July 4, 2026

N º 86

Cultivar Semanal

Drought-defying phenotype

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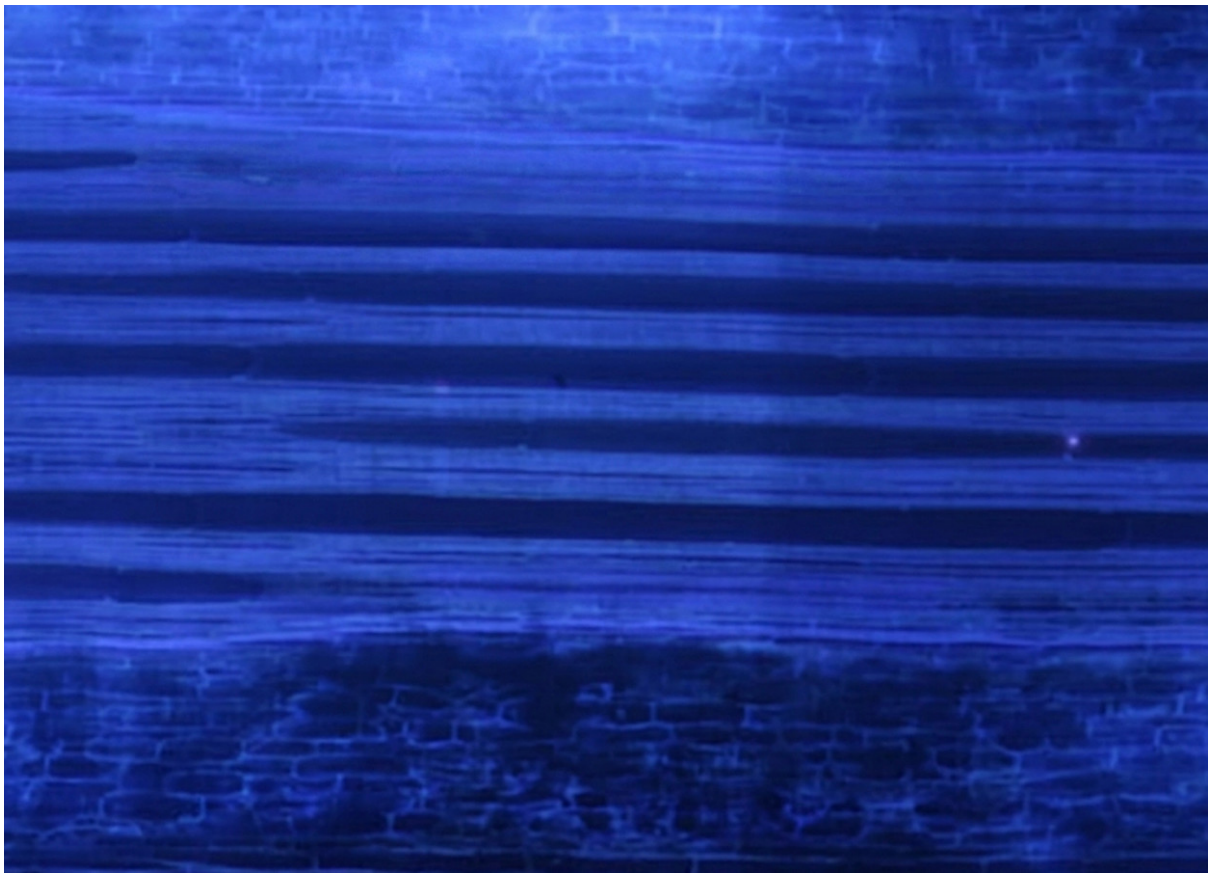
Junho/2026

Scientists discover phenotype that protects corn from drought

Study reveals that longer vessels in the xylem increase water transport and root depth

03.07.2026 | 10:35 (UTC -3)

Schubert Peter, Cultivar Magazine



DOI 10.1002/csc2.70287

Researchers have identified a set of characteristics in maize associated with greater drought adaptation. The study linked the length of metaxylem vessel elements to deeper roots, greater water transport, greater water uptake, and better yield under water deficit. The team called this set the "stretch phenotype" (DOI 10.1002/csc2.70287).

The research evaluated maize through computational modeling, controlled environment trials, and field studies under water deficit. The scientists observed genotypic variation in the length of metaxylem vessel elements, also called MVEL.

The metaxylem is part of the xylem, the vascular tissue responsible for transporting

water from the roots to the leaves. The study showed plants with longer vessel elements in the metaxylem. These plants also had smaller perforation plates. This combination reduced constrictions within the conducting vessels and increased axial hydraulic conductance, a measure related to the ease of water flow in the tissue.

Climate change

According to Jonathan Lynch, a professor of plant nutrition at Penn State and senior researcher on the study, drought limits agricultural production and tends to worsen with climate change. He stated that corn plants with longer vessel elements move water more efficiently, develop deeper roots, access moisture in lower soil

layers, and produce better under drought conditions.

The team evaluated hundreds of corn plants from different genetic lines, regions, and with different characteristics. Some plants showed longer cells in the xylem, while others showed shorter cells. This variation occurred naturally in the plants evaluated.

Researchers observed an association between higher MVEL (Mean Vessel Volume) and lower perforation plate height. These plates correspond to the porous end walls between adjacent vessel elements. During cell maturation, the dissolution of these walls forms continuous tubes for the flow of water and minerals. Smaller plates act as less restrictive

barriers.

Cell elongation

The research also linked the stretch phenotype to cell elongation in different plant tissues. This effect included roots. Plants with this phenotype showed faster root growth and deeper root systems. Under drought conditions, this architecture favored water acquisition in deeper layers.

The trials included computer simulations of the effect of xylem characteristics on water flow. The team also analyzed root tissues from plants grown in a greenhouse under water stress and at two field sites. One experiment took place at the Russell E. Larson Experimental Farm in central

Pennsylvania. Another took place at the Tuniche Research Farm near Graneros, Chile.

In Pennsylvania, scientists used rain exclusion structures to simulate drought. In Chile, the trial took advantage of a Mediterranean climate, with naturally dry summers. The simulations, greenhouse experiments, and field trials showed the same pattern: plants with a stretch phenotype captured and transported more water, grew better, and produced more under drought conditions.

Hydrical stress

Scientists report greater root length, greater root depth, and greater use of

deep water in mesocosms for plants with longer MVEL (Mesocosm-Level Variable Length). In the field, under water stress, MVEL was associated with leaf curl, leaf temperature, transpiration, photosynthesis, and grain yield.

The team applied genome-wide association studies to locate DNA variations linked to MVEL and perforation plate height. The result indicated partial genetic control of these traits. According to Lynch, the set may depend on one or two main genes, which could facilitate the isolation of the mechanism.

Researchers used cryogenic scanning electron microscopy to observe xylem perforation plates. The technique preserves delicate biological samples by

rapidly freezing them before visualization. The work took place at Penn State's Huck Institutes of the Life Sciences Microscopy Core Facility.

The team also used laser ablation tomography. The technique combines pulsed ultraviolet laser and serial imaging to generate high-resolution three-dimensional images of cross-sections of corn roots. The method allowed them to compare plants with longer vessel elements and smaller perforation plates with plants lacking these characteristics.

The results indicate a possible route for improving drought-tolerant maize.

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Bayer creates Ruveon LLC for glyphosate business in the US

The company will be responsible for pricing, production, logistics, and commercial strategy in the North American market

02.07.2026 | 07:50 (UTC -3)

Cultivar Magazine, based on information from Brian Leake

Bayer has consolidated its glyphosate business in the United States into Ruveon LLC. The new company will be responsible

for pricing, market access strategies, production, and logistics of products based on the molecule.

Ruveon is headquartered in St. Louis, Missouri. The company remains a Bayer Group business. According to the company, the consolidation is part of the Five-Year Framework plan, created by the Crop Science division to enhance growth, resilience, and profitability.

Specific focus

Bayer announced that Ruveon will have a specific focus on a commodity-based market. The company will assemble dedicated product and sales teams for the glyphosate business in the United States.

The company expects to supply North American agriculture with glyphosate products and maintain quality and service standards.

Brian Naber, Head of Crop Science for North America, Australia, and New Zealand, stated that the launch of Ruveon marks a milestone in the Five-Year Framework. According to him, the consolidation of resources and operations allows teams to dedicate more time to the needs of customers, partners, and other market stakeholders.

Work team

Alfonso Alba Ordóñez will assume the role of CEO of Ruveon. The executive has over

30 years of leadership experience within the Bayer Group and the global agricultural sector. He has held positions in Europe, South America, North America, and China.

Steve Knodle will serve as Executive Vice President and Chief Commercial Officer of Ruveon. He has over 28 years of experience in the agricultural industry. Knodle will lead the glyphosate sales and marketing teams in the United States, covering the agricultural, industrial, turf, and ornamental markets.

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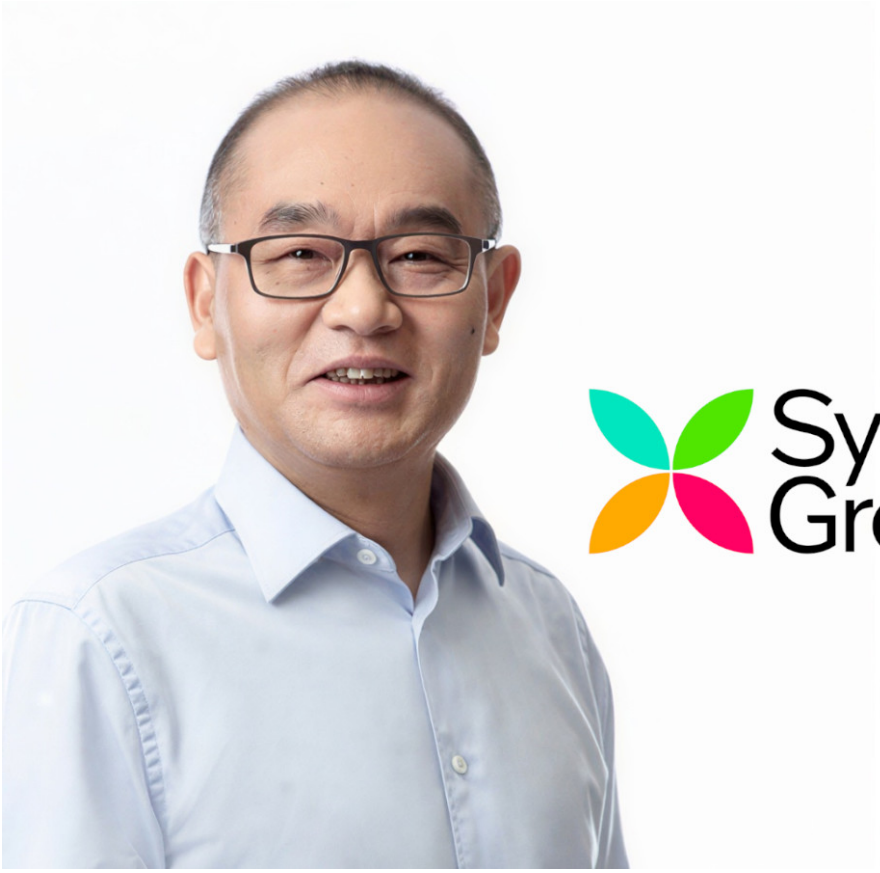
Syngenta Group appoints Hengde Qin as global CEO

The executive will assume the position on August 1, 2026, replacing Jeff Rowe, following a succession process

01.07.2026 | 07:46 (UTC -3)

Cultivar Magazine, based on information from Syngenta



The board of directors of Syngenta Group has appointed Hengde Qin as CEO of the company. The decision was unanimous. Qin will assume the position on August 1, 2026, following a nomination and succession process.

Qin currently holds the positions of Chief Operating Officer and Head of Seeds. He will replace Jeff Rowe. Rowe will remain in his position until August 1st. After that, he will return to the United States, following nearly ten years with the company.

Fanrong Li, chairman of the board, stated that Qin possesses operational, financial, and commercial expertise. According to Li, the board considers Qin the best candidate for the position. He also expressed gratitude for Rowe's contribution, who led

the company through a challenging period for agriculture.

Qin will be based in Basel, Switzerland. He has been working there since January 2023. The executive has been part of the Syngenta Group's leadership team since 2020. During this time, he has held positions in the areas of business, finance, human resources, and global operations.

Among the roles he has held, Qin served as Chief Financial Officer, Chief Human Resources Officer of the Syngenta Group, and President of Syngenta Group China. In the Chinese operation, he led a period of growth and increased profitability. The unit became one of the company's best-performing businesses. Qin also sits on the group's board of directors.

In a statement, Qin said that agriculture occupies a central position in challenges such as feeding the population, sustainability, and the resilience of food systems. According to him, the company's mission involves helping farmers achieve higher productivity with less impact.

Qin has previously held CEO positions at two publicly traded companies in mainland China and Hong Kong. He holds a bachelor's degree in economics and business administration from the East China Engineering Institute of Technology, a master's degree in industrial engineering from Huazhong University of Science and Technology, and an MBA from the China Europe International Business School.

Rowe joined Syngenta in September 2016. He led the turnaround of the seeds

business, achieving growth and a return to profitability. He then headed the crop protection business, the company's largest business unit, before taking over as CEO.

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Fungus with a broad diet kills insects and colonizes roots

Study with Metarhizium robertsii links metabolic flexibility to virulence and association with plants

03.07.2026 | 09:58 (UTC -3)

Schubert Peter, Cultivar Magazine

Photo: Raymond St Leger

Metabolic breadth enhances the ability of the fungus Metarhizium robertsii to infect insects and colonize roots. The result appears in a study from the University of Maryland. Researchers Huiyu Sheng and Raymond J. St. Leger compared ancient and recent strains of the fungus. The team evaluated genomes, virulence, root colonization, toxin activity, and growth on 95 nutrients. The work indicates a lack of trade-off between pathogenicity and endophytism. The two characteristics advance together when the fungus utilizes more carbon sources (DOI 10.1073/pnas.2608694123).

The strains with greater metabolic amplitude grew in more sugars, amino acids, and organic acids. They germinated rapidly on the cuticle of insects and roots.

They also killed insects more quickly. Some exhibited dethrixin activity. After the insect's death, they grew in hyphal form towards nearby roots.

The lineages that diverged at least 6 million years ago followed a different strategy. They killed insects slowly. Then, they multiplied in the host and produced many spores. This behavior favors persistence until encountering a new host.

The study repositions entomopathogenic fungi as organisms with broad environmental competence. The same nutritional basis underpins their action against insects and their association with plants. According to St. Leger, the versatility of these fungi begins with their metabolism.

The results can guide the selection of strains for agricultural use. Fungi with broad metabolisms can favor rapid pest suppression, root colonization, and promotion of plant growth. Strains with high sporulation can meet pest control strategies for a longer period.

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Agricultural Market - 3.Jul.2026

Soybean and corn production advances in the US, Brazil holds back supply

03.07.2026 | 09:50 (UTC -3)

Vlamir Brandalizze - @brandalizzeconsulting

The U.S. soybean crop is progressing normally and maintaining pressure on the Brazilian market. In the United States,

virtually all crops have already germinated. Flowering should reach 25% this weekend, above the average of 20% for this period. In Illinois, 22% of the areas have entered flowering. The state average is 16%.

Pod-forming crops account for 8% in the United States. The average for this period is 5%. Crop conditions show 65% in good or excellent condition. The index remained close to this level the previous week. Last year, 66% of crops were in good or excellent condition. The market considers a crop with more than 60% of the area in this classification to be normal.

In Brazil, the current soybean crop has been sold just over 70,5%. During the same period last year, it exceeded 71,5%. The historical average is over 72%.

Producers still hold approximately 53 million tons unsold. Last year, this volume reached 48,6 million tons. The difference indicates almost 5 million tons more in the hands of producers.

The week saw an increase in business. Expectations point to more than 2 million tons traded, between the current and new crop. Sales of the new crop reached 22,5%. Last year, it reached 26,5%. The average is 27,5%. The reaction of prices in Chicago stimulated barter operations, linked to the purchase of inputs.

Corn situation

In the US, the corn harvest is also progressing normally. Flowering has

reached 14%, above the average of 9%. Rapid planting has brought the cycle forward. Crops in good or excellent condition total 67%. Last year, the index reached 73%. Even so, levels above 60% indicate a good or normal harvest.

Corn also received support from production problems in the European Union. The July contract in Chicago is trying to maintain prices above $4,20. In recent days, it has hovered around $4. The 2027 positions are trading above $4,50. The July 2027 contract is trying to advance to levels close to $4,80.

In Brazil, corn shipments are expected to pick up in the coming weeks with the arrival of the second crop. Harvesting remains slow across all regions. Mato

Grosso and Paraná are experiencing delays. In Paraná, the return of sunshine may allow work to resume after a period of rain, cloudiness, and high grain moisture. Further rain could disrupt harvesting in the coming days.

The national harvest is expected to gain momentum after the first ten days of July. Expectations point to more significant progress starting on July 15th. The crop shows good potential. Field conditions have been favorable for the crops. Frosts affected few areas in Paraná. Estimates indicate a production close to 110 million tons for the second crop.

Sorghum situation

In the US, sorghum planting has reached 90%, the same level as the average. In Kansas, the leading producer, planting has reached 85%, also in line with the average. In Texas, planting has reached 99%. However, the condition of the crops is a concern. Only 51% of the areas receive a good or excellent rating. Last year, the rate reached 61%. The heat in Kansas and Texas is putting pressure on the crops.

In Brazil, sorghum harvesting is already underway in Goiás and Minas Gerais. Bahia is also starting to gain momentum. The crops show good potential. Producers have invested in technology and seeds. Projections indicate a record harvest, between 7,5 million and 8 million tons. The final area could reach 2,2 million hectares.

Wheat situation

In the wheat market, Chicago is trading at higher levels. The market is seeking support near $6. Longer-term positions, starting in mid-2027, are trading above $6,50. The US winter crop is facing difficulties. Harvesting has reached between 48% and 50%, above the historical average of less than 40%. This progress reflects early maturation. Only 26% of the crops are in good or excellent condition. Last year, the index reached 48%.

In Brazil, the wheat market remains calm. In Rio Grande do Sul, the price per ton ranges between 1.310 and 1.320 reais. In Paraná, it varies from 1.350 to 1.380 reais.

At the producer's counter, the price per sack fluctuates between 69 and 71 reais. The planted area has decreased. Estimates indicate less than 2 million hectares, compared to 2,5 million hectares in the last harvest. Some assessments point to an area of ??less than 1,8 million hectares. Brazil may need to import 7 million tons next year.

Rice situation

In the rice market, prices lost momentum after a strong recovery in early June. Some markets saw price increases between 2 and 3 reais, then fell by between 1 and 2 reais. The transition from June to July brought stability. The market is awaiting demand from retailers and

consumers.

Rice producers in Rio Grande do Sul are showing signs of discouragement. Market comments indicate a possible decrease of 100 hectares in planted area. Some agents point to a larger reduction. Lower supply in the next harvest and reduced carryover stocks may make the market firmer next year. Currently, prices in Tocantins and Mato Grosso remain stable.

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"Trojan horse" pathogen may open a new front against bed bugs

Bacteria invade symbiotic organ of Riptortus pedestris and cause near 100 percent mortality within ten days

03.07.2026 | 08:15 (UTC -3)

Schubert Peter, Cultivar Magazine

Photo: Harum Koh - CC BY-SA 2.0

Scientists have identified a pathogenic bacterium capable of exploiting the symbiotic system of bed bugs and killing the host. The microorganism, called Burkholderia sp. SJ1, uses a route similar to that of beneficial bacteria to reach the symbiotic intestinal organ. Then, it proliferates, ruptures the intestinal tissue, reaches the hemolymph and causes sepsis. Mortality reached almost 100 percent within ten days (DOI 10.1073/pnas.2533244123).

The study analyzed the symbiosis between the stink bug Riptortus pedestris and the bacterium Caballeronia insecticola. In this relationship, the insect obtains microorganisms from the soil and shelters them in a sac-like organ located in the posterior region of the intestine. These

symbionts assist in essential nutritional functions for the insect's survival, growth, and reproduction.

The bacterium Burkholderia sp. SJ1 mimics part of this process. It enters the intestine from the soil. Then, it uses the same "enveloping motility" method employed by symbionts to overcome host selection barriers and colonize the symbiotic organ.

The difference appears after colonization. While the symbionts maintain the mutualistic association, the pathogen resists digestion by the host, multiplies abnormally, and invades the organism. According to the researchers, colonization of the symbiotic organ plays an essential role in lethality.

The discovery points to a possible route for the development of highly specific biological pesticides.

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Cogny appoints new directors for Sales and Marketing.

Derik Chamberlain and Luiz Felipe Fiorese assume strategic positions in the biological ecosystem.

02.07.2026 | 15:23 (UTC -3)

Virgilio Amaral

The biological ecosystem formed by Simbiose, Bioma, Biagro, Biograss, Biojet, and Orygen announces a new structure for

its Commercial and Marketing areas. Derik Chamberlain (pictured) assumes the Executive Commercial Director position, while Luiz Felipe Fiorese will now serve as Head of Marketing and Communication. This move is part of the Cogny ecosystem's strategy to preserve the complementary role of the companies in the bio-inputs market and strengthen the brands, already recognized by rural producers in Brazil and several other countries.

In addition to strengthening brand positioning, executives will have the mission of fostering closer relationships with producers, cooperatives, distributors, strategic partners, and sales channels, as well as expanding recognition of ecosystem companies in markets

considered priorities for the advancement of biological products. The new structure follows the completion of the term for which executive Jair A. Swarowsky was hired, dedicated to organizing the Commercial and Marketing areas of the ecosystem.

Derik Chamberlain has over 20 years of experience in agribusiness and built his career through direct contact with the field. At Simbiose since 2009, he started as a technical assistant and, the following year, moved to the commercial area. In recent years, he has focused on market expansion, team management, and structuring sales strategies in different agricultural regions of the country. As the Executive Commercial Director, his priority will be to expand the presence of the

brands in Brazil's production hubs.

Felipe Fiorese has over 10 years of experience in the ecosystem, starting as a technical sales representative in Western Paraná. In recent years, he has focused on the international expansion of the brands, leading business development in markets in Europe, the United States, and the Southern Cone. As Head of Marketing and Communication, his mission will be to strengthen the institutional image and reputation of the companies and ensure global visibility of their technologies.

Currently, companies within the ecosystem maintain a presence in virtually all Brazilian agricultural regions. Internationally, their operations are expanding into Latin American countries

such as Argentina, Paraguay, Bolivia, and Uruguay. In Europe, expansion gained momentum with the distribution of a phosphorus solubilizer developed in partnership with Embrapa, a biological technology with proven effectiveness in increasing the availability of this nutrient to plants and resulting in consistent productivity gains in the field.

The brands within the ecosystem operate in complementary areas of the biologicals market. Simbiose develops microbiological solutions for crop nutrition, protection, and productivity, while Bioma is a leader in technologies focused on the nutritional efficiency of crops and the development of innovative solutions, including a water stress mitigator. With over 40 years of tradition, Biagro works on developing

biological technologies to increase agricultural productivity sustainably. Biograss operates with microbial technology embedded in seeds, while Biojet develops equipment and application solutions that enhance the operational efficiency and agronomic performance of bio-inputs in the field. The ecosystem also includes Orygen Research, the largest private research and development center for microbiologicals in the country, focused on agribusiness.

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Queen bees transfer methyl parathion to eggs

Study with Apis mellifera indicates loss of social filtering after chronic exposure to organophosphates

02.07.2026 | 14:35 (UTC -3)

Schubert Peter, Cultivar Magazine

Photo: Sascha Nicklisch - UC Davis

Worker honeybees (Apis mellifera) reduce the amount of pesticide entering the colony's diet, but this protection loses effectiveness under chronic exposure. When this social mechanism collapses, queens accumulate the compound in their ovaries and transfer part of the chemical load to developing eggs. The result appears in a study led by researchers at the University of California, Davis, using methyl parathion (DOI 10.1016/j.cub.2026.06.022). The product has been banned in Brazil since 2016.

The research evaluated the flow of organophosphates between food, worker bees, wax, queens, ovaries, and eggs. Methyl parathion was used as a model compound. This pesticide has a known

neurotoxic effect on bees and physicochemical characteristics similar to those of other organophosphates.

Reducing the concentration

The worker bees reduced the concentration of pesticide in the processed food stored in honeycomb cells. On the second day, the concentration in the cells dropped ninety-five percent compared to the food in the feeders. On the tenth day, the reduction fell to eighty-six percent. The data indicate a gradual loss of the filtering effect performed by the worker bees during the handling, processing, and deposition of the food.

Body load also changed over time. On the second day, queens and workers showed no significant difference. On the tenth day, workers accumulated fifty-five times more methyl parathion than queens. The average reached one thousand and forty-nine parts per billion in workers, compared to nineteen parts per billion in queens.

Targeted pesticide

Even with a lower body load, the queens directed the pesticide to reproductive tissues. On the tenth day, the eggs showed concentrations between eighty-one and one hundred and forty-one parts per billion. These values ??exceeded the queens' body load by five to ten times. Researchers interpret this pattern as

maternal discharge, a process in which the female transfers contaminants to her offspring.

The study also recorded differences between queens with higher and lower egg production. Queens with more eggs distributed the chemical load among more offspring, with a lower average concentration per egg. The researchers treat this result as a descriptive observation, since the number of queens evaluated limited the statistical analysis.

Distribution in the colony

The presence of the queen also altered the distribution of the pesticide in the colony.

Nano-colonies with a queen consumed more food than colonies without a queen. However, the total load measured in workers, wax, and cell food did not differ significantly. The queen changed the fate of the contaminant within the colony, with a higher concentration in workers and greater deposition in wax on the tenth day.

The results support the idea of ??colonies as integrated detoxification networks. The worker bees act as the first barrier. They process contaminated food and reduce the exposure of the queen and brood. Under chronic exposure, this barrier loses its effectiveness. The queen maintains a low body load, but transfers some of the contaminant to the eggs.

The research points to a limitation in toxicological assays based solely on

queenless worker bees. This type of test does not capture egg exposure or the chemical redistribution caused by the presence of the queen. According to the researchers, assessments within the social context of the colony can reveal hidden effects of contaminants on reproduction, brood, and the internal dynamics of the hive.

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RNAi acts against muscle actin to control thrips

Study expands dsRNA production and identifies absorption pathways in Megalurothrips usitatus and Frankliniella occidentalis

02.07.2026 | 10:29 (UTC -3)

Schubert Peter, Cultivar Magazine

Photo: Bruce Watt - University of Maine, Bugwood

Researchers have developed a bacterial system capable of increasing the production of double-stranded RNA, a molecule used in RNA interference strategies against agricultural pests, by about eleven times. The team tested the material on two species of thrips, Megalurothrips usitatus and Frankliniella occidentalis, and recorded adult mortality after ingestion of dsRNA targeting the muscle actin gene. The study also indicated two possible cellular pathways involved in the absorption of the molecule: clathrin-mediated endocytosis and transport by SID-1-like proteins (DOI 10.3390/insects17070685).

This study evaluated a molecular alternative to the use of chemical

insecticides in the management of thrips. These insects cause direct damage to plants through feeding and also act as vectors of viruses. Control depends on insecticides in many production systems, but frequent use promotes resistance.

Gene silencing

RNA interference, or RNAi, silences specific genes using dsRNA complementary to the target messenger RNA. Applying this technology requires large-scale dsRNA production and an understanding of how the molecule enters insect cells. According to the study, these two points still limit applications against thrips.

The team constructed pET28a-based vectors for dsRNA expression in Escherichia coli HT115(DE3). The researchers compared three configurations: no terminator, with one T7 terminator, and with three terminators in tandem. The vector with three terminators combined tT7, rrnB T1, and tT7 on each side of the expression region.

The system with three terminators increased dsRNA production by 11,37 times compared to the vector without terminator. Gel electrophoresis confirmed the synthesis of 400 base pairs of dsRNA. Bacterial growth decreased in the group with three terminators after induction, but the yield per cell increased.

With this system, the researchers produced dsRNA against a conserved region of the muscle actin gene. The chosen fragment showed greater than 97% identity between Megalurothrips usitatus and Frankliniella occidentalis. The choice sought a common target for thrips species present in mixed infestations.

Artificial diet

The assays used an artificial diet with sucrose and pine pollen between layers of Parafilm. Adults ingested dsRNA by feeding on the membrane. Ingestion was confirmed with Cy3-labeled dsRNA. Fluorescence appeared in the digestive tract of the treated insects, while unlabeled controls showed no signal.

Mortality increased with dsRNA concentration. After seventy-two hours, the dose of 1500 nanograms per microliter caused an average mortality of 72,2% in Megalurothrips usitatus. In Frankliniella occidentalis, the average mortality reached 47,8% at the same dose. Controls with dseGFP and water maintained low mortality.

Gene expression

The expression of the target gene also decreased. In Megalurothrips usitatus, dsRNA reduced muscle actin transcripts by 26,0% after forty-eight hours and by 33,1% after seventy-two hours. In Frankliniella occidentalis, the reduction reached 39,6% after seventy-two hours.

The team analyzed the transcriptome of Megalurothrips usitatus after feeding with 300 nanograms per microliter of dsactin, dseGFP, or water. The sublethal dose allowed them to observe gene expression responses with less interference from effects related to insect death.

Distinct grouping

RNA-seq analysis showed distinct clustering between treatments. Compared to dseGFP, dsactin treatment resulted in 86 genes being downregulated and 63 genes being upregulated. Compared to water, dsactin resulted in 1829 genes being downregulated and 695 genes being upregulated.

The enriched pathways included protein digestion and absorption, lysosome, and endocytosis. Genes linked to clathrin-mediated endocytosis, such as clathrin heavy chain, clathrin light chain, AP-2 adaptor, and Hsc70, showed increased expression after exposure to dsRNA. The same occurred with SID-1-like transcripts.

Two routes

The researchers propose a model with two potential routes for dsRNA entry into Megalurothrips usitatus. One route involves clathrin-formed vesicles. The other involves transmembrane transport associated with SID-1-like proteins. The study treats this second participation as a hypothesis and points to the need for

experimental validation.

Validation by RT-qPCR confirmed the consistency of the RNA-seq data. Twelve selected genes showed similar patterns between the two methods. The correlation between the results reached R = 0,8435, with a p-value less than 0,0001.

The results support muscle actin as a promising target for RNAi in thrips. The conservation of the sequence suggests an active ingredient with action on more than one species. The study itself highlights the need to test other Thysanoptera species and evaluate off-target effects on natural enemies, pollinators, and other non-target arthropods.

The work also points to avenues for formulations. Since free dsRNA is

degraded by ultraviolet radiation and nucleases, the researchers cite the importance of carriers capable of protecting the molecule and facilitating cellular entry. The study mentions star polymers, liposomes, and layered double hydroxides as possibilities for future investigation.

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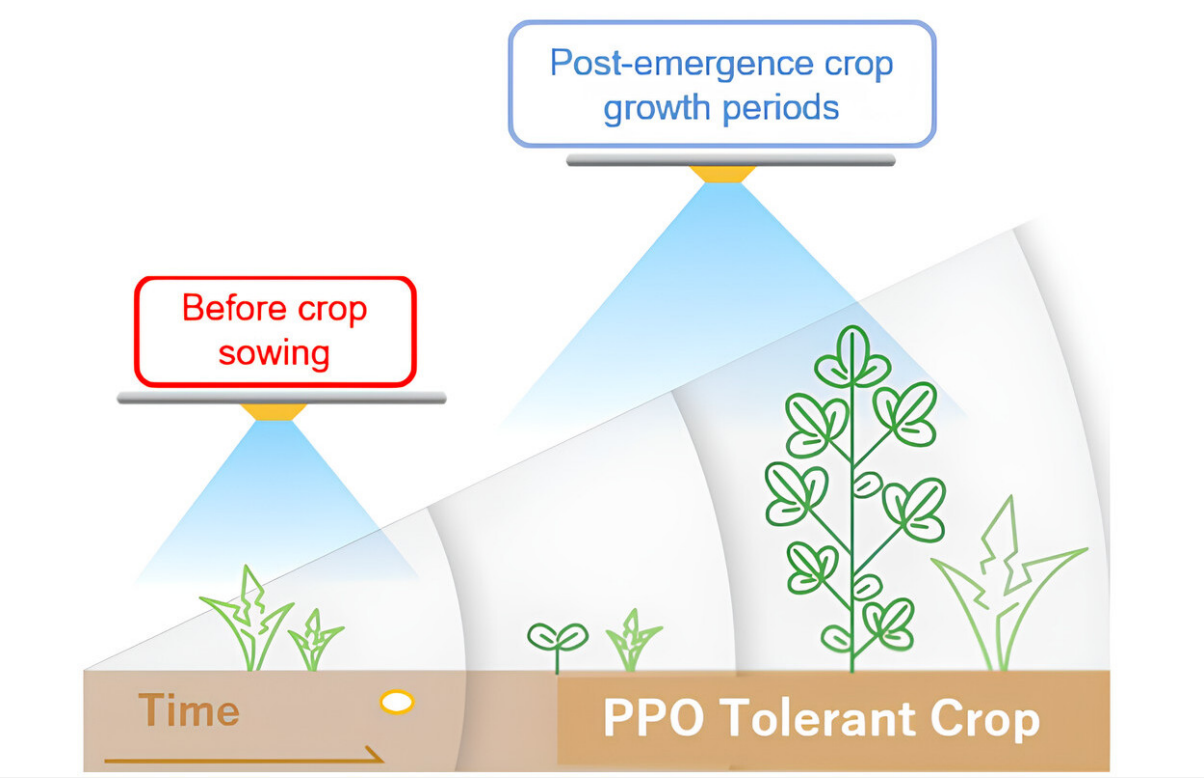
Rapidicil herbicide obtains registration in the United States

This is an active ingredient developed by Sumitomo Chemical

02.07.2026 | 09:07 (UTC -3)

Cultivar Magazine, based on information from Sumitomo Chemical



Sumitomo Chemical has obtained registration in the United States for the herbicide Rapidicil, brand name for the

active ingredient epyrifenacil., and for crop protection products formulated with the molecule. The country represents the fourth largest market with registration of these products.

Rapidicil is an active herbicide ingredient developed by Sumitomo Chemical itself. The company positions the molecule as the compound with the greatest market potential among the products in the “A2020” pipeline. This group includes agricultural pesticides under development with registration applications expected in the first half of the 2020s.

The herbicide belongs to the group of PPO inhibitors. These products inhibit the activity of protoporphyrinogen oxidase, an enzyme involved in chloroplast biogenesis.

According to the company, Rapidicil has a faster action compared to existing PPO inhibitors. The product also controls a broader spectrum of broadleaf weeds and grasses.

Low doses

Sumitomo Chemical also reports the use of Rapidicil in low doses. The company highlights the product's suitability for no-till farming, an agricultural practice that does not disturb the soil before sowing. The system leaves dead leaves and cut stems on the area. This practice can reduce erosion caused by wind and rain. It can also increase organisms and microorganisms in the soil.

The company associates the use of the herbicide in no-till farming with soil conservation and carbon neutrality, through the reduction of carbon dioxide emissions.

Following state filings, Sumitomo Chemical plans to begin sales of Rapidicil-based products in the United States through its subsidiary Valent USA. The launch is expected to take place in the second half of fiscal year 2026.

The company is also working on registering Rapidicil in Brazil and Canada. In global collaboration with Bayer, it intends to offer a weed control system combined with crops tolerant to PPO inhibitors being developed by Bayer.

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Egg parasitoids have been recorded in cassava

Research expands the distribution of Trichogramma marandobai and reports Trichogramma pretiosum in the crop in the region

02.07.2026 | 08:46 (UTC -3)

Schubert Peter, Cultivar Magazine

Trichogramma sp - Photo: Victor Fursov - CC BY-SA 4.0

Researchers have recorded for the first time the occurrence of Trichogramma marandobai and Trichogramma pretiosum in cassava crops in the Federal District. Both species belong to the Trichogrammatidae family and parasitize insect eggs. The study took place in an experimental area of ??Embrapa Cerrados, in Planaltina, between August 2023 and July 2024 (DOI 10.37486/2675-1305.ec08020).

This record expands the known geographic distribution of Trichogramma marandobai in the Central-West region. It also documents the first association of Trichogramma pretiosum with cassava cultivation in this region. The data support updates to the Taxonomic Catalog of

Brazilian Fauna and provide a basis for biological control programs in cassava agroecosystems.

Main problems

Among the main phytosanitary problems affecting cassava cultivation is the cassava hornworm, Erinnyis ello. This pest has a high capacity for leaf consumption and can cause severe defoliation and productivity losses.

The insect also possesses a high capacity for flight, migratory behavior, and adaptation to different climatic conditions. These factors favor its wide distribution across the American continent. Infestations can arise suddenly after the

migration of individuals from neighboring areas.

Egg parasitoids

The genus Trichogramma includes egg parasitoids used in biological control programs for lepidopteran pests. Approximately 240 species of this genus have been described worldwide. In Brazil, 30 species occur, distributed throughout all regions of the country.

In cassava agroecosystems, Trichogramma species had already been recorded as parasitoids of Erinnyis ello eggs. Trichogramma manicobai appears in Mato Grosso do Sul, Minas Gerais, Piauí, São Paulo, and Paraná. Trichogramma

marandobai had been recorded in Alagoas, Amazonas, Espírito Santo, Mato Grosso do Sul, Minas Gerais, São Paulo, Paraná, and Pará. Until this study, there were no records of Trichogramma species associated with Erinnyis ello in cassava crops in the Federal District.

Biweekly collections

The collections took place every two weeks in an experimental field at Embrapa Cerrados, in Planaltina. The team used a sweep net over the aerial parts of the plants. Each sampling had four repetitions, with 60 sweeping movements per repetition. The collected insects were preserved in 70 percent ethanol and taken to the Entomology Laboratory at Embrapa

Cerrados.

In the laboratory, the parasitoids were separated by morphotype, counted, and sexed. Identification was only performed on males, due to the presence of diagnostic taxonomic structures. The researchers mounted the specimens on slides with Hoyer's medium. Then, they examined the genital capsule, wings, and antennae under a microscope.

The team collected 105 specimens. The total included 97 females and eight males. Among the males, seven were identified as Trichogramma marandobai and one as Trichogramma pretiosum. Trichogramma marandobai occurred between March and April 2024. This period coincided with the occurrence of Erinnyis ello in the field,

according to the study.

Researchers identified Trichogramma marandobai by characteristics of the male genitalia. These included a long and distinct intervolselar process, a ventral carina not exceeding half of the genital capsule, and a dorsal blade with a narrow and rounded posterior extension. Trichogramma pretiosum presented a long and pointed intervolselar process, a short ventral carina, an elongated dorsal blade, ventral processes close to the base of the intervolselar process, and long flagelliform setae.

The work was carried out by researchers Suzana A. de Oliveira, Michely FS de Aquino, Marisa L. de Brito, Charles M. de Oliveira, and Ranyse B. Querino.

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Yara buys ammonia plant in Texas for US$1,3 billion

The Texas City plant is expected to reach a capacity of 1,3 million metric tons per year by the end of 2026

02.07.2026 | 08:12 (UTC -3)

Cultivar Magazine, based on information from Maria Gabrielsen

Yara International ASA announced an agreement to purchase the Gulf Coast Ammonia ammonia plant in Texas City, Texas. The acquisition will be made through its subsidiary Yara North America, Inc. The transaction is valued at $1,3 billion.

The unit belongs to GCA Holdings LLC, which is linked to Lotus Infrastructure Partners and MB Energy. Completion of the purchase is subject to customary closing conditions. It is also subject to regulatory approvals.

The plant is expected to expand Yara's presence in ammonia production in the United States. The company stated that the acquisition is part of its strategy to diversify its energy exposure and make its

global ammonia production base more competitive.

Nominal capacity

The plant is expected to have a nominal capacity of 1,3 million metric tons per year. The unit is currently undergoing commissioning. Yara anticipates gradual progress towards full production and stable operations by the end of 2026. The goal includes production exceeding nominal capacity.

Air Products will supply industrial gases to Yara through a long-term contract. The agreement includes hydrogen, nitrogen, and other utilities. Air Products operates the largest hydrogen pipeline network in

the United States, according to Yara.

Intermediate platform

The acquisition includes the ammonia synthesis circuit, storage structures, and exclusive use of the loading infrastructure. Yara intends to use its ammonia intermediate platform to meet external customers and internal supply demands.

According to Svein Tore Holsether, president and CEO of Yara, the incorporation of the plant strengthens the company's operational resilience and diversifies energy costs. He stated that the new capacity in the United States supports the company's long-term strategy, with economies of scale and reductions in fixed

and capital costs per ton.

Yara also reported that the structure of the operation opens opportunities for a gradual entry into low-carbon ammonia. This possibility will depend on regulatory developments and financial viability.

The purchase raises Yara's total projected capital outlay for 2026 to $2,5 billion. The company stated that the amount remains within the projected capital for ammonia investments between 2026 and 2030. The sale process took place via auction, with financial advisory provided by JP Morgan Securities LLC to GCA Holdings LLC.

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Bayer appoints new head of Plant Breeding and Plant Health

Pierre Spolti assumes global leadership in disease resistance programs

01.07.2026 | 16:48 (UTC -3)

Cultivar Magazine

Bayer has promoted Piérri Spolti to the position of Head of Breeding Plant Health. In his new role, he will be responsible for leading initiatives focused on advancing

disease resistance, risk assessment, innovation in phenotyping, and strengthening plant pathology capabilities for row crops and vegetables.

An agronomist and plant pathologist, Spolti has 11 years of experience in the Agricultural Sciences sector, with a focus on developing digital technologies, phenotyping, and managing global teams in Brazil, the United States, and France. Prior to his promotion, he held the position of global "leader" of Plant Health at the company.

The executive has been with Bayer for over six years. Throughout his career, he also worked at Monsanto and as a researcher at Embrapa, developing projects in the areas of plant pathology

and agricultural innovation.

Piérri Spolti holds a degree in Agronomic Engineering from the State University of Santa Catarina (Udesc) and a master's and doctorate in Phytopathology from the Federal University of Rio Grande do Sul (UFRGS). He also completed postdoctoral studies in modeling and simulation of wheat and soybean diseases at the Federal University of Viçosa (UFV), with a research period at the National Institute of Agronomic Research (Inrae) in France.

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Convitro herbicide registered for corn and soybeans in the USA

Bayer's product uses diflufenican, a PDS inhibitor from group 12, for pre-emergent pest management

01.07.2026 | 15:35 (UTC -3)

Cultivar Magazine, based on information from Kyel Richard

The United States Environmental Protection Agency granted federal registration to the herbicide Convintro (diflufenican), from Bayer, for pre-

emergent use in corn and soybeans. The product belongs to group 12 and targets Amaranthus species, focusing on resistant Amaranthus palmeri and Amaranthus tuberculatus.

According to Bayer, these weeds exhibit resistance to up to nine different herbicide sites of action. The company states that Convintro offers a new alternative for management programs in areas under resistance pressure.

The product's active ingredient is diflufenican. The molecule acts as an inhibitor of carotenoid biosynthesis at the phytoene desaturase step. According to Katilyn Price, technical leader for crop protection products at Bayer, the use of diflufenican in corn and soybeans

represents a first introduction of this technology to farmers in the United States.

The company reports that the herbicide exhibits residual activity early in the crop cycle. The product can also be used in tank mixtures with residual herbicides from other groups. Bayer emphasizes the need for mixing with herbicides from groups 14 or 15 to broaden the spectrum of control.

Price states that management programs should use multiple modes of action. According to her, multi-year plans and crop rotation help reduce the risk of resistance.

Bayer reports that temporary discoloration may occur in crops after application. In internal company trials, plants showed recovery with new growth. The company reports no average impact on yield

potential.

The EPA's federal registration does not authorize automatic use in all states. Convintro still needs state approvals. Bayer says it is working with state regulatory agencies and anticipates variable availability by region in the 2027 crop season.

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Strigolactones increase cucumber resistance to aphids

Study links CsCCD7 and CsCCD8 genes to the defense of Cucumis sativus against Aphis gossypii

01.07.2026 | 14:59 (UTC -3)

Schubert Peter, Cultivar Magazine

Photo: Alex Abair - CC BY 40

Researchers from Yangzhou University and the Hunan Academy of Agricultural Sciences have identified a hormonal mechanism associated with cucumber resistance to aphids. The study showed that strigolactones increase the defense of Cucumis sativus against Aphis gossypii through the activation of antioxidant enzymes and the control of reactive oxygen species (DOI 10.1093/hr/uhag260).

The application of the strigolactone analog rac-GR24 reduced the aphid population on cucumber plants. The 5 micromolar dose reduced the insects by approximately 25 percent. The 10 micromolar dose reduced the population by 60 percent, compared to the control. The effect increased with the

applied concentration.

Opposite result

The opposite result occurred with TIS108, an inhibitor of strigolactone biosynthesis. Plants treated with 5 micromolar and 10 micromolar doses showed a significant increase in the number of aphids. The increase also followed the concentration of the product. The data indicate a direct involvement of strigolactones in cucumber resistance.

Two genes

Scientists evaluated two genes in the strigolactone biosynthesis pathway. The gene CsaV3_6G008730 was designated

CsCCD7. The gene CsaV3_2G012080 was designated CsCCD8. After aphid infestation, both responded significantly. CsCCD7 expression reached its highest level 72 hours after inoculation, with a value approximately 2,5 times higher than the control. CsCCD8 also reached its maximum at 72 hours, with expression approximately four times higher.

The team generated knockout lines for CsCCD7 and CsCCD8 using CRISPR/Cas9. The edited plants received second-instar aphids. Ten days after infestation, populations in plants with CsCCD7 knockout were about 1,8 times higher than the control. In lines with CsCCD8 knockout, the number reached about 1,9 times the control. The loss of function of these genes reduced the plant's

defense.

The study also identified a link with the jasmonic acid pathway. The transcription factors CsMYC2-1 and CsMYC2-2 acted as positive regulators of CsCCD7. Yeast hybrid assays, luciferase assays, and EMSA assays showed a direct link between these factors and the CsCCD7 promoter. Therefore, CsMYC2-1 and CsMYC2-2 increased gene expression and favored cucumber aphid resistance.

Foliar application

Foliar application of methyl jasmonate also increased aphid resistance. Doses of 2 micromolars and 5 micromolars reduced insect populations on cucumber plants.

This result reinforces the connection between jasmonic acid signaling and strigolactone biosynthesis.

Researchers measured reactive oxygen species in four treatments: plants without aphids and without rac-GR24; plants without aphids and with rac-GR24; plants with Aphis gossypii and without rac-GR24; and plants with aphids and rac-GR24. Infested leaves without rac-GR24 accumulated the highest levels of reactive oxygen species. Leaves treated with rac-GR24 and infested showed lower levels.

The activity of antioxidant enzymes increased in treatments with rac-GR24. The study evaluated superoxide dismutase, ascorbate peroxidase, glutathione reductase,

monodehydroascorbate reductase, and dehydroascorbate reductase. In infested plants, rac-GR24 induced greater activity of these enzymes and contributed to the removal of excess reactive oxygen species.

According to the model proposed by the scientists, CsMYC2 activates CsCCD7. This gene participates in the conversion of 9-cis-?-carotene to 9-cis-?-apo-10'-carotenal. CsCCD8 acts in a later stage of the pathway. After infestation by aphids, strigolactones activate the antioxidant system and suppress the excess of reactive oxygen species, which increases the resistance of Cucumis sativus to Aphis gossypii.

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Microbes may influence insect diapause

A review indicates the roles of microbiota in nutrition, cold protection, immunity, and nitrogen recycling

01.07.2026 | 10:55 (UTC -3)

Schubert Peter, Cultivar Magazine

Photo: ME Clark

Microorganisms associated with insects can participate in processes related to

diapause, a dormant phase used by many species to survive periods of cold, drought, lack of water, and food scarcity. A scientific review gathers evidence on the role of microbiota in nutrition, protection against low temperatures, immunity, and the reuse of nitrogenous waste during this phase (DOI 10.1093/aesa/saag026).

Diapause involves the interruption of development and a reduction in metabolism. This process allows for survival in seasonal environments. During this period, insects reduce their feeding and begin to use reserves accumulated before dormancy. Lipids, carbohydrates, and amino acids sustain metabolism until development resumes.

Associated microorganisms

The review points to the microbiota as a possible component of this physiological adjustment. Host-associated microorganisms can provide nutrients, recycle waste, modulate immune responses, and contribute to defense against pathogens. However, scientists highlight important gaps. Many studies still describe taxonomic changes. Few demonstrate direct mechanisms.

The microbial communities of insects vary from obligate endosymbionts to transient microorganisms acquired from food or habitat. This difference makes diapause a

complex system. Some insects maintain stable associations. Others harbor open communities, influenced by the environment.

Reduction in diversity

During diapause, several studies have reported a reduction in bacterial diversity or abundance. Others have recorded an enrichment of microorganisms capable of persisting under low nutrient availability. Lower feeding rates, reduced metabolism, and alterations in the immune system may select for groups adapted to the intestinal lumen with limited resources.

In Nasonia vitripennis, a parasitoid wasp, diapause larvae with microbiota showed

higher levels of glycerol. The compound acts as a cryoprotectant. Larvae without microorganisms had less glycerol accumulation. The association with Providencia rettgeri also increased this response to cold. The study does not yet define whether the bacterium produces the compound or stimulates its synthesis by the host.

Amino acids involved

The review also cites amino acids, such as proline, among the compounds involved in cold tolerance. In Parastrachia japonensis, the Japanese stink bug, antimicrobial treatment reduced amino acid stores during diapause, particularly proline. This result indicates microbial involvement in

maintaining these resources during thermal stress.

Another important function involves nitrogen recycling. During diapause, reduced food intake limits nutrient intake. Excretion may also be restricted. In this context, bacteria can transform urea, uric acid, and other waste products into nitrogenous forms that can be used by the insect.

In Parastrachia japonensis, Erwinia-like bacteria express enzymes linked to the degradation of urea and uric acid. This activity allows for the reuse of nitrogen during adult reproductive diapause. The microorganisms occupy crypts in the midgut and are passed on to offspring via maternal feces.

Microbiota and immunity

The review also addresses interactions between microbiota and immunity. Insects in diapause may form aggregations, reduce feeding, and alter immune investments. These changes influence exposure to parasites and pathogens. Associated microorganisms may contribute to pathogen exclusion, antifungal defense, or maintenance of a stable gut community.

In solitary bees of the Anthophora bomboides stanfordiana group, microbial communities changed throughout dormancy. Researchers reported the presence of Streptomyces, Nocardioides, and fungi of the genus Moniliella. These

microorganisms were associated with antifungal defense, cold tolerance, and possible lipid accumulation.

The review proposes further mechanistic studies. Scientists advocate sampling throughout the entire diapause trajectory, from induction to recovery. They also point to the need for experiments with defined microbial communities, the use of antibiotics, microbiome transplants, multiomics analyses, metabolomics, and screening with stable isotopes.

Climate change amplifies the importance of this topic. Alterations in temperature regimes and freeze-thaw events can affect the duration of diapause, insect survival, and the stability of microbial communities. The review indicates a need to integrate field and laboratory studies to understand

whether microorganisms help hosts tolerate environmental stresses or add new physiological limitations.

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Peptides modulate rhizobia without loss of viability

Study describes NPGs in Robinia pseudoacacia nodules and points to a new pathway for controlling biological nitrogen fixation

01.07.2026 | 09:07 (UTC -3)

Schubert Peter, Cultivar Magazine

Photo: ?? ? from Pexels

False acacia (Robinia pseudoacacia) uses a novel family of small peptides to modulate symbiotic bacteria in root nodules. The mechanism induces a physiological condition associated with nitrogen fixation in Mesorhizobium robiniae and preserves bacterial viability. This information is contained in a study that expands knowledge about the regulation of symbiosis between legumes and rhizobia (DOI 10.1126/sciadv.aed2816).

The discovery involves peptides rich in proline and glycine. The team named them NPG, an acronym for nodular peptides rich in proline and glycine. These peptides appeared in the nodules after the roots were colonized by rhizobia. They accumulated in infected cells, within the nitrogen fixation zone.

The work was led by the Technical University of Braunschweig, in Germany, with participation from Southwest University, in Chongqing, China. Also participating were the Helmholtz Centre for Infection Research, Helmholtz Munich, and the Leibniz Institute for Natural Product Research and Infection Biology.

Associated transcripts

The research identified seven transcripts associated with NPG peptides in Robinia pseudoacacia nodules inoculated with Mesorhizobium robiniae. The genes occur in a tandem cluster in a region of approximately 850 kilobases. All showed high expression in nodules one year after inoculation. Some were just below

leghemoglobins among the most abundant transcripts.

Researchers observed strong NPG expression in the nodules. Adjacent roots showed lower levels. Stems and leaves showed no or very low signal. In uninoculated plants, the roots did not show NPG transcripts. This pattern indicates induction linked to nodule formation and the presence of rhizobia.

The team evaluated the effect of NPG2, one of the peptides, on Mesorhizobium robiniae in the laboratory. After exposure to the recombinant peptide, the bacterium altered the activity of genes linked to nitrogen fixation. The study recorded the induction of nitrogenase genes, such as nifH, nifD, and nifK. There were also

alterations in functions related to iron.

Road repression

Simultaneously, pathways associated with nitrate assimilation, siderophore transport, and nitrogen regulation were repressed. The profile indicates that the bacteria are being directed towards a physiological state related to biological nitrogen fixation. The assay used 250 micromolar of NPG2 to define a maximal transcriptional response. The induction of nifH appeared at concentrations starting from 0,025 micromolar.

Central point

The central point of the finding involves the preservation of bacterial viability. In many annual legumes, NCR peptides promote terminal differentiation of bacteroids. In this process, the bacteria increase nitrogen fixation but lose the ability to divide. In Robinia pseudoacacia, NPGs modulate rhizobia physiology without imposing this terminal fate.

This difference may be relevant for perennial plants. The false acacia maintains active nodules for extended periods. A strategy without loss of bacterial viability may favor a stable symbiosis across multiple growing seasons. Researchers treat this relationship as a hypothesis consistent with the data, although direct plant demonstration of all physiological effects is still lacking.

NPGs do not appear to be equivalent to NCR peptides. They lack the cysteine-rich composition typical of NCRs. The study describes them as intrinsically disordered, acidic peptides rich in proline and glycine. Modeling and biochemical analyses indicated an absence of stable tertiary structure in mature regions.

Full set

Conservation is also noteworthy. Researchers found the complete set of NPGs in four other Robinia lineages: Robinia neomexicana, Robinia hispida var. kelseyi, Robinia viscosa, and Robinia hispida. A survey of available Fabaceae genomes did not detect homologs outside of Robinia. The team itself, however,

highlights the low representation of woody legumes in public databases.

The results suggest an alternative route for controlling the symbiosis. Instead of forcing terminal differentiation, the plant adjusts the gene expression of its bacterial partner and maintains its survival. For agriculture, the study points to new avenues of research in biological nitrogen fixation and reducing the use of energy-intensive synthetic fertilizers.

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Tessenderlo will invest US$400 million in FMC

The investment will give the Belgian group approximately 20% of the agricultural company's ordinary shares

01.07.2026 | 08:08 (UTC -3)

Cultivar Magazine, based on information from FMC

FMC Corporation has reached an agreement to receive a minority investment of approximately $400 million from the Tessenderlo Group. The transaction is priced at $13,30 per share. Upon completion, the Belgian group will hold approximately 20% of FMC's common

stock.

The company announced on June 30, 2026, the end of the strategic options review announced in February. FMC intends to use the funds to reduce debt. The investment will allow it to reach its amortization target of approximately $1 billion.

According to FMC, the transaction maintains the company as an independent entity. The operational and strategic plan includes advancing the research and development pipeline and accelerating the commercialization of innovations.

Long term

The Tessenderlo Group reported that the investment is part of its strategy to expand its agricultural platform through minority stakes in companies. Luc Tack, CEO of the group, stated that FMC presents long-term potential linked to a new generation of proprietary molecules.

In recent months, FMC has also taken steps to free up capital and increase financial flexibility. The company altered its revolving credit facility. It also raised $1,2 billion in a high-yield secured bond offering. It signed an agreement to sell its commercial operation in India for $252 million. It entered into a supply and licensing agreement with Corteva, with an initial down payment of $200 million. It also signed a reference agreement for the sale and subsequent leaseback of a property in

Newark, Delaware, for $114 million.

The completion of the transaction is subject to customary conditions, including regulatory approvals.

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Simon Walter assumes the senior vice presidency of Nunhems

With over seven years of experience, the executive will lead BASF's global vegetable seed unit

30.06.2026 | 16:16 (UTC -3)

Roberta Silveira

BASF announced that Simon Walter, who previously served as head of the vegetable business unit at the KWS Group, will

assume leadership of Nunhems, its global vegetable seed unit. The appointment is effective September 1, 2026, when he will succeed Maximilian Becker as senior vice president. Becker joined the Executive Committee of BASF Agricultural Solutions on May 1, 2026.

"I am very excited to join BASF's vegetable seed unit and its strong Nunhems brand, which has an excellent reputation among farmers worldwide," said Simon Walter. "Alongside the team, I am committed to our future success, strengthening the portfolio and delivering relevant innovations for farmers and partners globally."

Simon Walter has over seven years of experience in the global seed industry. He joined the KWS Group in 2019, where he

has held various leadership positions. Throughout his career, he has developed extensive expertise in strategy, commercial leadership, and business development in international markets.

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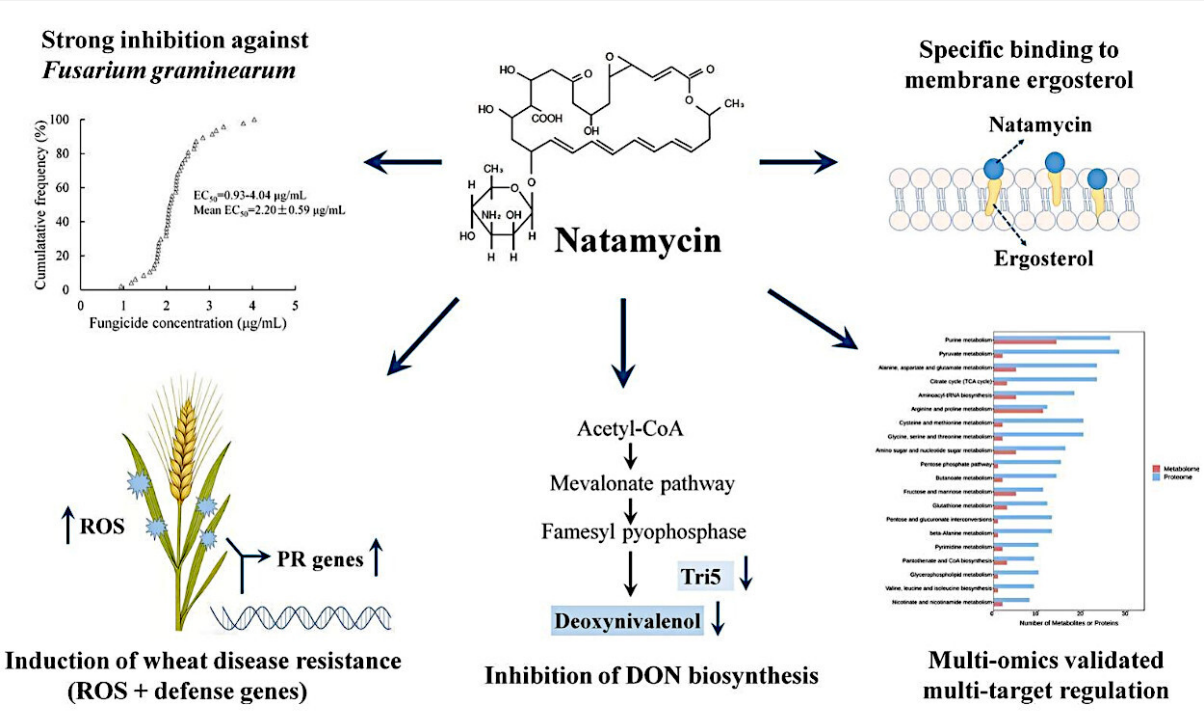
Natamycin inhibits Fusarium graminearum in wheat

Study points to action on ergosterol, reduction of DON and activation of defense responses in plants

30.06.2026 | 13:52 (UTC -3)

Schubert Peter, Cultivar Magazine



DOI 10.1016/j.pestbp.2026.107236

Natamycin exhibited antifungal activity against Fusarium graminearum, the causal

agent of Fusarium head blight in wheat, and reduced the biosynthesis of deoxynivalenol, a mycotoxin known by the acronym DON. The compound also activated defense responses in wheat leaves, inducing reactive oxygen species and resistance-related genes (DOI 10.1016/j.pestbp.2026.107236).

Researchers evaluated 47 isolates of Fusarium graminearum collected from different regions of China. The median effective concentration of natamycin ranged from 0,93 to 4,04 micrograms per milliliter. The average reached 2,20 ± 0,59 micrograms per milliliter. The data indicate an inhibitory effect on mycelial growth and the absence of resistant populations in the analyzed set.

Resistance Association

Natamycin did not show resistance to five fungicides used to control diseases. The study included isolates resistant to azoles, fenamacryl, pydiflumetofen, and pyraclostrobin. The resistant strains maintained sensitivity to the compound. For the scientists, this result indicates a difference between the site of action or the binding mode of natamycin and the mechanisms involved in resistance to the other fungicides.

The researchers also tested mixtures with tebuconazole and metconazole. The combinations showed no synergistic effect against Fusarium graminearum. The results fell within the range classified as an

additive effect by Wadley's method.

Reactive species

In wheat plants, natamycin induced a burst of reactive oxygen species. The effect showed a relationship with dose and exposure time. The treatment also activated defense genes linked to the salicylic acid pathway, such as TaPR1 and TaPR2. The expression of TaSOD, associated with the metabolism of reactive oxygen species, increased after treatment with 100 micrograms per milliliter.

The reduction of DON appears as one of the central results of the study. The researchers treated the PH-1 strain with 0,625, 1,25, and 2,5 micrograms per

milliliter of natamycin. The DON content decreased compared to the control. The difference became significant at a concentration of 2,5 micrograms per milliliter.

Natamycin also reduced the expression of FgTRI5 and FgTRI12. The FgTRI5 gene encodes trichodiene synthase, an enzyme related to the initiation of the DON biosynthesis pathway. The FgTRI12 gene encodes a transporter linked to the maturation and secretion of the toxin. The decrease in the expression of these genes suggests a blockage of the production and transport of compounds associated with the mycotoxin.

Structural changes

The study observed structural changes in toxisomes, cellular structures linked to DON synthesis in Fusarium graminearum. After treatment with natamycin, the toxisomes lost their typical spherical shape. The endoplasmic reticulum also showed alterations. The scientists linked this effect to interference in membrane homeostasis.

The main action of natamycin involved ergosterol. The compound increased the ergosterol content in the mycelium and caused an accumulation of lipid droplets. The researchers interpreted this increase as a compensatory response of the fungus to the binding of natamycin to the ergosterol in the membrane.

Tests with supplementation reinforced this interpretation. The addition of amino acid, nucleotide, and carbon pathway metabolites did not restore mycelial growth under natamycin stress. However, the addition of external ergosterol recovered growth in a dose-dependent pattern. The result confirmed ergosterol as a functional target of the compound.

Changes in metabolism

Metabolomics analyses and activity-based protein profiling indicated broad alterations in the pathogen's metabolism. Natamycin affected amino acid, purine, and sugar pathways, ABC transport, carbon metabolism, and protein processing in the endoplasmic reticulum and proteasome.

The data point to action on the membrane as the primary event, with secondary effects on metabolic and protein networks.

Molecular dynamics simulations showed the insertion of natamycin into the phospholipid bilayer and stable binding to ergosterol. According to the researchers, the set of results provides a scientific basis for studies on the control of Fusarium head blight and the development of agents aimed at reducing mycotoxins in wheat.

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Fungus changes the odor of corn and attracts stink bug parasitoid

Embrapa study indicates potential of Beauveria bassiana in the integrated management of the green stink bug

30.06.2026 | 09:29 (UTC -3)

Schubert Peter, Cultivar Magazine

The association of Beauveria bassiana with maize plants altered the emission of volatile organic compounds and increased the attraction of the egg parasitoid Telenomus podisi, a natural enemy of stink bugs. The effect appeared mainly after foliar application of the fungus and intensified one hundred and twenty hours after inoculation. The study, by researchers from Embrapa, evaluated the interaction between corn, Diceraeus melacanthus, Beauveria bassiana and Telenomus podisi (DOI 10.1007/s10340-026-02057-7).

The results indicate a possible contribution of the fungus to integrated pest management. Colonization by Beauveria bassiana did not reduce the survival of

Diceraeus melacanthus. It also did not alter the fecundity or fertility of the female stink bugs. Even so, it changed chemical signals emitted by the corn and influenced the foraging behavior of the parasitoid.

Fungal colonization

The research tested inoculation via seed and foliar application. Fungal colonization occurred in more than seventy-five percent of the plants treated by foliar spraying. In plants originating from inoculated seeds, colonization also occurred, but with heterogeneous distribution in the plant tissues.

The researchers used the CG1105 strain of Beauveria bassiana. Before the plant

trials, ten strains of the fungus were screened against adult Diceraeus melacanthus. The CG1105 strain caused one of the highest mortalities and generated the highest proportion of mummified insects among the strains evaluated.

In the corn experiment, the plants received the fungus in two ways. In the seed treatment, each seed received two milliliters of a suspension with twenty million conidia per milliliter. In the foliar application, plants at the V3 vegetative stage received three milliliters of the suspension, also with twenty million conidia per milliliter.

Volatile compounds

The study measured volatile compounds emitted by plants over five days. Samples were collected at twenty-four-hour intervals. The study compared untreated plants, plants infested with Diceraeus melacanthus herbivory, plants inoculated with Beauveria bassiana, and plants with inoculation plus herbivory.

In foliar application, the chemical profiles of the corn began to differentiate over time. One hundred and twenty hours after inoculation, plants sprayed with Beauveria bassiana emitted higher levels of methyl salicylate. They also emitted lower levels of (E)-beta-farnesene and (E,E)-alpha-farnesene compared to other treatments.

Bioassays using a Y-shaped olfactometer showed a temporal response of the

parasitoid. Forty-eight hours after inoculation, female Telenomus podisi showed no preference for plants treated only with the fungus, compared to clean air or untreated plants. At this stage, the parasitoid preferred odors from herbivorous plants over odors from plants treated only with the fungus.

The response changed one hundred and twenty hours after inoculation. At that time, female Telenomus podisi preferred volatiles from plants with foliar application of Beauveria bassiana compared to clean air and untreated plants. Plants with foliar application of the fungus and herbivory also attracted the parasitoid compared to the same controls.

Seed treatment

Seed treatment showed a more limited effect on the parasitoid's behavior. Eighteen days after seed inoculation, female Telenomus podisi did not prefer volatiles from seed-treated plants compared to clean air or untreated plants. Plants originating from inoculated seeds and subjected to herbivory attracted the parasitoid more than clean air and untreated plants.

Survival and reproduction

Survival and reproduction data for the stink bug indicate no direct effect of colonization

on Diceraeus melacanthus. Adults fed on plants with foliar application of Beauveria bassiana did not differ from adults maintained on untreated plants. The same occurred in plants originating from inoculated seeds. Egg fecundity and viability also showed no significant difference.

According to the researchers, partial colonization may explain this result. The fungus appeared on several treated plants, but occupied less than twenty percent of the plant segments evaluated. This limited distribution may not be enough to directly affect the stink bug. Still, it could modify corn signaling pathways and alter indirect defenses mediated by volatiles.

The study points to potential compatibility between entomopathogenic fungi and natural enemies in integrated pest management programs. Spraying Beauveria bassiana on corn did not negatively affect the evaluated parameters of Telenomus podisi in the experiment. On the contrary, under certain conditions, it increased the parasitoid's attraction to the plant's chemical signals.

The study was developed by Maria Carolina Blassioli Moraes, Rogério Biaggioni Lopes, Raul Alberto Laumann, Miguel Borges, Clenilson Martins Rodrigues, Mírian Fernandes Furtado Michereff, and Isadora Alexopoulos Quevedo.

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Gene increases citrus resistance to huanglongbing (HLB)

Study indicates degradation of effectors of Candidatus Liberibacter asiaticus by selective autophagy

30.06.2026 | 08:34 (UTC -3)

Schubert Peter, Cultivar Magazine

Symptoms induced in Nicotiana benthamiana plants by inoculation with PVX-FLAG-SDE1 (positive control), PVX-FLAG-SDE1 + PVX-EV (empty PVX vector, negative control), and PVX-FLAG-SDE1 + PVX-FLAG-CsNBR1, 12 days after infiltration (dpi). Scale bar = 2 cm - DOI 10.1111/mpp.70310

Overexpression of the CsNBR1 gene increased the resistance of orange trees to huanglongbing, a disease caused by

Candidatus Liberibacter asiaticus. The result points to a possible molecular target for breeding and genetic engineering programs aimed at controlling HLB in citrus (DOI 10.1111/mpp.70310).

Chinese researchers have presented a defense mechanism based on selective autophagy. The CsNBR1 protein recognized and interacted with four virulence effectors of Candidatus Liberibacter asiaticus: SDE5115, SDE1, SDE19, and SDE5. Following this, it led to the degradation of these proteins via the autophagic pathway.

Scientists evaluated transgenic Wanjincheng orange plants, of the Citrus sinensis species. Lines with CsNBR1 overexpression showed lower bacterial

titers after inoculation with material infected by Candidatus Liberibacter asiaticus. Four months after inoculation, researchers did not detect infection in the overexpression plants. At six months, the bacterial titer increased slightly, but remained below that observed in wild-type plants and in plants with CsNBR1 silencing.

RNA interference

Plants with RNA interference for CsNBR1 showed higher titers of Candidatus Liberibacter asiaticus. Eight months after inoculation, these plants exhibited more intense symptoms associated with HLB, such as leaf yellowing and zinc deficiency. Lines with overexpression showed mild

symptoms.

The study also analyzed the transcriptomic profile of plants with silenced CsNBR1. Comparison with wild-type plants identified 1.324 genes with reduced expression and 965 genes with increased expression. Functional analyses indicated involvement of hormonal signaling pathways and phenylpropanoid biosynthesis. According to the researchers, these data suggest the participation of CsNBR1 in metabolic and defense processes.

The team investigated the interaction between CsNBR1 and bacterial effectors using luciferase complementation assays, bimolecular fluorescence complementation, and coimmunoprecipitation. The results

indicated physical binding between CsNBR1 and the effectors SDE5115, SDE1, SDE19, and SDE5. The interactions occurred through the UBA domain of CsNBR1, associated with the recognition of ubiquitinated proteins.

Reduced accumulation

In assays with Nicotiana benthamiana, the presence of CsNBR1 reduced the accumulation of SDE5115, SDE1, SDE19, and SDE5 proteins. The inhibitor E64d, used at a concentration of 100 micromolar, blocked the degradation of these effectors. However, the proteasome inhibitor MG132, used at a concentration of 50 micromolar, did not alter the stability of the proteins. This result supported the involvement of

the autophagic pathway, not the proteasomal pathway.

Silencing the NbNBR1 homolog in Nicotiana benthamiana increased the levels of all four effectors. This finding reinforced the role of NBR1 in removing these bacterial proteins.

Researchers used SDE1 as a model to evaluate effects on symptoms. Expression of SDE1 by a vector derived from potato virus X caused dwarfism and leaf curling in Nicotiana benthamiana. Co-expression of CsNBR1 reduced SDE1 accumulation and attenuated these symptoms. Plants also showed greater height twelve and eighteen days after inoculation.

Milder symptoms

In another trial, systemic leaves of Nicotiana benthamiana were inoculated with Pseudomonas syringae pv. tomato DC3000. Plants treated with SDE1 and CsNBR1 showed milder symptoms and fewer colonies compared to the SDE1 controls.

The researchers state in the study that CsNBR1 acts as a positive regulator of citrus defense against Candidatus Liberibacter asiaticus. The protein degrades virulence effectors through selective autophagy and reduces the ability of these effectors to suppress immune responses. They also identify CsNBR1 as a molecular target for the development of citrus germplasm with

greater resistance or tolerance to HLB.

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Corteva announces boards of directors for new companies

Vylor will focus on seeds and genetics; the new Corteva will operate in crop protection

29.06.2026 | 18:11 (UTC -3)

Cultivar Magazine

Corteva has announced the projected boards of directors for the two companies resulting from its planned separation. The merger is still scheduled for the fourth

quarter of 2026. One company will operate in advanced seeds and genetics. The other will maintain its focus on crop protection.

The seed and genetics company will be named Vylor Inc. Karen Grimes will lead the board as independent chair. She has been a member of Corteva's board since March 2021. Previously, she served as a partner, senior managing director, and equity portfolio manager at Wellington Management Company LLP. She has also served as a board member of Toll Brothers Inc. since March 2019.

Vylor's board will have seven members at the time of the separation. Corteva has announced an ongoing search for at least one more board member. The composition

includes Karen Grimes, Victor Aguilar, Rajesh Kalathur, Marcos Lutz, Chuck Magro, Johannes J. Oosthuizen, and Kerry Preete. Magro will assume the role of future CEO of Vylor.

According to Corteva, Vylor's innovation engine will be based on germplasm and biotechnology. The company intends to use gene editing and molecular enhancement to strengthen its core business. It is also evaluating expansion into new annual crops and broadening its licensing.

The new Corteva will continue as a publicly traded crop protection company. Greg Page will lead the nine-member board as independent chairman. Luke Kissam will join the board at the time of the

separation. He will also assume the role of future CEO of Corteva.

The anticipated board of the new Corteva includes Greg Page, Klaus Engel, David Everitt, Janet Giesselman, Jean-Marc Gilson, Luke Kissam, Nayaki Nayyar, Christopher Policinski, and Patrick Ward. The company stated its intention to combine innovation in its portfolio and operating model with an efficient, less asset-intensive structure.

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Myrmecochory gains relevance in the face of environmental changes

Study points to risks posed by urbanization, climate, and invasive ants for seed dispersal by ants

29.06.2026 | 16:56 (UTC -3)

Schubert Peter, Cultivar Magazine

Photo: Seongwon Yun - DOI doi.org/10.3390/insects17070677

Seed dispersal by ants may gain importance in conservation strategies for threatened, rare, and endemic plants in temperate regions of East Asia. A scientific review points to the vulnerabilities of this process in the face of urbanization, climate change, and biological invasion by exotic ants (DOI doi.org/10.3390/insects17070677).

Myrmecochory is the dispersal of seeds mediated by ants. The process often depends on the elaiosome, a structure rich in nutrients attached to the seed. The ants collect the diaspore, transport the material to the nest or nearby areas, consume the elaiosome, and discard the seed. This discarding can promote germination, reduce predation, and distance the

seedling from the parent plant.

Three hypotheses

Researchers reviewed three main hypotheses to explain the ecological advantage of myrmecochory. The first involves directed dispersal. In this case, ants carry seeds to locations with better germination conditions, such as soils modified by nest activity. The second involves dispersal by distance, as transportation reduces competition between the parent plant and its offspring. The third involves escaping predators, as ants remove seeds before they are consumed by beetles, rodents, or birds.

The review points to the wide distribution of the phenomenon. Myrmecochory occurs in all major biomes, except Antarctica. Estimates cited in the article indicate more than 11 species of myrmecochorous plants worldwide, distributed across 334 genera and 77 families. The strategy frequently appears in dry formations in Australia and in the South African fynbos, as well as in temperate forests of the Northern Hemisphere.

In South Korea, researchers identified 130 myrmecochorous species, in 32 genera, 21 families, and 14 orders. Violaceae had the highest number of species, with 50. Papaveraceae followed, with 36. The list includes threatened, rare, and endemic species, mainly from the genera Viola and

Corydalis.

Groups of ants

The study also reviewed the ant groups involved. Researchers identified myrmecochorous genera in six subfamilies: Myrmicinae, Formicinae, Dolichoderinae, Ponerinae, Ectatomminae, and Aneuretinae. Myrmicinae, Dolichoderinae, and Formicinae concentrated the largest number of genera associated with seed transport.

Ants do not exhibit morphological adaptations exclusively for myrmecochory. Even so, they differ in their ability to disperse seeds. Larger species with efficient foraging behavior tend to transport

seeds over greater distances. Smaller species may only remove the elaiosome or move seeds over short distances.

Urbanization emerges as a significant threat. Habitat fragmentation, loss of green areas, changes in soil, and the heat island effect can alter ant communities. These changes can disrupt interactions between native plants and native seed dispersers. In some cases, however, dominant ants in urban environments can maintain or even expand the dispersal of certain seeds.

Biological invasions

Biological invasions represent another risk. Exotic ants can replace native dispersers, increase seed predation, or favor invasive

plants. The review cites cases in regions such as Australia and North America, where invasive species disperse seeds of exotic plants and contribute to secondary invasion processes.

Climate change can also affect the process. Warming can alter the distribution and activity of ants. In temperate regions, some species may expand their range. In tropical regions, extreme temperatures can reduce the survival of heat-sensitive ants. The study also highlights the risk of phenological mismatch between seed production by plants and the period of ant activity.

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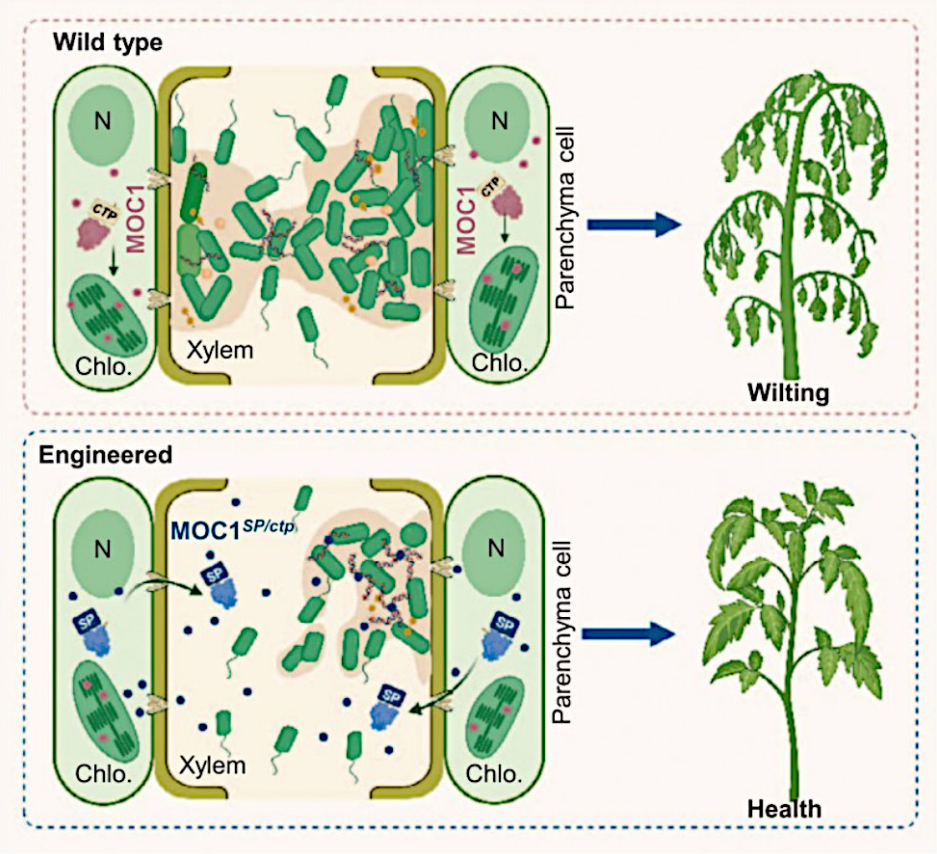
Redesigned enzyme enhances vascular defense in tomatoes and rice

Study repositions MOC1 in the apoplast to dismantle bacterial biofilms in the xylem

29.06.2026 | 08:21 (UTC -3)

Schubert Peter, Cultivar Magazine



DOI 10.1093/hr/uhag046

Chinese researchers have developed a genetic strategy to increase the resistance of tomatoes and rice against bacterial vascular diseases. The work repositioned the plant enzyme MOC1, previously directed to the chloroplast, to the apoplast. With this change, the protein began to act near the biofilms formed by bacteria in the xylem (DOI 10.1093/hr/uhag046).

The proposal addresses a common limitation in the control of vascular pathogens. Bacteria such as Ralstonia solanacearum and Xanthomonas oryzae pv. oryzae invade xylem vessels, advance through the vascular system, and impair water transport. These bacteria form biofilms, structures capable of protecting bacterial cells against plant defenses and

promoting their persistence in tissues.

Chosen target

The target chosen by the researchers received attention because of the role of extracellular DNA, or eDNA, in biofilm stability. This material functions as a structural basis for the bacterial community. The team explored the activity of MOC1, a Holliday junction resolvase conserved in plants, capable of acting on DNA structures. In its natural form, MOC1 migrates to the chloroplast. Therefore, it does not reach bacterial biofilms in the xylem.

To solve this localization problem, the scientists replaced the chloroplast transit

peptide with a secretion signal peptide. In tomato, the team used the secretion signal of the pathogenesis-related protein SlPR1. The modified version of SlMOC1 accumulated in the apoplast. The recombinant SlMOC1 also reduced the eDNA released by Ralstonia solanacearum and disrupted the eDNA network present in the bacterial biofilm.

In Moneymaker tomato plants, transgenic plants with secreted SlMOC1 showed milder symptoms of bacterial wilt after inoculation by waterlogging the soil with the GMI1000 strain of Ralstonia solanacearum. The plants also had a lower disease index and less bacterial movement in the vessels, compared to wild-type plants.

Strength gain

The gain in resistance did not result from widespread activation of plant immunity. The researchers evaluated defense genes in tomatoes and did not observe induction of SlPR1, SlERF2a, and SlEDR1 in plants with secreted SlMOC1. This result indicates an action mainly linked to the physical disruption of the bacterial biofilm.

The team also tested more precise control of expression. To do this, they used the SlERF2b promoter, induced by Ralstonia solanacearum infection, to direct the production of secreted SlMOC1. The plants showed delayed wilting, lower disease incidence fourteen days after inoculation, and less vascular blockage.

Xylem samples from the modified plants showed fewer adherent bacteria and less biofilm formation.

Test on rice

In rice, scientists applied similar logic. The team inserted OsMOC1 with the secretion peptide OsPR1b under the control of the constitutive promoter Ubiquitin 1, into the ZH11 gene pool. After inoculation by leaf cutting, under field conditions, the modified plants showed smaller lesions caused by three strains of Xanthomonas oryzae pv. oryzae: YN11, FuJ23, and PXO99A.

The researchers also developed a synthetic promoter induced by Xanthomonas TALE effectors. The array

brought together effector-binding elements, or EBEs, associated with ten conserved TALEs in Asian strains of Xanthomonas oryzae pv. oryzae. In rice, this system activated OsMOC1 secreted after infection with PXO99A. EBEXoo::OsMOC1SP/ctp plants showed a greater than sixty-five percent reduction in lesion length compared to ZH11.

Scanning electron microscopy reinforced the effect on the biofilm. In wild-type leaves, xylem vessels appeared filled with bacteria surrounded by a thick matrix. In plants with EBEs-induced expression, the vessels contained few bacterial aggregates and a thinner biofilm.

Cost assessment

The study also evaluated potential development costs. In tomato, plants with SlERF2b-induced expression maintained height and fruit weight comparable to wild-type plants. In rice, the modified lines did not show significant differences in relative chlorophyll content, plant height, flag leaf length, number of tillers, panicle development, or seed weight, according to the assays described in the article.

The model proposed by the researchers describes a change in the enzyme's cellular destination. In wild-type plants, MOC1 goes to the chloroplast and does not come into contact with the biofilm in the xylem. In the modified plant, the exchange of the transit peptide for a secretion signal sends MOC1 to the extracellular space. There, the enzyme

disrupts the eDNA network of the biofilm, reduces bacterial colonization, and increases vascular resistance.

Researchers suggest chloroplast-apoplast relocation as a platform for improving resistance to biofilm-dependent vascular diseases. They also point to the future use of CRISPR editing to replace native chloroplast-targeting sequences in the genome itself with secretion signals. This approach could generate edited germplasm without transgenic DNA and with enhanced vascular immunity.

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Wheat aphids challenge genetic resistance

Scientific review points to the role of insect saliva and layered defenses in the development of resistant cultivars

28.06.2026 | 15:39 (UTC -3)

Schubert Peter, Cultivar Magazine

Photo: Douglas Lau / Embrapa

Wheat aphids are among the most destructive pests of the crop and threaten

production in several producing regions. A scientific review indicates advances in understanding the interaction between wheat and aphids. The work highlights salivary proteins of the insects, hormonal defense pathways, physical and chemical barriers, resistance genes, and non-host resistance as central points for the sustainable management of these pests (DOI: 10.3390/insects17070672).

The main species associated with wheat include Sitobion avenae, Rhopalosiphum padi, Schizaphis graminum, Metopolophium dirhodum, and Diuraphis noxia. These insects extract sap from the phloem. They have small bodies, short life cycles, high reproductive capacity, and rapid population growth. Scientists point to the intensive use of chemical insecticides

in current control. This model favors pest resistance, affects beneficial insects, and increases environmental risks.

The review argues that improving resistant cultivars is one of the most economical and sustainable strategies for aphid management. However, the researchers highlight a limitation: resistant germplasm still appears infrequently in available cultivars.

Molecular dispute

The interaction between aphids and wheat involves a molecular contest. During feeding, aphids insert stylets into plant tissues and secrete saliva. This saliva can form a protective sheath or contain

proteins capable of altering the plant's response. Some of these proteins act as elicitors, activating the wheat's defenses. Others act as effectors, suppressing plant immunity and promoting colonization.

The review cites salivary proteins already described in wheat aphids. SmCSP4 activates the salicylic acid-mediated defense pathway. GroES induces defense responses, with hydrogen peroxide accumulation and callose deposition. Other proteins, such as Sm10, SmC002, Sm9723, SaCDK, SaE23, and SaApo AI, appear to be associated with the suppression of defenses or increased plant susceptibility. In Schizaphis graminum, Sg2204 reduces wheat defense. In Rhopalosiphum padi, RP1 suppresses defense responses in barley.

Researchers describe saliva as a central piece in the co-evolution between plant and insect. Resistance does not depend on a single protein. It results from the balance between elicitors, effectors, and plant responses. This point guides new research on salivary effector networks and their molecular targets in wheat.

Hormonal signals

Wheat responds to attack through hormonal signals. Salicylic acid, jasmonic acid, ethylene, abscisic acid, and reactive oxygen species participate in these responses. The review reports increased hydrogen peroxide in leaves attacked by Sitobion avenae and Schizaphis graminum. Salicylic acid appears as a

relevant route against aphids. Jasmonic acid also participates and can stimulate defensive compounds such as DIMBOA.

Physical defenses form another layer. Leaf trichomes, epicuticular waxes, flag leaf characteristics, awn length, and callose deposition influence host selection and feeding. There is a positive correlation between trichome length and density and wheat resistance to aphids. Callose can hinder sap flow in the phloem and reduce feeding.

Chemical defenses include nutrients and secondary metabolites. Soluble proteins, sugars, amino acids, and inorganic salts affect aphid growth and reproduction. Phenolic compounds, flavonoids, benzoxazinoids, and alkaloids also

contribute to resistance. Among the benzoxazinoids, DIMBOA stands out. Higher levels of this compound are associated with greater resistance to Rhopalosiphum padi and Sitobion avenae.

Volatile compounds

Wheat can also release herbivory-induced volatile compounds. These substances affect aphids and natural enemies. The review cites methyl salicylate, (E)-beta-farnesene, linalool, and other volatiles. In some cases, they repel aphids and attract predators or parasitoids.

The genetic basis of resistance still presents a challenge. Genes against Diuraphis noxia, Schizaphis graminum,

and Sitobion avenae have already been identified. The RA-1 gene, derived from durum wheat, is located on chromosome 6AL and confers resistance to Sitobion avenae. The Sa2 gene was identified on chromosome 7D. The review also cites resistance loci to Rhopalosiphum padi on chromosomes 4BL, 5AL, and 5BL. Despite advances, many molecular mechanisms remain without functional characterization.

Non-host resistance

Non-host resistance emerges as a promising source. It involves several barriers and multiple genes. Therefore, it can offer greater durability and a broad spectrum. The review points to similarities between plant-pathogen and plant-aphid

interactions. This logic paves the way for the use of genomics, transcriptomics, proteomics, RNA interference, and gene editing in the development of resistant wheat cultivars.

The researchers conclude that durable resistance will depend on a combination of resistance genes, endogenous defense pathways, and non-host resistance mechanisms. This integration could reduce dependence on insecticides and support wheat production systems with less environmental impact.

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Moericke's traps capture thrips in lettuce in Florida

Study points to a more practical method for monitoring orthotospovirus vector species in lettuce crops

28.06.2026 | 15:18 (UTC -3)

Schubert Peter, Cultivar Magazine

DOI: 10.3390/insects17070676

Researchers at the University of Florida assessed the abundance and species composition of thrips in lettuce crops in South Florida. The study indicated that Moericke traps are more practical for monitoring these insects in the field, as they captured a significant number of individuals and preserved specimens for taxonomic identification (DOI: 10.3390/insects17070676).

The research compared five sampling methods: whole-plant sampling, blue Moericke traps, yellow Moericke traps, blue sticky traps, and yellow sticky traps. The trials took place at an experimental farm of the Everglades Research and Education Center and in commercial lettuce areas in Belle Glade, Florida. The

evaluations spanned two growing cycles, in the fall of 2023 and the spring of 2024.

Thrips vectors

The study focused on the risk associated with thrips that transmit orthotospoviruses. The species Frankliniella occidentalis is a concern for the sector because it transmits the Impatiens necrotic spot virus (INSV). This virus causes losses in lettuce crops in California and appears as a potential threat to lettuce-producing areas in Florida.

The sticky traps captured the largest quantities of thrips over several weeks. However, the glue made it difficult to remove the insects and reduced the quality of the specimens. This limited identification

to the species level. For phytosanitary risk studies, this identification plays a central role, as not all thrips transmit viruses or cause the same level of damage.

Most useful method

Moericke traps ranked second in the number of captures. Even so, researchers considered this method more useful for lettuce surveys. The liquid in the traps kept the insects in suitable condition for later identification. Collection and processing also required less work compared to whole-plant sampling.

Collecting whole plants resulted in the lowest number of thrips. This method, however, allowed for the observation of

species present directly on lettuce plants. On the other hand, it requires removing plants from the field and demands laboratory processing. In commercial areas, this practice represents a loss of product.

The study collected a total of 9.814 thrips. Approximately 3.883 specimens were identified to the genus or species level. The composition varied according to the sampling method. The differences indicate the influence of the method on the portrayal of the thrips community present in the evaluated area.

Most abundant species

The most abundant species was Frankliniella bispinosa, known as the Florida flower thrips. It accounted for 77% of the specimens identified in whole-plant samples. It also dominated most Moericke traps, with a strong presence in experimental and commercial areas.

Researchers highlighted that Frankliniella bispinosa is not currently considered a lettuce pest. However, the high frequency of the species requires attention. The study cites its occurrence in various crops and wild plants in Florida. It also mentions its ability to transmit Tomato spotted wilt virus under laboratory conditions.

Other frequent species included Microcephalothrips abdominalis and Leucothrips piercei. The former

predominated in yellow Moericke traps installed in commercial areas. The latter appeared prominently in whole-plant samples. Researchers observed no visible damage from Leucothrips piercei on lettuce during the study, but recommended monitoring given the detected population.

The survey also confirmed the presence of orthotospovirus vector species. Among them were Frankliniella occidentalis, Frankliniella fusca, and Frankliniella schultzei. These species occurred in low abundance in the evaluated areas. However, the detection reinforces the need for continuous surveillance in lettuce crops in the region.

Difference between traps

The results did not show a consistent difference between blue and yellow traps. In some weeks, blue traps captured more thrips. In others, the differences did not occur or did not persist between areas and cycles. For the researchers, color performance may vary according to species, crop, and environmental conditions.

The study concludes by recommending the use of Moericke traps in lettuce thrips monitoring programs. The method combines the capture of individuals, the preservation of specimens, and operational feasibility. The research also

reinforces the need to monitor vector species and to expand lettuce screening for Impatiens necrotic spot virus and other orthotospoviruses.

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