers, an acronym for internal simple sequence repeats. They used 12 primers. The markers generated 168 bands in larvae, 178 in adults, and 223 in pupae. The analyses indicated polymorphism and genetic changes associated with the treatments.

The similarity matrix ranged from 61,6 percent to 74,1 percent in larvae, from

59,8 percent to 68,5 percent in adults, and from 36,2 percent to 49 percent in pupae. According to the researchers, the lower similarity in pupae indicates greater sensitivity at this stage. The study associates this response with intense remodeling during metamorphosis and the greater demand for DNA replication and repair.

Genomic changes

The researchers state that ISSR data should be interpreted as genomic changes associated with treatment, not as direct evidence of a specific mutagenic mechanism. The study suggests the need for further assays with comet assay and quantification of antioxidant enzymes to

separate direct effects on DNA from effects mediated by reactive oxygen species.

The results indicate the potential use of magnetic fields as a component in integrated management programs for *Spodoptera littoralis*. The researchers recommend long-term studies on population effects, reproductive performance, possible development of resistance, and ecological consequences.

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John Deere updates Series 8 tractors for 2027

The 8R, 8RT, and 8RX series will offer a new operating experience in models ranging from 250 to 410 hp

16.06.2026 | 07:31 (UTC -3)

Cultivar Magazine, based on information from Jenni Badding



John Deere has announced updates for its 2027 model year 8 Series tractors in the United States. The changes cover the 8R, 8RT, and 8RX models, in the 250 to 410 horsepower range. The company has expanded the John Deere Operator Experience to this line.

The updates aim to enhance comfort, customization, and operational consistency. According to Carlton Self, John Deere's marketing manager for large tractors, the MY27 8 Series line has received features focused on productivity and comfort during long workdays in the field.

In select 8R models, Reactive Command Steering offers greater control and maneuverability. The system automatically

returns the steering wheel to the center. It also offers three response settings. The operator can adapt the steering feel to the application and driving preference.

Cabin updates

The cab received three transmission lever options: CommandX, CommandX Plus, and CommandX Pro. Each version expands the level of customization. John Deere also redesigned the CommandARM layout. The assembly gained a more modern and adjustable configuration.

Among the new features are a convenience screen for quick access to climate control, radio, and seat adjustments. The line also includes quick-

access buttons, a wireless phone charger, CommandARM power adjustment, full-extension cushion adjustment, backrest ventilation, and assisted door closing.

Power Offboarding

Tractors with variable electric transmissions can use the 56V Power Offboarding system. This feature simplifies the setup of electric planters. The connection is made via a single harness, instead of multiple hydraulic or electrical connections.

In the 8R and 8RX models, Hitch Active Downforce assists in maintaining seeding depth in varying soil conditions. This feature is compatible with both all-in-one

and trailed planters.

Soil preparation

The line also comes prepared for autonomous soil preparation operations. The tractors include a G5 Plus monitor, compatibility with AutoTrac Turn Automation, AutoTrac Implement Guidance, and AutoPath. They also offer Machine Sync preparation and optional JDLink Boost connectivity.

In the United States, the 8 Series MY27 tractors, ranging from 250 to 410 horsepower, will have a three-year or 1.500-hour PowerGard limited extended warranty included in the base price. John Deere plans to expand the offering to Canada.

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Study identifies new natural enemy of the green stink bug

Trichopoda ypiranga is recorded for the first time on *Diceraeus melacanthus* in the mid-north of Mato Grosso

15.06.2026 | 05:30 (UTC -3)

Schubert Peter, Cultivar Magazine



Adult male of *Trichopoda ypiranga* - Photo: doi.org/10.37486/2675-1305.ec08017

Researchers have recorded the fly for the first time *Trichopoda ypiranga* parasitizing adults of green-bellied stink bug, *Diceraeus melacanthus*. The study took

place in agricultural areas of the mid-north of Mato Grosso, between October 2021 and February 2025. The result reinforces the potential of this natural enemy in integrated pest management programs.

The research evaluated 43 samples of soybeans, cowpeas, millet, sesame, and weeds. The collections covered nine municipalities in the region. In total, the scientists collected 7,754 adult *Diceraeus melacanthus*. Of this total, 703 showed parasitism. The average rate reached 9.06%.

Rates varied from 1,04% to 30,83% across sampling periods. The highest rates were observed between March and May. The highest averages occurred in millet areas, with 30,8%, and sesame areas, with 17%.

In May, approximately 25% of the stink bugs collected in millet and sesame showed signs of parasitism.

The species *Trichopoda ypiranga* accounted for approximately 84% of the emergencies recorded in *Diceraeus melacanthus*. The researchers also observed *Cylindromyia brasiliensis*, *Gymnoclytia* sp. and *Phasia* sp., but less frequently. The paper also reports the first observation of *Phasia* sp. parasitizing *Diceraeus melacanthus*.

Bedbug in the field

In the mid-north of Mato Grosso, soybeans predominate during the summer, between September and February. Corn follows,

from February to June. This sequence favors *Diceraeus melacanthus* because both crops act as hosts. After the soybean harvest, the insects can take shelter in crop residues or weeds. Then, they migrate to attack corn seedlings.

The data showed variation in parasitism throughout the soybean cycle. Values ??ranged from 2% to 23%. Sampling included weeds before sowing, areas during harvest, and areas after harvest. The highest rate occurred at the beginning of soybean development.

According to researchers, millet and sesame can offer favorable conditions for parasitoid activity. These crops can provide food, shelter, a suitable microclimate, or less interference from

agrochemicals. The study also reports that these areas receive less spraying compared to soybeans and corn. Therefore, they can act as reservoirs of parasitoids in the region.

Parasitism rate

Despite the constant presence of *Trichopoda ypiranga*, the overall parasitism rate was considered moderate. The study points to the intensive use of insecticides as a possible factor associated with this result. Non-selective chemicals can reduce the population density of natural enemies, affect the search for hosts, and compromise the emergence of parasitoids.

Scientists cite acephate as a product widely used in annual crops in the mid-north of Mato Grosso. In greenhouse tests mentioned by the researchers, corn plants sprayed with half the dose and the recommended dose caused 100% mortality of parasitoids within 24 hours.

Chemical control of bed bugs in Brazil utilizes broad-spectrum insecticides, such as pyrethroids, neonicotinoids, and organophosphates. The study highlights the need to integrate the rational use of these products with practices for conserving natural enemies.

Ecological relevance

Researchers claim that *Trichopoda ypiranga* has ecological relevance and can contribute to biological control strategies for *Diceraeus melacanthus*. They also indicate the need for further studies on biology, behavior, host specificity, and selectivity to agrochemicals. This data can guide the inclusion of the species in integrated pest management programs.

The study was developed by Suellen KA Barros, Camila S. de Oliveira, Rodrigo de VP Dios, Ana PM da Silva, and Rafael M. Pitta.

Further information can be found at doi.org/10.37486/2675-1305.ec08017

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Marcelo Giacometti takes over management position at Corteva Agriscience.

Marcelo, an agricultural engineer with 16 years of experience, will now lead District Marketing operations in Mato Grosso do Sul.

19.06.2026 | 14:40 (UTC -3)

Cultivar Magazine



Corteva Agriscience has made changes to its District Marketing management.

Marcelo Giacometti (pictured) assumed the role this June, focusing on market access, brand management, business planning, crop protection, and biologicals. He will be based in Mato Grosso do Sul.

With over 16 years of experience in sales and marketing positions in agribusiness, Giacometti built his career at companies such as BASF, Bayer, and Monsanto. Throughout his career, he led operations focused on crops such as rice, soybeans, corn, wheat, vegetables, and fruits.

Marcelo is an agricultural engineer with several MBAs in marketing, sales, leadership, innovation, and data analytics, earned at institutions such as Fundação Getulio Vargas (FGV), FIA Business School, and PUCRS.

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Phytolacca americana extract repels diamondback moths.

Study indicates olfactory action against *Plutella xylostella* and points to esters as active compounds.

19.06.2026 | 09:37 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Alberto Luiz Marsaro Júnior / Embrapa

Researchers have identified a repellent effect of the fruit extract of *Phytolacca americana* about adults [Plutella xylostella](#) [\(commonly known as diamondback moth\)](#)

The study combined chemical analysis, behavioral tests using a Y-shaped olfactometer, and electroantennography. The results indicate an olfactory-mediated action associated primarily with ethyl palmitate and ethyl oleate (DOI: 10.3390/insects17060641).

The research evaluated the fruit extract of *Phytolacca americana*. The scientists started from the hypothesis of the presence of chemical defenses in the species. The study sought alternatives to conventional chemical control of *Plutella xylostella*, an insect with a history of resistance to several classes of

insecticides.

The fruits were collected in Qingdao, China, dried in the shade, crushed, and subjected to steam distillation. The process took place at 100 degrees Celsius for eight hours. The extract yield reached 0,32 percent, on a fresh weight basis.

Analysis by gas chromatography coupled with mass spectrometry indicated 11 compounds. They represented 96 to 99 percent of the composition of the final distillate. Three substances dominated the sample: ethyl palmitate, with 26 percent; 6,10,14-trimethyl-2-pentadecanone, with 25,75 percent; and ethyl oleate, with 14,19 percent.

Males and females

In bioassays, the extract showed repellency against both male and female mosquitoes. *Plutella xylostella* The response increased with concentration. At a dose of 100 micrograms per microliter, 117 females chose the hexane arm in the olfactometer, compared to 29 in the extract arm, out of a total of 150 insects tested. Among the males, 119 chose hexane, compared to 23 in the extract arm.

The major compounds also underwent isolated tests. Ethyl oleate showed the strongest repellency. At a concentration of one microgram per microliter, 78 percent of the females chose the hexane control, while 21 percent chose the treatment.

Ethyl palmitate maintained repellency at different concentrations. At the same dose, 70 percent of the females chose hexane, compared to 27 percent for the treatment.

6,10,14-trimethyl-2-pentadecanone showed less effect. At a concentration of one microgram per microliter, 57 percent of the females chose hexane, while 39 percent chose the treatment. The study classified its repellency as inferior to that of the two esters.

Antennal responses

Electroantennagram recordings confirmed antennal responses to the compounds.

Ethyl oleate showed a concentration-dependent increase, reaching

approximately 0,56 millivolts at 100 micrograms per microliter. Ethyl palmitate generated the strongest response at 10 micrograms per microliter, with approximately 0,71 millivolts. 6,10,14-trimethyl-2-pentadecanone produced weaker responses, with a maximum near 0,26 millivolts.

The researchers also removed antennae from adults to assess the role of smell. After removal, the insects showed no significant difference in their choice between hexane, ethyl oleate, and ethyl palmitate. The result indicates a central role for antennae in the perception of repellent compounds.

The study also detected diethyl phthalate in the distillate. The substance showed a

significant antennal response and repellency in the tests. However, the researchers pointed to a likely origin in contamination by plastic materials used during the preparation and analysis of the samples. They highlighted the absence of blank controls as an important limitation.

The study concluded that the fruit extract of *Phytolacca americana* offers initial laboratory evidence as an olfactory repellent against *Plutella xylostella*

Scientists are advocating for further field and semi-field trials, as well as studies on formulation, environmental persistence, and effects on non-target organisms.

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Floral stripes reduce damage from *Tuta absoluta* in tomatoes.

Cosmos increased the retention of natural enemies and reduced damage by up to 15% in protected organic farming.

19.06.2026 | 08:58 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Joydeep - CC BY-SA 3.0

Floral headbands with cosmos reduced the damage of Phthorimaea absoluta (formerly known as Tuta absoluta) in organic tomatoes under protected cultivation. The study evaluated the use of floral resources and natural enemies in the management of the tomato leafminer. The cosmos, *bipinnatus*, had the best performance. The reduction in harm reached 10% to 15% (DOI: 10.1002/ps.71013).

The research also evaluated the marigold, *tagetes erecta*. Flowering plants were included in factorial combinations with the presence or absence of flowers and three natural enemies. The organisms evaluated were the mirid bug, *Nesidiocoris tenuis*, the green lacewing *Chrysoperla carnea* and the egg parasitoid *Trichogramma chilonis*.

The experiment took place in a greenhouse. Researchers selected and marked ten tomato plants per plot at the start of the trial. The same plants underwent weekly assessments of damage, abundance of natural enemies, and fecundity.

damage reduction

Treatments with flowers reduced damage compared to controls without floral resources. Cosmos exhibited longer and more stable flowering. This characteristic favored the persistence and performance of natural enemies. The highest levels of suppression occurred in the combination of cosmos and *Nesidiocoris tenuis*.

The population density of natural enemies per plant increased in the flower treatments. Fecundity also increased in these treatments. Parasitism by *Trichogramma chilonis* The increase was greater in plots with flowers. Parasitism maintained a positive correlation with floral intensity.

The results indicate the potential of habitat manipulation to strengthen biological control in organic tomatoes under protected cultivation. This strategy could support integrated pest management programs and reduce reliance on chemical inputs. Researchers point to the need for multi-year trials to broaden understanding of the mechanisms involved and promote the adoption of this practice.

The work was carried out by researchers Moazam Hyder, Farman Ullah, Tijjani Mustapha, Inzamam Ul Haq, Abdul Basit, Cai Xiang-Yun, Raul Narciso C Guedes, Kaleem Tariq and Youming Hou.

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Agricultural Market - 19.Jun.2026

The dollar is supporting grain prices, but weather and harvest are putting pressure on prices.

19.06.2026 | 08:22 (UTC -3)

Vlamir Brandalitze - @brandalitzeconsulting



The rising dollar supported agricultural prices at Brazilian ports this week.

Pressure came from the international market, following central bank decisions and a drop in oil prices. Soybean prices remained strong at the ports. Corn received currency support but remained under pressure in Chicago. Wheat found support in lower international supply. Rice began to recover in the South. Bean prices lost momentum with increased harvesting.

Soybeans felt the pressure in Chicago. The July contract attempted to hold levels above \$11,20 per bushel after trading below that level. The strongest support is at \$11 per bushel, with weaker support at \$11,10 per bushel. Longer positions performed slightly better, with 2027 contracts settling near \$11,50 per bushel.

In Brazilian ports, positive premiums and a strong dollar supported soybean prices. Indications ranged from R\$135 per sack in July to R\$142 per sack in October. The market experienced little fluctuation and slight upward pressure on prices in reais.

Weather in the United States has limited price increases for soybeans. Crops are progressing normally. Rainfall remains regular. A report indicates that 66 percent of crops are in good or excellent condition. The market is still observing risks for July, with concerns linked to El Niño, but no problems have been confirmed so far.

Corn situation

Corn also declined in the international market. The drop in oil prices pressured US ethanol. This movement affected the cereal. The US harvest continues without significant news. 68 percent of the crops are in good or excellent condition. The market is monitoring July as a period of climate risk, but is negotiating the current scenario with a regular harvest.

In Chicago, July corn futures held support near \$4,10 per bushel. The July 2027 contract remained near \$4,80 per bushel. In Brazil, ports traded near R\$61 to R\$62 per sack, supported by the dollar.

The corn harvest has gained importance in the domestic market. Mato Grosso is harvesting more than one million tons per day. Goiás, Minas Gerais, and Paraná

have begun advancing in the first areas. Compared to previous years, the harvest is slightly behind schedule. Planting occurred later in some regions.

The first crops were in good condition and had a normal cycle. The intermediate crops suffered more. The late-planted areas received rain in the last two weeks and showed good conditions. The risk now involves a polar air mass predicted for the end of June.

Wheat situation

Wheat behaved differently. The international market began to observe problems in Ukraine, a major exporter of the grain. Bombings hit shipping terminals

and may limit exports. The Russian harvest is also not performing well. In the United States, wheat quality remains low. Only 27 percent of the crops appear to be in good or excellent condition. The winter wheat harvest has reached about 30 percent.

Lower supply supported wheat prices. The July spot contract attempted to hold support at \$6 per bushel. Longer positions gained value. Contracts expiring in 2027 sought levels above \$6,50 per bushel.

In Brazil, wheat planting is in its final stages. The crops are in good condition. The weather has been regular, with rain and no significant problems. In Rio Grande do Sul, prices ranged between R\$ 1.300 and R\$ 1.320 per ton. In Paraná, they

varied from R\$ 1.360 to R\$ 1.380 per ton. For producers, wheat was priced between R\$ 69 and R\$ 71 per sack from Rio Grande do Sul to Paraná. States from São Paulo northward had slightly higher prices.

Sorghum situation

Sorghum has come onto the radar of Brazilian producers because of the United States. The country leads world exports and is expected to reduce its planted area by between 12 and 15 percent. This decrease could open up opportunities for other exporters. Analysis suggests the possibility of half a million tons of unmet export demand from US producers.

In Brazil, sorghum production could reach eight million tons or more. In the United States, planting has reached 75 percent of the area. The historical average is close to 78 percent. Kansas, the largest producer, has reached 60 percent, compared to an average of 65 percent. Texas is on track to close within normal levels. The weather has not yet brought major changes to North American sorghum.

Rice situation

Rice prices began to recover in the Rio Grande do Sul market. In the western border region, 58-grain whole rice reached R\$ 58 per sack, with purchase indications at R\$ 59. 60-grain whole rice reached R\$ 60. Other regions of Rio Grande do Sul

traded above R\$ 60 per sack. Southern Santa Catarina also showed a slight increase.

The reaction occurred after the peak of the harvest. Producers sold part of their production, and the market began to show signs of improvement. Mato Grosso remains firm, with little availability.

Indications range from R\$ 90 to R\$ 100 per sack, with few transactions. In Tocantins, the market ranged between R\$ 78 and R\$ 82 per sack.

Bean situation

Beans have entered a phase of increased supply. The harvest has progressed, reducing prices for producers. The

premium carioca bean, grade nine above, reached R\$ 500 per sack last month. Now it is trading between R\$ 370 and R\$ 390 per sack. The market is no longer registering deals close to R\$ 400.

The price of commercial carioca beans also fell. Indications ranged between R\$ 310 and R\$ 350 per sack, with most transactions between R\$ 310 and R\$ 340. This pressure is expected to last about a month while the harvest progresses.

Afterwards, between August and September, the supply of the crop tends to decrease. Irrigated beans are harvested at the end of September and in October.

Black beans also lost momentum. After reaching R\$ 300 per sack at their peak, prices now fluctuate between R\$ 180 and R\$ 210. In some places, the price at the

farm gate remained between R\$ 150 and R\$ 160. This lull is affecting producers and cooperatives in Santa Catarina and Paraná.

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ATENÇÃO

ESTE PRODUTO É PERIGOSO À SAÚDE HUMANA, ANIMAL E AO MEIO AMBIENTE; USO AGRÍCOLA; VENDA SOB RECEITUÁRIO AGRÔNOMICO; CONSULTE SEMPRE UM AGRÔNOMO; INFORME-SE E REALIZE O MANEJO INTEGRADO DE PRAGAS; DESCARTE CORRETAMENTE AS EMBALAGENS E OS RESTOS DOS PRODUTOS; LEIA ATENTAMENTE E SIGA AS INSTRUÇÕES CONTIDAS NO RÓTULO, NA BULA E NA RECEITA; E UTILIZE OS EQUIPAMENTOS DE PROTEÇÃO INDIVIDUAL.

Bayer appoints Kacy Perry to lead Crop Science in Canada.

The executive will assume leadership of the division on July 1st and will manage more than 550 employees in units across the country.

19.06.2026 | 07:38 (UTC -3)

Cultivar Magazine, based on information from Bayer



Bayer's Crop Science division announced the appointment of Kacy Perry as Country Division Head of Crop Science Canada. She will assume the role on July 1st. In this position, Perry will lead more than 550 employees across the company's facilities in Canada. She will also join the leadership team for Bayer's Crop Science in North America.

Perry serves as North America Soybean Business Lead for the Crop Science division. She has built her entire career at Bayer, holding field and leadership roles in marketing, product management, and sales. She also led the company's corn portfolio in the United States.

The new Country Division Head also led a strategic initiative as Brand Strategy Lead.

In this role, she guided the evolution and execution of the Channel Seed Professional Strategy in the United States business.

According to Perry, the priority involves expanding Bayer's impact on Canadian farmers. She also stated that she sees Canada gaining increasing recognition, both within Bayer and in the agricultural sector, as a leader in innovation in seeds and traits, crop protection, and digital agriculture.

She succeeds Antoine Bernet, former Country Division Head of Crop Science Canada. Bernet will return to France, his country of origin. According to Bayer, he played a significant role in advancing the organization's sustainable and innovative

agricultural practices. He also participated in the launch of the company's Dynamic Shared Ownership model in Canada.

Bernet worked for over 20 years at Bayer on initiatives related to advancing agriculture. The company also highlighted its support for Canadian agriculture and its advocacy for the sector's potential in the country.

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Viter expands its portfolio and launches foliar solutions at Hortitec.

The new Adapte and Maximize products mark the company's entry into the foliar segment.

18.06.2026 | 16:20 (UTC -3)

Cultivar Magazine



Viter took advantage of its participation in Hortitec 2026 to present two new solutions focused on plant nutrition and

management. Known for its soil-based products, the company is now expanding its portfolio with the foliar launches Adapte and Maximize.

According to Isabella Bertin, technical sales assistant at Viter, Adapte is a bioactivator developed to prepare plants for stressful situations, such as periods of water deficit and high temperatures. The aim is to stimulate physiological mechanisms that increase the crop's tolerance to adverse conditions.

Maximize, on the other hand, is indicated for the grain and fruit filling stages, considered critical for determining productivity. The product aims to provide essential nutrients during this period, contributing to the development of fruits and grains with greater quality, weight, and

size.

With these new product launches, Viter is now also operating in the foliar products segment, expanding the management options offered to producers.



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Following a focus on greening, Rio Grande do Sul inspects more than 500 properties.

Actions include plant eradication and monitoring in neighboring areas.

18.06.2026 | 16:02 (UTC -3)

Elstor Hanzen, Cultivar Magazine edition



Following the confirmation of the first outbreak of human greening (HLB) in Rio

Grande do Sul A task force mobilized by the Secretariat of Agriculture and the Ministry of Agriculture (Mapa) has already inspected 522 properties and eradicated 201 citrus plants in Palmitinho, in the Médio Alto Uruguai region. The teams have been working to contain the spread of the disease by eliminating infected plants, controlling the vector insect, and monitoring areas neighboring the outbreak.

In presenting an overview of the situation to the Agriculture, Livestock, Fisheries and Cooperativism Committee, the director of the Plant Protection Department of the Secretariat of Agriculture, Ricardo Felicetti, highlighted that the emergency protocol was put into practice immediately after the disease was confirmed.

Inspection and eradication efforts within a 500-meter radius of the fire outbreak have already been completed, while actions in the 2,4-kilometer monitoring area are in their final phase. The next step involves the possible expansion of surveillance to neighboring municipalities, with the aim of identifying any occurrences early.

The actions follow the guidelines of the National Huanglongbing Prevention and Control Program (PNCHLB). The main target is the psyllid. *diaphorina citri*, an insect responsible for transmitting the bacteria associated with citrus greening.

Updated overview

As of Wednesday (June 17), teams had inspected 42 properties located within a 500-meter radius of the property where the disease was identified. Within this perimeter, 178 plants were eradicated, 100 samples were collected for laboratory analysis, and another 217 plants without symptoms of the disease were inspected.

Within the expanded radius of 2,4 kilometers, 480 properties were inspected. The teams collected 70 samples for analysis and identified 13 properties requiring the eradication of citrus trees, resulting in the removal of a total of 23 plants.

According to Felicetti, the large number of citrus plants found in urban areas led to the expansion of surveillance efforts.

"Since we saw many citrus plants in people's yards, we opted to expand monitoring in the urban area and, in the coming weeks, we will conduct further surveys in the rural area," he stated.

The superintendent of the Ministry of Agriculture in Rio Grande do Sul, José Cleber Dias de Souza, stressed that the situation is under control and that there is no reason for alarm. According to him, state and federal teams remain mobilized and are working in a coordinated manner to contain the outbreak identified in Palmitinho.

"We have the structure and personnel working to contain the disease. The Ministry maintains agreements and joint actions with Seapi to strengthen the state's

plant health defense, and all protocols are being followed systematically,” he stated.

Considered one of the main threats to citrus farming worldwide, citrus greening has no cure. The disease compromises productivity, reduces fruit quality, and can lead to the death of plants. Therefore, the rapid identification and elimination of outbreaks are considered essential measures to protect citrus orchards in Rio Grande do Sul.

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Brandt announces change in marketing management in Brazil.

With a solid track record in agribusiness, Giano Caliari will have the mission of driving the company's expansion plans in the country.

18.06.2026 | 14:12 (UTC -3)

Rafael Iglesias, Cultivar Magazine edition



Brandt announced **Giano Caliari** (pictured) as the new marketing director in Brazil. With over 25 years of experience in

the sector, he joins the company with the mission of boosting expansion plans in the country. The executive succeeds Flavio Cotrin – promoted to senior marketing director at Brandt International, based in the United States..

Caliari holds a degree in Agronomy from the Federal University of Espírito Santo (Ufes) and various training programs in business. He has a solid track record in agribusiness, with experience in marketing, market development, and strategic management. Throughout his career, he has led high-impact initiatives in large multinational companies in the sector, always focused on brand positioning, business growth, and generating value for clients and partners.

“I am very happy with this new professional challenge and I hope to contribute, through marketing strategies, to Brandt's growth and the expansion of its connections with the market, consolidating the brand as a reference in innovation and high-performance solutions for agriculture,” says the new director. “With a qualified team and an excellent portfolio, we certainly have a very positive path ahead,” he concludes.

Brandt's growth in Brazil

Brandt has shown consistent growth in Brazil for 11 years. In 2025, revenue increased by 16%, and the expectation is for 22% growth in 2026, driven by

investments in production and expansion of the team and portfolio, including two new factories in Paraná.

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Bayer brings fungicides and seeds to Hortitec.

The portfolio includes Valpura, Xivana Smart, and new Seminis varieties for fruits and vegetables.

18.06.2026 | 13:04 (UTC -3)



Bayer is showcasing fungicides and horticultural seeds at Hortitec 2026, a trade fair taking place in Holambra, São

Paulo. The company is bringing technologies for crop protection and materials from its Seminis brand focused on productivity, regional adaptation, and quality to the event.

Key highlights in crop protection include fungicides. Valpura (bixafen) to Xivana Smart (fluoxapiprolim + fluopicolide) Valpura is indicated for the management of black spot in potatoes and tomatoes, powdery mildew in grapes, scab in apples, and Sigatoka disease in bananas. Xivana Smart acts in the control of late blight and downy mildew in crops such as potatoes, tomatoes, onions, grapes, and lettuce.

The company reports an annual global investment of 2 billion euros in research and development. In Brazil, the forecast includes five product launches per year

until 2030 in crop protection.

Seminis presents Argemiro, a new rootstock for bell peppers. This material expands the brand's offering of rootstocks and aims to provide vigor, health, and stable productivity to the crop. The company positions the solution for systems with pressure from soil diseases and adverse conditions.

The brand also carries Silverstar, a winter carrot focused on productive performance, root quality, and uniformity. The Laura carrot reinforces the summer portfolio. This variety has an average cycle of 110 to 120 days, vigorous emergence, erect foliage, field retention, and average tolerance to premature bolting and green shoulder.

Among the other new products are Abraham broccoli, adapted to the southern region of Brazil during the winter window, and the 1049 onion, with an early cycle of 115 to 120 days and suitable for use from the main to the late crop season. Bayer is also promoting the "Established Varieties" campaign, featuring seeds launched more than ten years ago and still present on the market.



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Adapzo Active receives new action mode code.

BASF's active ingredient is now included in FRAC Group 56 for fungal control.

18.06.2026 | 12:48 (UTC -3)

Cultivar Magazine, based on information from Verena Kempter



O fungicida Adapzo Actizve, da BASF,
cuja molécula tem o nome químico
flufenoxadiazam, it became the sole holder

of the new Group 56 of the Fungicide Resistance Action Committee (FRAC). The molecule represents the industry's first histone deacetylase (HDAC) inhibitor.

BASF announced the new classification in a statement released on June 18, 2026.

According to the company, Adapzo Active is part of its innovative crop protection portfolio. The company states that it maintains a research and development line with planned launches of fungicides and insecticides, in addition to a pipeline of herbicides linked to traits.

Christine Habicher, vice president of fungicide research at BASF Agricultural Solutions, stated in the press release that the company transforms science into value for farmers by introducing a new chemical

class based on its research and development. According to her, the new FRAC code is a result of this work and offers a tool for resistance management and preservation of productive potential.

Asian rust

Adapzo Active was developed to control Asian soybean rust. BASF claims that the new mode of action controls mutated fungal strains and offers an economic advantage to producers. Products based on the active ingredient have demonstrated productivity gains of approximately six sacks per hectare compared to the current market standard.

According to the company, including products with Adapzo Active in pest management can enhance resistance strategies. BASF also reports improved effectiveness in controlling Asian soybean rust. These productivity gains, according to the statement, translate into greater profitability for soybean farmers.

The active ingredient acts as the first to inhibit class II fungal HDACs. BASF reports that Adapzo Active should interrupt a coordinated gene expression program, considered critical for the formation of initial infection structures. With this action, the product prevents the onset of the Asian soybean rust infection process in the early stages of disease development.

The company states that the new fungicide does not demonstrate cross-resistance with known solutions for Asian soybean rust. BASF also reports that the product acts harmoniously with non-target species and beneficial organisms when applied according to the label instructions.

FRAC acts as an international organization focused on communication and education about fungicide resistance. Its mission, according to the statement, involves promoting resistance management strategies to maintain fungicide efficacy and support sustainable agriculture.

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AGCO appoints Emiliano Ferrari to lead its Argentinian operation.

Executive takes command of AGCO Argentina and retains commercial leadership of Fendt and Valtra for Hispanic America.

18.06.2026 | 10:29 (UTC -3)

Cultivar Magazine, based on information from Corina Tareni



AGCO Corporation announced the appointment of Emiliano Ferrari as general manager of AGCO Argentina and commercial director of Fendt and Valtra for Latin America. The executive will lead the company's operations in Argentina and the commercial strategy of the two brands in the region. The company aims to strengthen business growth, increase proximity to producers, and develop a value proposition based on innovation, technology, and service.

Ferrari holds a degree in Business Administration from the National University of La Matanza. He has worked at AGCO for over two decades. Throughout his career, he has held positions in areas such as finance, planning, market intelligence, pricing, advertising, after-sales service,

and sales. This experience has allowed him to build knowledge about the business, the dealer network, and the different production realities of Hispanic America.

In his new role, Ferrari will be responsible for leading AGCO Argentina's operations. The company considers the country one of the most important markets in the region. In Argentina, AGCO maintains an industrial and commercial presence. The structure includes a plant in General Rodríguez, where it manufactures equipment for different production segments, a logistics and parts distribution center in Haedo, and a dealer network covering the entire national territory.

The executive will also continue to lead the commercial strategy for Fendt and Valtra in Latin America. This role involves the growth of both brands, strengthening ties with the distribution network, and advancing the adoption of technologies aimed at transforming modern agriculture.

Ferrari stated that he feels proud to take on this new role within the company, where he began his career more than 20 years ago. According to him, his commitment involves leading Argentina's strategic agenda, aligning operations with business priorities, expanding collaboration between areas, and developing teams. The executive also cited the growth of people and customer satisfaction among his main priorities.

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Essential oils target leafcutter ants and symbiotic fungus

Study indicates greater potential in ginger and bottlebrush oils for use in toxic baits.

18.06.2026 | 09:11 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Eduardo Esquivel Rios - CC BY-SA 3.0

Essential oils of ginger and bottlebrush showed the most relevant results in tests against leafcutter ants and their symbiotic fungus. Researchers from the Federal University of Viçosa evaluated five vegetable oils against worker ants of *Atta sexdens* and *Acromyrmex subterraneus* in addition to the fungus *Leucoagaricus gongylophorus*, nutritional basis of the colonies. The data indicate potential for new control strategies, but also show the need for adjustments before use in toxic baits (DOI: 10.3390/insects17060645).

The research evaluated essential oils from weeping willow (*salix babylonica*), cherry (*eugenia uniflora*), bottle brush (*Melaleuca viminalis*), ginger (*Zingiber officinale*) and black pepper (*Piper nigrum*). The team characterized the compounds using gas

chromatography coupled with mass spectrometry. The chemical profiles showed a predominance of mono- and sesquiterpenes.

Bottlebrush oil was predominantly composed of 1,8-cineole, accounting for 75,77 percent of the relative area, followed by alpha-pinene, with 17,32 percent.

Ginger oil presented camphene, with 34,93 percent, beta-phellandrene, with 27,91 percent, and alpha-pinene, with 11,86 percent. Black pepper oil presented cis-caryophyllene, limonene, and beta-pinene as its main constituents.

Separated ants

Scientists separated the worker bees into foragers and gardeners. The foragers collect and transport plant material to the nest. The gardeners maintain the fungus garden. This separation played a central role in the study, as an effective bait needs to reach the interior of the colony before causing a lethal effect. Thus, low toxicity against foragers may favor the transport of the bait.

In bioassays with *Acromyrmex subterraneus*, foragers responded significantly to black pepper and ginger oils. Weeping willow, bottlebrush, and pitanga oils did not produce a concentration-dependent effect in this group. Among gardeners of the same species, almost all oils altered survival. The exception was bottlebrush.

In *Atta sexdens*, the effects on foragers remained low at the concentrations evaluated. There was no consistent relationship between concentration and mortality. Among the gardeners, bottlebrush, black pepper, and pitanga oils reduced survival. Bottlebrush oil showed marked toxicity to gardeners of *Atta sexdens* starting at 0,10 milligrams per milliliter, with less effect on foraging crops.

Functional components

The results reinforce the importance of targeting functional components of the colony. Controlling leafcutter ants depends on disrupting the social system, not just killing exposed individuals. The colony maintains its survival through association

with *Leucoagaricus gongylophorus*. The gardeners take care of this fungus and maintain the nutrition of the nest.

The symbiotic fungus responded clearly to the essential oils in the initial assay at 100 milligrams per milliliter. All oils reduced growth area and dry mass compared to the control. The control showed an average area close to 150 square centimeters. Ginger and bottlebrush oils completely suppressed mycelial development at this concentration.

Pitanga oil caused partial inhibition, with an average growth area of approximately 20 square centimeters. Weeping willow and black pepper oils caused moderate reductions, with average areas of approximately 50 and 80 square

centimeters, respectively.

Different concentrations

Following the initial trial, the researchers tested ginger and bottlebrush oil at different concentrations. Ginger oil maintained a concentration-dependent response and reduced growth area and dry mass above 10 milligrams per milliliter. Bottlebrush oil did not maintain a significant concentration-dependent effect at this stage.

The study points to two areas of interest. Ginger oil showed greater fungicidal action at high concentrations. Bottlebrush oil showed selective toxicity against *Atta*

sexdens plantlets and strong inhibition of the fungus in the initial assay. Even so, the researchers state that the effects were not widespread among all oils and biological targets.

Practical limits

The research also highlights practical limitations. Mortality rates in gardener plants rarely exceeded 50 percent after seven days. This level falls below the expected effectiveness of conventional products. Therefore, the oils evaluated do not appear as direct substitutes for active ingredients used in baits. They emerge as candidates for formulations, purified fractions, synergistic combinations, or additives with action against the fungus.

The researchers highlight another technical point. Essential oils have variable composition. Extraction, storage, temperature, light, and the phenological stage of the plant can alter the chemical profile. In the case of bottlebrush, the volatility and possible degradation of 1,8-cineole and alpha-pinene may explain differences between the initial assay and the dose-response phase.

The study concludes that selective caste toxicity and fungus suppression can occur with plant compounds. However, this effect does not appear in a generalized way among essential oils. Bottlebrush emerges as a candidate for further investigation, especially regarding individual compounds and synergistic interactions in toxic baits.

The study was conducted by researchers
Andressa Graebin, Patrícia F. Pinheiro,
Karina D. Amaral, Vinicius F. Santos,
Tarciza F. Nascimento, Marcela V. de S.
Vilela, Yenara KM Silva, Thais D.
Marcelino, and Raul Narciso C. Guedes.

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Insect microbiome opens new avenues for pest management

Study points to the use of volatile microbial compounds in baits, repellents, and pest management tools

18.06.2026 | 08:35 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Paulo Lanzetta

Microorganisms associated with insects can produce, modify, or mediate chemical signals used in aggregation, mating, feeding, and host choice. This conclusion appears in a study that points to four main routes of microbial influence on insect chemical communication: direct production of volatile organic compounds, provision or modification of pheromone precursors, alteration of host sensory and neural function, and effects dependent on diet, development, quorum sensing, and environmental microbiomes (DOI: 10.1002/ps.71015).

The scientists who conducted the study consider systems with the strongest experimental evidence to be those in which the removal of microorganisms

causes a loss of the chemical compound and behavior, followed by recovery after recolonization. This pattern appears in studies with the German cockroach, *blattella germanica*. Individuals lacking microbiota produced feces without several volatile carboxylic acids linked to aggregation. Recolonization with gut bacteria restored the chemical profile and aggregation behavior.

Application in the field

The closest field application involves fruit flies. Yeasts and bacteria associated with fermentation produce ethanol, acetic acid, fusel alcohols, and esters. These compounds attract adults to feeding and oviposition sites. Fermentative baits with

yeast and sugar have increased catches of [Drosophila suzukii](#) in comparison with vinegar-based baits or synthetic mixtures in various systems, researchers classify these tools as promising for monitoring and attraction and control strategies.

Scientists also highlight metabolites of *Xenorhabdus* spp. Among them, fabclavins and related compounds showed deterrent action against mosquitoes in laboratory tests. The work also cites geosmin, produced by soil microorganisms, as a signal capable of provoking aversion in *Drosophila*. These examples indicate microbial sources for new repellents or behavior modulators.

Agricultural vectors

The study also addresses agricultural vectors. In citrus, changes associated with Candidatus Liberibacter modify plant volatiles, increasing methyl salicylate and attracting the Asian citrus psyllid Diaphorina citri. This type of change can favor the transmission of pathogens. It can also aid in the design of traps or monitoring systems based on odors induced by infection.

Gaps in studies

Despite the potential, there are important gaps. Many studies still only show associations between insects, microorganisms, and volatiles. There is a lack of connection between microbial genes, metabolites, and behavioral

responses. Researchers advocate for assays using axenic rearing, antibiotics, recolonization, gas chromatography coupled with mass spectrometry, electroantennography, sequencing, microbial mutants, and field tests.

Scientists also warn about the effect of context. Substrate, diet, insect age, developmental stage, plant microbiome, and environment can alter the set of microorganisms and the volatile profile. A yeast can emit distinct mixtures in sucrose, fruit pulp, or plant tissue. Therefore, baits tested in the laboratory may lose performance in orchards, warehouses, or crops with a complex odorous background.

Microbiome engineering

Microbiome engineering emerges as the most ambitious route. The review cites microorganisms modified to produce attractive or repellent volatiles, as well as paratransgenesis with insect symbionts. These approaches still require containment, environmental risk assessment, gene transfer analysis, persistence in the environment, and regulatory acceptance. Operational use in crops remains distant.

For integrated pest management, researchers suggest applications in monitoring, push-pull systems, attract-and-kill baits, sterile insect techniques, and

post-harvest management. Priority is given to tools with chemical validation, demonstrated sensory response, and replicated field trials. Without this sequence, discoveries about microbiomes and semiochemicals tend to remain at the experimental level.

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STIHL presents stationary engines and lawnmowers at Hortitec.

The company is showcasing a new generation of engines and four models of combustion-powered lawnmowers at the trade fair.

17.06.2026 | 17:27 (UTC -3)

Gabriel Campos placeholder image



STIHL, a leader in the Brazilian market for portable motorized tools, is present at the

31st Technical Exhibition of Horticulture, Protected Cultivation and Intensive Crops (Hortitec), recognized as the most important fruit and vegetable show in Latin America, which takes place from June 17th to 19th in Holambra (SP). With 100 years of tradition worldwide and more than 50 years producing in Brazil, STIHL works to contribute to and facilitate work with and in nature through motorized tools.

At the event, the organization will present to the market the new models of stationary engines, as well as the new line of combustion lawnmowers. In addition to the highlights and the entire product line, the STIHL booth will feature a demonstration area and special offers.

“This is one of the main meeting points for agribusiness and horticulture in Latin America, bringing together professionals seeking productivity, efficiency, and innovation for their businesses. For STIHL, participating in this fair is a strategic opportunity to be close to customers, understand market demands, and present solutions developed with cutting-edge technology to facilitate work in the field. In a year in which we celebrate 100 years of history worldwide, we reinforce our ongoing commitment to innovation, quality, and the development of equipment that contributes to an increasingly modern and sustainable agriculture,” highlights Andréia Volz, marketing manager.

New stationary engine models

The STIHL EHC 405 S stationary engine arrives on the market as a compact and efficient solution. With a power of 3,0 kW (4,0 hp) and weighing only 15 kg, this model stands out for its ease of handling and transport. The EHC 405 S is the perfect choice for threshing corn or transporting silage. Its robust construction allows it to work in adverse conditions, guaranteeing high productivity in agricultural and construction applications with the reliability characteristic of the brand.

Raising the bar for performance for demanding professionals, the STIHL EHC

905 S combines power and durability in a 6,7 kW (9,0 hp) engine. This 4-stroke model offers excellent torque and quick acceleration, features that optimize performance in any application, from silage to milling. With a 6,5-liter fuel tank capacity and integrated safety sensors, such as an oil level sensor, the EHC 905 S ensures long and safe working days for farmers and contractors.

The STIHL EHC 1105 S was developed to be the heart of machines that demand high load capacity and continuous endurance, delivering 8,2 kW (11,0 hp) of pure power. Its advanced engineering focuses on sustainability and operational economy. Equipped with a robust metal tank with top sealing, the model prevents contamination and waste. It is the ultimate technological

solution for heavy-duty operations in civil construction and the nautical sector.

At the top of the line, the STIHL EHC 1505 S represents the maximum power of the new generation of STIHL stationary engines, delivering an impressive 11,2 kW (15,0 hp). With a displacement of 500 cm³, this engine was designed for the heaviest applications, ensuring that implements and tools operate at maximum efficiency through a versatile 25,4 mm coupling shaft. The EHC 1505 S establishes itself as an indispensable tool for those seeking high productivity with low maintenance costs, combining extreme durability with optimized fuel consumption.

New line of combustion-powered lawnmowers



Developed to deliver performance and practicality, the four new models of combustion lawnmowers - RM 2 R, RM 248, RM 253 and RM 253 T - are ideal for different types of terrain and are aimed at both home users and professional

gardeners. The equipment is designed for the maintenance of residential lawns and in condominiums, parks, farms, and other green areas. Technology and innovation are combined for the best user experience, offering excellent performance for large lawns.

All models feature a 4-stroke engine and guarantee high productivity for grass cutting, being compact, robust, and easy to handle. Ergonomics and comfort are also characteristics of the new releases, which stand out for their features such as cutting height adjustment via a single, very easy-to-use lever, and a single shaft that facilitates access to the grass catcher basket, in addition to the impact-absorbing blade, which protects the engine when the machine collides with a stone, for example.

The products also stand out for offering four discharge modes: rear discharge, side discharge, collection into the basket, or mulching.

All models operate at 2.800 RPM. The RM 2 R model has a power of 2,1 kW and a 46 cm cutting diameter, with adjustable lawn cutting height between 30 mm and 85 mm. This is the only model that does not have a collector; the fuel tank capacity is 0,9 L and the machine weighs 24 kg. The RM 248 has 1,8 kW of power and the same 46 cm cutting diameter, with adjustable lawn cutting height between 20 mm and 100 mm. The collector has a capacity of 52 L, the fuel tank capacity is 0,8 L, and the machine weighs 30 kg with the basket. The RM 253 and RM 253 T models differ from the previous model with a 51 cm

cutting diameter, a 55 L collector capacity,
and weights of 31 kg and 34 kg,
respectively.



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UPL appoints new global leader for bioinsecticides area.

Diego Costa brings his experience in R&D and biologicals to his new role.

17.06.2026 | 17:12 (UTC -3)

Cultivar Magazine



UPL has promoted Diego Henrique Mendes Costa (pictured) to the position of global “leader” of Technical Development for Bioinsecticides. With 15 years of

experience in the crop protection sector, the agronomist has been with the company for over eight years. Prior to his new appointment, he served as Project Manager for Natural Plant Protection (NPP).

Throughout his career, Diego has accumulated experience in the areas of research and development (R&D), marketing, regulatory affairs, supply chain, and product management. His career path includes coordinating field trials, developing experimental protocols, analyzing agronomic data, and transforming results into technical recommendations for the market.

The professional has a solid background in fungicides, biological products, plant

physiology, resistance management, and technical portfolio management, combining agronomic knowledge, analytical skills, and a strategic business vision.

Diego holds a degree in Agronomic Engineering from Faculdade Dr. Francisco Maeda (Fafram) and a master's degree in Agronomy and Agricultural Sciences from the Instituto Federal Goiano (IF Goiano). He also has postgraduate degrees in Crop Protection and Bioinputs from the Escola Superior de Agricultura Luiz de Queiroz (Esalq/USP), as well as a specialization in Crop Protection.

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Sumitomo Chemical highlights bionematicide at Hortitec 2026

Aveo SC microbiological nematicide was developed to control nematodes and protect the root system of plants.

17.06.2026 | 15:04 (UTC -3)

Luis Fernando Duarte, Cultivar Magazine edition



Between June 17th and 19th, Sumitomo Chemical will participate in the 31st

Hortitec, held in Holambra (SP), highlighting solutions focused on phytosanitary management and productivity gains. Among the highlights is the launch of Aveo SC, a unique microbiological nematicide developed to protect the root system of plants.

The bionematicide features a formulation technology designed exclusively for application in the planting furrow, contributing to operational flexibility and better product distribution in the soil.

Beyond nematode control, Henrico Bizão, BioRacionais Brazil manager at Sumitomo Chemical, highlights that the solution promotes healthy root system growth, helping the plant reach its maximum productive potential.

The portfolio includes solutions already established in the market.

In addition to the product launch, the company is showcasing established solutions. Among them is XenTari, a biological insecticide indicated for the control of the tomato leafminer ([Tuta absoluta](#)). Based on *Bacillus thuringiensis* var. *aizawai*, the product acts through ingestion, interrupting the feeding of caterpillars and contributing to the reduction of damage caused to leaves, shoots, and fruits. In addition to its control efficiency, it is an important tool for Integrated Pest Management (IPM).

programs, as it preserves natural enemies and assists in resistance management strategies.

Another solution presented at the event is Kaiso Max, which offers broad-spectrum control for important tomato pests, combining contact and ingestion action to provide a rapid response in the field and prolonged protection. The combination of two active ingredients contributes to the efficient management of sucking and chewing insects, helping producers maintain plant health and the quality of fruits and tubers throughout the production cycle.

To complement management solutions, Borneo is attractive due to its high efficacy against species of mite genera.

Brevipalpus e Tetranychus The product has ovicidal, larvicidal, and sterilizing action, in addition to a prolonged residual effect and high selectivity to natural enemies, characteristics that favor its inclusion in IPM programs.

“By participating in Hortitec 2026, Sumitomo Chemical reinforces its work with fruit and vegetable producers, presenting technologies that contribute to crop protection, increased productivity, and the sustainability of production systems,” concludes Bizão.

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Embrapa inaugurates laboratory building in Bento Gonçalves (RS)

The structure expands the country's capacity to generate solutions aligned with contemporary agricultural challenges.

17.06.2026 | 14:36 (UTC -3)

Viviane Zanella



Photo: Viviane Zanella

Embrapa Grape and Wine, headquartered in Bento Gonçalves (RS), will inaugurate a new laboratory building this Friday (June

19th) at 10:30 am. This new building will strengthen the conditions for Embrapa and its partners to develop strategic research focused on food quality and health, expand their analytical and technological capacity, strengthen innovation, and provide greater competitiveness for Brazilian agriculture and agribusiness. The inauguration will be attended by the Minister of Agriculture (Mapa), André de Paula, and the president of Embrapa, Sílvia Masshurá.

Attached to the Embrapa Grape and Wine Technical Center (see address at the end of this article), the building will house the expanded and modernized facilities of the Unit's Applied Microbiology Laboratory, the new Multi-User Food Health Laboratory, and spaces intended for activities related to technology transfer, innovation, and

communication.

The building, which has 2.200 m² of constructed area distributed over two floors, was designed in accordance with Good Laboratory Practices standards and made possible with an initial investment from Embrapa of R\$ 5,8 million and with an additional contribution of R\$ 16,1 million in its final phase within the scope of the New PAC (2023–2026), totaling more than R\$ 21,9 million.

Investment from the New PAC

The investment from the New PAC included the completion of the structure and the acquisition of equipment, furniture,

and improvements in its surroundings.

“This initiative is part of a set of strategic investments made by Embrapa to expand research for generating technological solutions in food that contribute to improving people's health. In addition to developing technological solutions in enology and biological control of plants, it will contribute to offering technology and knowledge to the production chains and companies linked to the food sector,” emphasizes the head of Embrapa Grape and Wine, Adeliano Cargnin.

The inauguration of the new laboratory is part of a series of investments made in the context of Embrapa Grape and Wine's 50th anniversary, consolidating a trajectory marked by the generation of technologies that have transformed Brazilian viticulture.

The new structure expands the institution's capacity to develop innovative solutions aligned with the contemporary challenges of agriculture, contributing to the development of healthier foods, more sustainable production systems, and greater competitiveness of the national agribusiness.

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Study links cotton domestication to Mexico

Genomes from wild populations indicate greater genetic diversity in the Yucatán Peninsula

17.06.2026 | 14:18 (UTC -3)

Schubert Peter, Cultivar Magazine



Wild cotton, on the left, has short, brown, and coarse fibers, while modern domesticated cotton has white, fine, and abundant fibers. A new study led by scientists at Iowa State University has identified the northwestern region of the Yucatán Peninsula in Mexico as the original source of domesticated cotton - Photo: Corrinne Grover - Iowa State University

Researchers at Iowa State University have identified the northwestern Yucatán Peninsula in Mexico as the primary genetic origin of modern domesticated cotton. The study analyzed genomes from wild and cultivated populations of *Gossypium hirsutum*, a species known as upland cotton. The results indicate the region as a center of domestication and as a reservoir of genetic diversity useful for crop improvement (DOI: 10.1073/pnas.2607107123).

The research combined new collections of wild cotton and genomic sequencing data. The team compared hundreds of genomes and assessed relationships between domesticated materials, wild populations from Yucatán, Florida, Puerto Rico, and Guadeloupe, as well as closely related

species. The analyses linked the genomes of domesticated cotton to materials from northwestern Yucatán.

The working group included 19 researchers. Jonathan Wendel, professor of ecology, evolution, and organismal biology at Iowa State University, led the investigation. Corrinne Grover, a researcher at the same university, coordinated the sequencing of new specimens and the analysis of the data.

Old hypothesis

The results confirm an old hypothesis. Previous studies had already pointed to northern Yucatán as the likely area of ??domestication. However, large samples

of truly wild populations were lacking. Advances in genomic sequencing have allowed for a more precise assessment.

The study included 158 plants from the Yucatán Peninsula and 141 plants from Florida. It also incorporated data from wild populations already described in the Caribbean, domesticated materials, and related species. Genomic comparisons separated the groups by geographic origin and domestication status. The Yucatán samples ranked close to domesticated cottons in the population structure analyses.

Genetical diversity

The greatest genetic diversity appeared in northwestern Yucatán. Two wild individuals chosen at random in this region showed, on average, almost twice the nucleotide differences observed between two modern cultivars. This pattern indicates a genetic bottleneck during domestication and subsequent breeding.

Domesticated cotton has undergone selection over thousands of years.

Farmers favored plants with longer, whiter, finer, and more abundant fibers. Wild forms have smaller bolls and short, brown, and coarse fibers. Selection has also altered the architecture, cycle, and physiological characteristics of the plants.

According to the researchers, the narrowing of the genetic base occurred

because domestication starts from a small fraction of a large population. After successive generations under human selection, many alleles present in wild populations cease to be part of the cultivated gene pool.

Signs of introgression

The research also recorded signs of introgression with *Gossypium barbadense*, a species domesticated independently in South America. Modern cultivars of *Gossypium hirsutum* showed approximately 13% to 14% of ancestry associated with *Gossypium barbadense*. The study links this pattern to natural events and to improvement after the species dispersed throughout the

Caribbean.

The data did not point to a single main domestication gene. The candidate regions contained thousands of genes, but none of them concentrated a dominant signal. The researchers' interpretation indicates gradual domestication, with an accumulation of mutations of lesser phenotypic effect over time.

Northwestern Yucatán also showed lower genetic load and less accumulation of transposable element insertions compared to peripheral populations such as Florida and Guadalupe. Researchers associate these results with larger population sizes, less isolation, and more efficient natural selection.

For improvement, the main result lies in the genetic map produced by the study. Wild populations in Yucatán may contain alleles linked to disease resistance, salt tolerance, and other traits lost during domestication. Grover stated, according to material from Iowa State University, that the Yucatán data can already guide the search for useful traits in cultivated cotton.

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Syngenta automates compatibility testing of spray solutions

The robot processes up to 600 combinations per month and supports technical recommendations

17.06.2026 | 10:40 (UTC -3)

Cultivar Magazine, based on information from Mark LaFleur



Syngenta has begun using its proprietary ATLAS robot, an acronym for Application

Technology Laboratory Automation System, in tank mix compatibility testing. The automated system speeds up product evaluation, reduces the subjectivity of analyses, and helps replicate field usage conditions.

The technology was developed and refined by the company. The goal is to generate more consistent and accurate results before the products reach the market. The robot processes 500 to 600 combinations per month. According to Syngenta, this volume could require up to six months of manual evaluation.

ATLAS handles the entire compatibility process. The routine includes sample preparation, image recording of mixtures, and complete sample analysis. Automation

reduces variations associated with manual evaluation. The data aids in product development, responsible handling, and technical recommendations.

The system also assists with technical support after product launches. In cases of unexpected difficulties with tank mixing, ATLAS can use water sources or adjuvants supplied by customers. This allows the company to recreate specific application conditions in a controlled environment.

The platform assesses problems related to sedimentation, nozzle clogging, mixing order, and other factors. The analyses help to understand the behavior within the spray tank. The results also feed into a historical test database to guide faster, data-driven diagnoses.

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Case IH updates Axial-Flow 160 combines to 2027

The series now includes automation, connectivity, and a new cabin for the Class 6 and 7 segments

17.06.2026 | 09:57 (UTC -3)

Cultivar Magazine, based on information from Jana Wolf



Case IH has introduced updates to its Axial-Flow 160 combine harvesters, model year 2027. The series now features new factory-installed technologies, with advancements in automation, connectivity, precision agriculture, and operational comfort. The machines serve the Class 6 and 7 segments.

According to the manufacturer, the changes aim to simplify harvesting, improve performance, and expand digital integration across farms of different sizes. This update follows the launch of the Axial-Flow 160 series in 2024, when Case IH brought its Harvest Command automation technology, previously found in larger machines, to the mid-range segment.

Technological architecture

The new model year features an updated technological architecture. The solution integrates embedded and remote resources for automation, connectivity, and precision agriculture. The company reports gains in data processing, diagnostics, and integration with digital tools. The system also allows for remote support, aiming to reduce technical assistance visits and minimize downtime during harvesting.

The updated series features two Pro 1200 monitors. The interface operates similarly to tablets, with multi-touch controls and configurable layouts. The operator can view machine data and agronomic

information simultaneously. The system also allows for remote display viewing, or Remote Display Viewing, for real-time monitoring and support.

The monitors combine advanced diagnostics, Harvest Command automation, AccuGuide automatic guidance, and real-time productivity monitoring. The separation between machine control and agronomic data on two screens aims to enhance operational awareness and reduce workload during long shifts.

The upgrade also includes the Vector Pro receiver. This component enhances guidance accuracy, even in more complex field conditions. The Connectivity Included package provides connectivity for the

entire lifespan of the modem, with no subscription or renewal fees, according to Case IH.

Other technologies

Other technologies are now part of the series' offering. AccuSync allows for real-time data sharing between machines. AccuTurn automates headland turns. The manufacturer also offers flexible technology packages with adjustable levels of automation and connectivity according to the customer's needs.

In the feeding and processing area, the Axial-Flow 160 has received changes focused on efficiency and grain quality. A new clutch for the transverse auger allows

independent control of the discharge system. This allows the discharge tube to be completely emptied, reducing losses during discharge while in motion.

Feeder activation

Case IH also included the option of a two-speed feeder drive. This feature aims to optimize material flow under different harvesting conditions. A new concave configuration improves performance in high-moisture crops. Enhanced sensors increase the accuracy in monitoring machine parameters.

According to the manufacturer, these changes help maintain a constant flow of material and reliable performance under

varying field conditions.

Cabin update

The cab has also been updated. The operating environment follows the design and architecture of the 260 series cab. Identification is achieved through the Pro decal. The interior has gained a new color combination and revised layout, focusing on ergonomics and ease of operation.

The manufacturer also reports improvements in air conditioning flow management and the inclusion of additional camera inputs. These items aim to enhance visibility, comfort, and usability during operation.

“With the latest updates to the Axial-Flow 160 series, we are bringing advanced automation, connectivity and operator experience into the mid-range segment,” said Andreas Saile, harvesting product manager for EMEA.

According to Saile, the harvesters maintain the simplicity of the Axial-Flow design and incorporate technologies focused on productivity, grain quality, and return on investment.

Following field tests in the last harvest, the updated Axial-Flow 160 series will be presented at exclusive events in Europe. Its first public appearance at an international exhibition will take place at EIMA in Bologna in November 2026.

Series production begins in July, with initial deliveries expected by the end of the third

quarter.

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Trials show less defoliation in soybeans with MON 94637 in Brazil

Bioassays and field tests indicate protection against *Chrysodeixis includens*, *Anticarsia gemmatalis*, and *Spodoptera eridania*

17.06.2026 | 09:23 (UTC -3)

Schubert Peter, Cultivar Magazine

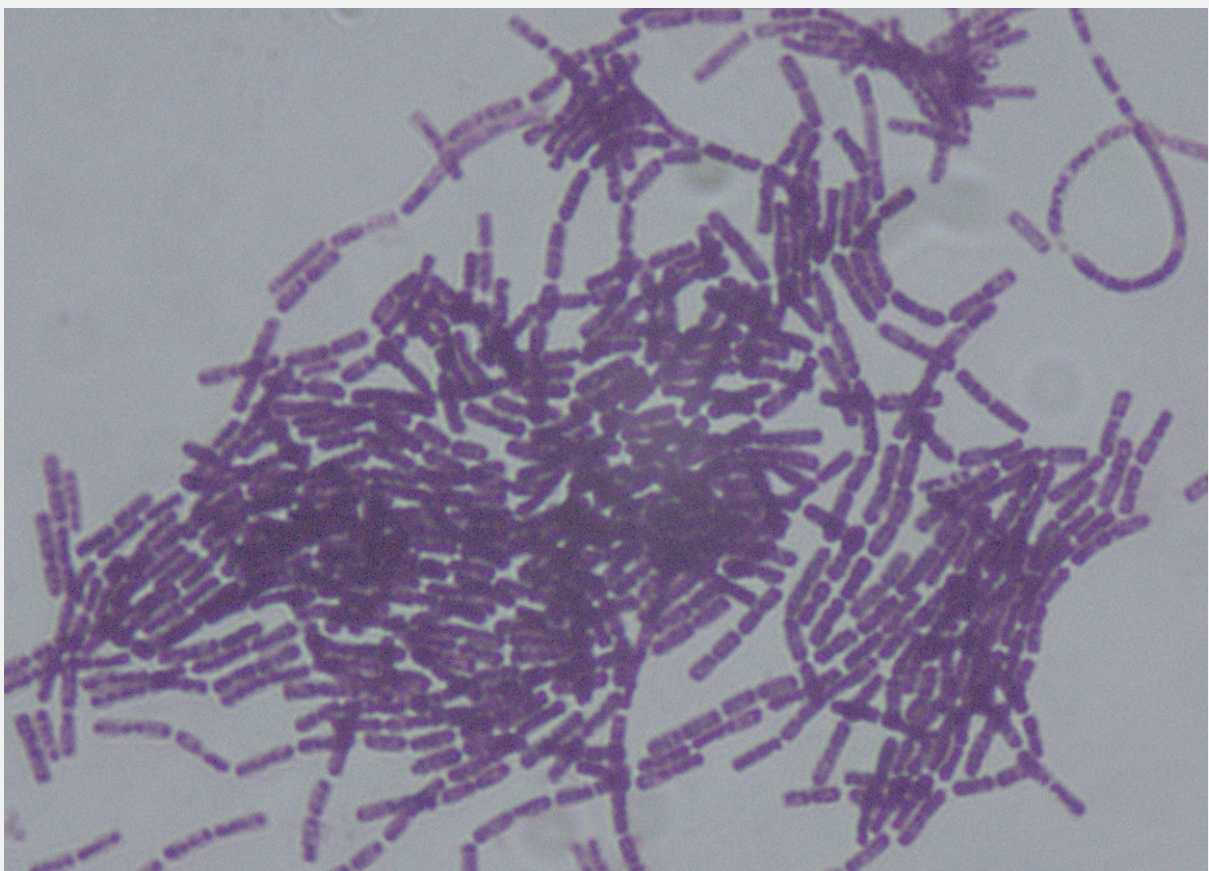


Photo: Dr Sahay - CC BY-SA 3.0

Genetically modified soybeans MON 94637 × MON 87751 × MON 87701 × MON 94313 × MON 89788, called [Intacta 5+](#), demonstrated high efficacy against important defoliating caterpillars of the crop in Brazil. The technology expresses five Bt proteins: Cry1A.2, Cry1B.2, Cry1A.105, Cry2Ab2, and Cry1Ac. Laboratory tests indicated 100% mortality in newborn caterpillars [Chrysodeixis includens](#), [Anticarsia gemmatalis](#) and [Spodoptera eridania](#) at different stages of soybean development. The technology also maintained high performance against populations resistant to Cry1Ac of [Rachiplusia nu](#) and *Crociosemasp.* (DOI: 10.1002/ps.71024).

This study evaluated the Bt pyramiding strategy for managing lepidopteran pests

in soybeans. Pyramiding uses two or more Bt proteins with independent modes of action against the same pest. The objective is to increase plant protection and delay the evolution of resistance in the field. In the case of I5+, the events combine Bt proteins originating from Bacillus thuringiensis and herbicide tolerance characteristics.

Researchers conducted bioassays with leaf discs and leaf tissue from soybeans. Evaluations involved plants at the V4, R1, R3, R5.1, and R5.5 stages for neonates. For third-instar larvae, tests were conducted at the R3 and R5.1 stages. The species evaluated included *Chrysodeixis includens*, *Anticarsia gemmatalis*, *Spodoptera eridania*, *Rachiplusia nu*

Cry1Ac resistant and *Crocidosema* sp. resistant to Cry1Ac.

Bioassays with newborns

In bioassays with neonates, *Chrysodeixis includens* and *Anticarsia gemmatalis* showed 100% mortality in all Bt packages evaluated. This result surpassed the performance observed in non-Bt soybeans. For *Crocidosema* sp. resistant to Cry1Ac, the I5+, I2X, and SIP2 packages caused 100% mortality. The SIP3 combination, composed of Cry1A.2 and Cry1B.2, also showed high mortality, varying according to the plant stage.

The response of *Spodoptera eridania* was highlighted in the study. Neonates had 100% mortality in I5+ and SIP3, except for stage R5.5 in SIP3, in which mortality reached 89,84%. The study also revealed high mortality in I2X and SIP2 in stages R5.1 and R5.5, but with lower performance in the earlier stages.

Third instar

In tests with third-instar caterpillars, I5+ caused 100% mortality against all species tested, in stages R3 and R5.1. This result indicated high toxicity of the package with five Bt proteins. Third-instar caterpillars usually show greater tolerance to Bt proteins compared to neonates. Therefore, the researchers used this stage to

differentiate the toxicity levels between the packages.

SIP3 technology also played a relevant role in the trials. Soybeans with Cry1A.2 and Cry1B.2 showed high mortality against *Spodoptera eridania* and against populations resistant to Cry1Ac of *Rachiplusia nu* and *Crociosema* sp. The result suggests the usefulness of these proteins in scenarios with resistance to Cry1Ac.

MON 94637

Performance

The study also evaluated the performance of MON 94637, identified as SIP3, under field conditions. The experiments took

place in six locations in Brazil: Luís Eduardo Magalhães, Bahia; Sorriso, Mato Grosso; Cachoeira Dourada, Minas Gerais; Santa Cruz das Palmeiras, São Paulo; Não-Me-Toque, Rio Grande do Sul; and Rolândia, Paraná. The crop seasons evaluated were 2021/2022 and 2022/2023.

In the field, SIP3 reduced defoliation compared to non-Bt and RR soybeans in most of the evaluated locations and stages. Performance was close to that observed in I2X, a package with Cry1A.105, Cry2Ab2, and Cry1Ac. The average defoliation in SIP3 remained below 10%, even under higher insect pressure.

The cited limit for applying insecticides against caterpillars in soybeans during

reproductive stages was 15% defoliation. In both growing seasons, SIP3, I2X, and IPRO were below this limit in most evaluations. The exceptions occurred for IPRO in Rolândia, Paraná, at stage R6 in the 2021/2022 growing season, and at stages R5.4 and R6 in the 2022/2023 growing season.

The researchers highlighted the importance of resistance management. The pyramid's effectiveness depends on the combined action of the proteins and the maintenance of the susceptibility of pest populations. The study affirms the need for refuge practices to preserve the protection conferred by the technology.

This work was developed by Leonardo L Miraldo, Joacir do Nascimento, Thais LB dos Santos, Hallison V Vertuan, Luciana V

Machado, Augusto C Crivellari, Márcia
OMA José, Jessica Fernandez, Erick MG
Cordeiro, Paula M Antunes, Samuel
Martinelli, Graham P Head, Katherine
Caldwell, Uma Kesanapalli, Ester Buiate,
Patrick M Dourado, Ramiro FL Ovejero,
Geraldo U Berger, and Renato J Horikoshi.

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FMC licenses herbicide rimisoxafen to Corteva for corn and soybeans

Agreement provides for the supply and licensing of a herbicide with a dual mode of action for use in corn and soybeans

17.06.2026 | 07:45 (UTC -3)

Cultivar Magazine, based on information from FMC



FMC and Corteva have signed an agreement for the supply and licensing of the technology [rimisoxafen](#) in the North

and South American corn and soybean markets. The partnership includes the development and commercialization of unique formulations by each company.

Rimisoaxafen is part of FMC's portfolio. The company will retain all proprietary rights to the molecule. FMC will also supply the active ingredient to Corteva. The agreement will continue for the next decade.

The companies state they are seeking greater access for producers to control herbicide-resistant weeds. The statement cites species of Amaranthus as the main global challenge of resistance in soybeans. The text also points to significant pressure in corn.

Each company will develop and market its own premixes for corn and soybeans in the Americas. FMC will continue developing rimssoxafen-based products for other crops and regions. Corteva will make an initial upfront purchase payment of two hundred million dollars per product supplied by FMC.

According to the statement, rimssoxafen has a dual mode of action. This characteristic increases the barrier to the development of resistance compared to herbicides with a single mode of action. The technology targets broadleaf weeds resistant to multiple classes of herbicides.

The first commercial sales are expected to occur by the end of the decade, pending applicable regulatory approvals. Additional terms of the agreement were not

disclosed.

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Soil bacteria accelerate potato tuberization

A study with *Pseudomonas protensis* and *Pseudomonas simiae* indicates effects on roots, defense, and tuber quality

16.06.2026 | 17:32 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Wenderson Araujo / CNA

Researchers at Umeå University in Sweden have demonstrated the ability of

two soil bacteria to work together to promote potato development. The association between *Pseudomonas protensis* CHA0 and *Pseudomonas simiae* WCS417 elicited distinct responses in plants of *Solanum tuberosum*. In the greenhouse, treatments with bacteria anticipated signs of tuber formation and influenced yield-related characteristics (DOI: 10.1093/jxb/erag237).

The study evaluated two plant growth-promoting rhizobacteria in isolated and combined applications. The tests used the 'Mandel' and 'Désirée' cultivars. The group sought to understand whether the combination of strains could generate complementary or synergistic effects on growth, tuberization signaling, and plant

defense.

Root development

Bacteria colonized potato roots within twenty-four hours of inoculation. Confocal microscopy showed bacterial cells on the root surface and in intercellular spaces. Inoculated plants exhibited greater root development compared to the control. Two weeks after inoculation, the treatments induced greater proliferation of lateral roots and initial stolon formation. The control did not show this phase during the same period.

The strains also exhibited characteristics associated with promoting plant growth. Both produced indoleacetic acid,

solubilized inorganic phosphate, and produced hydrogen cyanide in laboratory tests. *Pseudomonas simiae* showed greater production of indoleacetic acid over a period of one hundred and twenty hours and a higher phosphate solubilization index.

Metabolomics analysis

Metabolomic analysis indicated differences between the isolated bacterial cultures and the combined culture. Researchers identified one hundred and eighty-one metabolites in the samples. The combination of strains generated non-additive patterns in some compounds. This result suggests metabolic interaction between the bacteria during co-growth.

In the bacterial supernatants, the study recorded amino acids, phenolic compounds, tricarboxylic acid cycle intermediates, fatty acids, nucleotides, carboxylic acids, sugars, and auxin-related compounds. The combined culture showed an increase in metabolites such as xanthine, pipecolic acid, L-methionine, cyclic adenosine monophosphate, and flavin adenine dinucleotide. At the same time, it reduced tricarboxylic acid cycle intermediates such as citric acid, isocitric acid, α -ketoglutaric acid, succinic acid, and fumaric acid.

Plant response

The plants' response varied depending on the cultivar. 'Désirée' showed a more

intense morphological reaction to the bacterial treatments than 'Mandel'. For this reason, the researchers chose 'Désirée' for the gene expression analyses.

Inoculation affected genes linked to tuberization and defense. The StSP6A gene, a regulator of tuberization, showed strong induction in roots two weeks after inoculation. Treatment with *Pseudomonas* protens increased expression 5,8-fold. The combined application increased expression 5,6-fold. The StBEL5 gene also showed an increase in roots in the first evaluations.

Genes linked to jasmonic acid signaling also responded to the treatments. AOC showed an increase in roots two weeks after inoculation. MYC2 reached peak

expression in roots during the same period, with induction 2,8 times under *Pseudomonas* protensis and 2,4 times under *Pseudomonas simiae*. The study also evaluated CalS12, linked to salicylic acid signaling, and ETR1, associated with the response to ethylene.

Expression in tubers

In tubers, bacterial treatments increased the expression of several genes. The combined treatment elicited the strongest transcriptional responses. StSP6A reached 2,4-fold expression at six weeks and 2,9-fold at the final harvest. AOC reached 2,1-fold at six weeks under double inoculation. CalS12 also reached 2,1-fold during this period.

The researchers also evaluated chlorophyll content, plant height, and minituber quality. Quality included starch, soluble sugars, specific gravity, and ascorbic acid. The treatment effect appeared for starch content. The interaction between treatment and cultivar occurred for starch and sugar. The responses, however, varied between 'Mandel' and 'Désirée'.

According to Professor Benedicte Riber Albrechtsen, the next step involves testing natural combinations of beneficial bacteria under field conditions. The goal is to verify whether the results obtained in the greenhouse can be replicated in agricultural systems.

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Rute Vieira assumes vice-presidency of IBMA group

Rovensa Next executive will participate in discussions on natural substances and biocontrol

16.06.2026 | 17:10 (UTC -3)

Cultivar Magazine



Ruth Vieira(pictured), Global Director of Regulatory Affairs for Biocontrol and Adjuvants at Rovensa Next, has been

appointed Vice President of the Natural Substances Professional Group of the International Biocontrol Manufacturers Association (IBMA).

With over 25 years of experience in the regulation of plant protection products, the executive has worked in the areas of biocontrol, botanical products, and natural substances. Throughout her career, she has held positions in regulatory bodies, companies in the sector, and consulting firms.

The new role places Rute among the professionals responsible for discussing and supporting the development of regulatory frameworks for natural substances used in agriculture. The IBMA group brings together technical and

regulatory experts focused on promoting science-based approaches and encouraging innovation in biocontrol solutions.

The executive's career path includes work related to regulatory strategies in the European Union and other markets, risk assessment, data generation, and the development of regulatory approaches tailored to the specific characteristics of natural substances.

“It is an honor to assume the role of Vice President of IBMA’s Natural Substances Professional Group at a time of significant regulatory evolution in the European Union. I look forward to collaborating with colleagues in the association to build approaches that support innovation in

biocontrol solutions,” she stated.

In a statement, Rovensa Next congratulated the executive on her appointment and highlighted her contribution to advancing regulatory discussions related to the biosolutions sector.

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Research seeks to expand control of the woolly aphid

Epagri is testing alternatives to reduce losses and costs in apple production

16.06.2026 | 16:37 (UTC -3)

Cléia Schmitz, Cultivar Magazine edition



The woolly aphid (*Erosoma lanigerum*) is among the main pests of apple trees and continues to be a challenge for producers. The insect produces a white secretion

similar to wool or cotton, which protects the colonies and hinders the action of insecticides. As a consequence, infestations persist in orchards, compromising plant vigor, productivity, and fruit quality.

To increase the efficiency of pest control, the Agricultural Research and Rural Extension Company of Santa Catarina (Epagri) initiated a research project at the Caçador Experimental Station (SC), a national reference in apple tree genetic improvement. Coordinated by researcher and entomologist Janaína Pereira dos Santos, the study evaluates chemical and biological alternatives to define more effective, sustainable, and economically viable management strategies.

Funded by the Santa Catarina State Research and Innovation Support Foundation (Fapesc), the research is expected to be completed in November 2027. Expected results include the development of a specific methodology to evaluate the effectiveness of insecticides and the creation of recommendations for more rational use of these products, avoiding waste and reducing costs.

The study also aims to validate chemical and biological control strategies for the main apple production systems — conventional, integrated, and organic — considering their economic and environmental impacts. "We want to generate reliable data to support practical recommendations for producers in different production systems," says Janaína.

In total, nine insecticides, both chemical and biological, are being evaluated in experiments conducted in both greenhouses and field conditions. The tests include the analysis of already registered products and new alternatives for pest management.

Alternatives for organic production

Among the focuses of the study are biological insecticides intended for organic orchards. According to Janaína, controlling woolly aphids is even more challenging in this system due to the scarcity of efficient products that are registered and compatible with the requirements of organic production.

The researcher points out that making new control tools available can expand producers' access to markets that demand food produced without the use of synthetic pesticides.

Furthermore, biological solutions tend to especially benefit small and medium-sized producers, who frequently seek certifications and higher value-added market niches. Another expected benefit is the reduction of rural workers' exposure to more toxic products, as well as the risks of soil, water, and air contamination.

Cost reduction and increased competitiveness



Photo: André Sezerino

Another objective of the research is to contribute to reducing apple production costs. By identifying more efficient products and management strategies, researchers seek to avoid expenses on treatments with low efficacy and promote a more rational use of inputs.

“We are generating knowledge to develop integrated management practices that combine efficiency, cost-effectiveness, and

lower environmental impact. The goal is to increase the competitiveness of the productive sector, strengthening Santa Catarina's position as a national leader in apple production, with higher quality fruit and greater added value in the national and international markets,” concludes the researcher.

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Legal certainty supports innovation in agriculture

Experts point out that property rights boost the national harvest, but warn of the risks of the illegal seed market

16.06.2026 | 10:24 (UTC -3)

Cultivar Magazine



Catharina Pires and Luiz Henrique do Amaral

Legal certainty is one of the pillars of the advancement of tropical agriculture in Brazil, according to Catharina Pires, director of germplasm and biotechnology at CropLife Brasil. In a lecture held yesterday in São Paulo, she stated that soil, climate, water availability, and the innovative profile of producers do not, on their own, explain the performance of Brazilian agribusiness.

According to Catharina, Brazil has built, since the 1990s, a regulatory environment capable of attracting private investment. She cited patent legislation, the Plant Variety Protection Law, and biosafety regulations as part of this set of measures.

In their assessment, this framework allowed for advancements in biotechnology, plant genetics, and other

inputs used in agriculture. Producers gained access to layers of technology to address climate challenges and pest pressure in tropical environments.

Catharina explained that innovation depends on respect for contracts, intellectual property rights, clear rules, and functional regulation. This environment, according to her, allows the private sector to invest in solutions to increase productivity.

The CropLife representative also pointed to the illegal seed trade as one of the main challenges. She cited a study conducted by the organization, with the consulting firm Spark, on soybean seeds. The survey indicated that approximately 11 percent of soybean seeds used in Brazil are of illegal origin. In Rio Grande do Sul, the rate

exceeded 28 percent.

According to Catharina, soybean seed piracy generates an annual impact of 10 billion reais. She stated that the losses affect producers, industry, exporters, and public revenue. The illegal input does not issue invoices and does not pay taxes.

According to her, the farmer takes a risk when using pirated seeds. The product offers no guarantee of vigor, purity, germination, quality, or productivity. It also lacks technical assistance, an invoice, or a formal customer service channel.



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Innovation and Law

Legal certainty has allowed Brazil to structure the development of transgenic soybeans and expand access to technologies in the field, according to lawyer Luiz Henrique do Amaral, senior partner at the Dannemann Siemsen law firm and member of the Brazilian Association of Intellectual Property.

Amaral stated that innovation in biotechnology requires long timeframes, continuous investment, and the discarding of several lines of research. According to him, a technology can take ten to fifteen years to reach commercial use. The process involves DNA research, protein selection, molecule testing, and validation of characteristics inserted into the plant.

He highlighted the difference between biotechnology and genetic enhancement. Biotechnology involves engineering and developing DNA sequences capable of expressing characteristics that do not exist in nature. This type of invention is protected by the patent system.

Genetic improvement, in turn, involves the development of plants or plant parts with the capacity for reproduction. This activity usually involves agronomists and occurs through natural crossbreeding, selection, and evaluation of cultivars. Legal protection is provided by specific cultivar laws.

Amaral explained that a patent grants the holder the right to prevent the unauthorized use of the invention.

Protection lasts twenty years from the date

of filing. Part of this period, however, is spent on research, regulation, and preparation for commercial launch.

According to him, regulatory approval also requires demonstrations of food safety, environmental safety, and public health safety. The process needs to take place in Brazil and in the countries where the production is destined. Without this approval, grain exports may face barriers.

The lawyer stated that licensing agreements enable the regular use of the technology throughout the supply chain. These agreements involve multipliers, distributors, traders, and farmers. The goal is to guarantee the marketing and export of grains produced with the licensed technology.

According to Amaral, Brazil has made progress in creating solid legislation for intellectual property in agriculture. He assessed that this environment has contributed to attracting innovation, increasing productivity, and consolidating foreign markets for Brazilian soybeans.

Innovation in soybeans

Brazil has increased its soybean production from less than 60 million tons to approximately 180 million tons per harvest. This growth has placed the country in a leading global position in production, exports, and productivity per hectare, according to Fabiano Oliveira, head of Bayer's soybean business.



First Name

In his lecture, Oliveira stated that Brazil accounted for approximately 70 percent of the growth in global soybean supply over the past 20 years. He believes the crop has become a driver of economic progress in rural areas. Producing municipalities have begun to register improvements in indicators related to income, schools,

hospitals, and sanitation.

The executive cited Cascavel, Lucas do Rio Verde, and Luís Eduardo Magalhães as examples of urban transformation associated with agribusiness. According to him, soybeans helped to create regional centers with a higher quality of life.

Oliveira attributed Brazil's performance to four pillars. The first involves institutions, with intellectual property laws, plant variety protection, biosecurity, regulatory agencies, and sectoral representation. The second involves infrastructure. The third involves the profile of the Brazilian farmer, open to innovation. The fourth involves technology adapted to the tropical climate, with the participation of Embrapa, foundations, universities, and private companies.

The lecture also highlighted biotechnology. According to Oliveira, Brazil offers producers more options, with technologies such as RR soybeans, Intacta, Intacta 2 Xtend, and refuge materials. He stated that, in audited data from the Brazilian Soybean Strategic Committee's maximum productivity challenge, cultivars with new generations of biotechnology delivered 10 to 12 percent more productivity per hectare.

In the calculation presented, this gain is equivalent to about six sacks per hectare. With soybeans at 120 reais per sack, the benefit would reach about 700 reais per hectare.

The biotechnology remuneration model occurs in three stages. The first occurs with the purchase of certified seeds, used

in approximately 85 percent of the area. The second occurs with the so-called legal reserve, covering about 10 percent of the area. The third occurs with the sale of the grain at the grain silo.

According to Oliveira, biotechnology represents less than 4 percent of the total cost of soybean production. He stated that this percentage has decreased since the launch of Intacta technology in 2013 and 2014.

The seed supply chain has also grown. The country has more than 25 genetics companies, more than 300 seed multipliers, and more than 11 reseller branches. For Oliveira, this environment has supported the expansion of soybean production and can support new demands related to food, climate change, energy

transition, and biodiesel.



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RNAi targets chitin to control whitefly

Study identifies four chitin deacetylase genes and tests silencing using nanoparticles and transgenic plants

16.06.2026 | 09:04 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Syngenta

Researchers at Hebei University have identified four chitin deacetylase genes in

Bemisia tabaci MEAM1 and demonstrated the potential of these targets for whitefly control through RNA interference. The study evaluated the genes BtCDA1, BtCDA2a, BtCDA2b, and BtCDA4, which are linked to the formation and remodeling of chitin-based structures, such as the cuticle and midgut matrix.

The team tested two methods for delivering double-stranded RNA. The first used the nanomaterial SPc, applied to nymphs. The second used transgenic tomato plants capable of producing double-stranded RNA against the target genes. Both strategies reduced the expression of chitin deacetylase genes in *Bemisia tabaci*.

RNA interference acts through post-transcriptional silencing. The introduction of double-stranded RNA into the cell leads to the degradation of specific messenger RNA. This process can generate functional defects in the target gene and insect death.

Bioinformatic analysis

In the study, bioinformatics analysis located seven candidate chitin deacetylases in the whitefly genome. Three CDA-like proteins were ruled out due to a lack of chitin-binding domain. With this, the researchers confirmed four members of the CDA family in the species' genome: BtCDA1, BtCDA2a, BtCDA2b, and BtCDA4.

Phylogenetic analysis classified BtCDA1, BtCDA2a, and BtCDA2b in group I. The BtCDA4 gene was placed in group III. Groups II, IV, and V did not appear in *Bemisia tabaci*. According to the article, this pattern differs from that observed in other hemipterans, such as *Nilaparvata lugens*, *Acyrtosiphon pisum* and *Sogatella furcifera*.

Eggs and nymphs

All four genes showed expression in eggs and nymphs. Expression in adults remained low. This pattern indicates a greater involvement of these genes in phases with intense chitin remodeling, such as embryogenesis, hatching, and nymphal molting.

In assays using double-stranded RNA coupled with SPc, researchers treated fourth-instar nymphs. After 72 hours, all target genes showed a significant reduction in expression compared to the dsEGFP control. BtCDA1 expression fell by approximately 60,7%. BtCDA2a/b expression fell by 23,2%. BtCDA4 expression fell by 24,4%.

Corrected mortality

The corrected mortality rate of nymphs at 120 hours reached 84,1% in the dsBtCDA1 treatment. The dsBtCDA4 treatment reached 88,1%. The dsBtCDA2a/b treatment reached 40,8%. The relative emergence rates of adults were 11,5%, 7,5%, and 48,1%,

respectively.

The researchers also designed a gene fusion called 3CDA. This construct brought together fragments of BtCDA1, BtCDA2a/b and BtCDA4 into a single double-stranded RNA molecule. The goal involved silencing multiple genes at the same time.

Treatment with ds3CDA reduced the expression of all three targets. After 72 hours, BtCDA1 expression decreased by 60,7%. BtCDA2a/b expression decreased by 23,1%. BtCDA4 expression decreased by 34,3%. At 120 hours, nymph-corrected mortality reached 69,5%. The relative emergence of adults was 16,8%.

Stage with plants

In the plant phase, the team produced transgenic tomato plants of the Micro-Tom cultivar expressing ds3CDA. Newly emerged whitefly adults remained on the plants for three days. After the feeding period, the average expression of BtCDA1, BtCDA2a/b and BtCDA4 fell to 23,9%, 30,0% and 40,5% of the levels observed in the dsEGFP control.

Three weeks after the release of the adults, the researchers observed fewer eggs, nymphs, and exuviae on the abaxial surface of tomato leaves with ds3CDA, compared to plants with dsEGFP. The study did not present complete mortality and development data for the plant stage, as most of the transgenic tomato plants wilted and died before the end of the evaluations.

The results indicate the potential of chitin deacetylases as targets for whitefly control strategies based on RNA interference. The work also points to two technical routes: formulations with nanocarriers for double-stranded RNA delivery and plants expressing dsRNA. The researchers themselves highlight the need to optimize the design of double-stranded RNAs, evaluate sprayable formulations, and investigate environmental safety and resistance risk before field use.

Further information at
doi.org/10.3390/insects17060628

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Protein organizes plant response to heat

Study indicates functional redundancy in growth pathways and may support the search for crops more tolerant to warming

16.06.2026 | 08:00 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Hunt Mercier - Ole Miss Digital Imaging Services

Researchers at the University of Mississippi have identified a molecular

mechanism used by plants to adjust growth under higher temperatures. Their study points to the PIF4 protein as a regulatory center of thermomorphogenesis, the process by which the plant alters its architecture in response to moderate heating. The results indicate a function less dependent on direct binding to DNA and more linked to PIF4's ability to recruit partner proteins.

The research evaluated internal structures associated with plant adaptation to warmer environments. According to the scientists, understanding this response helps predict changes in plant growth and can guide strategies to maintain agricultural productivity in a scenario of rising temperatures. The basis of the study

involves the protein PHYTOCHROME-INTERACTING FACTOR 4, known as PIF4. It acts as a transcription factor and participates in the activation or repression of genes linked to growth.

Analysis at work

The study analyzed the species [Arabidopsis thaliana](#), a model used in plant biology, in addition to assays in *Nicotiana benthamiana*. The team investigated how structured and disordered regions of PIF4 contribute to the heat response. The protein has an intrinsically disordered N-terminal region. This region allows the formation of low-mobility condensates. The condensates appeared in both in vitro

assays and plant tissues. They did not change significantly between 20 and 27 degrees Celsius.

Moderate warming

Plants respond to moderate heating by elongating hypocotyls, roots, and petioles. They can also lengthen stems, bring forward flowering, and bend leaves to dissipate heat. In crops, these responses can have distinct effects. In cereals, stem elongation can increase the risk of lodging in wind or rain. In leafy vegetables, larger leaves may be a desirable characteristic, depending on the production system.

Researchers tested mutations in parts of PIF4 associated with transcriptional

activation, DNA binding, and condensate formation. Some alterations reduced the protein's ability to form nuclear structures or activate genes in experimental systems. Still, mutant plants retained some of the growth response to heat. This result surprised the team, as it indicated functional redundancy in the system.

Important difference

The team observed an important difference between the protein's functions. Mutations in hydrophobic residues of the transactivation domain reduced condensate formation but did not eliminate thermomorphogenesis. Mutations in acidic residues affected the protein's stability and prevented growth recovery in mutant

plants. Alterations in the basic DNA-binding motif, however, reduced condensate formation but still allowed for a growth response under higher temperatures.

The critical point appeared when scientists replaced twelve basic residues located in the basic motif and the first helix of the bHLH domain. This alteration interrupted oligomerization and abolished heat-induced growth. The result indicates a central role for PIF4's oligomerization competence. The protein appears to function as a molecular organizer. It assembles partners capable of providing DNA binding and trans transcriptional activation functions.

Central position

According to the study, PIF4 occupies a central position in the thermal response network. Other thermosensory factors converge on its pathway. Among them are B-BOX proteins, class A1 heat shock factors, TCP proteins, and BZR1. The protein also lies below established thermal sensors such as phytochrome B and ELF3. This position helps explain why PIF4 integrates signals from light, temperature, drought, salinity, and pathogen attack.

The results shift the focus of future approaches. Instead of targeting only individual genes or specific biochemical activities, the researchers suggest

prioritizing organizing proteins. These proteins occupy central points in regulatory networks and coordinate multiple partners. Identifying these regulators could support programs aimed at developing crops with more stable growth under hot conditions.

Further information can be found at
doi.org/10.1038/s41467-026-70748-x

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Genetic discovery helps rice avoid heat stress

Rare variant anticipates flower opening and preserves productivity

15.06.2026 | 17:18 (UTC -3)

Cultivar Magazine, based on information from the International Rice Research Institute



Rice plants at 8:30 am: the plant with the normal EMF3 gene, on the left, does not show flowers, while the plant on the right, carrying the rare EMF3-1D allele, has already started flowering; photo: International Rice Research Institute

With the advance of climate change and the increasingly frequent occurrence of

heat waves and prolonged periods of drought, scientists have identified a gene capable of increasing rice's tolerance to high temperatures during one of the most critical phases of its development. This discovery could contribute to maintaining the crop's productivity in tropical and subtropical regions.

The study, conducted by researchers from Japan's National Food and Agriculture Research Organization (NARO), the International Rice Research Institute (IRRI), and other Japanese institutions, identified the EMF3 (Early Morning Flowering 3) gene, responsible for advancing the opening of the plant's flowers to the early morning, when temperatures are still milder.

Typically, rice flowers between 10 am and 12 pm, a period when temperatures usually reach their highest levels of the day, between 33°C and 35°C. When exposed to excessive heat during this phase, the flowers may suffer from fertilization failures, resulting in sterile spikelets and reduced grain formation.

According to the researchers, a specific variant of the gene, called EMF3-1D, was able to advance flowering by about 1,5 hours. This seemingly simple change showed a significant impact on grain fertility under heat stress conditions.

“The gene allows the rice to 'escape the heat' precisely at its most vulnerable stage, protecting fertilization and helping to ensure a harvest even under extreme

temperatures,” stated researcher Tsutomu Ishimaru, from Naro.

Rare variant with global potential

According to the research team, no known commercial variety of rice naturally possesses the EMF3-1D allele. The trait was considered rare, but with potential application in different genetic groups of the crop, including indica and japonica varieties.

In addition to contributing to heat tolerance, altering the timing of flower opening can also bring benefits to hybrid seed production programs, where synchronization of flowering between parental lines is a determining factor for

pollination success.

“This characteristic can be extremely useful for the production of hybrid seeds, where the alignment of flower opening times is an important consideration,” highlighted Sung-Ryul Kim, a scientist at IRRI.

Tests include Brazilian cultivar

Researchers have already begun introducing the EMF3-1D gene into widely cultivated varieties in different regions of the world. These include IR64, Swarna, and Pusa Basmati in India; TDK1 in Laos; Sahel 329 in West Africa; Toyomeki in Japan; and the Caiapó cultivar, developed for Brazilian conditions.

These experimental lines have shown potential for maintaining high grain fertility rates even under temperatures considered critical for the crop.

According to researchers Hideyuki Hirabayashi, from Naro, and Kazuhiro Sasaki, from the Japan International Agricultural Research Center (JIRCAS), the gene could be incorporated into breeding programs through marker-assisted selection, accelerating the development of new cultivars adapted to global warming.

Path to gene editing

The discovery also opens new perspectives for the use of gene-editing technologies. According to Inez Slamet-

Loedin, leader of the Rice Genetic Design and Validation Unit at IRRI, tools such as precision editing could allow for the rapid introduction of the early flowering trait into elite varieties.

Another aspect considered relevant by scientists is that the gene exclusively affects the time the flowers open, without altering plant growth or compromising productive potential under normal growing conditions.

“With EMF3, rice plants simply 'wake up earlier' to avoid the heat. It's a natural adaptation strategy that could become an important tool for ensuring food security in a global warming scenario,” Ishimaru concluded.

The work was published in the journal *Plant Biotechnology Journal* under the title *Rice EMF3 alleles adjust flower opening time to increase seed-setting rate under high-temperature stress*, signed by Takuma Ishizaki and collaborators (2026).

More information at
doi.org/10.1111/pbi.70653

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Nanoformulation enhances emamectin action in study

A strategy using acetic acid reduced particles to 7 nanometers and increased penetration into leaves and roots

14.06.2026 | 15:50 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Florida Division of Plant Industry, Bugwood

Researchers have developed a disaggregation strategy to produce a nanopesticide from emamectin benzoate without nanocarriers and without surfactants. The method uses acetic acid in aqueous suspension and generated particles with an average diameter of 7 nanometers. The study reports increased bioactivity against *Megalurothrips usitatus* and *Meloidogyne enterolobii*, in addition to greater penetration into cowpea leaves and bell pepper roots.

The study evaluated the direct effect of size reduction on pesticide biointeractions. According to the researchers, most nanopesticides involve nanocarriers or surfactants. These components can alter the interaction with organisms and make it

difficult to distinguish between the effect of size and the effect of formulation.

Acetic Acid

In the tested strategy, acetic acid broke hydrogen bonds present in emamectin benzoate aggregates. Analysis indicated the absence of a chemical reaction and the absence of a stable complex between acetic acid and the active molecule. The process generated a stable colloidal dispersion called HOAc-EB.

The formulation showed stability after 14 days at 0 degrees Celsius, 25 degrees Celsius, and 55 degrees Celsius. It also maintained particle size after three freeze-thaw cycles. The active ingredient content

did not differ from conventional emamectin benzoate under the evaluated conditions.

In bioassays, HOAc-EB reduced the median lethal concentration by 91 percent compared to *Megalurothrips usitatus*. The value dropped from 3,02 milligrams per liter to 0,280 milligrams per liter. Against *Meloidogyne enterolobii*, the median lethal concentration fell 56 percent, from 18,5 milligrams per liter to 8,1 milligrams per liter.

Use by the plant

The researchers also evaluated the plant's use. On cowpea leaves, the contact angle of the HOAc-EB droplet reached 66,3 degrees, compared to 87,8 degrees for

conventional emamectin benzoate. The surface tension dropped from 64,1 millinewtons per meter to 53,1 millinewtons per meter. The result indicates better spreading of the spray solution on the leaf surface.

In soil, HOAc-EB showed lower adsorption. Conventional emamectin benzoate showed complete adsorption within 24 hours at concentrations below 250 milligrams per liter of active ingredient. HOAc-EB showed complete adsorption only at 62,5 milligrams per liter. At 250 milligrams per liter, adsorption was below 10 percent.

Translaminar penetration

Translaminar penetration also increased. In cowpea leaves, the peak of active ingredient accumulated with HOAc-EB reached 1,29 milligrams per gram at 25 minutes. This value exceeded the result of conventional emamectin benzoate by 5,1 times, which was 0,21 milligrams per gram at 30 minutes.

In bell pepper roots, the peak accumulated active ingredient reached 1,09 milligrams per gram at 25 minutes with HOAc-EB. This result exceeded the value observed with the conventional formulation by 4,4 times, which was 0,20 milligrams per gram. Despite this improvement, the

compound did not exhibit systemic behavior. The active ingredient remained at the application site on leaves and roots.

Field trials showed differences depending on the target. In the control of *Megalurothrips usitatus* in cowpea, the number of thrips per flower dropped to 5,5 after 48 hours with HOAc-EB. The conventional treatment recorded 7,1 individuals per flower. Statistical analysis did not indicate a significant difference between the two treatments.

Nematode control

In control of *Meloidogyne enterolobii* in bell peppers, the difference was most noticeable. The conventional treatment

recorded 80,7 galls per gram of root, a value with no statistically significant difference compared to the control, which had 72,0 galls per gram of root. The HOAc-EB treatment reduced the number to 37,6 galls per gram of root.

Safety assessments did not indicate increased toxicity in non-target organisms. In cowpea, repeated spraying with 1000 milligrams per liter for 14 days did not cause visible symptoms of phytotoxicity. In bell pepper, a single root drench application at the same concentration also did not cause visual growth inhibition during the observed period.

Tests with zebrafish, earthworms, and mice indicated similar toxicity between HOAc-EB and conventional emamectin

benzoate. The researchers report no increase in toxicity after size reduction.

The study also points to operational feasibility. The formulation with up to 30 percent active ingredient was obtained by simply mixing emamectin benzoate, acetic acid, and water. The process eliminates the need for high-energy milling, organic solvents, and external surfactants.

Further information can be found at doi.org/10.1002/advs.75914

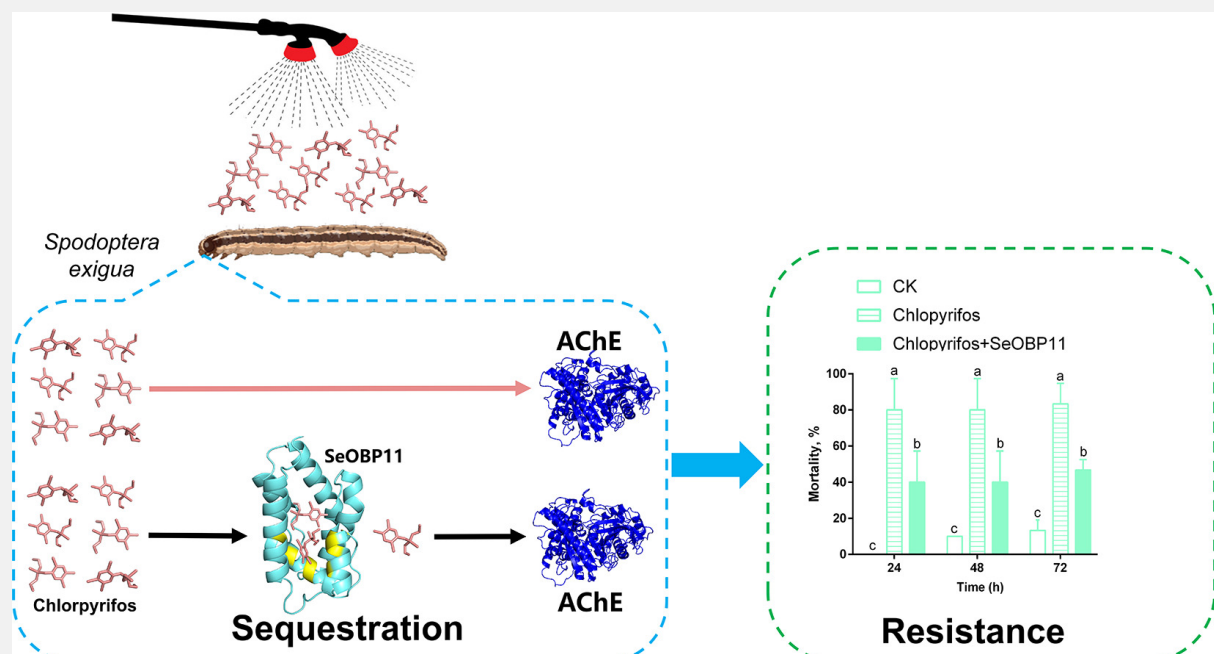
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Protein reduces chlorpyrifos toxicity in *Spodoptera exigua*

Study points to sequestration by SeOBP11 as a distinct mechanism of insecticide resistance

14.06.2026 | 10:28 (UTC -3)

Schubert Peter, Cultivar Magazine



DOI: 10.1016/j.pestbp.2026.107211

Researchers have identified a resistance mechanism to chlorpyrifos in *Spodoptera exigua*. The study indicates a direct link between this protein and the insecticide,

mediated by the SeOBP11 protein. This interaction reduced the bioavailability of the product and decreased caterpillar mortality in an in vivo assay.

The study evaluated 36 genes for odorant-binding proteins, known as OBPs, in *Spodoptera exigua*. These proteins are traditionally associated with olfaction. The study showed their expression in tissues without olfactory function, such as hemolymph, fat body, and midgut. This pattern indicates involvement in the transport of hydrophobic molecules, including insecticides.

Lineages compared

The research compared a susceptible laboratory strain with a multi-resistant field strain. The resistant strain came from scallion (*Allium fistulosum*) crops in Huizhou, Guangdong province, China. It showed 935 times greater resistance to chlorpyrifos and 3.449 times greater resistance to [lambda-cyhalothrin](#).

Among the genes evaluated, SeOBP11 stood out the most. The transcript level was 20,4 times higher in the resistant strain compared to the susceptible strain. Other genes also showed a significant increase, such as SeOBP28, SeOBP9, SeOBP24, and SeOBP23. SeOBP2 and SeOBP13 showed reduced expression in the resistant strain.

The researchers produced recombinant proteins for six SeOBPs: SeOBP2, SeOBP9, SeOBP11, SeOBP13, SeOBP23, and SeOBP24. They then measured the affinity of these proteins for 34 insecticides using competitive fluorescence binding assays. Chlorpyrifos bound to all six proteins with high affinity. SeOBP11 showed the strongest binding, with a K_i of 5,0 micromolar.

Specificity of interactions

The specificity of the interactions was noteworthy. Twenty of the 34 insecticides tested showed no detectable binding, or only weak interaction, with the six proteins

evaluated. The study also found no simple relationship between chemical class and binding. Among the organophosphates, chlorpyrifos and foxim showed strong binding with several SeOBPs. Profenofos, methyl-pirimiphos, diazinon and malathion did not follow the same pattern.

The functional assay focused on the SeOBP11 and chlorpyrifos pair. The researchers pre-incubated chlorpyrifos with recombinant SeOBP11 and injected the mixture into caterpillars of *Spodoptera exigua*. The application of chlorpyrifos alone, at a concentration of 140 micromolar, caused mortality close to 80% within 24 hours. The mixture with SeOBP11 reduced mortality to approximately 40%. This effect remained

in the 48-hour and 72-hour evaluations.

Insecticide sequestration

The result indicates sequestration of the insecticide by the protein. The binding reduces the free fraction of chlorpyrifos available to reach its targets in the insect. Researchers classify this process as sequestration-based resistance. The mechanism differs from classic resistance models, such as metabolic detoxification, alteration in the target site, and reduced cuticular penetration.

Molecular docking analysis reinforced this interpretation. Chlorpyrifos, thiodicarb, and dimethoate occupied the same SeOBP11

binding cavity. Hydrophobic interactions predominated in the complexes with the highest affinity. Chlorpyrifos showed the most favorable profile. Thiodicarb occupied an intermediate position. Dimethoate had a weak interaction.

Researchers identify SeOBP11 as a potential molecular marker for monitoring resistance in *Spodoptera exigua*. The study also suggests new approaches to resistance management, focusing on the expression or function of SeOBPs.

Further information at
doi.org/10.1016/j.pestbp.2026.107211

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*The Cultivar Semanal magazine is a technical and scientific publication focused on agriculture in Brazil.
It was designed to be read on mobile phones.
It is published on Saturdays.*

Grupo Cultivar de Publicações Ltda.

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