

June 6, 2026

N ° 82

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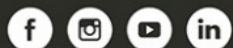
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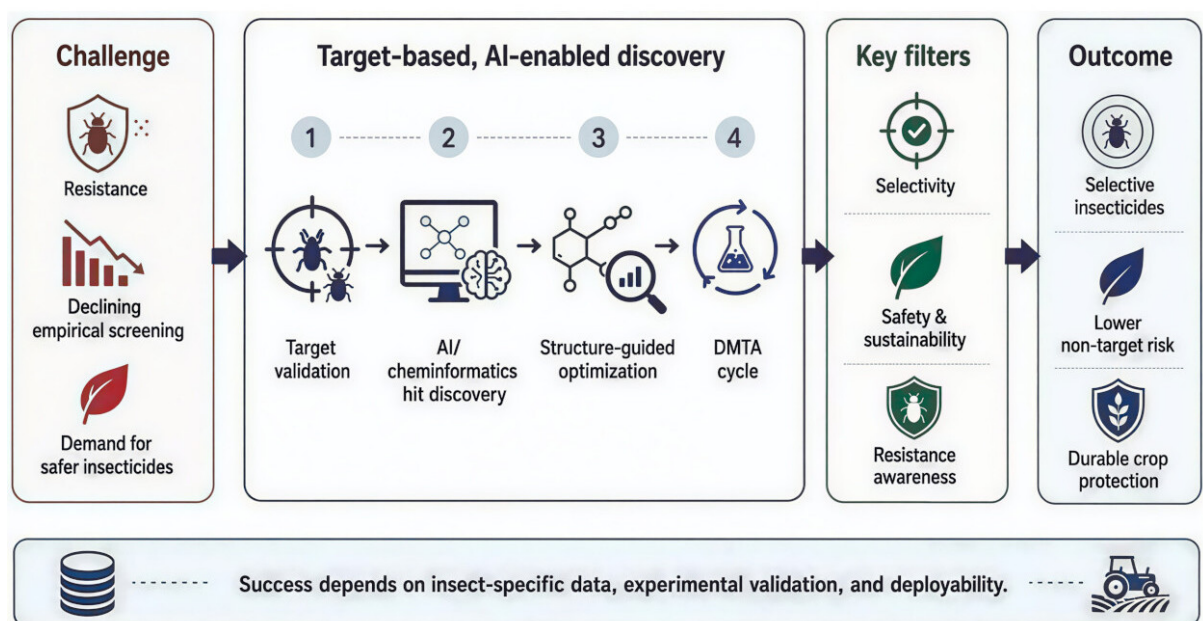
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Artificial intelligence could reshape insecticide discovery

Scientists propose using pharmaceutical logic, molecular targets, and chemoinformatics for new modes of action

05.06.2026 | 14:52 (UTC -3)

Schubert Peter, Cultivar Magazine



The discovery of insecticides needs to shift from broad empirical screenings to systems guided by molecular targets,

artificial intelligence, and chemoinformatics. This is the main conclusion of a study that evaluates how concepts from pharmaceutical research can support the development of molecules for insect control, with greater selectivity, less risk to non-target organisms, and a better response to resistance.

Researchers point to a deficit in innovation in insecticide discovery. The introduction of compounds with truly novel modes of action has slowed, while pest resistance, regulatory requirements, and environmental restrictions have increased. According to them, the current arsenal still relies on only a few groups of modes of action. This scenario reduces the durability of products and increases the risk of cross-

resistance.

Central proposal

The central proposal involves adopting a logic inspired by drug discovery. The process begins with the selection and validation of biological targets. It then progresses to the identification of active molecules, the progression from "hit" to "lead," and the optimization of multiple parameters. The approach includes cycles of design, production, testing, and analysis. This model allows for the evaluation of potency, selectivity, safety, physicochemical properties, and resistance risk from the initial stages.

Researchers highlight the role of artificial intelligence as a decision support layer. Computational models can assist in virtual screening, activity prediction, generative molecule design, active learning, and compound prioritization. Chemoinformatics provides the basis for representing molecules through descriptors, fingerprints, SMILES chains, molecular graphs, and three-dimensional structures.

However, scientists warn of important limitations. Artificial intelligence alone does not solve the problem of innovation. The performance of models depends on data quality, standardization of tests, the scope of applicability, and experimental validation. The review highlights the gap between results obtained in silico and

products applicable in the field.

Consolidated targets

Among the established targets, scientists cite acetylcholinesterase, GABA-activated chloride channels, voltage-gated sodium channels, and nicotinic acetylcholine receptors. These targets support relevant commercial classes, but accumulate problems related to resistance and selectivity. The opportunity, according to the review, does not lie in repeating old chemistries. The value lies in structure-oriented redesign, comparison between orthologs, and evaluation of mutations associated with resistance.

Emerging targets

The study also highlights emerging or underexplored targets. Octopamine receptors are gaining interest due to the absence of a direct equivalent system in vertebrates. Chitin biosynthesis offers selectivity, as chitin participates in the formation of the cuticle and peritrophic matrix in arthropods, but does not occur in vertebrates and plants. Ecdysone receptors and juvenile hormone pathways also appear as options for developmentally linked insecticides. G protein-coupled neuropeptide receptors comprise another promising group, due to their importance in feeding, diuresis, reproduction, and stress responses.

Selectivity receives special attention. Comparison between orthologous proteins from pests, mammals, pollinators, and beneficial arthropods can reveal differences in binding sites. These differences can direct molecules with greater affinity for the pest target and less interaction with non-target organisms. The article highlights a critical point: "selective for insects" does not automatically mean safe for pollinators.

Structural biology

Structural biology appears as a condition for the advancement of rational design. Experimental structures and predictive models help to locate binding pockets, interpret resistance mutations, and

compare targets across species. Structural prediction tools expand the number of exploitable proteins, but still require caution. Models can fail in flexible regions, conformational states, membrane complexes, and ligand-dependent interactions.

Scientists conclude that the future of insecticide discovery depends on an integrated ecosystem. This ecosystem must connect target biology, structural data, synthetic chemistry, predictive modeling, experimental validation, environmental safety, and field viability.

Further information at
doi.org/10.1016/j.pestbp.2026.107190

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Study evaluates herbicides and bionematicides in soybeans

Research tested imazethapyr and S-metolachlor in the management of *Meloidogyne javanica* in succession with brachiaria

05.06.2026 | 07:34 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Jonathan D. Eisenback - Virginia Polytechnic Institute and State University

Pre-emergent herbicides used in soybeans did not compromise the effectiveness of biological nematicides Pochonia chlamydosporia and Bacillus firmus in the management of Meloidogyne javanica.

The conclusion is based on a study conducted in a greenhouse, in a succession system between *Urochloa brizantha* and soy. The research evaluated the effects of imazethapyr and S-metolachlor on biological agents applied via seed treatment.

This work stemmed from a frequent demand in agricultural systems. The use of biological nematicides has grown in Brazil and has become integrated into nematode management programs in crops such as soybeans and cotton. However, the

compatibility of these products with herbicides still requires evaluation under conditions closer to agricultural cultivation.

Products tested

Scientists tested products based on *Pochonia chlamydosporia* and based on *Bacillus firmus*. The treatments involved application to brachiaria seeds, soybean seeds, or both crops. The soybean used in the trial belonged to the BMX Potência RR cultivar, which is susceptible to *Meloidogyne javanica*.

The experiment took place in Bandeirantes, Paraná. The experimental design involved eight replications and a factorial scheme with 24 combinations.

The factors included nematicide use strategy, brachiaria management method, and pre-emergent herbicide applied to soybeans.

The Marandu cultivar of brachiaria grass was grown in 1,8-liter pots with a sterilized mixture of soil and sand. Five days after transplanting, each plant received one thousand eggs and second-stage juveniles *Meloidogyne javanica*. The plants remained in the system for 90 days.

Afterward, they underwent mechanical management, through manual cutting, or chemical management, through desiccation with glyphosate.

After managing the brachiaria grass, the pots were left fallow for 30 days. The researchers placed ten grams of dry

brachiaria straw on the soil to simulate cover. Soybeans were then sown. One day after sowing, pre-emergent herbicides were applied. Imazethapyr was applied at a dose of 106 grams of active ingredient per hectare. S-metolachlor was applied at a dose of 1.440 grams of active ingredient per hectare.

Evaluation time

The assessment took place 75 days after soybean emergence. Scientists quantified the final nematode population, consisting of eggs and second-stage juveniles extracted from the roots.

Search results

The results indicated an interaction between brachiaria management and nematicide use strategy. In mechanical management, treatment with *Bacillus firmus* applied only to soybeans, it resulted in the largest population of *Meloidogyne javanica*. In the chemical management of brachiaria grass, the strategies for using nematicides did not differ.

The difference between mechanical and chemical handling only became apparent when *Bacillus firmus* was applied exclusively to soybeans. In this case, the nematode population increased under mechanical management. In the other treatments, the brachiaria management method did not alter the final nematode population.

S-metolachlor reduced the population of *Meloidogyne javanica* in two situations. The first occurred when *Pochonia chlamydosporia* was applied to both brachiaria and soybean. The second effect occurred when *Bacillus firmus* was applied only to soybean. In the other treatments, the herbicides did not differ.

Imazethapyr did not impair the action of biological nematicides under the evaluated conditions. S-metolachlor also did not compromise the efficiency of the biological agents. The data indicate compatibility between the evaluated herbicides and the biological nematode management strategies in succession *Urochloa brizantha* - soy.

Laboratory and greenhouse

The study also shows differences between laboratory results and greenhouse responses. Previous research had reported inhibitory effects of herbicides on biological control microorganisms under in vitro conditions. In the soil-plant system, factors such as soil adsorption, microbial activity, and herbicide degradation can reduce the direct exposure of biological agents to the active ingredients.

The study was carried out by Paula Fernanda de Azevedo Ribeiro, Andressa Cristina Zamboni Machado, Santino Aleandro da Silva, Jethro Barros Osipe and Marcelo Giovanetti Canteri.

Further information at
doi.org/10.1007/s40858-026-00809-5

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Amanda Moraes joins Biotrop's Portfolio area

The professional will work on the technological development and strategic direction of the company's solutions

02.06.2026 | 13:49 (UTC -3)

Cultivar Magazine



The agricultural engineer **Amanda Moraes** (pictured) has assumed the role of Portfolio Coordinator at Biotrop. She will now be responsible for technological

development and strategic direction of the company's solutions.

With over five years of leadership experience in market development, marketing, and market access, Amanda has built a career in the biologics sector, having worked at Vittia and AgBiTech.

At Vittia, she was the Market Access and CRM Manager, collaborating on initiatives related to marketing, business development, and pricing strategies.

At AgBiTech, where he worked for over five years, he most recently served as Marketing Manager. He was also responsible for the conception and management of the Valoriza AgBiTech Program, an initiative aimed at incentivizing sales among partner

distributors.

Amanda holds a degree in Agronomic Engineering from the Federal University of Goiás (UFG) and an MBA in Marketing from Esalq/USP.

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ADM has a change in national sales management

Marlon Guzzi de Andrade joins the company with extensive experience in the agricultural market

01.06.2026 | 15:41 (UTC -3)

Cultivar Magazine



ADM appointed **Marlon Guzzi de Andrade** (pictured) as the new National Sales Manager. The professional has

experience in the animal nutrition sector and has previously held commercial leadership positions at companies such as Novonesis and Chr. Hansen.

Before joining ADM, Marlon held the position of national manager at Novonesis for over two years. Prior to that, he held the same role at Chr. Hansen for over four years.

Marlon is a veterinarian graduated from the Federal University of Paraná (UFPR), and also holds an MBA in Strategy and Communication from the Getulio Vargas Foundation (FGV), in addition to a career linked to agribusiness and animal nutrition.

In a statement, the manager highlighted the focus on market expansion and strengthening the company's partnerships.

"I look back with great gratitude for all the experiences and connections that have brought me here. Now, the focus is on the future: leading with purpose, developing the national market, strengthening relationships with our key partners, and walking side-by-side with our team," he stated.

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Alessandro Flamini takes over leadership of Ourofino Agrociência

Marcelo Abdo will begin serving as an
administrative advisor and institutional director
starting June 1st

01.06.2026 | 09:09 (UTC -3)

Cultivar Magazine, based on information from Fernanda Chiossi



Ourofino Agrociência has announced a change in its leadership structure.

Alessandro Flamini will assume the role of CEO starting today. Marcelo Abdo will now serve as an administrative advisor and institutional director.

The company stated that the change is part of a planned succession process. The measure follows corporate governance practices and the organization's sustainable growth plans.

Flamini has been part of the company's journey since 2011. In recent years, he served as CFO and financial director.

Later, he held the position of vice president. As CEO, he will be responsible for the company's strategy and positioning with clients, the market, investors, and

industry associations.

With a degree in business administration, Flamini has over 24 years of experience in agribusiness. His career includes national and multinational companies. He has worked in the financial, administrative, and operational areas. He has also accumulated experience in strategic planning, risk management, controllership, supply chain, innovation, and information technology.

“I accept with great responsibility the challenge of accelerating our evolution and leading Ourofino Agrociência into the future. Always preserving our essence as a Brazilian company, with a real understanding of the farmer's needs and a focus on solving these challenges,” said

Flamini.

Marcelo Abdo will work more closely with the board of directors. He will also represent the company before government agencies and entities in the agricultural sector.

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Agricultural Market - 5.Jun.2026

Soybean exports sustain record levels amid external pressure.

05.06.2026 | 10:27 (UTC -3)

Vlamir Brandalitze - @brandalitzeconsulting



Soybeans will remain the leading export commodity in Brazil in 2026, even with pressure on prices in Chicago. The

international market is operating under the influence of weather in the United States, geopolitical tension in the Middle East, and the trade dispute between China and the United States. In Brazil, positive premiums help offset some of the decline in external prices and support prices at ports.

Soybean planting in the United States has entered its final stretch. According to reports, the USDA indicated that planting has progressed to over 91% to 92% of the area. The historical average for this period is 85%. The progress within the ideal window is putting pressure on Chicago. Positions have lost previous support levels and are now trading with support at \$11 per bushel and resistance at \$11,50 per bushel.

Chinese demand is also weighing on prices. China appears with lower purchases in recent US export reports. The Asian country is concentrating its acquisitions in Brazil. This movement supports Brazilian premiums, all above 50 positive points in both short and long positions to 2026.

Oil prices above \$90 a barrel are putting pressure on international costs. This scenario affects fertilizers, maritime transport, freight, and insurance. Tensions involving Iran, Israel, and Lebanon remain on the radar, although the market shows less direct reaction to each new round of news.

In Brazil, the soybean harvest closed at around 180 million tons, according to

reports. Approximately 65% ??of the production has been traded. The previous year, the rate reached 68%. The average is 68,5%. The percentage delay does not represent an equivalent drop in volume, as the current harvest exceeds the previous one.

The new crop has seen recent progress in negotiations, especially through barter transactions. The volume traded has reached approximately 17%. In the same period of the previous year, the index was close to 23%. The average reaches 25%. The area could grow between 500 hectares and one million hectares. Part of the price fixing occurred with producers taking advantage of price levels.

Corn situation

In the corn market, Chicago is also feeling the pressure from the US planting season. The planted area reached 96%, compared to the historical average of 94%. Favorable conditions are reducing price support. The July contract lost support and is now trading near \$4,20 per bushel. The market is still trading with a bearish bias in the short term.

The US corn crop is projected to cover 38 million hectares, down from 40 million hectares in the previous cycle. Despite positive supply and demand fundamentals, the harvest effect dominates the current situation. Ukraine, Russia, and China are also reporting normal production

conditions. This combination increases pressure on Chicago.

In Brazil, the corn harvest is progressing. Mato Grosso has harvested between 3% and 4% of the area. The first crops are performing well. Areas harvested after June 20th or 25th require more attention, as some of them suffered from hotter and drier weather.

Wheat situation

Wheat is trading under slight pressure. The July contract lost support at six dollars per bushel and is seeking support near 5,80 dollars per bushel. Longer-term contracts also retreated. Even so, the curve indicates future tightening, with 2027

prices above current values. Global consumption is expected to exceed production in the new cycle, according to the report.

In the Brazilian market, wheat from Rio Grande do Sul trades between 1.300 and 1.330 reais per ton. In Paraná, prices range from 1.330 to 1.380 reais per ton. At the producer's counter, Paraná operates near 70 reais per sack in most regions, except for the south of the state and the region near Ponta Grossa, where prices are between 77 and 80 reais per sack. In Rio Grande do Sul, the reference price is around 68 reais per sack.

Wheat planting is gaining momentum, but the area is expected to decrease. In 2025, Brazil planted more than 2,5 million

hectares. For 2026, the projection is between 2,2 million and 2,3 million hectares. Producers are still indicating a smaller intention. Concerns involve the market, grain quality, and the risk of rain during the harvest in the South.

Sorghum situation

In Brazil, the planted area for sorghum is approaching 2,2 million hectares.

Harvesting is beginning in some regions.

The country could export between 450 and 500 tons in the new season. In the United States, the world's largest exporter, planting has reached about 50%, in line with the historical average. Kansas is over 30%, also within the average. Texas is

approaching 90%. Sorghum is gaining ground due to the demand for ethanol.

Rice situation

In the rice market, the Rio Grande do Sul market is operating with stability.

Producers are complaining about prices.

Conab announced new Pepero auction notices for June. The auction on the 10th includes more than 52 tons offered in Rio Grande do Sul and about 5,8 tons in Santa Catarina.

Rice prices range from 51 to 55 reais, depending on the type and region. Retail prices vary widely. There are promotions below 11 reais, offers between 14 and 17 reais, and regular prices between 18 and

30 reais for some brands.

Bean situation

In the bean market, the harvest in Paraná is changing the price environment. The market peaked in recent weeks, with grade 9 beans above 500 reais per sack.

Indications have since retreated to between 415 and 450 reais. Buyers suggest the possibility of prices below 400 reais next week.

Commercial beans rated 8 to 8,5 also lost momentum after trading near or above 450 reais per sack. Prices are now below 400 reais. Black beans reached nearly 300 reais at their best recent moment, but have retreated to 220 to 240 reais. The arrival of supplies from Paraná explains the

pressure.

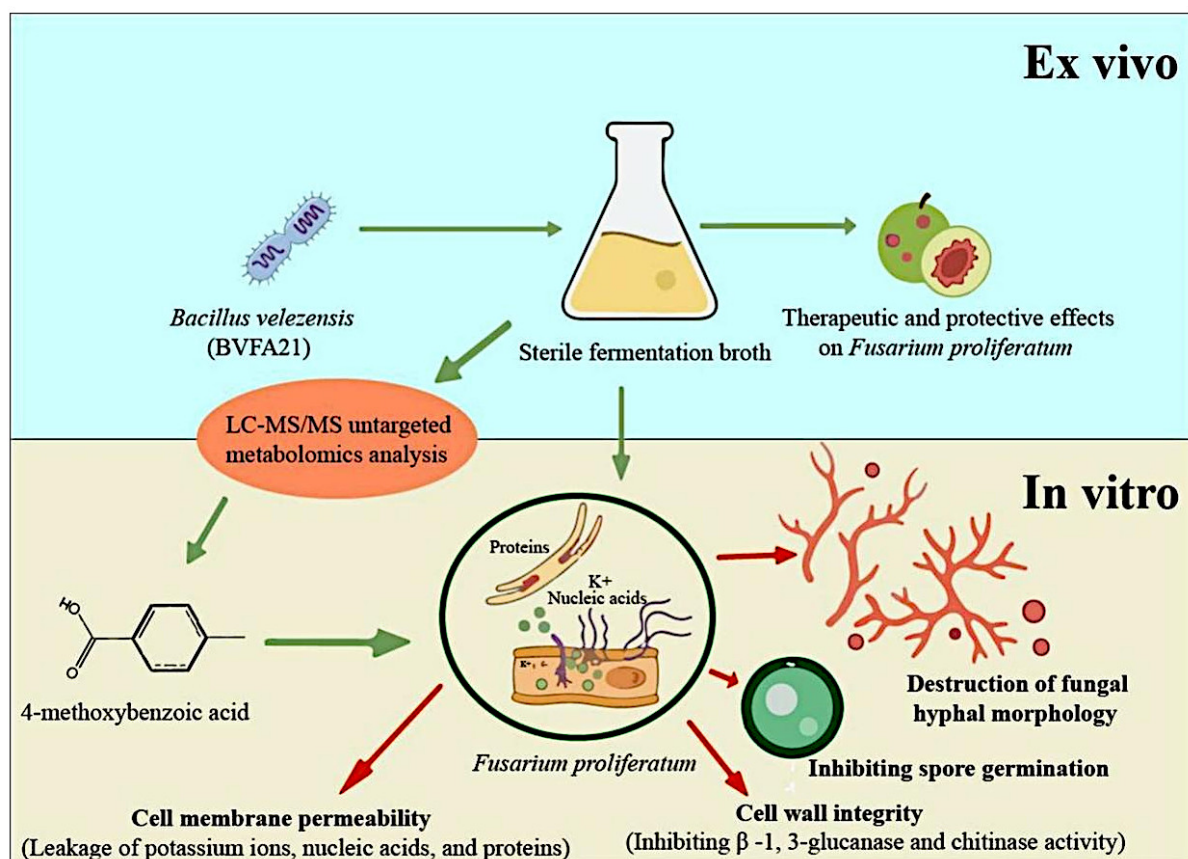
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Bacillus velezensis inhibits Fusarium proliferatum in plum

Study points to action of the bacteria and 4-methoxybenzoic acid on the membrane, cell wall and spores

05.06.2026 | 10:08 (UTC -3)

Schubert Peter, Cultivar Magazine



doi.org/10.1016/j.pestbp.2026.107189

The strain Bacillus velezensis BVFA21 showed antifungal activity against *Fusarium proliferatum* and reduced infection in plum fruits in laboratory tests. The study also identified 4-methoxybenzoic acid, called 4-MBA, as a key metabolite in the biocontrol effect.

Researchers isolated 39 bacterial strains from healthy plum fruits and rhizosphere soil. BVFA21 showed the strongest antagonistic effect against *Fusarium proliferatum*, with a 75,17 percent inhibition of mycelial growth. Identification was made through colony morphology, Gram staining, physiological and biochemical tests, and analysis of the 16S rRNA gene. The sequence was assigned the GenBank number PV131680.1.

Fermentation conditions

The study also evaluated the fermentation conditions of the strain. After testing with culture media and adjusting the process, the scientists defined the YSB medium, with a 3 percent inoculum, agitation at 200 revolutions per minute, a temperature of 31 degrees Celsius, and fermentation for three days. Under these conditions, the sterile fermentation broth increased the antifungal activity. Inhibition increased from 46,53 percent to 71,90 percent with 10 percent broth. With 20 percent broth, it increased from 66,88 percent to 82,77 percent.

In detached plum fruits, the fermentation broth showed a preventive and therapeutic effect against *Fusarium proliferatum*.

Preventive application of the integral solution resulted in 82,45 percent lesion control. The therapeutic effect reached 66,37 percent. However, the researchers emphasize that the diameter of the lesions does not measure the entire internal colonization of the fungus. Confirmation of the effect on the actual infection load would require direct quantification of the pathogen's biomass.

Microscopic analyses

Microscopic analyses indicated damage to the fungal hyphae. In the control, the hyphae presented a thin, smooth, and

regular shape. With 10 percent broth, scientists observed increased gourd-shaped growth, shorter internodes, and sectioning. With 20 percent, they observed swelling, wrinkling, collapse, fractures, and superficial rupture. The effect increased with concentration.

The broth also reduced spore germination. In the control, germination reached 96,48 percent. The 10 percent treatment reduced germination to 35,56 percent. The 20 percent treatment reduced it to 21,45 percent. Inhibition rates reached 63,11 percent and 77,77 percent, respectively.

The data indicate an effect on the pathogen's cell membrane. After 24 hours, the relative conductivity reached 41,69 percent in the treatment with 10 percent

broth and 71,65 percent in the treatment with 20 percent. The control registered 10,56 percent. The treatments also increased the leakage of potassium, nucleic acids, and proteins. Staining with propidium iodide confirmed loss of membrane integrity.

The cell wall also underwent changes. After 72 hours, beta-1,3-glucanase activity decreased from 19,86 units per gram in the control to 18,28 units per gram with 10 percent broth and 14,99 units per gram with 20 percent broth. Chitinase activity in the 20 percent treatment was 8,39 units per gram, compared to 21,24 units per gram in the control. Calcofluor White staining indicated greater blue fluorescence in the treated hyphae, a sign

consistent with cell wall alteration.

Metabolomics analysis

Untargeted metabolomic analysis by LC-MS/MS identified 382 compounds in the fermentation broth. The researchers selected 20 commercial compounds with reported antifungal activity for validation against *Fusarium proliferatum*. Among them, 4-methoxybenzoic acid showed the greatest effect, with an inhibition of 74,07 percent at a concentration of 200 micrograms per milliliter.

The EC25, EC50, and EC75 values ??for mycelial growth reached 35,94 micrograms per milliliter, 83,55 micrograms per milliliter, and 194,23 micrograms per

milliliter, respectively. At the EC75 concentration, 4-MBA reduced the dry weight of the mycelium by 71,27 percent after three days.

4-MBA altered hyphal morphology, reduced spore germination, and affected membrane permeability at concentrations equal to or greater than EC50. In spore germination, rates fell from 99,26 percent in the control to 77,04 percent at EC25, 58,87 percent at EC50, and 41,00 percent at EC75.

The compound also reduced beta-1,3-glucanase activity. At EC75, enzyme activity reached 6,34 units per gram after 72 hours, compared to 12,03 units per gram in the control. Chitinase activity did not show a consistent difference compared

to the control.

According to the researchers, 4-MBA acts as a relevant active component, but it does not alone explain the entire effect of the fermentation broth. The 20 percent broth achieved 82,77 percent inhibition, while 4-MBA at EC75 reduced mycelial dry weight by 71,27 percent. The study attributes this difference to a probable combined action between 4-MBA and other metabolites present in fermentation, including compounds active on the membrane and cell wall.

Further information at
doi.org/10.1016/j.pestbp.2026.107189

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Chitosan shows potential against Fusarium head blight in wheat

A study by UFV evaluated chitosan oligosaccharide in the management of *Fusarium graminearum* and deoxynivalenol

05.06.2026 | 09:22 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Douglas Lau

Researchers at the Federal University of Viçosa evaluated the use of chitosan oligosaccharide as an alternative to reduce [Fusarium graminearum](#) and deoxynivalenol contamination in wheat. The product reduced fungal growth and conidia germination in in vitro assays. It also decreased the incidence of the pathogen in seeds. In greenhouses and in the field, performance varied according to dose, application time, and assay. The results indicate potential for use in integrated management of Fusarium head blight, but do not support its use alone as a consistent substitute for fungicides.

The study tested chitosan oligosaccharide under controlled conditions, seed treatment, greenhouse, and field.

Researchers compared the product with fungicides used as a reference.

Tebuconazole was included in mycelial growth assays, seed treatment, and plant applications. Pyraclostrobin was included in the macroconidia germination assay.

In vitro tests

In in vitro tests, chitosan oligosaccharide reduced mycelial growth of *Fusarium graminearum* with increasing concentration. The effective concentration to reduce mycelial growth by fifty percent reached 7.155,9 milligrams per liter. For tebuconazole, the estimated value was 0,11 milligrams per liter. In macroconidia germination, chitosan oligosaccharide showed an effective concentration of

519,31 milligrams per liter. Pyraclostrobin showed an estimated value of 0,0002 milligrams per liter.

The data indicate a direct effect of chitosan oligosaccharide on the pathogen. This effect occurred at doses higher than those required for the fungicides used for comparison. Increasing the concentration of the product also reduced the pH of the solutions and increased the electrical conductivity.

Seed treatment

In seed treatment, chitosan oligosaccharide reduced the incidence of *Fusarium graminearum*. The same occurred with tebuconazole. Inoculated

and non-disinfected seeds from the control group showed the highest incidence of the pathogen. This treatment also showed the greatest reduction in germination. The result showed a direct association between the presence of the fungus in the seeds and a decrease in germination potential.

The incidence of the pathogen in seeds treated with tebuconazole ranged from zero to 2,5 percent in both disinfected and undisinfected seeds, depending on the combinations evaluated. In seeds treated with chitosan oligosaccharide, the incidence ranged from three to 8,5 percent. Germination in seeds treated with tebuconazole ranged from 65 to 80 percent. In seeds treated with chitosan oligosaccharide, it ranged from 62 to 85

percent.

Greenhouse

In a greenhouse, researchers tested doses of 500, 1.000, 2.000, and 3.000 milligrams per liter of chitosan oligosaccharide.

Applications were made five days before inoculation. The area under the disease progress curve values ??did not differ from the untreated control. Tebuconazole reduced the disease in both trials and showed better performance.

Even without statistically significant differences in severity in some comparisons, certain treatments with chitosan oligosaccharide reduced disease and DON compared to the untreated

control. In the first trial, the 1.000 milligram per liter dose reduced the area under the disease progress curve by 36,6 percent and DON by 47,6 percent. In the second trial, the 500 milligram per liter dose reduced disease by 20,6 percent and DON by 42,4 percent. Tebuconazole reduced DON accumulation from 78,6 to 91,4 percent.

Application periods

The study also evaluated application times. Chitosan oligosaccharide was applied at a dose of 2.000 milligrams per liter. Spraying occurred five and two days before inoculation, on the day of inoculation, and two and five days after. Results varied between trials. In general,

fungicide and chitosan oligosaccharide performed better in the first trial. Only the fungicide reduced the area under the disease progress curve compared to the untreated control.

In greenhouse-harvested grains, DON appeared in all inoculated samples. The uninoculated control showed no DON. Some treatments with chitosan oligosaccharide reduced the mycotoxin. Application five days before inoculation reduced DON by 33,1 percent in the first trial. In the second trial, application on the day of inoculation reduced DON by 42,3 percent. Application two days later reduced DON by 13,6 percent.

Field trials

In field trials, data variation prevented the detection of significant differences between treatments. There was a small reduction in severity in ears inoculated and treated with chitosan oligosaccharide or tebuconazole. The greatest reductions occurred with fungicide, ranging from 8,37 to 100 percent, depending on the application time. Among plants treated with chitosan oligosaccharide, the greatest reduction occurred with application five days before inoculation, at 31,03 percent. Application on the day of inoculation reduced severity by 19,41 percent.

The study found no consistent biostimulant effect. The chitosan oligosaccharide and fungicide did not increase plant height. The product also did not significantly reduce the percentage of grains damaged by

Fusarium compared to the untreated control. Tebuconazole reduced these grains in trials with inoculated plants, except in the field.

The study was conducted by Gabriel Ferreira Paiva, Lara Lorrayne Silvestre de Andrade, José Maria da Silva, Renato Arruda dos Santos, Emerson Medeiros Del Ponte, and Franklin Jackson Machado.

Further information at
doi.org/10.1007/s40858-026-00801-z

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Excess nitric oxide blocks systemic immunity in plants

Study shows failure in salicylic acid transport and loss of acquired resistance

04.06.2026 | 18:02 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Syngenta

Researchers at the University of Kentucky have identified a mechanism by which excess nitric oxide impairs systemic plant immunity. The study showed that high levels of this molecule alter cellular pH, reduce salicylic acid movement, and compromise systemic acquired resistance, known by the acronym SAR. The research used [Arabidopsis thaliana](#) as a model.

The study analyzed plants with a mutation in the GSNOR1 gene. These plants accumulate high levels of nitric oxide. They also exhibit a failure in the activation of SAR, a whole-plant immune response. This response occurs after infection in one part of the plant and prepares distant tissues for further pathogen attack.

Salicylic acid

According to scientists, the problem involves not only the production of the defense signal. The plant also needs to transport this signal. The study showed that salicylic acid, a molecule associated with plant defense, has difficulty entering the plant's transport system when nitric oxide accumulates in excess.

In *gsnor1* mutants, the space outside the cells became more acidic. The cell interior became more alkaline. This change affected pH homeostasis and created a barrier to the movement of salicylic acid. The result reduced signal entry into tissues and limited the activation of systemic immunity.

Scientists report that *gsnor1* plants accumulate less salicylic acid in petiole exudates after inoculation with *Pseudomonas syringae* p.v. *tomato*. These exudates serve as an experimental proxy for evaluating compounds associated with the phloem. The reduction occurred even when other signals linked to SAR remained present, such as glycerol-3-phosphate and TAS3a.

Less buildup

The researchers also observed less accumulation of salicylic acid in the apoplast and cuticular waxes of infected leaves. Assays with labeled salicylic acid indicated less displacement of the molecule from the treated tissue. The

authors interpreted the result as evidence of failure in cellular uptake and/or transport to the phloem.

The team tested the exogenous application of salicylic acid via two routes. When the molecule was sprayed onto the leaves, the mutants continued to show a limited response. When salicylic acid was applied via the soil, the plants recovered immune signaling and RAS. This result indicated that the perception system did not lose its function. The main failure occurred in the delivery of the signal via the foliar route.

Direct effect

The study also evaluated the direct effect of nitric oxide on salicylic acid uptake.

Protoplasts from wild-type plants received nitric oxide donors and labeled salicylic acid. Increased nitric oxide reduced salicylic acid uptake in a concentration-dependent manner. Treatments with hydrogen peroxide did not produce the same effect.

Scientists used pH sensors directed at the cytosol and apoplast to measure the change in vivo. In *gsnor1* plants, the sensors indicated a more acidic apoplast and a more alkaline cytosol. This pattern supports the model in which excess nitric oxide disrupts pH gradients and reduces the transport of weak molecules such as salicylic acid.

Acquired resistance

Systemic acquired resistance also failed in another mutant with excess nitric oxide, called *nox1*. This mutant showed less salicylic acid accumulation in exudates and loss of SAR. However, *nox1* and *gsnor1* showed different metabolic profiles and distinct patterns of subcellular nitric oxide localization. The study concluded that the amount and spatial distribution of nitric oxide shape immune and metabolic responses.

The results reinforce the dual role of nitric oxide in plant defense. The molecule participates in the immune response, but requires balance. Levels that are too low or too high can impair RAS (respiratory

system). For scientists, the discovery offers a new way to analyze disease resistance in agricultural crops. The plant needs not only to produce defense signals, but also to move these signals to the right tissues.

Further information can be found at
doi.org/10.1126/sciadv.adz4776

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Heat wave redefines economic strategy for wine grapes

Study suggests shade, cultivar change, or migration depending on the intensity of extreme events

04.06.2026 | 17:47 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Wenderson Araujo / CNA

Grape growers for wine can achieve better economic returns with distinct heat adaptation strategies, depending on the severity of extreme events. A study by scientists at Cornell University evaluated three approaches for Cabernet Sauvignon vineyards in California: using shade netting, switching to a more heat-tolerant cultivar, and migrating to a cooler region. The conclusion points to a rule of thumb: maintaining the current system pays off under mild warming; installing shade netting gains strength under moderate stress; adopting a more heat-tolerant cultivar yields a greater return in extreme scenarios.

The study analyzed the net present value of revenues and costs over a thirty-year

cycle. The team considered the planting of one hectare of vineyard, the phase up to full production, annual costs, grape prices, and yield losses under heat events. The study focused on Cabernet Sauvignon in Napa County, Carignane in Napa, and Cabernet Sauvignon in Lake County.

High temperatures

The research stemmed from a growing technical problem in viticulture. High temperatures affect the growth, productivity, and composition of berries. Above thirty degrees Celsius, photosynthesis loses efficiency. Above thirty-five degrees Celsius, phenolic degradation occurs. Above forty degrees

Celsius, there is a risk of cell damage and sunburn. In Cabernet Sauvignon bunches, temperatures in unprotected controls reached fifty-eight degrees Celsius. The use of netting reduced the bunch temperature to forty-seven point seven degrees Celsius in a study cited by the scientists.

First alternative

The first alternative evaluated involves shade netting over the vines or on the south side of the canopy. This technology reduces direct sun exposure and can lower the fruit temperature by about 3.5 degrees Celsius. The cost is a significant factor in the outcome. The model included an initial

cost of \$74,100 per hectare and maintenance costs of \$12,350 per hectare every six years.

Second alternative

The second alternative involves switching cultivars. The study used Carignane as a potential substitute for Cabernet Sauvignon in Napa. Carignane is part of the group of *Vitis vinifera* cultivars with the highest production capacity in warmer climates, alongside Grenache, Zinfandel, and Nebbiolo. The analysis indicated greater productive stability for Carignane in Napa when faced with days with temperatures above thirty-five degrees Celsius.

Third alternative

The third alternative involves a change of location. The model compared Napa with Lake County, a nearby and cooler region. In this scenario, the producer maintains Cabernet Sauvignon but shifts production to an area with a lower history of extreme temperature events. The costs of planting and annual production in Lake County appeared to be lower than those in Napa. However, the average price of the grapes was also lower.

The study also measured consumer reaction. The team interviewed three hundred and three participants in the United States. They evaluated hypothetical labels linked to the three strategies. When

given an explanation about climate adaptation, consumers stated a willingness to pay premiums. The average premium reached seventeen percent for wines associated with the use of shading, twelve percent for cultivar switching, and about eleven percent for regional change.

The researchers treated these premiums as temporary. The model applied the price increases only during the first five years of full production, from the fifth to the ninth year. After that, prices returned to the standard used in the simulations. This choice reflected the hypothesis of loss of novelty over time.

In scenarios without extreme events, Cabernet Sauvignon in Napa maintained the highest net present value. This result

reflected the high price of the grape in this origin and the absence of heat losses.

With mild events, maintaining the traditional system also led the way.

Shading appeared as the second best alternative.

With moderate heat events, the shade cloth generated the highest net present value. In this case, the protection preserved sufficient yield to offset implementation and maintenance costs.

With extreme events, switching to Carignane showed the best financial performance. The higher yield of the cultivar helped to offset the lower price per thousand kilograms.

Scientists say the method can help producers, technology providers, breeders,

landowners, financiers, policymakers, and consumers. The model allows for the input of local prices, yields, and costs. Thus, each vineyard can evaluate technology, cultivar, or region based on its own productive and financial conditions.

More information at
doi.org/10.5344/ajev.2026.25043

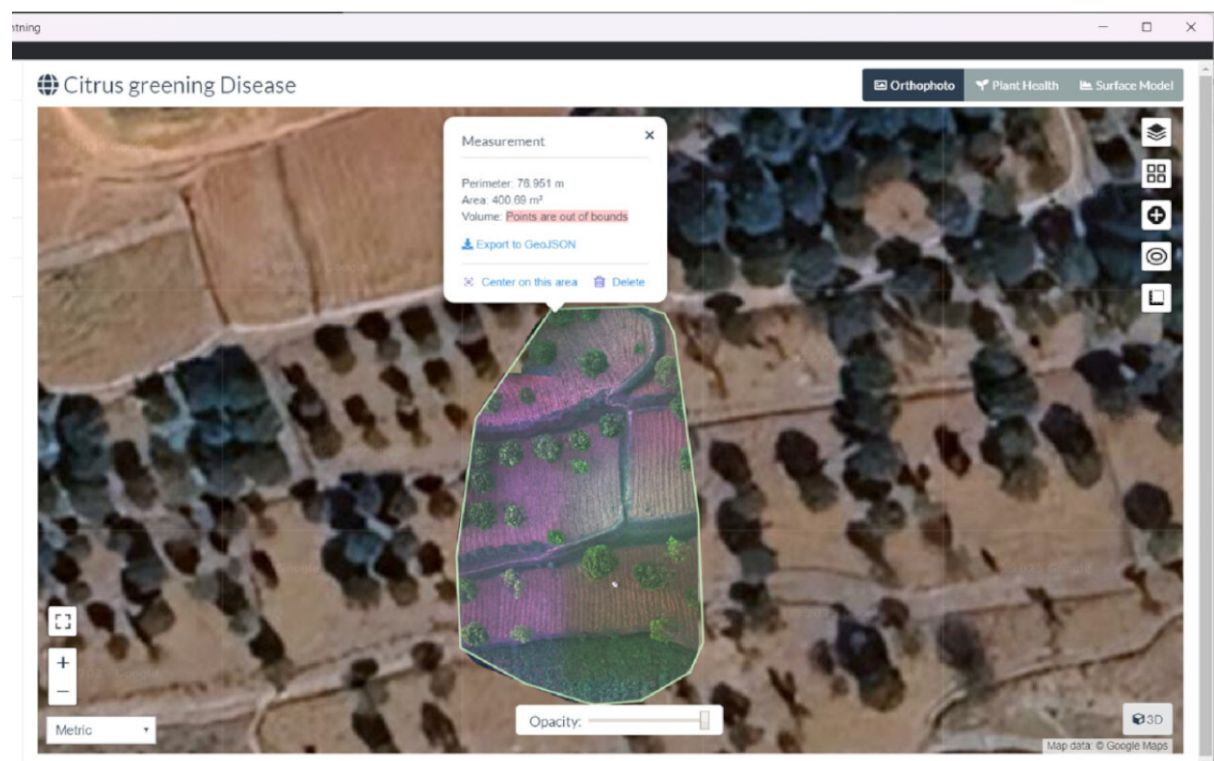
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Drones and AI detect HLB in citrus with 89% accuracy

This study evaluated ResNet-50, EfficientNetV2B0, and DenseNet-121 in aerial images of an orchard

04.06.2026 | 17:19 (UTC -3)

Cultivar Magazine



doi.org/10.1016/j.atech.2026.102274

Researchers have developed a method to detect huanglongbing, or HLB, in citrus

orchards using drone-obtained images and deep learning neural networks. The ResNet-50 model showed the best performance among the architectures tested. It achieved 89% overall accuracy, with 90% macro precision, 89% recall, and an F1-score of 89%.

The study evaluated three convolutional neural network models: ResNet-50, EfficientNetV2B0, and DenseNet-121. The networks classified images into three classes: healthy plants, plants infected with HLB, and image background. EfficientNetV2B0 achieved 87% accuracy. DenseNet-121 reached 85%.

The team collected images in a citrus orchard at Kathmandu University in Dhulikhel, Nepal. The experimental area

was located 1.455 meters above mean sea level. Data collection took place between May 5 and 15, 2025, from 10:00 AM to noon. This period aimed to maintain constant light intensity and lower wind speed.

Orchard dimensions

The orchard had one hectare of sweet orange trees. The spacing between the plants was six meters by six meters. The population reached 277 plants per hectare. The trees were between two and four meters tall, with a semi-spherical crown and a crown diameter between two and a half and four meters.

The researchers used a DJI Phantom 4 Multispectral drone. The equipment operated at an altitude of 20 meters, with a speed of two meters per second and 85% overlap. The RGB camera had 20 megapixels. The multispectral sensor recorded blue, green, red, red-edge, and near-infrared bands.

The initial database gathered 6.000 RGB cutouts in TIFF format. Each cutout measured 128 by 128 pixels. The scientists distributed the images into three equal groups, with 2.000 samples per class. In each class, 1.600 images were used for training. Another 400 images comprised the validation.

After enlarging the image bank through 90-degree, 180-degree, and 270-degree

rotations, as well as adjusting brightness and contrast, the total reached 24.000 images. The procedure simulated variations in canopy orientation and camera angle during flight.

Cup cutouts

The classification used canopy cutouts and spectral attributes. The study evaluated mean, median, maximum and minimum values, standard deviation, skewness, and kurtosis in the analyzed bands. Healthy areas presented uniform green foliage and a compact canopy. Infected areas exhibited partial yellowing, a mottled pattern, and an asymmetrical vein distribution. Soil, weeds, and shadows were classified as background.

ResNet-50 correctly classified 397 out of 400 background samples. The model also identified 373 out of 400 samples infected with HLB. In the healthy group, it correctly identified 295 out of 400 samples. The greatest confusion occurred between healthy and infected canopies. This result indicates difficulty in separating initial HLB symptoms from natural canopy variations.

The EfficientNetV2B0 model correctly identified 396 background samples, 362 infected samples, and 291 healthy samples. The DenseNet-121 model classified 384 background samples, 358 infected samples, and 282 healthy samples. All three models performed best in the background class. The healthy class had the lowest F1-score.

Detection map

The study also generated an orchard-scale HLB detection map. The map divided a region of the orthomosaic into 154 grids. Each cell represented a 128-by-128 pixel section. ResNet-50 classified 92 sections, or 62%, as background. Another 51 sections, or 31%, appeared as HLB-infected. Only 11 sections, or 7%, came in as healthy canopy.

This map showed infection spots in contiguous blocks. The visualization can support localized spraying, targeted inspection, and removal of diseased trees. The method avoids uniform treatment across the entire area and allows for site-specific management.

Scientists conclude that the integration of drones, RGB images, and neural networks can support automated HLB monitoring in citrus. The work also indicates potential for advancement with the use of near-infrared and red-edge bands, as these ranges record changes linked to the internal structure of leaves and chlorophyll concentration.

Further information can be found at doi.org/10.1016/j.atech.2026.102274

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Cotton exports hit a record in May

Shipments totaled 291,2 tons, and the season's accumulated total exceeded 3,1 million tons

04.06.2026 | 17:08 (UTC -3)

Cultivar Magazine, based on information from Catarina Guedes



Brazilian cotton exports reached 291,2 tons in May 2026. The volume marked a historical record for the month. Revenue

reached US\$449,6 million, according to data from Secex analyzed by the National Association of Cotton Exporters.

The result raised the accumulated total for the season, from July 2025 to May 2026, to 3,129 million tons. The volume also marked an unprecedented level for the sector.

Compared to April, there was a decrease in volume and revenue. The previous month recorded 370,4 tons and US\$560,6 million. Anea attributes the decline to the seasonality of fiber shipments.

Before May 2025, exports grew 51,5% in volume and 45,3% in revenue. Cotton accounted for 1,41% of total Brazilian exports in the month. The product ranked 15th overall. In the agricultural sector, it

came in third place, with a 5,52% share.

The president of Anea, Dawid Wajs, stated that the country surpassed three million tons in the accumulated total for the season. According to him, Brazil has consolidated itself as a supplier throughout the 12 months of the year.

Bangladesh led the destinations in May, accounting for 21,1% of shipments. Pakistan followed with 19%. Turkey accounted for 14,2%, and Vietnam had 13,4%. Bangladesh and Pakistan combined accounted for 40% of the month's exports.

China's rate fell to 9,6% in May. India's rate dropped from 11% in April to 6,3% in May, following the end of the tax exemption on cotton imports in the

country.

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CNH has a new director for its dealership network

With two decades of experience at the company, Marcio Contreras will focus on regional strategy and commercial performance

03.06.2026 | 17:07 (UTC -3)

Cultivar Magazine



CNH has appointed Marcio Contreras as the new director of development for its dealer network. Contreras, who has over

20 years of experience with the company, previously held the position of Marketing Director for New Holland in Latin America.

Based in Curitiba (PR), Contreras' responsibilities will include overseeing network performance metrics, identifying market opportunities, leading regional initiatives, and supporting organizational transformation processes in the distribution channel.

Throughout his career at CNH, Marcio consolidated experience in the areas of commercial leadership, channel strategy, and business transformation. He also served on the company's Innovation Committee and participated in initiatives related to startup ecosystems, such as Cubo Itaú and Fiep, in addition to

developing leadership and entrepreneurship programs in partnership with the Brazilian government.

Marcio Contreras holds a degree in Business Administration and Management from the Federal University of Mato Grosso (UFMT) and has specializations in finance, marketing, business, administration, and leadership. His training has been conducted at institutions such as Harvard Business School, Tel Aviv University, Saint Paul Business School, and Fundação Getulio Vargas (FGV).

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MF 9S tractor debuts in Argentina during Agroactiva 2026

Machines with up to 425 horsepower combine autopilot, telemetry, and Dyna-VT transmission for large-scale operations

03.06.2026 | 15:58 (UTC -3)

Cultivar Magazine, based on information from Corina Tareni



Massey Ferguson is presenting the MF 9S tractor for the first time in Argentina during Agroactiva 2026. The event takes place until June 6th in Armstrong, in the province of Santa Fe. This model represents the largest and most powerful tractor from the brand, with a power output of 425 horsepower.

The series caters to large-scale agricultural operations. The design incorporates smart farming technologies. The package includes automatic driving, operating assistants, and real-time remote monitoring.

High power

According to the company, the MF 9S inaugurates a high-power segment in the brand's portfolio. The series uses a Dyna-VT continuously variable transmission as standard. The system delivers greater torque and power without gear changes.

The tractor incorporates an AGCO Power six-cylinder, 8,4-liter engine. The line offers power outputs from 345 to 425 horsepower. The fuel tank holds 660 liters. The equipment also has a 68-liter AdBlue tank. The engine can operate on HVO fuel.

Autopilot

Automation is featured in the MF Guide autopilot. The system maintains tractor alignment. MF AutoTurn directs the

machine to the next pass. AutoHeadland executes commands at the beginning and end of each row. The goal is to reduce operator intervention and increase operational efficiency.

Connectivity is achieved using MF Connect. The platform allows monitoring of fuel consumption, location, and machine performance. The producer can perform remote management and diagnostics in real time. The FarmEngage platform combines agronomic data and connects existing machines on the property, including those from other brands.

The cabin utilizes the Protect-U design. An 18-centimeter space separates the engine from the cabin. This solution reduces vibration, heat, and noise. The reported

noise level reaches 69 decibels. The internal volume reaches 3,4 cubic meters. The glazed area totals 6,6 square meters.

The hydraulic system can deliver up to 400 liters per minute at 1.850 revolutions per minute. The exportable oil capacity reaches 101 liters. The rear hitch can lift up to 20 tons. The front hitch has a capacity of 5 tons.

[Click here and watch "Exclusive Test Drive with the Massey Ferguson MF 9S tractor"](#)

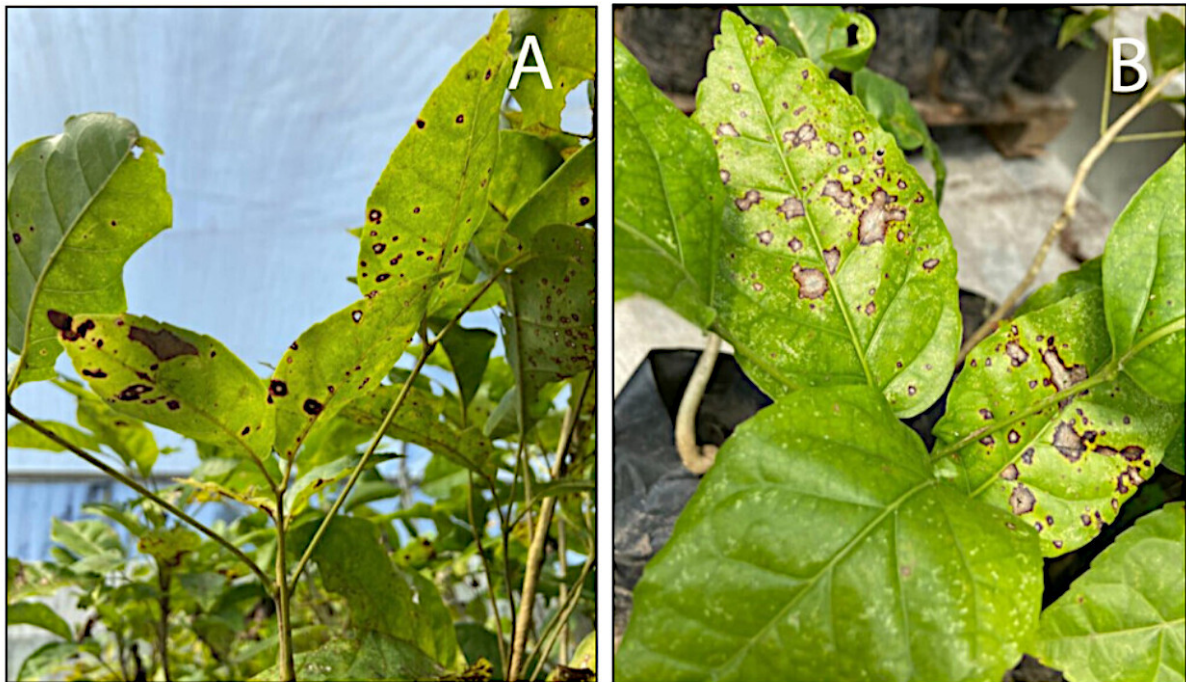
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The fungus *Corynespora cassiicola* causes target spot in ipê trees in Brazil

Study confirms pathogen in *Handroanthus serratifolius* and *Tabebuia rosea*

03.06.2026 | 15:09 (UTC -3)

Schubert Peter, Cultivar Magazine



doi.org/10.1111/jph.70329

Researchers confirmed *Corynespora cassiicola* as a causal agent of target spot

in seedlings of *Handroanthus serratifolius* and *Tabebuia rosea* in Brazil. The record involves plants in a forest nursery in São Lourenço da Mata, Pernambuco. The work represents the first worldwide report confirmed by molecular phylogeny for these two hosts.

Leaves showing symptoms were collected in March 2023. The seedlings presented dark brown necrotic spots with grayish centers. The symptoms had a typical target spot pattern. The nursery maintained approximately 500 seedlings of each species. The incidence of the disease reached 80 percent.

Handroanthus serratifolius, known as yellow ipê, and *Tabebuia rosea*, pink ipê, have ecological and economic importance

in Brazil. The species occurs in urban landscaping and native vegetation. Despite its hardiness, it can suffer from diseases in urban areas, natural ecosystems, and nurseries.

Three leaflets

Scientists collected three leaflets from each host species. Symptomatic fragments underwent surface asepsis in 70 percent ethanol for 1 minute, 1 percent sodium hypochlorite for 1 minute, washing in sterile distilled water, and drying in a laminar flow hood. Then, the fragments were transferred to potato-dextrose-agar medium with 0,5 grams per liter of streptomycin sulfate.

The plates were kept at 28 degrees Celsius, with a 12-hour photoperiod. After 21 days, the researchers obtained six monosporic isolates. The colonies presented a dark brown color, velvety texture, well-defined margins, and abundant aerial mycelium.

Morphological characterization

Morphological characterization indicated septate, light brown hyphae.

Conidiophores appeared macronematic, mononematic, solitary, straight to slightly curved, smooth, and tapered.

Conidiogenous cells presented a monophialidic pattern. Conidia appeared

solitary or in chains, straight to slightly curved, obclavate, light brown, and with four to ten pseudosepta. Measurements ranged from 63,5 to 234,7 micrometers by 7,2 to 9,6 micrometers.

Based on these characteristics, the isolates received initial identification as *Corynesporaspp.* The observed characters coincided with descriptions of *Corynespora cassiicola*, especially due to the morphology of the conidia, septation, pigmentation and structure of the conidiophores.

Two isolates were sent for molecular analysis. CFC 1784 came from *Handroanthus serratifolius*. The CFC 1785 came from *Tabebuia rosea*. Researchers extracted total DNA and amplified ITS,

TEF-1?, TUB2, and LSU regions. The sequences were deposited in GenBank.

Searches for BLAST showed high similarity to isolates of *Corynespora cassiicola*. The ITS sequences showed 100 percent similarity. The TEF-1? sequences also showed 100 percent similarity. The TUB2 sequences reached 99,77 percent similarity. The LSU sequences reached 99,55 percent similarity.

Phylogenetic analysis

The maximum likelihood phylogenetic analysis used combined sequences from the four markers. The tree grouped isolates CFC 1784 and CFC 1785 with

Corynespora cassiicola CBS100822. The clade received 93,9 percent support. The isolates were deposited in the Cariri Phytopathogenic Fungi Collection, at the Federal University of Cariri, in Crato, Ceará.

The pathogenicity tests involved healthy plants of *Handroanthus serratifolius* and *Tabebuia rosea*, one-year-old plants grown in plastic pots were sprayed with 10 milliliters of conidial suspension at a concentration of 2×10^7 conidia per milliliter. Control plants received sterilized water.

Each isolate and the control treatment consisted of ten plants per species. The plants were covered with plastic bags to simulate a humid chamber, with

approximately 85 percent relative humidity, for seven days. Afterward, they remained in a greenhouse at a temperature of 24 to 30 degrees Celsius.

Two months after inoculation, the inoculated leaves exhibited symptoms similar to those observed in the nursery. The control plants remained asymptomatic. The pathogens were re-isolated and maintained the same morphology as the inoculated isolates. Thus, the tests fulfilled Koch's postulates.

The researchers report a previous account of *Corynespora cassiicola* associated with leaf spot in *Handroanthus serratifolius* and *Tabebuia rosea* in Brazil, a study published in 1980 identified that record based solely on morphological

characteristics. The new study adds confirmation through multilocus molecular phylogeny.

The study was conducted by scientists Ingryd Luzia de Farias Andrade, André Nunes de Oliveira, Ana Gabriele Gurgel Amaral, Kamila Câmara Correia, Rosana Blawid, Humberson Rocha Silva, Marcos Paz Saraiva Câmara, and Sami Jorge Michereff.

Further information can be found at doi.org/10.1111/jph.70329

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Why does this matter?

The discovery that the fungus *Corynespora cassiicola* - the causative

agent of target spot in soybeans - infects yellow and pink ipê trees and is important for soybean farmers. Target spot causes losses of up to 40% in soybean productivity in Brazil (DOI: 10.1111/ppa.12925).

Native species, common in nurseries and rural areas, can act as perennial reservoirs of the pathogen, contributing to the maintenance of inoculum between harvests.

This is the first molecular confirmation of the disease in these hosts worldwide. The finding expands knowledge about the broad spectrum of hosts of *Corynespora cassiicola* and its epidemiology, supporting more comprehensive integrated management strategies, such as

monitoring ornamental plants near crops and crop rotation.

The discovery does not change immediate control practices, but it strengthens the scientific basis for protecting soybeans more effectively.

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Weak demand increases pressure on urea prices

Prices have fallen for six consecutive weeks, according to StoneX

03.06.2026 | 14:22 (UTC -3)

Cultivar Magazine, based on information from Bruno Cirillo



Urea prices in Brazil fell for the sixth consecutive week, amid an international scenario marked by weakened demand and a loss of price support. According to

an analysis by StoneX, the accumulated decline in Brazilian ports has already reached approximately 25%, with deals around US\$600 per ton.

The downward trend is also observed in important global markets, such as the United States, China, Egypt, and Russia. According to the consultancy, buyers remain cautious given the still high prices and unattractive terms of trade. "As a result, commercial activity remains limited, evidencing weakened demand," states Tomás Pernías, analyst at StoneX.

Despite the series of declines, prices remain above the levels recorded before the start of the war in the Middle East, signaling that supply-related factors continue to support the international

market.

Restricted logistics affect the market.

One of the main points of concern remains logistics in the Persian Gulf region. Since the beginning of the conflict, navigation through the Strait of Hormuz has remained practically paralyzed, hindering the flow of nitrogen fertilizers produced by countries dependent on the route.

The restriction directly affects products such as urea, ammonia, and sulfur, limiting global supply and preventing more significant price adjustments.

Nevertheless, the prevailing sentiment in the market remains bearish. Not even the

announcement of a new purchase tender by India — traditionally seen as a factor supporting prices — was enough to reverse the recent trend, reinforcing the perception of weak global demand.

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Prionus imbricornis threatens blueberries in North Carolina

Study confirms species in roots and points to flaws in available management practices

03.06.2026 | 07:11 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: North Carolina State University

Researchers at North Carolina State University have identified *Prionus imbricornis* as an emerging pest in commercial blueberry crops in North Carolina, United States. The species belongs to the Cerambycidae family and attacks the roots of *Vaccinium corymbosum*. The study confirmed, through genetic comparison, the presence of the beetle in infested plants in the state's main production center.

The identification resolves a question that has existed since 2010, when producers in Sampson, Pender, and Bladen counties reported severe damage to the roots and crowns of Duke cultivar plants.

Subsequent reports indicated larvae of *Prionus* in blueberry growing areas, but the

species involved remained unconfirmed. The difficulty stemmed from the subterranean habits of the larvae and the morphological similarity between species of the genus.

First case

Researchers report that North Carolina has recorded the first case in the United States of *Prionus imbricornis* in active feeding on commercial blueberry plants. The research also confirms *Vaccinium corymbosum* as a new host of the species through comparative larval barcoding. Prior to this, hosts confirmed by emerged adults included oak, chestnut, and apple trees.

Main damage

The larvae cause the main damage. They bore into and consume roots, create galleries, and compromise the root system. In blueberries, symptoms include shoot dieback in early spring, leaf wilting, and weakened plants. Many infested plants can be pulled from the soil by hand or during mechanized harvesting. Once these signs appear, recovery is usually not possible.



Photo: North Carolina State University

The infestation has already reached a significant scale in the producing region. Scientists report hundreds of dead plants with active larvae, thousands of suspected plants, and more than 202 hectares with confirmed presence of the parasite.

Prionus Over the past two years, the Duke, O'Neal, Star, and Legacy cultivars have been among those infested. Most of the affected plants are ten to fourteen years

old, but the study also cites five-year-old plants.

Researchers installed black-panel traps with sex pheromones on six commercial farms between April and September 2025. The areas were located in Pender, Sampson, Bladen, and New Hanover counties. The traps captured adult males.

Prionus imbricornis e *Prionus pocularis*

Among 5.150 adults surveyed, 89,6 percent belonged to *Prionus imbricornis*.

The team collected two larvae actively feeding on roots of *Vaccinium corymbosum*, on two farms belonging to Pender and Sampson. Then, he sequenced the CO1 gene of these larvae and compared the results with identified adults of *Prionus imbricornis* e *Prionus*

pocularis The larvae showed a 98 to 99 percent correspondence with adults of *Prionus imbricornis*.

Species involved

The result indicates *Prionus imbricornis* as a species involved in blueberry infestations. The article highlights, however, a possibility that remains open: *Prionus pocularis* It can also occur on plants, as adults of this species have appeared in the traps. Confirmation depends on further barcoding or the rearing of larvae to the adult stage.

The biological cycle makes management difficult. Adults do not feed. Females lay eggs in the soil, near the base of the

plants. The larvae burrow into underground tissues and can take three to five years to pupate. In North Carolina blueberries, the larvae can reach up to 62 millimeters in length and 15 millimeters in width.

chemical control

Research points to limitations in chemical control. There are no registered insecticides effective against beetles.

Prionus in blueberries in the United States.

The larvae remain protected in the soil, inside roots and stems, which reduces the reach of contact and systemic products.

The most susceptible stage tends to occur soon after hatching, a few weeks after

mating.

Insecticide trials

Lorena Lopez, an assistant extension professor in the Department of Entomology and Phytopathology at North Carolina State University, has begun insecticide trials. The goal involves identifying effective molecules and tailoring applications to the reproductive cycle of insects. *Prionus imbricornis* The goal is to limit the initial development of the larvae and reduce root damage.

The work also addresses the use of pheromones. Previous studies with other species of *Prionus* Studies have indicated potential for mating disruption in hops,

cherry, and pecan. However, the effectiveness of this tactic for *Prionus imbricornis* The use of pheromones in blueberries has not yet been evaluated. The pheromone traps used in North Carolina were employed to monitor adult emergence and estimate populations.

Scientists warn of a limitation in monitoring. The number of males captured in pheromone traps does not, by itself, indicate the level of infestation in the plants. Adults can come from areas hundreds of meters away, including from neighboring woody hosts. The presence of larvae actively feeding on the roots remains the main evidence of infestation in the crop.

Further information can be found at doi.org/10.1093/jipm/pmag018

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Predators increase whitefly control in tomato plants

A greenhouse study indicated greater suppression of *Bemisia tabaci* with the combined use of *Nesidiocoris tenuis* and *Orius laevigatus*

03.06.2026 | 07:01 (UTC -3)

Cultivar Magazine



Photo: Merle Shepard - Gerald R Carner - PAC Ooi

The joint release of *Nesidiocoris tenuis* and *Orius laevigatus* reduced egg density by 79,50% and nymph density by 78,02% Bemisia tabaci in tomato plants grown in a greenhouse. The result surpassed the performance of predators used in isolation and increased crop productivity components, without compromising the evaluated fruit quality parameters. None of the species exist in Brazil.

The research evaluated the biological management of whitefly in tomato plants under controlled conditions in Saudi Arabia. The experiment took place at the National Organic Agriculture Center in Unaizah, Al-Qassim, between December 2024 and June 2025. The scientists worked with the Newton tomato cultivar in

a 360-square-meter greenhouse. The temperature remained at 24 degrees Celsius, with a variation of one degree Celsius. The relative humidity was between 60% and 70%.

Six treatments

The researchers compared six treatments. The list included isolated release of *Nesidiocoris tenuis* isolated release of *Orius laevigatus*, joint release of the two predators, control without treatment, organic insecticide based on azadirachtin and chemical insecticide dinotefuran 20% SG. The plots received adults of *Bemisia tabaci* In early February 2025, at a dose of 20 adults per plot. The predator releases occurred on March 18 and April 20, 2025.

In isolated treatment, *Nesidiocoris tenuis* It had the greatest effect on eggs. The average reduction reached 67,44%. *Orius laevigatus* The reduction in egg production was 57,71%. When the two predators acted together, the reduction increased to 79,50%. The difference between treatments was statistically significant.

For nymphs, *Orius laevigatus* It showed slightly better performance when used in isolation. The average reduction reached 63,30%. *Nesidiocoris tenuis* The combined release reduced nymph populations by 60,73%. The combined release reached 78,02%. Scientists interpreted the result as a possible additive or synergistic effect between the predators.

chemical treatment

The chemical treatment showed the greatest reductions among all treatments. It reduced eggs by 88,81% and nymphs by 85,74%. The combination of predators outperformed the isolated biological treatments and the organic insecticide. The organic insecticide reduced eggs by 50,47% and nymphs by 52,88%.

The pest population grew throughout the evaluation period in the untreated plots. Egg density ranged from 3,44 to 32,24 eggs per leaf. The highest egg density occurred in the eleventh weekly evaluation. Nymph density ranged from 4,48 to 124 individuals per leaf. The peak nymph population occurred in the fifteenth

evaluation.

Fruit quality

In terms of fruit quality, the combined treatment stood out for its vitamin C content, reaching 124,66 milligrams per 100 grams. This value surpassed the other treatments and showed a statistically significant difference. The same treatment recorded 2,42% nitrogen and 13,97% protein. The differences in phosphorus, potassium, total phenols, and total soluble solids did not show statistical significance.

Scientists stated that the predators act in a complementary way on different stages of the pest. *Nesidiocoris tenuis* It had a greater effect on eggs. *Orius laevigatus*

had a greater relative effect on nymphs. This complementarity favored greater suppression of *Bemisia tabaci* and improved tomato plant productivity in greenhouses.

Further information at
doi.org/10.3390/insects17060582

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Apple harvest registers higher incidence of "honey drop" disease

A phenomenon observed in the 2025/2026 harvest indicates sweeter, more aromatic, and juicier fruits, explains the Association

02.06.2026 | 16:46 (UTC -3)

ABPM, Cultivar Magazine edition



The 2025/2026 Brazilian Fuji apple harvest has drawn the attention of the sector due to a characteristic considered rare in

national orchards: the higher incidence of the so-called "honey drop." Associated with the high natural concentration of sugars in the fruit, this phenomenon results in apples with a more intense flavor, pronounced aroma, and juicier texture.

Visually, the "honey drop" manifests as translucent areas in the pulp, close to the core of the fruit. Despite the name, there is no honey present. The phenomenon occurs naturally, mainly in Fuji apples, when specific climatic conditions favor the accumulation of sugars during the final stage of ripening.

According to the executive director of the Brazilian Association of Apple Producers (ABPM), Moisés Lopes de Albuquerque,

the conditions recorded in this harvest favored the development of this characteristic.

“We had a longer cycle, with a later harvest and lower temperatures during fruit ripening. This scenario favored the natural accumulation of sugars in the pulp, contributing to a more pronounced presence of honey droplets in this harvest,” he explains.

According to Albuquerque, the result is fruit with higher sensory quality, combining high sweetness and balance with the natural acidity characteristic of the Fuji apple.

This feature is associated with premium products.

The presence of honeydew is especially valued in Asian markets, particularly in Japan—the country of origin of the Fuji variety. In these markets, apples with this characteristic are often associated with premium products and achieve higher commercial value due to their more intense flavor.

In addition to quality, the harvest is also expected to show a recovery in volume produced. According to estimates from ABPM, Brazilian apple production should be between 1,1 million and 1,2 million tons in the 2025/2026 cycle, above the

approximately 850 tons harvested in the previous season. Santa Catarina and Rio Grande do Sul continue to concentrate the majority of national production.

“We are facing a very positive harvest. The weather has favored both the productivity and the quality of the fruit, allowing consumers to find apples with distinct sensory characteristics this season,” concludes the executive director of ABPM.

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Erika Mello assumes the directorship of Agricultural Defense in São Paulo

In 27 years, the Directorate of Agricultural Defense has its first female manager

02.06.2026 | 16:12 (UTC -3)

Felipe Nunes



The appointment of the new director of the Agricultural Defense of São Paulo, an agency of the Secretariat of Agriculture

and Supply (SAA), was published in the Official Gazette of the State (DOE) on Tuesday, June 2, 2026. For the first time in the institution's 27-year history, a woman, veterinarian Erika Ramos Mello (pictured), will assume the position.

Originally from Rio de Janeiro, Erika holds a Master's degree in Veterinary Medicine from the Federal Rural University of Rio de Janeiro (UFRRJ) and a Bachelor's degree in Public Administration from the Federal Fluminense University. She has worked in Agricultural Defense since 2008, when she joined the Agricultural Defense Inspectorate of Bananal, part of the then Agricultural Defense Office of Guarantiguetá.

In the regional office where she began her career in Agricultural Defense, she was

Head of her unit and Deputy Director of the regional office. Subsequently, she was assigned to work at the organization's headquarters, where she served as Technical Assistant to two Coordinators (at the time, the highest position in the institution) and was appointed as a substitute for two other Coordinators. She also held the position of directing all animal health services in the State.

His work has always involved various actions within animal welfare programs, in addition to coordinating and implementing projects in this area, including removing the mandatory branding of bovine and buffalo calves vaccinated against Brucellosis and, recently, establishing standards and strategies for the implementation of the Intelligence and

Transit Coordination (Coint), a newly created department within the institution, which brought, for the first time, the concept of "data intelligence" into the institution.

The new director was part of the State Technical Management Group for actions related to the National Foot-and-Mouth Disease Program and is also a member of the State Zoosanitary Emergencies Group (GEEZ).

Furthermore, on an international level, Erika has represented the Agricultural Defense of the State of São Paulo during the general sessions of the World Assembly of Delegates of the World Organisation for Animal Health (WHO) in 2018, 2025, and 2026. In 2018, she also participated in the 45th Ordinary Meeting

of the South American Commission for the Fight against Foot-and-Mouth Disease (COSALFA) in Bolivia.

Erika Ramos Mello will lead the twelfth administration of the Agricultural Defense, an agency created on September 2, 1998, whose mission is to guarantee the health and quality of the production chains of São Paulo's agribusiness to increase its competitiveness in national and international markets and contribute to the protection of the environment, public health, and economic and social development.



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Case IH presents the LB436 HD baler at AgroActiva

High-density machine produces bales weighing up to 500 kilograms and exceeds 40 tons per hour

02.06.2026 | 14:00 (UTC -3)

Cultivar Magazine, based on information from María Micaela Albónico



Case IH is showcasing the LB436 HD baler at AgroActiva in Argentina. The equipment caters to large producers and service providers in the forage sector. The machine increases operational capacity, automates adjustments, and improves bale compaction.

The LB436 HD produces bales weighing up to 500 kilograms. Its capacity exceeds 40 tons per hour. The baler uses a reinforced piston and a redesigned compaction chamber. This combination facilitates the transport and storage of the baled material.

The machine features TwinePro double knot technology. According to Case IH, the patented system generates knots up to 30% stronger. This solution improves bale

stability under high-density conditions. The system also eliminates twine residue during tying. This contributes to cleaner forage and reduces environmental impact.

The baler also operates with ISOBUS III compatible automation. The system integrates the tractor and baler. Sensors and automatic controls adjust the forward speed and optimize the uniform filling of the bales. This technology reduces operator fatigue and improves overall efficiency.

Efficiency and productivity

“With the LB436 HD, we aim to take a leap in efficiency and productivity within the

forage segment, incorporating technologies that allow for greater capacity, better compaction quality, and more precise and uniform operation even under demanding conditions,” stated Rodrigo Lanciotti, Marketing Manager.

The LB436 HD features a double axle with hydraulic suspension, large tires, and a new short-shoot boom. These components improve stability, maneuverability, and ease of transport over long journeys.

The pick-up measures 2,35 meters and has five finger bars. The system aims for uniform feeding at high speeds. The machine also has automatic density control to produce homogeneous bales in different crops.

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Proteins anchor plant cells against water loss

Study in *Arabidopsis thaliana* links cellulose synthase and remorins to cellular recovery after water stress

02.06.2026 | 13:32 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Yue Rui

Researchers led by Stanford University have identified two protein systems with

opposing functions in the stability of plant cells under water deficit. The cellulose synthase complex, known as CSC, increases anchoring points between the cell wall and plasma membrane.

Remorins, or REMs, limit this process. The study indicates a new cellular pathway associated with resilience to water loss stress.

The research analyzed structures described more than a century ago by the botanist Karl Hecht. Under conditions of water loss, the plasma membrane retracts relative to the cell wall. Part of it remains attached by filaments and attachment points, called Hechtian structures. The team showed that these anchorages keep the membrane connected to the wall

during cell dehydration. Cells with more attachment points recovered better after water returned.

Experimental model

The work used roots of Arabidopsis thaliana as an experimental model.

Researcher Yue Rui compared wild-type plants with genetically modified lines. The group applied live-cell imaging, protein mapping, genetics, confocal microscopy, and cryogenic electron tomography. The objective involved observing the interface between the cell wall and plasma membrane during hyperosmotic shock.

Scientists describe the cell's outer surface as the first line of perception and response

to environmental stimuli. In plants, this interface includes the plasma membrane beneath the cell wall. The two structures remain associated by anchoring points. These points become evident during hyperosmotic shock, when severe water loss causes membrane retraction.

Cellulose complex

The cellulose synthase complex played a central role. According to the article, the density of CSCs in the plasma membrane correlated with resistance to hyperosmotic stress. Higher CSC density favored the maintenance of cell wall-membrane bonds. Cellulose deficiency produced the opposite effect, with greater plasmolysis and less recovery of root growth.

In assays with 0,28 molar sorbitol, wild-type roots showed a 52 to 57 percent reduction in growth. Cellulose-deficient mutants, such as *cesa3je5*, *cesa6prc1-1*, and *cob-1*, had a reduction equal to or greater than 75 percent. Expression of GFP-CELLULOSE SYNTHASE 3 in the *cesa3je5* mutant restored root growth to wild-type levels.

Distinct effect

The results also pointed to a distinct effect of rhamnose, a component of the rhamnogalacturonan-I chain. *rhm1-1*, *rhm1-2*, and *rhm1-3* mutants, deficient in rhamnose, experienced less growth reduction under hyperosmotic stress compared to the wild type. The

researchers observed an increase in proteins associated with the CSC machinery in the *rhml-1* mutant. Among these were CESA1, CESA5, CESA6, CSI1, CSI3, PATROL1, and CMU1.

Remorins acted as negative regulators of anchorages. Under sorbitol treatment, REM1.2 formed nanodomains in about five minutes. These nanodomains appeared in the roots of five-day-old seedlings. Their density increased with the concentration of sorbitol. The study indicates that REMs restrict the abundance of CSCs, with the participation of SHOU4 and SHOU4L proteins.

Scientists propose a model in which CSCs function as stitching points between the membrane and the cell wall. By producing

cellulose, the complex also attaches the membrane to the cell wall. REMs act as a brake on this system, limiting the amount of CSCs at the anchoring sites. When REMs are lacking, the number of CSCs increases in the membrane. The anchoring becomes firmer during stress.

The agronomic importance stems from the relationship between cellular water loss and common field stresses. The source cites drought, salinity, heat, and freezing as conditions associated with cellular water loss. Identifying these proteins opens possibilities for studying crop engineering to produce more stress-tolerant crops. The next step mentioned by Yue Rui involves observing the same mechanism in species with greater drought tolerance and verifying whether they

exhibit more stable or denser anchoring points.

Further information at
doi.org/10.1016/j.cell.2026.05.009

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Bean plant receptor links caterpillar attack to predatory wasps

Study shows how INR activates volatile compounds in common beans and promotes the removal of caterpillars in the field

02.06.2026 | 10:49 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Brian Behnken / University of Washington

The common bean uses an immune receptor to recognize chemical signals left by caterpillars during feeding and trigger the release of volatiles capable of attracting predatory wasps. The mechanism involves the INR receptor, present in the leaves of the bean *Phaseolus*, and the peptide inceptin, found in the oral secretions of caterpillars. Laboratory and field trials in Mexico have shown a link between molecular recognition of herbivory, plant defense, and the recruitment of natural enemies.

The study evaluated tritrophic interactions between plants, herbivorous insects, and predators. Scientists demonstrated that INR recognizes inceptin and activates specific responses in the common bean.

These responses amplify the reaction to injury and induce an immune pathway associated with herbivory. The result includes the release of a characteristic mixture of volatile compounds. This mixture guided predatory wasps to the attacked plants.

Comparison of lineages

The team compared bean lines with a functional receptor and lines with a natural mutation in the INR gene. The mutation was named *inr-1*. It involves a deletion of 103 base pairs in the *PvINR* locus. This alteration generates a truncated protein and impairs the perception of inceptin.

In initial tests, the PI 311785 cell line responded to inceptin application with ethylene accumulation and volatile emission. The W6 13807 cell line did not show the same response. The analysis also indicated activation of MAPK3 and MAPK6 in PI 311785 after fifteen minutes of inceptin treatment. This phosphorylation did not occur in W6 13807. The result indicated a failure in the inceptin-specific signaling cascade.

Near-isogenic strains allowed the isolation of the mutation effect. *inr-1/inr-1* plants did not produce inceptin-induced ethylene. Even so, they maintained a response to the bacterial peptide flg22. This data indicates that insensitivity to inceptin did not result from a general failure in the

plant's immune system.

Direct defense

The mutation also reduced direct defense against herbivory. Larvae of Spodoptera exigua grew 72,7 percent more in INR-1/INR-1 plants than in INR/INR sister plants during five days of feeding. This result indicates the participation of the functional receptor in the resistance of the common bean to caterpillars.

The molecular response included transcriptional reprogramming. In *Phaseolus* cv. *Red hawk*, the treatment with wounding and inceptin induced 527 genes compared to wounding with water. Some of these genes were related to

protein phosphorylation and transcription regulation. Transcription factors from the ERF, WRKY, bHLH, MYB, and bZIP families, linked to defenses against herbivores, also appeared.

Emission of volatiles

The emission of volatiles depended on the receptor. INR/INR cell lines treated with inceptin or oral secretions of Spodoptera frugiperda emitted a typical mixture of volatile compounds induced by herbivory. Among the compounds, the study highlighted DMNT, methyl salicylate, and TMTT. Inr-1/inr-1 plants did not emit this typical mixture. They released compounds associated with isolated injury.

The field tests took place in a 925-square-meter agricultural area near Bajos de Chila, in Oaxaca, Mexico, during the experimental growing seasons of 2023 and 2024. The scientists used sentinel caterpillars of *Spodoptera frugiperda* attached to bean leaves. The plants were wounded with water, oral secretions from caterpillars, or inceptin at physiological concentration.

Wasp visits occurred in both years.

Visitation rates to the treatments ranged from 55,1 percent to 86,9 percent. In 2023, plants with the *inr-1/inr-1* mutation treated with oral secretions showed a 40 percent reduction in wasp attacks of the genera *Polybia* and *Mischocyttarus* to sentinel caterpillars. In 2024, the application of inceptin also resulted in a 40 percent

reduction in attacks on *inr-1/inr-1* plants. In the water treatment, there was no difference in visitation.

The results indicate that the INR receptor connects caterpillar detection to predator recruitment in common beans. The study also points to agronomic relevance for systems with legumes, such as milpa and push-pull intercropping. According to the scientists, the evolutionary distribution of INR in phaseoloid legumes may help explain the indirect defense mediated by volatiles in these systems.

Further information can be found at doi.org/10.1126/sciadv.aec3229

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AGCO makes progress in fuel efficiency for tractors

Independent DLG PowerMix tests indicate gains in Fendt, Massey Ferguson, and Valtra models

02.06.2026 | 10:07 (UTC -3)

Cultivar Magazine, based on information from Bob Blakely



AGCO has announced advancements in fuel-efficient technologies for tractors under the Fendt, Massey Ferguson, and Valtra brands. The results come from independent DLG PowerMix tests conducted by Deutsche Landwirtschafts-

Gesellschaft. The company attributes the gains to the use of AGCO Power engines and the integration between the engine, transmission, and powertrain.

According to the company, the goal is to reduce farmers' operating costs without compromising performance, reliability, and availability during field operations. Kari Aaltonen, engineering director at AGCO Power, stated that the division develops integrated engines and powertrains to generate measurable gains in real-world working conditions.

At Fendt, the AGCO Power CORE engine family integrates recent tractor platforms. The CORE50 engine powers the Fendt 600 Vario series. The CORE75 powers the Fendt 700 Vario Gen7 series. Independent

testing of the Fendt 700 Vario series, with continuously variable transmission, has indicated fuel efficiency in field and transport applications.

Massey Ferguson also uses AGCO Power engines in its current product line. In a recent DLG PowerMix test, the Massey Ferguson 8S.265 Xtra Dyna E-Power came in first overall for field work in its category. AGCO attributes the result to the integration of the engine with the transmission and the tractor's design.

At Valtra, AGCO Power engines are the power source for the tractor line. The EcoPower philosophy prioritizes high torque at lower engine speeds. This concept aims to reduce fuel consumption in field and transport operations. The brand also uses a selective catalytic

reduction system, known by the acronym SCR, to promote efficient combustion and improve fuel consumption compared to previous engine generations.

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Gene Kr-h1 regulates fecundity in predatory ladybugs

RNAi silencing reduced egg laying in *Coccinella septempunctata* and delayed ovarian development

02.06.2026 | 09:17 (UTC -3)

Schubert Peter, Cultivar Magazine



Image: Wikipedia - CC BY-SA 3.0

The Kr-h1 gene, linked to juvenile hormone signaling, interferes with ovarian development and egg production in females of *Coccinella septempunctata*. The result comes from a study by Chinese scientists. The research used RNA interference to reduce gene expression and evaluate its reproductive effects on the predator, used in the biological control of aphids and other arthropod pests.

The team observed a 28,74 percent drop in average egg production after Kr-h1 silencing. Females injected with Kr-h1-dsRNA produced 119 eggs per female in twenty days. In the control group without injection, the average reached 167 eggs per female. In the group treated with GFP-dsRNA, used as a control for the

technique, the average reached 168 eggs per female.

Central role

The study indicates a central role for Kr-h1 in the fertility of *Coccinella septempunctata*

The gene encodes the Krüppel homolog 1 transcription factor. The protein acts in the juvenile hormone pathway, known for regulating growth, metamorphosis, and reproduction in insects.

The researchers also tested the gene's response to juvenile hormone in an artificial diet. Females fed a diet containing juvenile hormone showed higher Kr-h1 expression at five and ten days, compared to females maintained on a diet without the

hormone. At five days, expression was 3,02 times higher. At ten days, it was 1,76 times higher.

The experiment reinforces the relationship between juvenile hormone and Kr-h1 transcription in *Coccinella septempunctata*. According to scientists, this response helps explain previous effects of hormone supplementation on the species' reproduction. In a study cited in the article, an artificial diet with juvenile hormone increased egg production fourfold compared to a diet without supplementation.

Gene function

To evaluate gene function, researchers injected newly emerged females with one microliter of Kr-h1-dsRNA at a concentration of 4500 nanograms per microliter. The injection was administered into the intersegmental membrane between the third and fourth abdominal segments. The control group received GFP-dsRNA. Each treatment involved 50 females, with three replicates.

The interference reduced Kr-h1 expression compared to the GFP-dsRNA control. The decrease reached 30,97 percent five days after injection and 38,32 percent ten days after injection. The reduction in expression was accompanied by delayed ovarian development.

Images and measurements

Images and measurements of the ovaries showed less reproductive advancement in the group treated with Kr-h1-dsRNA. At five days, the ovaries had fewer mature eggs. The ovarioles also exhibited a shrunken appearance. Measurements of ovarian length, length and width of the left and right ovarian chambers decreased compared to the GFP-dsRNA group.

At ten days, researchers recorded an increase in some dimensions of the ovaries in the Kr-h1-dsRNA group compared to the GFP-dsRNA control. Even so, the treated females presented more empty ovarioles. This pattern

suggests impairment in the reproductive process, despite the partial recovery of gene expression over time.

Scientists point to a possible gradual reduction in the efficiency of RNA interference. The injected Kr-h1-dsRNA may undergo degradation by cellular nucleases. As a result, Kr-h1 expression may recover some activity after a few days.

Coccinella septempunctata It occupies an important position in biological control programs. The predatory species attacks aphids, whiteflies, leafhoppers, and mites. Therefore, understanding its reproductive regulation can support improvements in artificial diets and mass rearing systems.

The study also provides a basis for research on hormonal pathways in insects. The juvenile hormone-Met-Kr-h1 pathway participates in vitellogenesis, ovarian development, and fecundity in different species. In *Coccinella septempunctata* The data indicate a direct involvement of Kr-h1 in egg production and ovarian development.

Further information at
doi.org/10.3390/insects17060577

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Bt-based bioinsecticide preserves lacewing predation on *Spodoptera frugiperda*

Study indicates compatibility between *Ceraeochrysa cincta* and *Bacillus thuringiensis*

02.06.2026 | 07:58 (UTC -3)

Schubert Peter, Cultivar Magazine

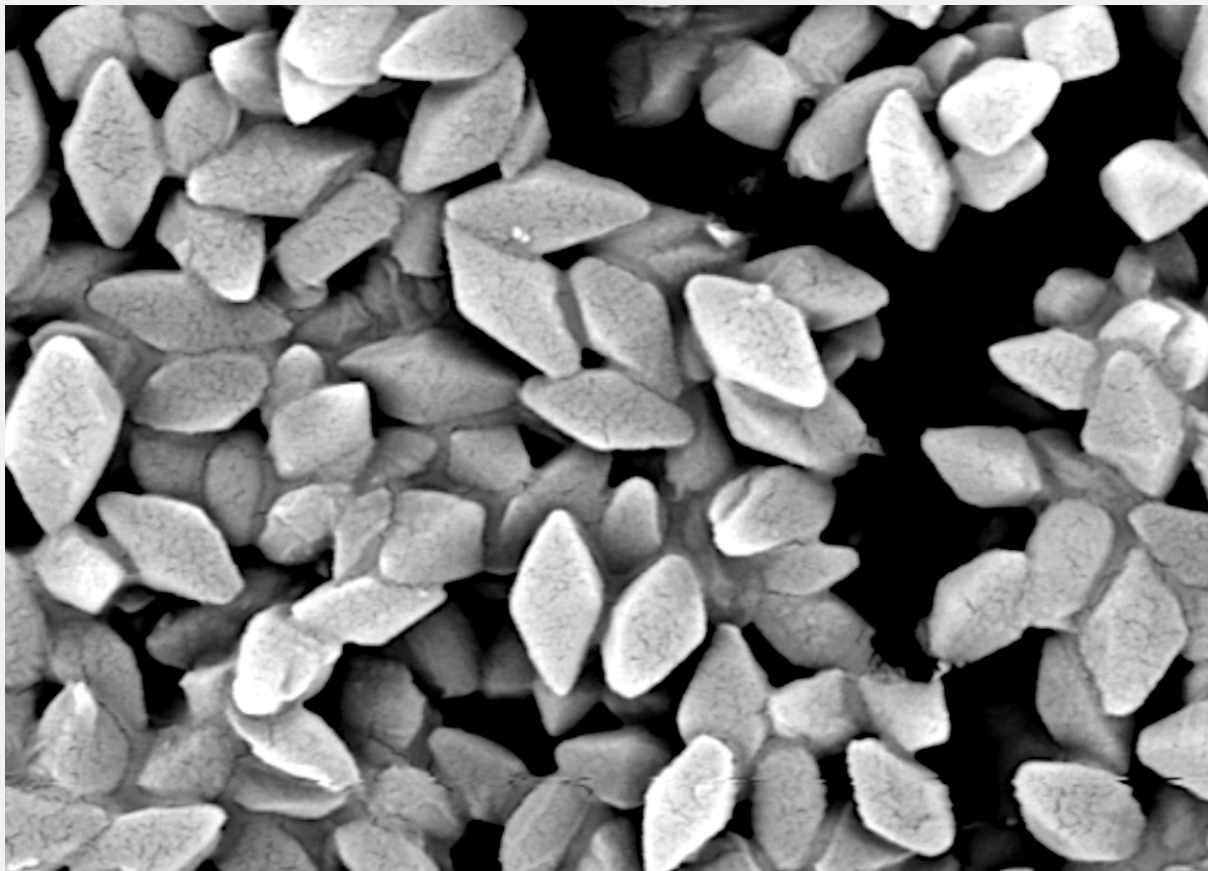


Photo: Jim Buckman

A bioinsecticide based on Bacillus thuringiensis altered the functional response pattern of second and third instar larvae of Ceraeochrysa cincta, but did not compromise the overall predatory capacity of the lacewing on newborns of Spodoptera frugiperda. The results support the combined use of the predator and the microbial product in integrated management programs for the fall armyworm.

The research evaluated first, second, and third instar larvae of *Ceraeochrysa cincta* fed with newborns of *Spodoptera frugiperda*. Part of the prey received an artificial diet treated with a bioinsecticide formulated with *Bacillus thuringiensis* subsp. *tolworthi*. The study used functional response analyses to measure prey

consumption at different densities.

The scientists conducted the bioassays at the Insect Biology and Rearing Laboratory of FCAV/Unesp, in Jaboticabal, São Paulo. The insects were kept at a temperature of twenty-five degrees Celsius, with a variation of two degrees Celsius, relative humidity of seventy percent, with a variation of ten percent, and a photoperiod of twelve hours.

Artificial diet

Newborns of *Spodoptera frugiperda* The plants used in the Bt treatment received an artificial diet treated for twenty-four hours. The product followed the manufacturer's recommended field dose of one thousand

milliliters per hectare. The calculation considered a spray volume of two hundred liters per hectare, equivalent to five milliliters per liter.

In the experiment, the researchers offered two to sixty-four larvae of *Spodoptera frugiperda* for first instar larvae of *Ceraeochrysa cincta*. For second and third instars, densities ranged from two to one hundred and twenty-eight larvae. Each density had ten replicates. Each replicate received one predatory larva. Before the bioassays, the predators were deprived of food for twenty-four hours.

Experiment results

First instar larvae showed a type III functional response in both the control and Bt treatments. This pattern indicates a sigmoidal curve, with lower consumption at low densities and increased consumption at higher densities. According to the study, this behavior may reflect limitations in prey detection or handling in early instars.

Second and third instar larvae showed a type I functional response in the control group. Under these conditions, consumption increased linearly with prey density. When the prey received Bt, both instars transitioned to a type III functional response. This change indicates an alteration in the predator-prey interaction pattern after the caterpillar's exposure to the bioinsecticide.

Attack rate

The attack rate reached its highest values ??in the first and third instars in the control treatment. Exposure of prey to Bt reduced the attack rate in these two instars. In the second instar, there was no significant difference between the control and Bt treatments. Handling time did not differ between instars or between treatments.

Prey consumption increased with density for all instars and treatments. First instar larvae consumed less prey after exposure to Bt. Second and third instar larvae maintained similar consumption levels in both treatments, especially at medium and high densities.

Effect of the bioinsecticide

The results indicate a greater effect of the bioinsecticide on early instars of *Ceraeochrysa cincta*. The most advanced instars preserved predatory performance on *Spodoptera frugiperda*...even after indirect exposure to the product. For the researchers, the developmental stage of the predator and the condition of the prey need to be factored into the evaluation of integrated pest management programs using microbial insecticides and natural enemies.

The study points to possible alterations in the quality, mobility, or chemical signaling of prey after ingestion of *Bacillus*

thuringiensis These factors can modify the encounter and capture by the predatory larva. The study did not directly measure these mechanisms. Scientists recommend further evaluations with behavioral observations and wider ranges of prey density.

The work was conducted by Sarah C. da Silva, Danrley da R. Pacheco, Isabela C. de O. Pimenta, Dagmara G. Ramalho, and Sergio A. De Bortoli.

Further information can be found at doi.org/10.37486/2675-1305.ec08014

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Bugs management requires a landscape-scale approach

Study suggests integration between soy and corn to reduce outbreaks of pentatomid flies in the Neotropics

01.06.2026 | 15:00 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Paulo Roberto Valle da Silva Pereira

The management of stink bugs in soybean-corn crop rotation systems needs to move from the field scale to the landscape scale. This recommendation appears in a study authored by Weidson Plauter Sutil, Antônio Ricardo Panizzi, and Adeney de Freitas Bueno. The study states that the rotation between soybeans in the summer and corn in the second crop provides a continuous food source for stink bugs. This process forms "green bridges" and favors outbreaks of Pentatomidae in Neotropical agroecosystems.

Researchers advocate monitoring and management throughout the entire production system. Infestation in a crop is influenced by neighboring areas, successive crops, crop residues, weeds,

and volunteer soybeans. Therefore, the stink bug should be treated as a pest of the system, not just as a pest of a single crop.

Control in soybeans

In soybeans, control should only occur during the reproductive stage, from R3 to R6, when the population reaches or exceeds the action threshold. In Brazil, the reference cited in the study corresponds to two stink bugs larger than 0,5 centimeters per meter of row in grain crops. For seed fields, the limit drops to one stink bug per meter.

The application of insecticides based on action level reduced the use of these

products by an average of 46,6 percent, compared to producers without this criterion. In data from ten harvests in Paraná, the adoption of integrated pest management reduced spraying against stink bugs between 26,3 percent and 66,2 percent, depending on the harvest analyzed.

Diceraeus' advance

The study highlights the progress of *Diceraeus furcatus* and *Diceraeus melacanthus* in soybean-corn systems. The participation of [Diceraeus spp.](#) population increased from 3,7 percent in the 2014/2015 crop season to 26,3 percent in the 2024/2025 crop season, according to samples taken from soybean fields in

Paraná. The increase exceeded 700 percent in ten years.

The brown stink bug, [Euschistus heros](#), while still considered a major species in soybean cultivation, the green stink bug has gained relevance in crop rotation systems. No-till farming, crop residue, and intensive land use provide shelter in the soil. This behavior reduces the insects' contact with insecticides and makes control more difficult.

Late applications

Researchers state that late applications of insecticides to soybeans, at stages R7 and R8, do not protect corn planted after harvest. In these situations, the

recommendation involves more tolerant corn hybrids, rapid initial growth, and seed treatment with recommended insecticides.

Soybean harvesting is also part of crop management. Grains lost in the soil, volunteer plants, and weeds serve as food until corn emerges. The review cites average losses of 4 to 6 percent of grains during harvesting in the Neotropics. In Brazil, this volume can represent from 885 to more than one million volunteer soybean plants per hectare, according to the estimate presented by the researchers.

Control in corn

In corn, seedlings are at greatest risk between emergence and the V5 stage.

Chemical spraying may still be used in management during outbreaks of *Diceraeus* spp. reach or exceed three bed bugs per meter during the initial stages, up to V5 to V7.

The review also highlights the use of tolerant plants, biological control, and innovative tools. Soybean cultivars with Block technology show less damage from stink bugs. In corn, hybrids with early vigor, rapid growth, a more rigid stalk, and greater recovery capacity reduce losses.

Among the biological agents, the egg parasitoid [telenomus podisi](#) appears as an alternative to *Euschistus heros* and *Diceraeus melacanthus*. The study cites releases of approximately 6 parasitoids per hectare, carried out two to three times,

with a 14-day interval. Entomopathogenic fungi, such as [beauveria bassiana](#), [Metarhikum anisopliae](#) and *Cordyceps fumosorosea*, are also part of the set of options.

Scientists say that no single tool solves the problem. The most consistent management combines action level planning, monitoring, crop loss reduction, weed control, use of tolerant cultivars, seed treatment, biological control, and selective insecticides when necessary.

Further information can be found at doi.org/10.3390/agronomy16111087

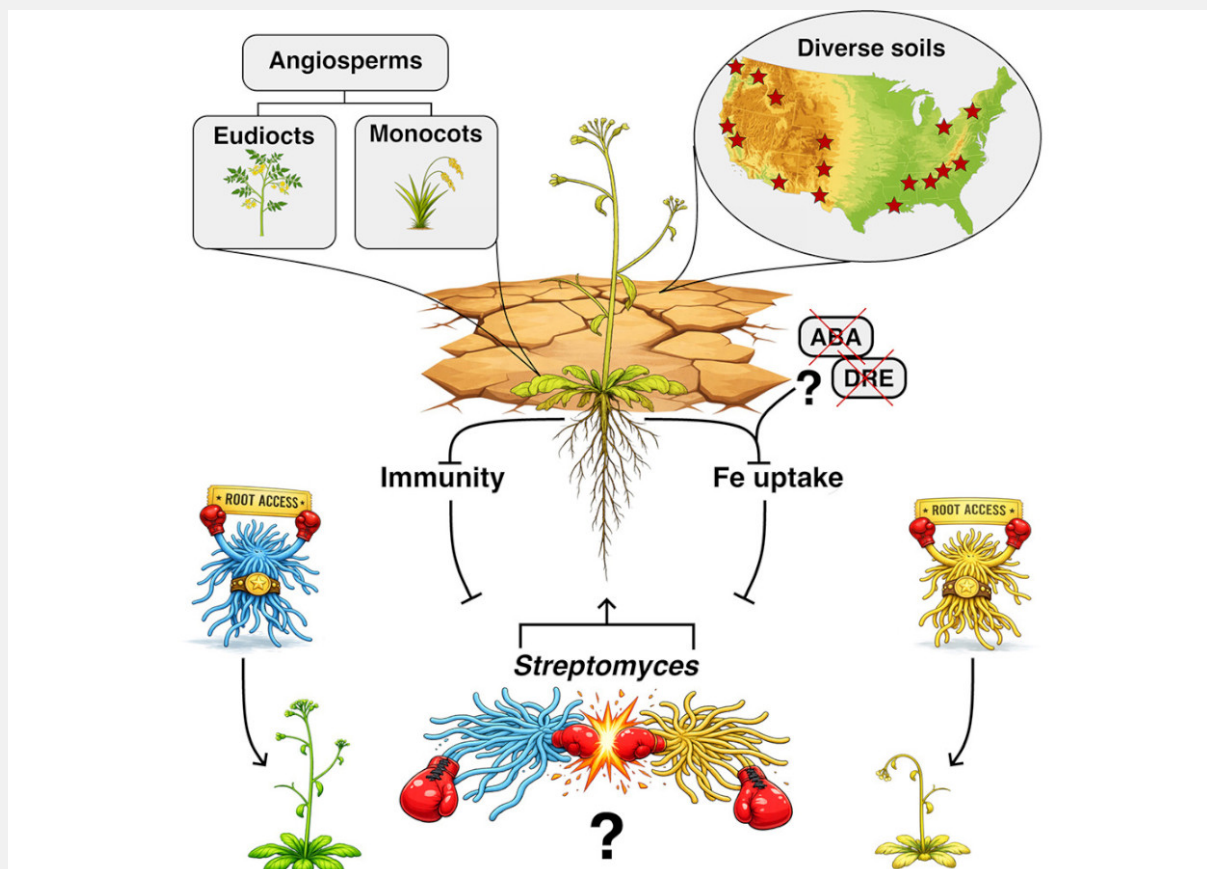
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Drought alters root microbiota due to iron and immunity issues

Study indicates that enriching *Streptomyces* plants does not guarantee any benefit to the plant

01.06.2026 | 14:36 (UTC -3)

Schubert Peter, Cultivar Magazine



doi.org/10.1016/j.cell.2026.04.027

Drought favors the accumulation of *Streptomyces* in plant roots, but this increase does not, in itself, mean a benefit to the host. Studies point to another mechanism. Water deficiency reduces responses related to plant immunity and iron absorption. This suppression creates space for the proliferation of these bacteria inside the roots.

Scientists tested [Arabidopsis thaliana](#) on soils from 18 locations across the United States. The soils exhibited physical, chemical, and climatic differences. After two weeks in stress-free conditions, the plants spent six weeks under drought or irrigation regimes. Drought reduced biomass by an average of 4,3 times, with variations ranging from two to 10,5 times

between soil types.

Drought and change

The team analyzed the microbiota of the soil, leaves, and different root fractions.

Drought did not promote a uniform change throughout the bacterial community. The effect appeared more consistently in regions associated with the roots. The phylum Actinomycetota increased in the rhizoplane and in the root endophytic compartment. Within this group, *Streptomyces* showed the strongest and most frequent enrichment.

The result reinforces previous observations about an increase in *Streptomyces* in roots under drought. But

the study questions the simple interpretation of the plant as a "cry for help." According to the data, the plant does not directly select these bacteria to alleviate stress. Drought reduces physiological and immune barriers. With less defense activity and lower iron absorption, the roots become a more permissive niche.

The expression of genes linked to salicylic acid and iron homeostasis decreased during drought. Salicylic acid participates in defense responses. Genes linked to iron, on the other hand, are involved in the acquisition and transport of this nutrient. The suppression of these two sets of genes accompanied the increase in *Streptomyces* in the roots.

Route manipulation

The researchers also manipulated these pathways. Foliar application of benzothiadiazole, an analog of salicylic acid, reduced the abundance of *Streptomyces* in the roots of irrigated and drought-treated plants. Increasing the soil pH through the addition of lime increased the enrichment of *Streptomyces* in the roots. The same occurred with the application of ferrozine, an iron chelator. These results indicate a link between iron availability, plant response, and bacterial colonization.

The suppression of iron absorption during drought did not appear only in *Arabidopsis thaliana*. Scientists observed a similar effect

in *Solanum lycopersicum* and *Oryza sativa* in addition to a reduction in iron content in the aerial parts of *Triticum aestivum*, *zea mays*, *Brassica* and *Pisum sativum* cultivated in soil under drought conditions. The study points to the conservation of this mechanism over approximately 160 million years of divergence between monocotyledons and eudicotyledons.

Plant performance

Some lineages of *Streptomyces* They improved plant performance under conditions similar to drought and low iron availability. The CHAS_16 lineage increased biomass under iron-limited conditions and maintained chlorophyll production under iron limitation. It also

maintained the iron content in the aerial part of *Arabidopsis thaliana* and restored chlorophyll production in *Solanum lycopersicum* in most of the iron concentrations tested.

This benefit depended on a live bacterium and a functional system of reductive iron import in the plant, involving IRT1 and FRO2. Activation of immunity reduced or eliminated the benefit. Therefore, the same condition of reduced plant defense associated with bacterial enrichment also influenced the ability of some strains to promote positive responses.

The central point of the study involves the dissociation between abundance and function. Lines enriched during drought did not necessarily show the capacity to

benefit the plant. Consortia and isolates of *Streptomyces* They exhibited wide variation in biomass and chlorophyll recovery. Enrichment status, soil origin, and sequence variant identity did not allow for prediction of the effect on the plant.

Competition in the genre

Competition within the genus itself helped explain these results. In assays with synthetic communities, the BOIS_53 strain eliminated the ability of other strains to recover chlorophyll. The effect occurred due to secreted substances with inhibitory action against others. *Streptomyces* Thus, interactions between lineages defined part

of the final composition of the community and its functional effects.

The researchers propose a two-step model. First, drought reduces plant pathways linked to immunity and iron, which favors the enrichment of *Streptomyces*. Then, competition between lineages of the same genus adjusts the composition of the community and determines effects on growth and nutrition.

The conclusion has implications for the agricultural use of microorganisms associated with drought tolerance. The presence or increase of *Streptomyces*. The presence of microbial cells in roots alone is not sufficient as an indicator of benefit. The selection of inoculants or microbial communities must consider the behavior of

specific strains, their competitive interactions, and the plant's physiological response.

Further information at
doi.org/10.1016/j.cell.2026.04.027

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Valtra presents A5 and A5 Hitech tractors at Agroactiva

New series replace A4 and A4 Hitech and bring advancements in performance, comfort, and precision agriculture

01.06.2026 | 14:18 (UTC -3)

Cultivar Magazine, based on information from Corina Tareni



Valtra officially presents the new generation of A5 and A5 Hitech tractors during Agroactiva 2026 in Argentina.

These series replace the A4 and A4 Hitech lines. The equipment has received improvements in performance, operational comfort, and technologies to increase productivity in the field.

The A5 Series caters to general tasks. The line combines fuel efficiency, ease of operation, and low operating costs. The tractors use engines optimized for torque at low RPMs. This configuration improves responsiveness in daily operations and reduces specific fuel consumption.

The cabin has been improved in terms of insulation, visibility, and control layout. The optimized turning radius enhances

maneuverability in open fields, confined spaces, and mixed activities. The design aims for a more agile and comfortable operation throughout the workday.

More demanding operations

The A5 Hitech Series caters to the most demanding operations. The line features engines with higher power delivery and torque reserve. This configuration sustains performance under high load conditions.

The A5 Hitech models also feature a high-capacity hydraulic system. Valtra reports improvements in flow and lifting capacity. This system allows for the operation of larger and more complex implements.

The transmission was designed for intensive use. The goal is greater durability and better power transfer to the ground. Weight distribution and traction have also been optimized. The change improves grip and reduces slippage losses.

Both series are prepared for precision agriculture solutions. The tractors are compatible with guidance and monitoring systems. These features aid operational efficiency and management of operations.

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Valtra produces its XNUMXth CVT transmission in Finland

The Suolahti plant received an investment of 38 million euros and supplies Valtra, Fendt, and Massey Ferguson tractors

01.06.2026 | 09:02 (UTC -3)

Cultivar Magazine, based on information from Bob Blakely



Valtra has produced its 1,000th continuously variable transmission, known as a CVT, at its factory in Suolahti, Finland. This milestone comes about a year after the start of series production at

the expanded facility. The project received an investment of €38 million.

The expansion of the transmission plant is part of Valtra and AGCO's strategy to manufacture powertrain components close to tractor production. AGCO CVT transmissions produced in Suolahti equip Valtra tractors. They also serve selected models from the AGCO Fendt and Massey Ferguson brands.

According to the company, the expanded unit has reached a stable and efficient production level. The investment is among the largest in Valtra's history. The company points to Suolahti as a manufacturing center for tractors with advanced technology.

Kullervo Mansikkala, manager of Valtra's transmission plant, stated in the AGCO press release that the milestone demonstrates the performance of the new expansion. According to him, quality, delivery reliability, and efficiency have reached the planned level.

The production of CVT transmissions in Suolahti reinforces Valtra's vertical integration. It also expands the company's production self-sufficiency in Finland. According to Mansikkala, the structure created allows for scaling up and developing transmission manufacturing in cooperation with AGCO's global manufacturing network.

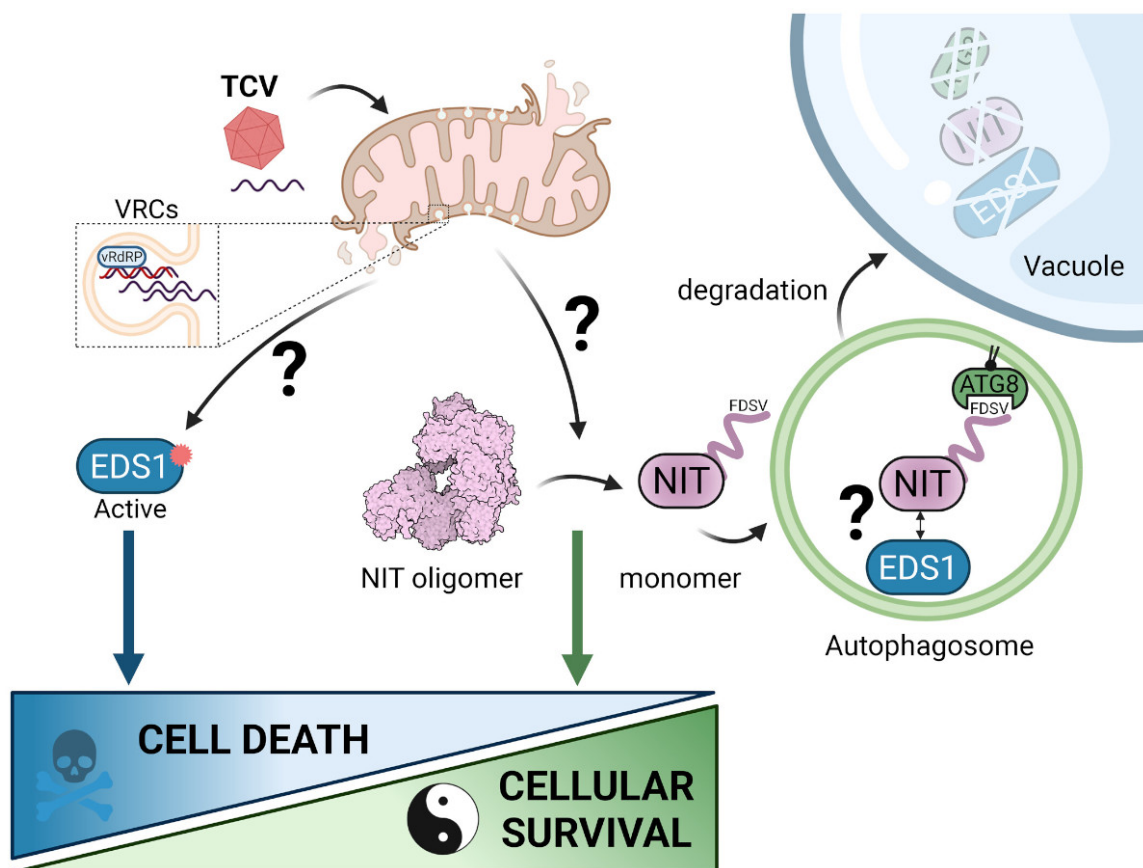
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Plants suppress their immune system to survive viruses

Research shows how selective autophagy limits cell death during viral infections

31.05.2026 | 14:38 (UTC -3)

Schubert Peter, Cultivar Magazine



doi.org/10.1126/science.adu9554

Plants infected with positive-sense single-stranded RNA viruses trigger selective autophagy to limit damage caused by their own immune response. This mechanism does not reduce the amount of virus; it favors cell survival during systemic infection. This conclusion comes from a study with [Arabidopsis thaliana](#).

Scientists evaluated three viruses. The turnip crinkle virus uses mitochondria. The turnip yellow mosaic virus uses chloroplasts. The turnip mosaic virus uses the endoplasmic reticulum. These viruses remodel organelles to form viral replication complexes. This process causes stress and interferes with cellular integrity.

Mutants with autophagy defects exhibited more severe symptoms and spontaneous

necrosis. Even so, there was no detectable increase in the viral genome, viral proteins, or virion assembly. The result indicates a tolerance function, not direct resistance to the virus.

During infection associated with mitochondria, the formation of replication complexes coincided with mitochondrial clustering and membrane damage.

Autophagy did not eliminate viral complexes or entire mitochondria. It removed mitochondrial matrix proteins released into the cytosol after membrane rupture.

The study identified two metabolic enzymes, nitrilase and inosine monophosphate dehydrogenase, as selective autophagy receptors. These

proteins interacted with ATG8 and associated with the immune regulator EDS1. During infection, EDS1 underwent degradation via autophagy. The loss of EDS1 reduced necrosis in autophagy-deficient plants.

According to scientists at the Max Planck Institute, the process functions as a safety check for plant immunity. Instead of destroying the virus, the plant reduces part of the immune response to avoid tissue death. The researchers are now seeking to verify if this pathway occurs in other plant species or in infections caused by other pathogens.

Further information can be found at doi.org/10.1126/science.adu9554

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Tiririca demonstrates action against fall armyworm

Isolated compound reduced feeding and affected detoxification enzymes of *Spodoptera frugiperda*

31.05.2026 | 13:49 (UTC -3)

Schubert Peter, Cultivar Magazine



Researchers have identified insecticidal and antifeedant activity of cadalene, a compound isolated from rhizomes of purple nutsedge (Cyperus rotundus), against fall armyworm larvae, Spodoptera frugiperda. The study evaluated plant extracts and the purified compound in tests of contact toxicity, feeding inhibition, larval development, and detoxification enzyme activity.

The dichloromethane fraction showed the highest insecticidal activity among the extracts tested. The median lethal dose reached 4,58 micrograms per larva after 24 hours. Cadalen alone showed a median lethal dose of 4,12 micrograms per larva in the same period. Cypermethrin, used as a positive control, showed a median lethal

dose of 0,01 micrograms per larva.

Leading molecule

The results indicate the potential of cadalene as a lead molecule for botanical insecticide research. However, the study was conducted under laboratory conditions. The researchers themselves point to the need for evaluations regarding field persistence, photostability, phytotoxicity in corn, and effects on pollinators and other beneficial organisms.

In the work, the dried rhizomes of *Cypress round* The samples underwent sequential extraction with hexane, dichloromethane, ethyl acetate, and ethanol. Methanol yielded the highest crude extract yield, at

4,37% by dry weight. Even with lower yields, the dichloromethane and hexane extracts concentrated the most relevant biological activities against... *Spodoptera frugiperda*.

Contact toxicity

In contact toxicity tests, researchers applied the extracts to second-instar larvae. All extracts showed activity. The dichloromethane extract reached a median lethal dose of 4,58 micrograms per larva in 24 hours and 4,04 micrograms per larva in 48 hours. The hexane extract showed 5,83 micrograms per larva in 24 hours. The ethanol extract registered 6,49 micrograms per larva. Ethyl acetate showed the lowest toxicity, with 13,95 micrograms per larva.

The team selected the dichloromethane extract for compound isolation.

Chromatographic separation yielded ten fractions. Fraction F2 underwent preparative thin-layer chromatography.

The process resulted in the isolation of cadalene, obtained as a colorless oil.

Identification was performed using hydrogen and carbon nuclear magnetic resonance spectroscopic analyses. The estimated purity exceeded 95%.

Cadalene maintained activity close to that of the original extract. In a contact bioassay, the compound showed a median lethal dose of 4,12 micrograms per larva at 24 hours and 3,76 micrograms per larva at 48 hours. In an artificial diet, the compound also reduced larval feeding.

The median feeding inhibition value was 11,07 milligrams per gram of diet after 24 hours.

Action in nutrition

The extracts also affected feeding on artificial diets. After 12 hours, the dichloromethane extract showed a median feeding inhibition of 12,07 milligrams per gram of diet. The ethanol extract registered 14,91 milligrams per gram. The hexane extract showed 15,65 milligrams per gram. After 24 hours, the ethyl acetate extract showed the lowest value, with 8,51 milligrams per gram.

In a test using corn leaf discs, the hexane extract showed a greater antifeeding effect

at the beginning of exposure. The median feeding inhibition value reached 17,13 micrograms per square centimeter after 2 hours. The dichloromethane extract registered 24,48 micrograms per square centimeter during the same period. After 4 and 6 hours, the dichloromethane extract maintained a more consistent effect, with 27,68 and 28,46 micrograms per square centimeter, respectively.

Insect development

The treatments also altered insect development. Larvae fed treated diets did not show immediate mortality in the feeding assay, but exhibited lower pupation and higher cumulative mortality until adult emergence. The

dichloromethane extract reduced pupation to 53,33% and increased cumulative mortality to 60%. Cadalene resulted in pupation of 50,33% and cumulative mortality of 53,33%. In the control, pupation was 90% and cumulative mortality was 10%.

Enzymatic analysis showed interference in detoxification pathways. At median lethal doses, the dichloromethane extract reduced carboxylesterase activity from 886,60 to 639,63 nanomoles of p-nitrophenol per minute per milligram of protein. Cadalene reduced this activity to 557,85 nanomoles of p-nitrophenol per minute per milligram of protein.

Glutathione S-transferase also showed a reduction with cadalene at a median lethal

dose. The activity dropped from 7,06 to 4,98 times 10^3 CDNB conjugate product per milligram of protein per minute. The dichloromethane extract reduced the value to 6,06 times 10^3 CDNB conjugate product per milligram of protein per minute.

Evidence of interference

Researchers interpret these results as evidence of interference in detoxification mechanisms. However, they caution that the data do not allow them to distinguish between direct biochemical inhibition and secondary effects resulting from toxic stress. The study only evaluated median lethal dose concentrations and median

food inhibition. Assays with higher concentrations and in vitro enzymatic tests are still needed to confirm the mechanism of action.

The study also highlights limitations for agricultural application. The evaluations were conducted in a laboratory. There was no phytotoxicity testing on corn plants. There was also no evaluation in semi-fields or in a greenhouse.

Further information can be found at doi.org/10.1016/j.napere.2026.100201

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SUA MÁQUINA DE TRABALHO



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