

July 11, 2026

N ° 87

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Hunter's eyes

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Hunting strategy shapes spiders' eyes

Study shows convergent evolution of frontal eyes in visually-hunting spiders

10.07.2026 | 15:10 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Sam England / Museum fuer naturkunde

Visual hunter spiders have eyes concentrated in the frontal region of their bodies. The pattern appeared convergently

in different lineages and accompanies vision-dependent hunting strategies. This conclusion comes from a study by European researchers, with three-dimensional analysis of the position, orientation, and angles between eyes in 52 spider species.

Far from being just a curiosity of evolutionary biology, unraveling the "super eyes" of these spiders has a direct impact on integrated pest management in soybean, corn, wheat, and cotton crops. In these crops, species from the Lycosidae (wolf spiders) and Salticidae (jumping spiders) families act as voracious predators of severe threats, such as stink bugs, aphids, and the caterpillar complex (including *Spodoptera frugiperda* and *Helicoverpa armigera*).

Knowing that these predators possess a highly specialized "frontal visual hub" for calculating distances and detecting movement in three dimensions explains their enormous efficiency in patrolling and clearing the plant canopy. For farmers, understanding this mechanism reinforces the need to protect these natural allies, transforming the arachnids' keen vision into a free barrier against pests in the field.

How the study was conducted

Returning to the scientists' work (DOI 10.1016/j.cub.2026.06.019), representatives of major families were evaluated. The researchers used three-

dimensional geometric morphometrics and evolutionary modeling. The team measured the eye configuration in species with different prey capture modes. The study compared visual hunters, web-hunting hunters, and species grouped in other hunting strategies.

In the group of active visual hunters (frontal strategy), genera from the families Lycosidae, Oxyopidae, and Salticidae were analyzed. In the group of orb web weavers (wide visual field strategy), genera from the families Tetragnathidae and Araneidae were analyzed. In the group of nocturnal foliage and ambush hunters, genera from the families Cheiracanthiidae, Philodromidae, and Thomisidae were analyzed. These families

exist and are also important in Brazil.

Hunting ecology

The results indicate an association between hunting ecology and visual architecture. Visual hunting spiders differed from web-hunting spiders and other species. They exhibited greater morphological disparity in eye configurations. They also showed higher evolutionary rates for these arrangements compared to web-hunting spiders.

The study shows anterior concentration of several pairs of eyes in visual hunters. The anterior median eyes, the anterior lateral eyes, and, in many cases, the posterior median eyes converged toward the front of

the carapace. This arrangement suggests repeated sampling of the frontal visual field by different pairs of eyes.

According to the researchers, this organization may favor the detection and capture of prey. The overlap between visual fields of pairs of eyes may increase sensitivity, redundancy, and depth perception. The team also recorded greater angular separation between the anterior and posterior lateral eyes in visual hunters. This pattern suggests compensation for coverage of the rest of the visual field.

Other species

The web-wielding hunters and other species did not exhibit such a defined morphological signature. In these groups, the lens axes appeared more uniformly distributed among the four pairs of eyes. This organization may expand the total coverage of the visual field. The study points to a possible relationship with wide-field tasks, such as predator detection and directional phototaxis.

Evolutionary analysis indicated an ancestor with small primary eyes, flanked by triads of secondary eyes. The pattern resembles the condition observed in spiders of basal lineages. In orb-weaver spiders, the study identified lateral displacement of the posterior lateral eyes, forming a halo configuration. In derived lineages, the team detected greater frontal

grouping of the eyes.

The study also assessed modularity in the visual system. The results support semi-independent evolution of the eye pairs.

The hypothesis with the most support separated medial and lateral modules.

This result differs from the expectation based solely on the developmental origin of the primary and secondary eyes.

Evolutionary rates

Evolutionary rates also varied between pairs of eyes. Anterior median eyes evolved more slowly. Posterior median eyes showed greater lability. Researchers treat this result with caution, as more data is needed between species and within

each species.

The research used specimens preserved in ethanol, held in collections at the Museum für Naturkunde Berlin and the Oxford University Museum of Natural History. The team prioritized females to reduce the effects of sexual dimorphism. The images came from micro-computed tomography, with synchrotron and laboratory data.

Each lens received 13 markers: 11 semi-marks on the perimeter and two fixed points at the center of the inner and outer surfaces. This design allowed them to capture the shape, position, and primary axis of the lenses. The team also calculated the smallest angles between the axes of adjacent eyes.

Researchers conclude that ecological pressures shaped the visual architecture of spiders. In visual hunters, evolution favored repeated frontal arrangements across different lineages. The study indicates that the modularity of the visual system allowed for specialization of individual eyes as well as changes in the overall organization of the eyes.

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Sumitomo Chemical applies for registration of new fungicide in Brazil

Bifemetstrobilin acts as a QoI (Quality Inhibitor) and has shown efficacy against resistant strains, including soybean rust

09.07.2026 | 08:54 (UTC -3)

Cultivar Magazine, based on information from Sumitomo Chemical



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Sumitomo Chemical reported that it has submitted registration applications for [bifemetstrobilin \(bifemetstrobilin\)](#), a new

active fungicidal ingredient to regulatory authorities in Japan, the United States, and Brazil. The company anticipates launching products containing the molecule starting in 2030, pending approval from the relevant agencies.

Bifemethstrobil is the result of research by Sumitomo Chemical. The molecule belongs to the group of quinone external inhibitors, known as Qols. Its mode of action inhibits the energy production process in pathogenic fungi.

Internal and external evaluations conducted to date have confirmed the high efficacy of bifemstrobil against strains resistant to available Qols. Among the targets, the company cites Asian soybean rust.

According to Sumitomo Chemical, the new molecule could serve as a tool in managing fungicide resistance. The company also hopes to contribute to crop protection and the productive security of farmers.

Following orders in Japan, the United States, and Brazil, the company plans to move forward with the development of products containing bimethstrobilin in other countries.

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Agricultural Market - 10.Jul.2026

Improved forecasts in the United States reduce the climate premium

10.07.2026 | 10:17 (UTC -3)

Vlamir Brandalizze - @brandalizzeconsulting



The resumption of attacks between the United States and Iran drove up oil prices and increased volatility in agricultural

markets. The rise in oil prices heightened concerns about production costs. Fertilizer and maritime freight costs gained support. This scenario favored barter transactions for inputs carried out during the appreciation of soybeans.

At the same time, weather forecasts improved for the U.S. Midwest. The reduction in predicted heat removed some of the Chicago weather premium.

Soybeans traded above \$12 per bushel at their peak during the week. Afterward, most contracts returned to levels below \$12.

North American crops are progressing at a faster pace than historically. About 40% of the soybeans have reached flowering, compared to an average of 33%. Pod

formation is close to 15%, compared to an average of 10%.

Chinese purchases in the United States provided support to the market. The weekly volume reached at least 600 tons. Some estimates pointed to purchases between 750 and 800 tons.

In Brazil, the commercialization of the current soybean crop has reached 71,5%. The rate was 72% last year and 72,5% on average historically. Producers still hold approximately 51,3 million tons unsold. In the previous cycle, this volume totaled 48 million tons.

Advance sales for the next harvest reached 23,5%. This percentage remains below the 27% recorded last year and the average of 28%. Business picked up pace

during the week, with more than two million tons traded.

Export premiums remained firm.

Indications ranged from 85 points for immediate delivery to 115 points for September and October. The over-the-counter market also reached some of its best levels of the year.

Corn situation

In the corn market, improved weather forecasts also put pressure on Chicago. More than 20% of US crops have entered the flowering stage. The estimate reaches about 22%, compared to an average of 18%. Ear formation reached 7%, compared to an average of 4%.

In Brazil, the harvest of the second corn crop has reached nearly 35% of the area. Mato Grosso leads the work, with approximately 55%. Paraná and Goiás have surpassed 15%, while Mato Grosso do Sul has exceeded 12%. All states are experiencing delays.

The progress of the harvest should increase supply in the coming weeks. Producers are prioritizing the delivery of contracts. Selling pressure on new deals remains limited. Brazilian shipments are beginning to pick up pace.

Sorghum situation

The national sorghum harvest is performing well. Production could reach

eight million tons and set a new record. Harvesting is progressing in Goiás, Minas Gerais, and Bahia.

In the United States, sorghum planting has entered its final phase. Kansas, the main producing state, has less than 2% of the area remaining to be planted. Panicle formation is approaching 30%, compared to an average of 27%.

The quality of U.S. crops is causing concern in the market. Only 50% of the areas received a good or excellent rating. The index reached 52% the previous week and 67% last year. Projections indicate production of less than nine million tons, compared to 11,1 million tons last season.

Wheat situation

Wheat prices remain firm in Chicago amid production problems in Europe and Eastern Europe. Contracts are trading above six dollars per bushel. Positions for 2027 exceed six dollars and fifty cents.

Brazilian planting is nearing completion. Some late-planting areas in Rio Grande do Sul are still receiving seeds. The estimated area is around two million hectares or less. In the previous cycle, the crop occupied approximately two and a half million hectares.

Rice situation

Rice showed a slight recovery in the domestic market. A reduction in planted area in the next cycle appears to be a trend among producers, especially in Rio Grande do Sul. The size of the crop cut remains undefined.

Prices rose between one and two reais per sack in some regions. The western border region of Rio Grande do Sul registered an improvement of close to one real. Lower supply pressure favored the adjustment, with a greater presence of buyers.

Bean situation

In the bean market, prices halted their downward trend in several areas. The best quality carioca beans range between 390

and 415 reais per sack. Some regions registered increases of between three and five reais.

Commercial carioca beans are priced between 330 and 350 reais per sack. Batches with defects caused by rain or frost remain more than 100 reais cheaper than the best quality products.

Black bean prices remain low. Prices range between 190 and 210 reais per sack. The market is awaiting restocking by retailers and the resumption of purchases by packers.

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Gene editing increases soybean yield at high density

Mutation in four genes increased seed weight, productivity, and protein content

10.07.2026 | 08:08 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Roberto Kazuhiko Zito / Embrapa

Chinese researchers have increased soybean yields under high-density planting by simultaneously editing four genes. The CRISPR/Cas9 technique deactivated the GmCRCK1a, GmCRCK1b, GmCRCK1c, and GmCRCK1d genes. The mutant lines produced larger seeds and recorded productivity gains between 12% and 29% compared to the Dongnong50 cultivar (DOI 10.1111/pbi.70713).

The trials took place in Daqing in 2024 and Heihe in 2025. The study evaluated different plant populations. Increased density reduced the number of pods and seeds per plant in all materials. The mutants, however, maintained a higher weight of one hundred seeds. This result increased production per plant and per plot.

In Daqing, plot yields increased between 12% and 16%. In Heihe, the increase ranged from 15% to 29%. Researchers attributed the performance to the greater weight of the seeds. The number of pods and grains per plant did not show a significant difference compared to the control.

The editing also increased the length, width, and thickness of the seeds. The lines showed a higher total amino acid and protein content. The oil content did not undergo significant changes in most materials. One line showed a reduction in the total fatty acid and linoleic acid content.

Phosphoproteomic analysis identified 1.163 proteins with differential phosphorylation. These proteins participated in pathways linked to nitrogen,

carbon, and fatty acid metabolism. The results indicate potential for incorporating the four genes into breeding programs focused on high-yield, high-protein, and high-density soybean crops.

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Bayer raises 3 billion euros with investment from Apollo

The management company will have a minority stake in the long-acting contraceptive business

10.07.2026 | 07:52 (UTC -3)

Cultivar Magazine, based on information from Christian Hartel



Bayer has reached an agreement with global asset manager Apollo to receive €3

billion in equity. The transaction aims to strengthen the group's capital structure and increase its financial flexibility.

Funds and affiliates managed by Apollo will acquire a minority, non-controlling stake in a new company. The entity will bring together Bayer's long-acting reversible contraceptive business, known by the acronym LARC.

Bayer will retain a majority stake and full operational control. The investment will not cause any changes to the business strategy or activities. The operation will remain linked to the pharmaceutical division and will continue to be consolidated in the group's financial statements.

According to Bayer's CFO, Judith Hartmann, the transaction offers a financing solution capable of preserving control over a core area of ??the pharmaceutical division. The funds will also support the management of increased liquidity needs in 2026, related to maturing bonds and legal proceedings.

The transaction is expected to close in the third quarter of 2026. Closing is subject to approval by antitrust authorities and the fulfillment of customary closing conditions.

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Sumitomo Biorational has a new president for AgroSolutions

Remy Lyczko will now head the company's biorational and botanical technologies division

09.07.2026 | 16:09 (UTC -3)

Cultivar Magazine, based on information from Steve Tatum



A Sumitomo Biorational, [Sumitomo Chemical Global Center of Excellence in Biorational Innovation](#), announced today (July 9th) the appointment of Remy Lyczko

(pictured) as president of its AgroSolutions Division (ASD). The executive officially assumed the position on July 1st and will lead the area responsible for the development of biorational and botanical technologies for agriculture.

According to the company, Lyczko's priority will be to expand the offering of solutions that contribute to modern agricultural practices, such as regenerative agriculture, in addition to meeting the demands of producers in different markets.

With over 20 years of experience in the global agrochemical and biorational products industry, the executive has a track record of launching crop technologies, developing commercial partnerships, and expanding business in

North America, Europe, the Middle East, and Africa.

Lyczko joined the Sumitomo Chemical Group in 2014 and has held various leadership positions. Most recently, he served as Vice President of Commercial Operations for Sumitomo Biorational Company. Prior to that, he was Commercial Director for the EMEA region and Director of Sustainable Solutions Business for the same region at Sumitomo Chemical Agro Europe, as well as Country Manager for Philagro France.

“Remy’s vast experience, strategic vision, and collaborative leadership style make him the ideal person to lead our AgroSolutions Division,” said Tadashi Katayama, CEO of Sumitomo Chemical

and President of the Agro & Life Solutions Sector.

According to Katayama, throughout his career, Lyczko has demonstrated the ability to build high-performing teams, strengthen customer relationships, and drive sustainable growth. "We expect his leadership to further strengthen our portfolio of biorational innovations for agriculture on a global scale," he concluded.

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Roots avoid areas of rot due to pH gradients

Study describes saprotropism and shows root response to decaying plant matter

09.07.2026 | 15:51 (UTC -3)

Schubert Peter, Cultivar Magazine

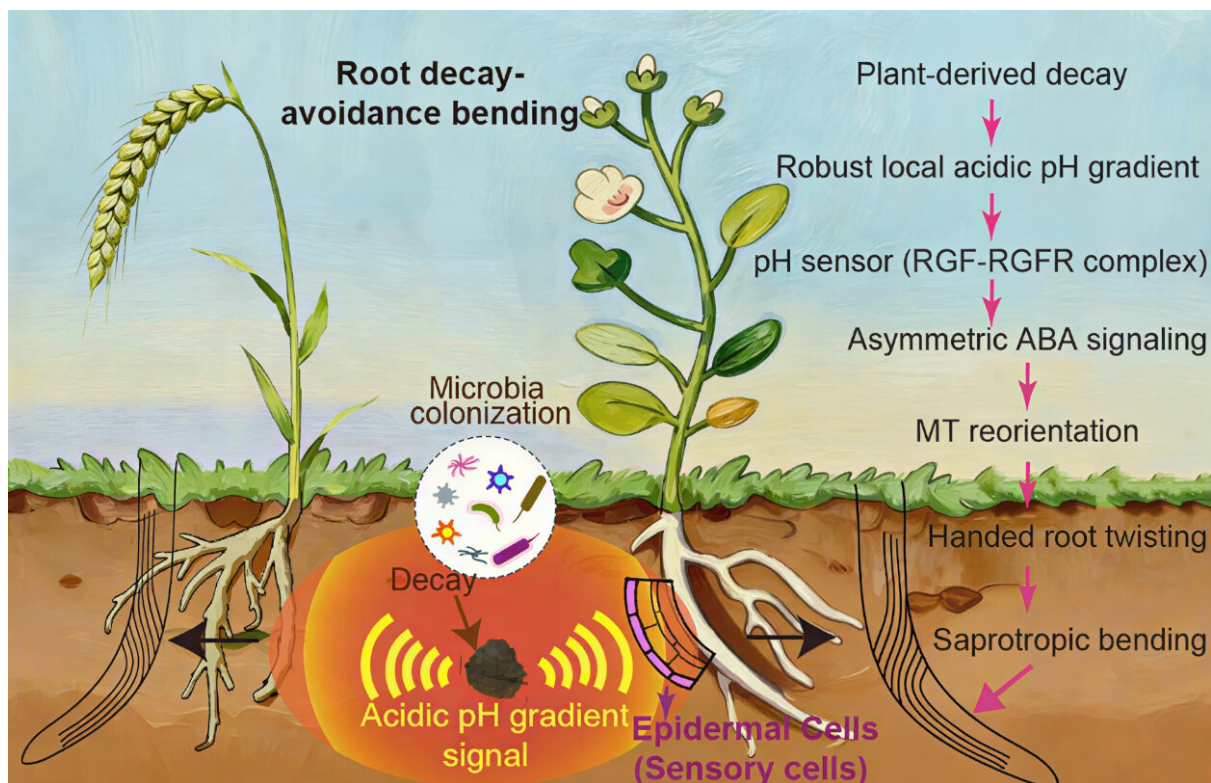


Image: Bao et al. / Science - DOI 10.1126/science.adw6568

Plant roots detect local pH gradients around decaying plant matter and redirect their growth to avoid zones with potentially harmful microorganisms. This mechanism

is called saprotropism and expands the set of tropisms used by plants to guide growth in the soil (DOI 10.1126/science.adw6568).

The study identified the response in *Arabidopsis thaliana* and in crops such as canola, tomato, and wheat. The roots avoided decaying plant tissues, such as apples, leaves, and sawdust. The same reaction did not occur in the presence of decaying animal matter, such as chicken meat.

Researchers have shown that direct contact with decaying plant tissue inhibited root growth and activated defense pathways linked to immunity and pathogens. In tests with roots near, but without contact with, the source of

decomposition, consistent curvature away from the decay zone occurred.

Acid metabolites

Fungal-mediated decomposition released acidic metabolites, including organic and phenolic acids. These compounds diffused into the soil and formed stable acid gradients. Roots used this acidity pattern as a directional signal before physical contact.

Epidermal root cells perceived the acidic microenvironment through the RGF-RGFR peptide-receptor module. This sensor converted pH asymmetry into an asymmetric distribution of abscisic acid, known as ABA. Hormonal asymmetry

reorganized microtubules and altered cell expansion, leading to root curvature away from decay.

The acid signal lost strength when the plant material was almost completely decomposed. At that point, the roots stopped deviating.

According to the researchers, the discovery could guide studies on crop residue management, root diseases, and crop resilience. Excessive incorporation of undecomposed residues can create decomposition zones that are too large for root navigation and increase exposure to harmful microorganisms.

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SLC Agrícola acquires 8,9 hectares in Mato Grosso.

The R\$669 million operation includes infrastructure and areas already integrated into the company's operations

09.07.2026 | 15:08 (UTC -3)

Gabriel Queiroz, Cultivar Magazine editor



SLC Agrícola has entered into an agreement with Grupo Radar, through its subsidiaries, for the acquisition of a portion

of its rural property portfolio known as Bloco Mato Grosso, continuing the process initiated after the company exercised its right of first refusal in June. The Bloco comprises approximately 41,2 hectares of physical land, equivalent to about 28 hectares of arable land.

Following the simultaneous exercise of the right of first refusal by other tenants of the areas, the parties conducted a negotiation process that resulted in a consensual solution for the division of the portfolio among the purchasers involved. Under the terms of the agreement, SLC Agrícola will acquire 8,9 hectares of arable land, including the infrastructure installed on the property, such as silos, a cotton processing unit (cotton gin), and other operational improvements.

The total value of the transaction is R\$ 669,0 million, of which R\$ 255,2 million will be paid upon signing the agreement, via deposit into an escrow account, while the remaining balance of R\$ 413,9 million will be paid by October 30, 2026. Excluding the infrastructure incorporated into the operation, valued at approximately R\$ 29,7 million, the value of the bare arable land totals R\$ 639,3 million, equivalent to approximately R\$ 72 per arable hectare.

For Ivo Brum (pictured), CFO and Investor Relations Director of SLC Agrícola, the operation reinforces the company's disciplined capital allocation strategy. "The operation is aligned with SLC Agrícola's strategy of growth with financial discipline and a focus on long-term value creation. It

involves the acquisition of an area that is already part of our operation, with known productive characteristics and installed infrastructure, factors that contribute to operational efficiency and predictability of execution," says Brum.

Next Steps

The completion of the transaction is conditional upon the fulfillment of the precedent conditions set forth in the definitive documents, including, where applicable, the approval of the Administrative Council for Economic Defense (Cade).

According to the company, agricultural activities are already being carried out in

the areas through lease agreements. Currently, SLC operates 17,6 hectares with soybeans, corn, and cotton in a crop rotation and second-crop system. With the acquisition, the company will own 8,9 hectares, while another 8,7 hectares will remain under lease, ensuring the continuity of agricultural operations in the region.

The acquisition aligns with the company's strategy of strengthening its operational base in regions where it already operates, while preserving productive efficiency, agronomic knowledge, and operational scale.

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Review warns of global spread of *Spodoptera frugiperda*

Study gathers data on bioecology, genetics, and pest control impacting more than 350 plants

09.07.2026 | 10:34 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: John C French Sr - University Auburn - Bugwood

The fall armyworm, *Spodoptera frugiperda*, has established itself as one of the main global threats to food security. This pest, native to the Americas, has invaded areas of Africa, Asia, and Oceania. It has also recorded initial incursions into Europe. Its ability to attack more than 350 plant species increases the risk to food crops, fiber crops, and agricultural systems in tropical and subtropical regions.

A review authored by 19 scientists from various countries compiled data on the bioecology, genetics, and control strategies of the species (DOI [10.1127/entomologia/4342](https://doi.org/10.1127/entomologia/4342)). The study points to productivity losses close to 70% in some regions. It also cites annual economic losses exceeding 13 billion

dollars in more than 42 countries. In corn, damage can affect leaves, tender stalks, silks, and ears. The larvae feed mainly at night.

Invasion routes

The pest exhibits high migratory potential, broad ecological plasticity, and a large reproductive capacity. These factors favor the invasion of new areas. Favorable climatic conditions and global trade also contribute to its dispersal. The review reports disagreement about the exact routes of invasion. One hypothesis indicates an origin in North America, probably the Caribbean, with entry into West Africa and subsequent advance to sub-Saharan Africa, India, China, and

Southeast Asia. Another genomic study points to multiple independent introductions in Asia.

Europe has not yet recorded any establishment of the pest. However, the risk is growing with migration from North Africa, the flow of goods and people, and climate warming. The review estimates annual losses of up to 900 million euros in maize alone, should *Spodoptera frugiperda* become established on the European continent.

Sympatric lineages

The insect has two sympatric lineages, morphologically identical. One lineage shows a preference for corn and sorghum.

The other is associated with rice, forage grasses, pastures, alfalfa, and millet. Genetic markers in the Triosephosphate isomerase gene and the mitochondrial Cytochrome oxidase I gene help in the differentiation. The review also reports hybrids between lineages in field populations, with an average frequency of approximately 9% in hosts from the corn group and 10% in hosts from the rice group.

The wide range of hosts includes plants from the Poaceae, Asteraceae, and Fabaceae families. Corn, rice, and sorghum are among the main hosts. The pest also damages wheat, barley, soybeans, cotton, onions, potatoes, and sugarcane. In the invaded area,

researchers project negative impacts on economically valuable tree species, such as incense trees, rubber trees, and coconut palms.

Caterpillar adaptation

The caterpillar's adaptation involves detoxification mechanisms. *Spodoptera frugiperda* uses enzymes such as cytochrome P450, carboxylesterases, UDP-glycosyltransferases, glutathione S-transferases, and ABC transporters. These systems help the insect neutralize secondary plant metabolites and synthetic insecticides. The review cites 244 cases of insecticide resistance up to June 2025, involving 47 active ingredients, including

organophosphates, pyrethroids, diamides, and growth regulators.

Handling microorganisms

The management of microorganisms is highlighted in the study.

Entomopathogenic fungi such as *Beauveria bassiana* and *Metarhizium anisopliae* show potential against eggs and larvae. Isolates of *Metarhizium anisopliae* achieved mortality rates exceeding 93% in tests with eggs and larvae. However, field efficacy depends on temperature, humidity, and ultraviolet radiation. The review advocates for more stable formulations and the selection of local

isolates.

Endophytic fungi also appear as an alternative. Applications in corn, through foliar spraying, seed inoculation, or soil drench, can promote internal colonization of plants and reduce larval performance. In one cited study, *Beauveria bassiana* and *Metarhizium anisopliae* applied to the soil caused up to 87% larval mortality in corn. Widespread adoption still faces limitations, such as uneven colonization and lower effectiveness under field conditions.

Products based on *Bacillus thuringiensis* are also part of control strategies. The review reports toxicity of several strains against larvae in the laboratory. In the field, control may fail because the caterpillars lodge in the whorl and

reproductive structures of the corn. Transgenic Bt plants offer another management approach, with proteins such as Cry1F, Cry2Ab, Vip3Aa, and Cry1A.105. Practical resistance to Cry1F has already been documented in populations in the Americas.

Biological agents and insecticides

The combination of biological agents and insecticides can increase efficiency. The association of *Beauveria bassiana* Bb88 with spinosad increased larval mortality by 34% compared to spinosad alone. The combination of *Beauveria bassiana* GHA with emamectin benzoate resulted in

92,6% larval mortality, compared to up to 70% with the insecticide alone.

Compatibility depends on dose, application time, formulation, and the physiology of the agents involved.

The review also points to emerging tools such as RNA interference, CRISPR-Cas9 gene editing, and manipulation of microbial symbionts. RNA interference faces challenges in oral delivery, midgut degradation, and low field stability.

Nanocarriers and polymers have shown potential in laboratory studies. Gene editing can aid in the functional assessment of genes linked to metabolism, development, detoxification, and chemical signaling.

Integrated management

Integrated pest management emerges as a central axis. The review cites crop rotation, intercropping with aromatic plants, early planting, conservation of natural enemies, parasitoids, pheromone traps, and the judicious use of insecticides and biopesticides. The study highlights the need for rotating modes of action to reduce the selection of resistance. It also points out economic differences between integrated pest management programs in countries such as India and Burkina Faso.

Climate change may alter the distribution of the pest. Models indicate its spread to new regions, including Southern and Eastern Europe, Central Asia, and higher altitude areas in East Africa and the

Andes. Higher temperatures accelerate development and reduce the time required to complete thermal units. Changes in rainfall may increase the availability of hosts or interrupt the insect's life cycle in situations of excess water.

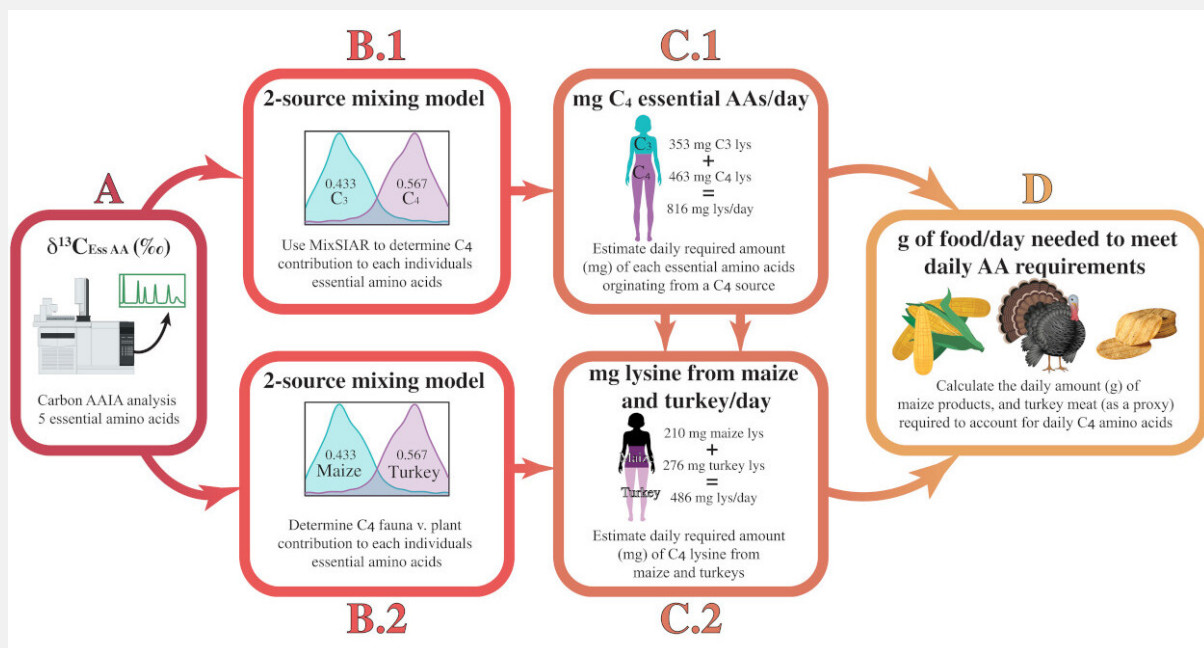
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Study indicates ancient use of corn in animal feed

Isotopes in human bones from Belize suggest consumption of animals fed with corn 6.100 years ago

09.07.2026 | 08:31 (UTC -3)

Schubert Peter, Cultivar Magazine



DOI 10.1126/sciadv.aec3522

Ancient communities in southern Belize incorporated protein from animals fed with maize into their diet around 6.100 years

before present. This conclusion comes from isotopic analysis of amino acids in directly dated human remains. The study indicates a dietary strategy to compensate for the nutritional limitations of maize, especially its low lysine concentration (DOI 10.1126/sciadv.aec3522).

Scientists analyzed 39 human individuals from archaeological sites in southern Belize. The samples cover the period between 6.100 and 1.100 years before present. The study also evaluated modern plants and modern turkeys fed on corn.

Corn has a high energy value. However, it has a low protein content and is deficient in lysine. Lysine is one of the essential amino acids. Humans need to obtain it through their diet. To give an idea of ??the

nutritional challenge, scientists calculate that a 68 kg adult would need to devour more than 6 kg of dried corn daily to meet their lysine needs, a humanly impossible goal that forced our ancestors to seek a creative solution: meat.

C4 sources in protein

The models indicated an increase in the share of C4 sources in human protein over time. Between 6.100 and 3.000 years before present, individuals obtained an average of 22,8% of their protein from C4 sources. After 3.000 years before present, this percentage reached 79,6%.

The results point to regular animal consumption linked to corn. Researchers

used modern turkeys as a reference for omnivorous or herbivorous animals fed with corn. The study suggests trophic transfer of lysine derived from corn. In this process, animals consumed corn. Then, humans assimilated the lysine by consuming these animals.

The hypothesis does not depend on formal domestication. The work mentions the handling, direct provision, or use of animals near cultivated areas. The evidence predates the first direct records of domesticated animals in regional zooarchaeological assemblages by approximately 4.000 years.

Scientists argue that maize likely did not replace diverse food systems based on C3 resources. It entered into combination with plants, wildlife, and management

practices. This combination may have supported the expansion of maize cultivation in Mesoamerica.

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Training keeps pace with technological advancements in the field

Operator training promotes the use of more efficient machines and reduces operational errors

08.07.2026 | 13:42 (UTC -3)

Larissa Souza dos Santos



The technological evolution of agricultural machinery has increased the need for

professional qualification in agribusiness. Precision agriculture, digital systems, and connected equipment require operators and technicians who are increasingly prepared to leverage the potential of available technologies and ensure greater operational efficiency.

In addition to contributing to productivity gains, training helps reduce operational errors, optimize resource use, and increase safety in the workplace. Technical knowledge also allows professionals to make more precise adjustments to equipment and quickly identify potential problems, preventing interruptions during critical harvest activities.

For Vitor Kaminski, technical training manager at AGCO, a global leader in

agricultural machinery and precision agriculture technologies, qualification has become a decisive factor in transforming innovation into practical results in the field. "The evolution of machinery has brought new possibilities for producers, but it has also increased the need for training. Professionals who know the available resources can make more precise adjustments, use equipment better, and achieve greater efficiency in operations," he states.

The benefits of training can be seen throughout the entire production process. In planting, proper machine adjustments promote a more uniform distribution of seeds and inputs. In spraying and harvesting, the correct use of onboard technologies contributes to more precise

and efficient operations.

Qualification also directly influences the proper functioning of equipment. Trained professionals can identify signs of wear, perform preventive inspections, and correctly follow maintenance procedures, reducing the risk of unscheduled downtime.

Safety is another important benefit.

Mastering operational procedures and machine usage recommendations helps minimize risks and make activities safer for operators and field teams. "Safety begins with preparing people. When the operator knows the machine and understands how to use its features correctly, they work with more confidence and reduce the possibility of incidents during operation," Kaminski

points out.

The demand for skilled workers is keeping pace with the advancement of digitalization in agriculture. Beyond mechanical knowledge, professionals in the field increasingly need to interpret data, use digital tools, and understand the electronic systems embedded in machinery.

This trend has led manufacturers and dealerships to increase investments in training and technical development. At AGCO, which serves producers through leading brands such as Fendt, Massey Ferguson, PTx, and Valtra, training programs aim to prepare professionals to keep pace with the technological evolution of the sector and contribute to more efficient, productive, and safe operations.

As new solutions arrive in the field, the combination of technology and knowledge tends to gain even more relevance for the competitiveness of agribusiness, reinforcing the role of training as one of the pillars of modern agriculture.

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Ourofino Agrociência appoints Ricardo Eguchi as new CFO

Executive assumes financial leadership with a focus on governance, innovation, and operational efficiency

08.07.2026 | 13:35 (UTC -3)

Fernanda Chiossi



Ourofino Agrociência announced the arrival of Ricardo Eguchi (pictured) as its new Chief Financial Officer (CFO). The

executive will work alongside the company's Executive Board with the mission of strengthening financial management, expanding the integration between strategy and operations, and supporting the company's next growth cycle.

This move reinforces Ourofino Agrociência's current momentum, as the company invests in expanding its business and launching innovative products for Brazilian agribusiness. Eguchi will be responsible for leading the areas of Order to Cash, Planning, Technology and Innovation, Administration and Finance, Tax and Controlling.

With over 20 years of experience as a CFO, Eguchi has built a career marked by

transforming financial management in companies across various sectors and developing innovative solutions for agribusiness. Throughout his career, he has led initiatives focused on creating financial services, including Barter – a negotiation method that allows the exchange of inputs for part of agricultural production – strategic partnerships, and AI-based evaluation tools, always with a focus on driving sustainable results.

"The arrival of Eguchi represents an important step in our strategy to further strengthen corporate governance and prepare the company for the challenges and opportunities of the market. His expertise will contribute to accelerating our plans for sustainable expansion," says Alessandro Flamini, CEO of the company

since June 1, 2026.

For Eguchi, taking on this new challenge at Ourofino Agrociência represents an opportunity to contribute to a company recognized for its broad product portfolio and field expertise. "It is a pleasure to join an organization whose purpose is to develop reimagined solutions for Brazilian agriculture. My goal is to expand Ourofino Agrociência's capacity to connect technology, financial planning, and innovation to face an increasingly competitive and dynamic environment in agribusiness," he concludes.

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Bacteria reduces Fusarium wilt in banana plants

Streptomyces angustmyceticus GD7-29 inhibited Foc TR4 in the laboratory and reduced symptoms in blood vessels

08.07.2026 | 10:37 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Thirunarayanan Perumal / Banaras Hindu University - Bugwood

Researchers have identified the GD7-29 strain of *Streptomyces angustmyceticus* as a candidate for biocontrol of Fusarium wilt of banana caused by *Fusarium oxysporum* f. sp. cubense tropical race 4, known as Foc TR4. The bacterium inhibited 70,1% of the pathogen's mycelial growth in an in vitro assay. In an experiment with potted plants, it achieved 50,8% control efficiency (DOI 10.1016/j.pestbp.2026.107249).

The study points to the strain as a promising agent for sustainable disease management. Fusarium wilt of bananas limits global crop production. Foc TR4 causes leaf yellowing, vascular wilt, and plant death. Control is difficult due to the fungus's persistence in the soil and in infected tissues. The work also highlights the lack of effective chemical control and

the limited availability of resistant cultivars.

The GD7-29 strain came from the rhizosphere of healthy banana plants of the Brazilian cultivar, from the Cavendish group, in Huizhou, Guangdong province, China. Researchers isolated 114 bacteria. Seven showed antagonistic activity against Foc TR4. GD7-29 exhibited the strongest antifungal effect.

Bacterial identification

The identification of the bacterium combined morphological observations, physiological and biochemical tests, and molecular analyses. The data placed the strain within *Streptomyces angustmyceticus*. According to the study,

this constitutes the first report of the use of this species against Foc TR4.

In pot trials, plants inoculated only with Foc TR4 showed typical symptoms, such as yellowing of leaves and darkening of the corm. The incidence of the disease reached 93,3% in the control group with the pathogen. In the group treated with GD7-29, it dropped to 61,1%. The disease index decreased from 79,7 to 39,2.

Plant growth

The strain also promoted plant growth. Compared to the uninoculated control, the treatment increased fresh mass by 23,3%, plant height by 14,2%, corm diameter by 15,2%, and relative chlorophyll content by

6,5%. The bacteria solubilized potassium and inorganic phosphate. It also produced protease and siderophores. It did not exhibit lignin degradation capacity.

The supernatant from the GD7-29 culture also showed antifungal activity. At tested concentrations of 5%, 10%, and 20%, the supernatant reduced the mycelial growth of Foc TR4. At a concentration of 20%, the inhibition reached 70,8%. The supernatant also delayed and reduced the germination of conidia of the pathogen.

Metabolomics analysis

Metabolomic analysis identified 1.409 metabolites with differential abundance. Among these, researchers selected 48

compounds with antifungal, antibacterial, or growth-promoting activity, based on literature records. These compounds included antibiotics, flavonoids, polyketides, terpenoids, alkaloids, non-ribosomal peptides, and sulfonamides.

The GD7-29 genome presented a linear chromosome with 7.810.685 base pairs and a guanine and cytosine content of 72,43%. Annotation indicated 6.729 predicted coding regions. The analysis also identified 33 gene clusters of biosynthesis linked to secondary metabolites, including polyketides, terpenes, non-ribosomal peptides, and post-translationally modified peptides.

The volatile organic compounds produced by the strain also reduced the growth of

Foc TR4. The assay indicated 67,3% inhibition. Gas chromatography-mass spectrometry analysis detected five characteristic volatiles. Butanoic acid showed the highest relative abundance, accounting for 63,05% of the total peak area.

Commercial compounds

In bioassays with commercial compounds, butanoic acid inhibited Foc TR4 in a concentration-dependent manner.

Inhibition rates reached 13,9%, 35,8%, and 60,3% at concentrations of 0,1, 1, and 5 milliliters per liter. At a low concentration of 0,1 milliliter per liter, the compound

increased the fresh mass, height, and corm diameter of banana plants. In a biocontrol assay, it reduced the disease index from 75,4 to 60,5, with an efficiency of 19,8%.

GD7-29 also activated genes related to banana plant defense. The study recorded an increase in the expression of markers of the salicylic acid, jasmonic acid, and ethylene pathways in the first days after inoculation. The researchers indicate a systemic resistance-inducing effect associated with the treatment.

The results still depend on validation outside of controlled conditions. The study recommends field trials in different locations and growing seasons, evaluating application timing, colonization, productivity, soil health, and economic

return compared to chemical controls.

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Claas presents the new Axion 8 Cmatic tractor line

The tractors will have three models, an engine with up to 313 horsepower, Cemos Auto Powertrain, and automated operation with VCU

08.07.2026 | 08:22 (UTC -3)

Cultivar Magazine, based on information from Claas



Photo: Claas

Claas has announced the replacement of the Axion 800 series with three tractors from the new Axion 8 Cmatic line in the European summer of 2026. The family will include the Axion 8.240 Cmatic, Axion 8.270 Cmatic, and Axion 8.290 Cmatic models. The manufacturer reports a maximum power output of 264 to 313 horsepower with Dynamic Power, a new cab, digital connectivity, and the possibility of automated operation with operator supervision.

The new line uses a 6,7-liter, six-cylinder FPT NEF engine. Maximum torque ranges from 1.132 to 1.282 newton-meters. The engine works with the Dynamic Power system, part of the Cemos Auto Powertrain. The system adjusts power according to the demands of the

transmission, power take-off, hydraulics, and auxiliary consumers.

Claas also incorporated Auto Droop into the package. This feature adjusts the engine speed drop according to usage conditions. According to the company, the combination with the Cmatic continuously variable transmission aims to reduce fuel consumption and maintain performance under full or partial load.

At idle, the engine reduces its rotation to 650 revolutions per minute. The manufacturer also reports approval for use with hydrotreated vegetable oil, HVO. According to Claas, this fuel allows for a reduction of up to 90 percent in the carbon dioxide footprint.

Maintenance intervals

Maintenance intervals have been revised. Oil change intervals have been extended from 600 to 750 operating hours. The main filters will also have longer intervals, increasing by 150 to 300 hours.

Transmission assembly

The transmission assembly retains the Cmatic architecture, with continuously variable transmission and power splitting. The electronic powertrain management has been redesigned. The system allows switching between pedal mode, joystick mode, and power take-off mode without altering engine speed or vehicle speed.

The adaptive powertrain management system has been updated with Auto Load Anticipation. This technology uses a self-learning algorithm and efficiency maps for the engine, transmission, hydraulics, and auxiliary units. The system anticipates load peaks, such as when lowering an implement to the ground. Before the load increases, it raises the engine speed and adjusts the transmission. The goal is to prevent engine speed drops and maintain operational stability.

The line reaches 40 kilometers per hour at 1.300 revolutions per minute and 50 kilometers per hour at 1.400 revolutions per minute, depending on the tire configuration. Claas also offers automatic anti-trailer braking for road operations with

implements or trailers.

New cabin

The cabin has been redesigned. The interior volume reaches approximately three cubic meters. The noise level reaches 67 decibels. The premium seats can be equipped with ventilation, heating, and massage. The operator's seat rotates up to 40 degrees to the right and ten degrees to the left.

The package includes up to three integrated digital cameras, with images displayed on the Cebis connect terminal. The camera between the headlights assists with maneuvering in low-visibility areas and attaching front implements. Two external connections allow the use of

cameras on implements.

The Electropilot joystick allows programming of up to 30 hydraulic and Isobus functions. The optional dynamic steering halves the number of steering wheel turns between stops. The lighting package uses up to 22 LED headlights, with a maximum total flux of 56.000 lumens.

The Cebis Connect system features a main 12-inch display and an optional second 12-inch touchscreen display. The GPS Pilot can appear on the armrest screen or the additional display. The system also handles Isobus applications, work orders, application maps, documentation, and precision agriculture.

The Auto CSM system activates headland maneuver sequences when entering or exiting the programmed area. The guidance system also automatically switches between reference lines according to the tractor's position and direction of travel.

Claas connect

Connectivity is achieved via Claas Connect. The platform allows for the management of machines, fleet, work orders, application maps, performance data, and documentation. The Remote Display View function shows the tractor's terminal on remote devices for operational support or technical assistance.

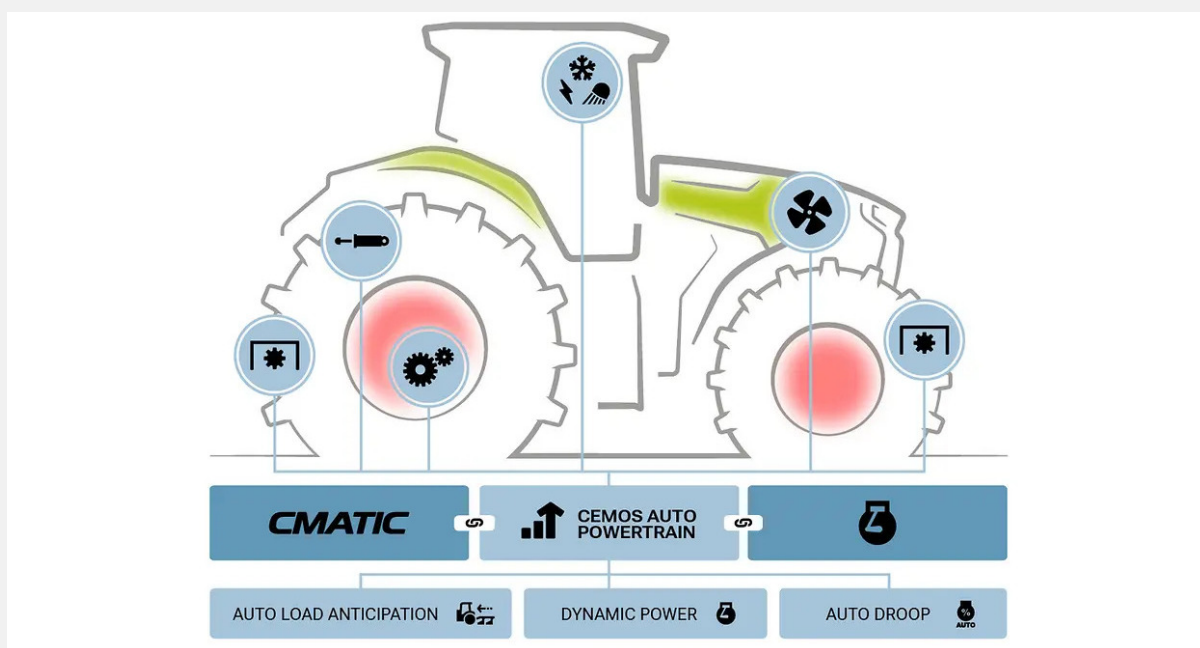
Automated operation relies on a VCU connected to the Isobus. With pre-programmed work orders, the tractor and implement perform tasks in the field with automated steering, obstacle avoidance, headland management, and variable rate application via map. The operator remains in the cab, monitors the work, and can take control at any time.

The load-sensing hydraulic system will have options of 150 or 205 liters per minute. In the higher flow version, up to 140 liters per minute can be delivered by a single control unit with three-quarter-inch couplers. The line accepts up to seven hydraulic control units.

The maximum rear lifting capacity reaches 9.700 kilograms on the Axion 8.240 Cmatic and 10.200 kilograms on the Axion 8.270

Cmatic and Axion 8.290 Cmatic. The front lifting capacity is 5.900 kilograms.

Claas also offers the Maxi Care Focus warranty for the engine, transmission, and front axle for five years or 5.000 operating hours at no additional cost. The Maxi Care Protect extension covers up to eight years or 8.000 operating hours.



AXION		8.290	8.270	8.240
Engine				
Number of cylinders / displacement	cm³	6 / 6728	6 / 6728	6 / 6728
Variable geometry turbo		●	●	●
Max. output with Dynamic Power (ECE R 120)	kW / hp	230 / 313	214 / 291	194 / 264
Max. output (ECE R 120)	kW / hp	214 / 290	199 / 270	177 / 240
Type approval value max. output / rated output ^{1, 2}	kW	230 / 218	214 / 204	194 / 186
Max. torque	Nm	1282	1215	1132
Engine speed at max. torque	rpm	1400	1400	1400
Maximum tank volume	l	463	463	463
Oil-change interval	h	750	750	750
CMATIC continuously variable transmission				
Min. ground speed at rated engine speed	km/h	0,05	0,05	0,05
Max. speed	km/h	50	50	50
Hydraulics				
Max. output (standard)	l/min	150	150	150
Max. output (optional)	l/min	205	205	205
Linkage				
Max. lift capacity at ball ends, rear	kg	10200	10200	9700
Hydraulic stabilisers		o	o	o
Max. lift capacity at ball ends, front	kg	5900	5900	5900
Cabs				
Display		Dashboard terminal, CEBIS connect 12-inch monitor, 12-inch additional monitor		
ELECTROPILOT		1 level und 10 function keys, 3 levels and 30 function keys		
Driver's seat		Swivels 40° to the right, heated, ventilated, side suspension, massage function, fabric or leather		
Infotainment		Radio sound system DAB+, 4 loud speakers, subwoofer		
Comfort		Footrests, compressed air connection, extra cool box		
Lighting		28000 lumen with 20 LED work lights, 56000 lumen with 22 LED work lights		
Operator assistance and data management systems				
CEMOS		●	●	●
GPS PILOT ready		●	●	●
Machine connect – 5-year licence		●	●	●
Dimensions and weights				
Wheelbase	mm	2980	2980	2980
Tare weight	kg	10150 - 10650	10150 - 10650	9950 - 10450

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Endophytic fungi show activity against brown stink bugs

This study evaluated *Trichoderma asperelloides* SF001 and *Beauveria bassiana* SF002 in soybeans and adult *Euschistus heros*

08.07.2026 | 08:02 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Jovenil Jose da Silva / Embrapa

Brazilian researchers evaluated the potential of two native endophytic fungal isolates in managing the brown stink bug (*Euschistus heros*) in soybeans. The study tested *Trichoderma asperelloides* SF001 and *Beauveria bassiana* SF002 under controlled conditions. Both microorganisms increased adult insect mortality and also altered enzymes linked to plant defense (DOI 10.1016/j.cropro.2026.107762).

The research indicates 58 percent control for *Trichoderma asperelloides* SF001 and 46 percent control for *Beauveria bassiana* SF002 against adult *Euschistus heros*. Mortality in the untreated control group reached 48 percent. Treatment with SF001 achieved 78 percent mortality. Treatment with SF002 achieved 72 percent. The trial

lasted seven days after application.

Research format

The researchers used fermented broths of the two fungi. Applications against adult *Euschistus heros* were carried out in containers with ten insects and commercial soybean pods as food. The volume of broth corresponded to 100 liters per hectare. The treatments with the fungi used 0,350 liters per hectare of fermented broth. The trial had five replicates per treatment.

Chitinolytic activity

Analysis of chitinolytic activity showed differences between the isolates.

Beauveria bassiana SF002 exhibited almost twice the chitinase activity compared to *Trichoderma asperelloides* SF001. This result was consistent with the cuticle degradation assay of the stink bug. The fermented broth of SF002 also promoted greater in vitro cuticle degradation.

Despite lower chitinase activity, SF001 also degraded the cuticle and increased insect mortality. According to the researchers, other mechanisms may contribute to this action. Metabolomic analysis by UHPLC-Q-TOF showed distinct chemical profiles among the fungi.

The fermented broth of *Trichoderma asperelloides* SF001 yielded 15 identified compounds. Among them were peptaibols,

mainly derivatives of asperellins and trichotoxins. Indole compounds and metabolites from other classes also appeared. The broth of *Beauveria bassiana* SF002 yielded ten identified compounds, including cyclic peptides and cyclodepsipeptides, as well as indole compounds and other metabolites.

Foliar application

In soybeans, researchers evaluated the foliar application of fermented broths on plants at the V5–V6 growth stage. The experiment used the Brasmax Lótus IPRO cultivar in four-liter pots. Treatments included water, SF001, SF002, and a mixture of the two broths in a one-to-one ratio.

The analyses measured peroxidase, polyphenol oxidase, and phenylalanine ammonia-lyase activities seven and 15 days after application. These enzymes participate in pathways associated with plant defense, phenol metabolism, and cell wall reinforcement.

The combination of SF001 and SF002 increased enzymatic responses compared to individual applications, with effects lasting up to 15 days after treatment. For peroxidase, the interaction between the fungi appeared at seven days and remained at 15 days. For phenylalanine ammonia-lyase, the two fungi showed individual effects at seven days, while the interaction between them became significant at 15 days. For polyphenol

oxidase, the interaction also became evident at 15 days.

Physiological responses

The researchers interpret these results as indicating physiological responses in soybeans not predicted by the isolated action of each fungus. The study does not attribute the effects to specific metabolites, as the assays used whole fermented broths, not purified compounds.

The data support the potential of a consortium with *Trichoderma asperelloides* SF001 and *Beauveria bassiana* SF002 as a component of integrated strategies against *Euschistus heros*. The work points

to the need for field studies, compatibility assessments with integrated pest management programs, and the development of stable formulations before practical use in soybean production systems.

This work was developed by João Arthur dos Santos Oliveira, Natieli Jenifer Mateus Corniani, Erika Fritegotto Leite, Livian Yumi Iwaoka, Giovana Gomes Ferreira Matos, Gabriela Bissoli Silva, Luana Thais Varize Marcusso, Carlos Augusto Corniani da Silva, and Willian Martire Marcusso.

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UPL appoints Déborah Cavalcante as communications manager

The executive has experience working for companies such as Rainbow Agro, Bayer, and Syngenta

07.07.2026 | 16:15 (UTC -3)

Cultivar Magazine



Déborah Cavalcante has been appointed as communications manager at UPL. She has over ten years of experience in communications and strategic branding, working in Latin America, Europe, and Asia.

Prior to UPL, Déborah worked as branding and communications manager at Rainbow Agro, between April 2024 and June 2026. At the company, she structured and expanded corporate communications, with actions in public relations, events, digital campaigns, and internal communication. She also led the company's first institutional campaign, implemented in countries in Latin America and Europe.

Between December 2020 and April 2024, she worked as a marketing and branding

communications coordinator at Bayer Crop Science. During that time, she managed biotechnology brand communications in the seed segment and participated in the launch of a strategic initiative in the biotechnology sector.

The executive also worked at Sindiveg, where she served as marketing, communication, and public relations coordinator in 2020. Prior to that, she worked at Grupo ECI, Synapse, Syngenta, and Uni Design e Comunicação.

Her career path includes projects in digital and traditional marketing, corporate storytelling, public relations, internal communication, event planning, and brand architecture. Déborah has also collaborated with multicultural teams on different continents, focusing on strategies

aligned with global objectives and local impact.

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Fendt offers dollar-denominated credit for the purchase of machinery

Financing lines are also available in euros for the purchase of agricultural equipment

07.07.2026 | 16:09 (UTC -3)

Monica Pileggi



In a scenario of tight margins and volatile commodity prices, Fendt, a German

manufacturer of high-tech agricultural machinery and innovations, is highlighting its foreign currency (dollar and euro) credit lines. The initiative aims to offer farmers attractive alternatives that transform the acquisition of high-tech agricultural equipment into a more profitable and strategic investment.

For the 2025/2026 cycle, the great challenge for the agricultural sector is not only to produce more, but to better manage capital costs. Given the rising cost of credit lines in reais, credit in dollars presents a more attractive financial cost and allows for a so-called "natural hedge," where producers who receive payment for their harvest in foreign currency settle their installments in the same monetary base, eliminating the risk of cash flow mismatch.

According to Julio Hercules, commercial manager of AGCO Finance, the factory's bank, among the main attractions of the foreign currency credit line are the more competitive interest rates and extended terms, which help mitigate the impacts of exchange rate fluctuations throughout the financing period.

When aligned with the flow of revenue in foreign currency, this modality helps preserve purchasing power and the balance of the contract. “Since the producer sells their harvest based on the dollar price, they have natural protection against exchange rate fluctuations. If the dollar rises, the debt on the machinery becomes more expensive, but their harvest also becomes more valuable. The exchange rate risk, therefore, tends to be

neutralized," emphasizes Hercules.

The executive also highlights cutting-edge technology as an asset for the producer, "since this type of credit line facilitates access to equipment such as Fendt machinery, whose operational efficiency gains offset the investment in just a few harvests."

Furthermore, the producer eliminates the waiting time and dependence on state credit lines. "The resource comes from the factory bank, available immediately, directly at the dealership, without tied selling or traditional banking bureaucracy," concludes Hercules.

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Cold weather reduces reproduction and demand for tomato plants in *Tuta absoluta*

Study points to metabolic and genetic alterations in adults exposed to temperatures of fifteen and five degrees Celsius

07.07.2026 | 15:46 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Marja van der Straten - Bugwwod

Stress from low temperatures reduced emergence, fecundity, egg hatching, and orientation of females of Tuta absoluta (currently named Phthorimaea absoluta) for tomato plants. The effect increased with the intensity of the cold. The response involved physiological, biochemical, metabolic, and transcriptional changes in adult pests (DOI 10.3390/insects17070706).

A study conducted by Chinese researchers evaluated adult *Tuta absoluta* kept under three temperature regimes. The control remained at twenty-five degrees Celsius. Moderate cold stress occurred at fifteen degrees Celsius. Severe cold stress occurred at five degrees Celsius. The insects remained under a photoperiod of sixteen hours of light and eight hours of

darkness. Biochemical, metabolomic, and transcriptomic analyses were performed using adults kept for seven days under these treatments.

Low temperatures impaired adult emergence. Control and moderate stress maintained the highest rates. Severe stress caused the greatest reduction. The result indicates impaired completion of metamorphosis after exposure to cold.

Greater impact

Reproduction was most impacted. Control females produced more eggs. Females under fifteen degrees Celsius showed a slight reduction, with no significant difference compared to the control.

Females under five degrees Celsius had

almost complete suppression of oviposition. Egg laying in the control and moderate treatment groups peaked on the seventh day. Then, it decreased on the fourteenth day and almost ceased on the twenty-first day. In severe cold, egg laying remained minimal throughout the period.

Egg hatching also decreased with increased stress. The control group showed greater hatching success. The treatment at fifteen degrees Celsius did not differ from the control. The treatment at five degrees Celsius caused the greatest reduction. Severe cold also delayed the hatching process.

Search for a host

Host-seeking behavior changed. Control females showed a clear preference for tomato odors in a Y-shaped olfactometer. Females subjected to fifteen degrees Celsius had less attraction to the plant. Females subjected to five degrees Celsius showed the lowest response to volatiles. The data indicate a progressive loss of the ability to locate the host mediated by smell.

Energy metabolism

Cold weather also altered energy metabolism. Triglyceride levels remained similar between the control group and moderate cold, but decreased in severe cold. Sodium-potassium ATPase activity followed a similar pattern. It remained stable below fifteen degrees Celsius and

decreased below five degrees Celsius. This enzyme functions as an indicator of membrane ion transport. The decrease suggests impairment in bioenergetic processes associated with cellular homeostasis.

Glycogen reserves also decreased under severe cold. The content remained similar between control and moderate cold. The result indicates the use or loss of lipid and carbohydrate reserves under intense thermal stress. Trehalose showed a tendency to increase with decreasing temperature, but without statistical difference. This pattern suggests a possible metabolic adjustment associated with protection against cold.

Antioxidant enzymes responded differently. Superoxide dismutase activity

increased under severe cold compared to the control. Peroxidase activity decreased below five degrees Celsius. Catalase activity did not change between treatments. This suggests a progressive alteration in defenses against oxidative stress.

Non-targeted metabolomics revealed widespread metabolic reprogramming. Control, moderate cold, and severe cold samples showed distinct metabolic profiles. Comparison between control and 15 degrees Celsius identified 324 reduced and 291 increased metabolites.

Comparison between control and 5 degrees Celsius identified 297 reduced and 333 increased metabolites.

Comparison between 5 and 15 degrees Celsius showed 111 reduced and 132

increased metabolites.

The affected pathways included amino acid metabolism, alkaloid biosynthesis, central carbon metabolism, transfer aminoacyl-RNA biosynthesis, tyrosine metabolism, purine metabolism, alanine, aspartate and glutamate metabolism, arginine biosynthesis, nicotinate and nicotinamide metabolism, phenylalanine metabolism, terpenoid and steroid biosynthesis, and carbon metabolism.

Transcriptomic analysis

Transcriptomic analysis also showed a clear separation between treatments. The comparison between control and moderate cold showed the greatest alteration: nine hundred and thirty-nine genes with lower

expression and one hundred and four with higher expression. The comparison between control and severe cold indicated eighty-four genes with lower expression and fifty-eight with higher expression. The comparison between the two levels of cold showed one hundred and thirty-seven reduced genes and one hundred and forty-five increased genes.

The enriched gene pathways involved thermogenesis, oxidative phosphorylation, MAPK signaling, glycolysis, gluconeogenesis, propanoate metabolism, cGMP-PKG signaling, and processes associated with cellular response, metabolism, biological regulation, development, and response to stimuli. The study also found coordinated networks between genes and metabolites. These

networks grew in proportion to the intensity of the stress.

Researchers conclude that adult *Tuta absoluta* triggers an integrated response to cold. The pest prioritizes survival mechanisms, with changes in energy metabolism, accumulation of cryoprotectants, and antioxidant defenses. In parallel, it reduces reproduction, growth, and host searching. The results help explain the species' response to low temperatures and may support population dynamics models and management strategies under variable climate scenarios.

Parâmetro Avaliado	Controle (25 °C)	Frio Moderado (15 °C)	Frio Severo (5 °C)
Emergência de adultos	Taxa máxima (normal)	Mantida em níveis altos	Redução drástica (prejuízo na metamorfose)
Fecundidade (Oviposição)	Pico ao 7º dia; cessa ao 21º dia	Pequena redução (sem diferença estatística)	Quase supressão total da postura
Eclosão de ovos	Sucesso máximo	Sem alteração frente ao controle	Forte redução e atraso no tempo de eclosão
Localização do hospedeiro	Preferência clara por odores de tomateiro	Atração reduzida pelas plantas	Resposta mínima aos voláteis (perda de olfato)
Reservas de energia	Níveis normais de glicogênio e triglicerídeos	Preservadas (semelhantes ao controle)	Queda acentuada (gasto de reservas lipídicas e carboidratos)
Homeostase celular	Atividade normal da Na ⁺ /K ⁺ -ATPase	Atividade mantida	Queda na atividade da enzima (prejuízo bioenergético)
Açúcares protetores	Níveis basais de trealose	Tendência de aumento	Tendência de aumento (mecanismo de crioproteção)
Defesas antioxidantes	Equilíbrio oxidativo basal	Resposta inicial de estresse	Aumento da SOD (Superóxido Dismutase) e queda da Peroxidase
Reprogramação metabólica	Perfil metabólico padrão	615 metabólitos alterados frente ao controle	630 metabólitos alterados frente ao controle
Expressão gênica (RNA)	Expressão basal estável	1.043 genes modulados (tentativa de adaptação ativa)	142 genes modulados (supressão/choque metabólico)

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Technology advances in potato cultivation in Europe

PotatoEurope 2026 will feature demonstrations of machinery, robotics, automation, and artificial intelligence for the potato supply chain

07.07.2026 | 14:30 (UTC -3)

Cultivar Magazine, based on information from Malene Conlong



Photo: DLG

Digitization, automation, and artificial intelligence are expected to mark the next stage in the development of potato production. This theme will be highlighted at PotatoEurope 2026, scheduled for September 9th and 10th, 2026, in Rittergut Gestorf, Springe, near Hanover, Germany. The event will feature approximately 300 exhibitors and will showcase demonstrations of machinery for planting, harvesting, loading, and crop protection technologies.

The German Agricultural Society (DLG) is organizing the fair. The technical program will also include “DLG Spotlight: Digital Farming powered by FarmRobotix.” This initiative will address robotics, automation, and artificial intelligence applied to

agricultural production. DKE-Data, DLG, and FarmRobotix will present technologies through live demonstrations, technical discussions, and hands-on activities.

Productivity increase

According to technical material prepared by Rolf Peters of PotatoConsult UG, the continuous increase in potato productivity is partly due to the mechanization of agricultural operations. The advancement of digitalization and artificial intelligence opens a new phase. The expectation involves gains throughout the value chain.

Peters highlights a key point for the adoption of these technologies. The solutions need to meet the agronomic

requirements of potatoes and simplify operations on farms. Restrictions on fertilizer use and reduced availability of pesticides also influence how each production step is carried out.

In planting, digital tools already allow for planning machine traffic in the field from the office. The plans are sent to tractors via USB devices or cloud systems. The information can also include variable row shutoff in irregularly shaped areas and automated creation of traffic lanes.

Quality criteria

Uniformity of planting depth and regular row formation are key quality criteria, explains Rolf Peters. These factors

influence plant emergence, crop development, and the required harvest depth. The combination of sensors with hydraulic chassis control systems allows for maintaining a constant distance between the planter's main structure and the soil surface. This condition favors precise control of the furrow openers and uniform row formation.

There are greater benefits in planting seed potatoes with narrow seed spacing. The usual 20-millimeter spacing leads to variations in planting depth. Larger tubers tend to be planted deeper in the furrow than smaller ones. In planters with horizontal elements, wider spacing can also reduce the uniformity of row spacing. This can interfere with the size distribution of the harvested tubers.

The increasing use of hydraulically powered planting elements, and in the future, electric ones, allows for adjusting the spacing between plants in traffic lane areas. It also allows for the application of specific planting maps for each plot.

Weeds

In weed management, potatoes present a known challenge. Slower initial growth and relatively wide row spacing reduce their ability to compete in the early stages.

Mechanical control, herbicides, and the selection of cultivars with faster canopy closure can help reduce weed pressure.

Variable weather makes it difficult to determine the correct time for mechanical

intervention. The potato root system extends along the sides of the rows. Intervention at an inappropriate time can harm crop development. Delays, on the other hand, reduce efficiency against larger weeds.

One alternative cited by Rolf Peters involves mechanical cultivators with a wider working width. With autonomous implement guidance or individual lateral movement of the tools, these machines can work over multiple traffic lines and reduce damage to plants.

During harvesting and storage, risks are concentrated on damage to the tubers. Undetected failures can compromise storage and subsequent marketing. Sensors and cameras are beginning to

improve the monitoring of product flow within harvesters. Artificial intelligence is starting to capture and analyze information generated by images during harvesting.

Separation of impurities

Another technical point involves the separation of soil, stones, and impurities, explains Peters. Some farms remove stones or separate materials before planting to facilitate a high-capacity harvest with less contamination. Others use mechanical, pneumatic, and electronic systems to remove impurities only at the entrance to storage.

This shift stems from increased harvesting capacity in the field, a shortage of reliable

labor for manual sorting, and advancements in optoelectronic sorting. These systems utilize image recognition and processing, with increasing support from artificial intelligence.

Electro-optical systems can also be used in the shipping of stored potatoes. They detect visible impurities and defects, such as rotten or damaged tubers. In principle, they can also classify unwashed potatoes by quality, provided they have the appropriate software.

Current trends point towards dedicated sorting machines. They capture multiple images of each tuber before the decision is made and can divide the flow into more than three fractions or size classes.

Despite the higher investment, producers associate these systems with reduced

labor needs and greater flexibility to meet different quality and size specifications required by buyers.

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Pioneer introduces new leadership for Brazil and Paraguay

Ana Paula Nascimento takes over the position at the brand, which has been the market leader in corn for two decades

07.07.2026 | 13:58 (UTC -3)

Ana Beatriz Januzi



Pioneer, a seed brand of Corteva Agriscience, announces Ana Paula Nascimento (pictured) as its new "leader" for Brazil and Paraguay. With over 18 years of experience in agribusiness, the "leader" of the Product Agronomy team at Corteva Agriscience now assumes the mission of reinforcing Pioneer's leading role in corn, in addition to expanding the sorghum business in the country.

The appointment comes in a symbolic year for Pioneer, which is celebrating its global centenary. With more than 50 years in Brazil, the brand has been a leader in the corn market for two consecutive decades, according to the consulting firm Kynetec.

Originally from the interior of Minas Gerais, Ana Paula holds a degree in Agricultural

Engineering and a Master's degree in Phytotechnics from the Federal University of Uberlândia. She has built a solid career combining technical knowledge, strategic vision, and a passion for developing people, products, and brands. Throughout her career, she has worked in various areas of the seed business, accumulating a broad market perspective and contributing to the strengthening of important brands, always focused on generating value for the farmer.

In taking on this new challenge, she reinforces her commitment to innovation, customer proximity, and building strategies that further strengthen Pioneer's connection with Brazilian producers. "I believe the future is built by uniting science, technology, people, and

genuinely listening to those who are in the field every day," says the executive.

With collaborative and results-oriented leadership, Ana Nascimento begins this new chapter with the purpose of strengthening a brand that has been a benchmark in productivity, innovation, and trust for decades, helping producers cultivate the future of agriculture.

"I take on this new challenge with great honor. Leading Pioneer, a brand with such a solid history and so valued by farmers, is very valuable for my career. My commitment is to use my experience and dedication to contribute even more to the development of solutions that meet the needs of the field, helping farmers at all times," comments Ana Paula.

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Domesticated wheat alters biological control of aphids

Study compares wild wheat and wheat cultivated in the geographic center of domestication of the crop

07.07.2026 | 11:26 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Adam Sisson / Iowa State University - Bugwood

The domestication of wheat has altered the interaction between the aphid *Rhopalosiphum padi* and the parasitoid *Aphidius colemani*. Researchers compared a wild wheat genotype collected on Mount Carmel in Israel with the domesticated cultivar 'Galil', used in the same region. The results indicate distinct effects on the pest and its natural enemy (DOI 10.3390/insects17070704).

The initial hypothesis predicted greater aphid performance on domesticated wheat and less parasitism in this material. The greenhouse experiment showed a more complex pattern. At low density, wild wheat favored a faster increase in the *Rhopalosiphum padi* population. After three days, wild plants had an average of

71,6 aphids per plant. Domesticated plants had an average of 56,1 aphids per plant.

Introduction of the parasitoid

This trend changed after the introduction of the parasitoid. Twelve days later, the domesticated plants supported larger aphid populations. The study recorded approximately 780 aphids per plant in domesticated wheat and approximately 420 aphids per plant in wild wheat. The difference occurred despite the higher parasitism in the domesticated plants.

The parasitoid *Aphidius colemani* performed better on domesticated wheat. The number of mummies formed per plant

doubled in this material compared to wild wheat. The percentage of parasitism was also higher. In domesticated plants, 85,3 percent of the mummies originated from adult parasitoids. In wild plants, this rate reached 53,2 percent.

The number of offspring of the parasitoid also changed according to the wheat genotype. Domesticated plants produced 2,7 times more adult wasps. The difference resulted mainly from the greater number of males that emerged in this material. The total production of females did not differ between the two types of wheat. Even so, the effective proportion of females was higher in wild wheat.

Study characteristics

The researchers used seeds of *Triticum turgidum* subsp. *dicoccoides* as wild wheat. The material came from a natural population near Beit-Oren, Israel. The 'Galil' cultivar of *Triticum aestivum* represented domesticated wheat. Both materials exhibit late maturation.

The plants received six adult *Rhopalosiphum padi*. ??After three days, a female *Aphidius colemani* was introduced into each cage for two hours. The researchers monitored the formation of mummies, the emergence of parasitoids, and the growth of aphid populations. The plants remained in a greenhouse with a temperature of 25 degrees Celsius, with a variation of three degrees Celsius.

The study also measured plant biomass. At the end of the experiment, domesticated wheat showed a higher dry weight of the aerial part. The average reached 302 milligrams, compared to 179 milligrams in wild wheat. The final density of aphids per biomass did not differ statistically between genotypes. Even so, the final total population of aphids was higher in domesticated wheat.

Different mechanisms

The data suggest different mechanisms of population limitation. In wild wheat, competition among aphids may have limited the pest's growth to high densities. In domesticated wheat, parasitoid activity appears to have exerted greater pressure

on the population.

The researchers emphasize caution in the interpretation. The study evaluated only one wild genotype and one domesticated genotype. The number of replicates was also reduced. Even so, the organisms used came from the same geographic region, with a history of association. This condition increases the ecological relevance of the observed interactions.

The conclusion points to varying effects of domestication on pests and natural enemies. Domesticated wheat favored a larger final population of aphids, but also increased biological control by *Aphidius colemani*. This control may partially compensate for infestation by *Rhopalosiphum padi* in wheat cultivars.

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Orange juice revenue drops 30% in the 2025/26 harvest

Brazilian export volume remained stable, but lower prices reduced revenue to US\$2,38 billion

07.07.2026 | 10:57 (UTC -3)

Cultivar Magazine, based on information from Eduardo Savanachi



Photo: Eduardo Augusto Girardi / Embrapa

The drop in global demand for orange juice reduced Brazilian export revenue in the 2025/26 crop year. The country shipped 746,9 tons of FCOJ equivalent. This volume increased by 0,2% compared to the 745,7 tons of the 2024/25 crop year. Revenue totaled US\$2,38 billion. This value fell by about 30% compared to the US\$3,42 billion of the previous cycle.

The data comes from the Foreign Trade Secretariat. They consider shipments through the Port of Santos. The National Association of Citrus Juice Exporters (CitrusBR) compiled the information.

According to the CEO of CitrusBR, Ibiapaba Netto, the result reflects the high prices of previous harvests. This scenario led consumers to seek cheaper options.

He also cited product quality problems, linked to the climate and citrus greening in the past season.

Europe, historically the main market for Brazilian juice, reduced its purchases. The volume fell 10,9%, from 376,5 to 335,2 tons of FCOJ equivalent. Revenue decreased to approximately US\$1,11 billion. This value represents a decrease of approximately 38% compared to the US\$1,78 billion of the 2024/2025 harvest. The European share of the total volume fell from about 50% to close to 45%.

The United States increased its share. The country accounted for almost 48% of the total volume exported, compared to about 40% in the previous crop year. Purchases totaled 355,8 tons of FCOJ equivalent. The

volume grew 16,3% compared to the 305,8 tons of the 2024/2025 crop year. Revenue, however, fell 20,6%, to approximately US\$1,08 billion.

China purchased 25,5 tons of FCOJ equivalent. The volume grew 26% over the previous 20,1 tons. Revenue increased 1%, to approximately US\$70,3 million.

Japan experienced the largest decline among the major destinations. Volume fell 28,6%, from 20,1 to 14,3 tons of FCOJ equivalent. Revenue decreased 45,9%, to approximately US\$58,9 million.

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Direct seeding and robots are making progress in sugar beet cultivation

SugarBeet Expo 2026 will showcase soil management, machinery and technologies for weed control and field efficiency

07.07.2026 | 10:43 (UTC -3)

Cultivar Magazine, based on information from Malene Conlong



Photo: DLG

Direct seeding and robotic weeding are gaining prominence in the technical debate on professional sugar beet (*Beta vulgaris*) production. These topics are part of the program at SugarBeet Expo 2026, an international trade fair organized by the DLG, the German Agricultural Society. The event will take place on September 9th and 10th, 2026, in Rittergut Gestorf, near Hanover, Germany. The exhibition accompanies PotatoEurope and includes demonstrations of machinery in the field.

The fair focuses on practical solutions, machinery, digitalization, and sustainability. The technical program addresses the challenges and opportunities of no-till farming. It also covers robotics, technological trends, and research applied to the crop. Producers

will be able to observe modern technologies in real field conditions.

Direct seeding is noteworthy for its reduced soil disturbance. The system preserves soil capillaries and earthworm burrows. This improves water infiltration and movement. It also increases the soil's carrying capacity and reduces the risk of erosion. This advantage is particularly important in vulnerable areas.

Land cover

The system also maintains ground cover for almost the entire year. It uses cover crops, crop residues, and organic material on the surface. This protection reduces soil drying, limits losses due to evaporation,

and promotes biological activity. Organic matter accumulates in the surface layer and reaches deeper layers through the action of soil organisms.

Permanent cover helps the soil retain moisture for longer during dry periods. This condition creates an important foundation for the productive stability of sugar beet. Direct seeding also reduces weed pressure in many systems, as less soil disturbance encourages fewer seeds to germinate.

Integration with precision technologies expands the system's potential. Localized spraying allows for more efficient application of pesticides with less resource use. The document also indicates the possibility of reducing fungicide and

insecticide applications, with more resilient plant stands and well-planned crop rotations.

Direct seeding

Adopting direct seeding requires attention. The soil warms up more slowly in the European spring. This can delay the initial development of the crop. Slugs and rodents may also increase in some situations, as their habitats are less disturbed. Plant emergence may be less uniform in certain cases. Therefore, higher seeding rates may become necessary.

Information from DLG indicates productivity reductions of approximately four to eight percent in sugar beet

cultivation. The success of the system depends on a high level of management, experience, and specialized equipment. Precise seed placement, crop management, and phytosanitary protection account for some of the technical requirements. Even so, the source considers the system economically attractive with consistent implementation.

Robotics and change

Robotics is emerging as another driver of change in sugar beet cultivation. The document on SugarBeet Expo 2026 points to challenges related to economic viability, diseases and pests, such as the SBR/Stolbur complex and cercosporiosis, as well as weed control. The reduction in

the number of approved plant protection products, the increase in labor costs, and the lower availability of workers are putting pressure on producers, especially in organic production.

The Kirschgartshausen experimental farm, belonging to Südzucker Landwirtschaft, north of Mannheim, is testing alternative weed control methods. The trials include tractor-mounted inter-row weeding systems, conventional mechanical weeding with strip spraying, localized spraying, electric control, and autonomous robots. Among the systems being evaluated are Farmdroid from Denmark, Farming Revolution from Germany, and Naïo Technologies from France.

Two autonomous systems have undergone intensive testing in recent years. The Farmdroid FD20 uses GPS and acts as a specialized system for sowing and weeding sugar beets. It needs to sow the area to position the seeds with high precision. The Farming GT, from Farming Revolution, uses cameras and artificial intelligence to distinguish weeds from the crop. It operates on more than one hundred crops and allows sowing with conventional equipment.

Both systems are able to weed within the row and work close to the cultivated plant, with minimal damage. There is a combination of precision weeding robots with localized application technology. In this strategy, pesticides or liquid nutrients receive targeted application. Compared to

applications across the entire area, input volumes can be reduced by more than ninety percent.

The trials in Kirschgartshausen required a larger experimental design than conventional plots. The plots measured fifty meters in length and twelve rows in width. The arrangement followed a randomized block design, with four replications. Each plot totaled two hundred and seventy square meters. The evaluations measured weed infestation and plant density after each treatment.

Südzucker Landwirtschaft has been accumulating results from field robot trials since 2020. In the last three years evaluated, the robots significantly reduced weeds under varying pressures. Control

effectiveness ranged from ninety percent to almost ninety-eight percent. In two of the three years, the autonomous systems achieved results comparable to three standard post-emergence herbicide applications. In 2025, under high weed pressure, the robots did not eliminate all plants from the plots.

The plant loss results also favored the robots. They operated more carefully than conventional mechanical cultivation with hoes and harrows, a method associated with significant damage to sugar beet plants. In Farmdroid, losses did not differ significantly from the untreated control in any of the three years. Farming GT performed similarly, but caused greater losses under high weed pressure in 2025. Even so, the density of over ninety

thousand plants per hectare achieved with Farming GT should not harm productivity, according to the document.

Tests indicate potential for reducing manual weeding hours in organic production. Practical adoption, however, requires analysis on a property-by-property basis. Operational capacity is limited by working width and speed. The systems work best in large, flat areas with few maneuvers. Use on side slopes, stony areas, or surfaces with mulch cover is not recommended in the technical material.

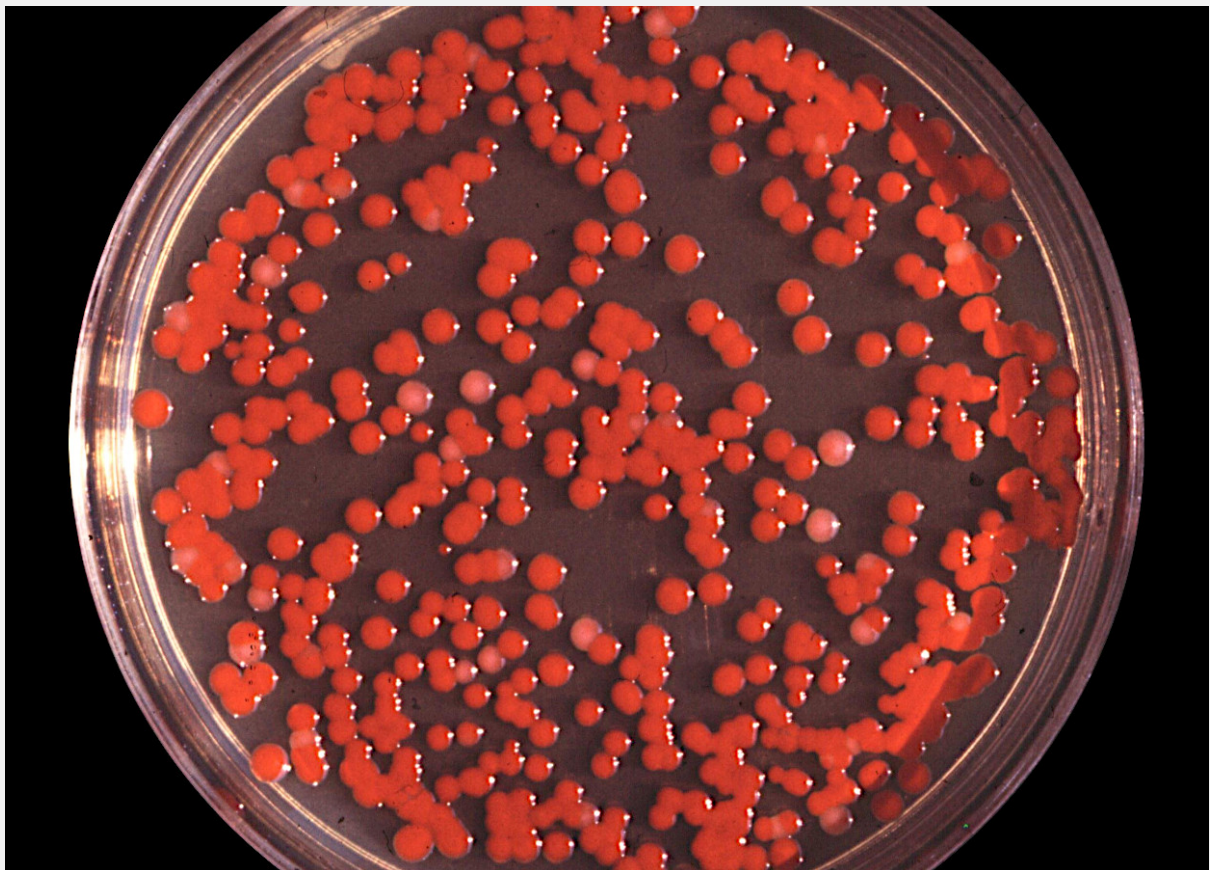
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Microcapsules containing *Serratia marcescens* control white mold

The G4Ms formulation reduced sclerotinia disease in potted soybeans and increased enzymatic activity and microbial diversity in the soil

07.07.2026 | 08:23 (UTC -3)

Schubert Peter, Cultivar Magazine



Microcapsules produced with the bacterium *Serratia marcescens* G4 achieved 55,84 percent control of soybean sclerotinia in a pot experiment. A study by Chinese researchers evaluated the optimization of the fermentation medium, the preparation of the G4Ms formulation, and the effect of the biological agent against *Sclerotinia sclerotiorum* (DOI 10.1002/ps.71092).

Under initial cultivation conditions, the optical density of the G4 strain reached 2,241 after 12 hours. Sucrose and soy peptone performed best as carbon and nitrogen sources. Response surface optimization indicated a medium with 13,21 grams per liter of sucrose, 10,33 grams per liter of soy peptone, 10,95

grams per liter of yeast extract, and 10 grams per liter of sodium chloride. With this composition, the predicted optical density rose to 2,474. The increase reached 10,4 percent.

The best growing conditions included a temperature of 35 degrees Celsius, pH 7,0, inoculum of 3 percent by volume, agitation of 155 revolutions per minute, and a working volume of 50 milliliters.

Efficiency of microcapsules

G4M microcapsules were prepared with 80 percent maltodextrin. The formulation showed greater storage stability, greater biofilm formation, and greater inhibitory

activity compared to free G4 cell lines.

In addition to controlling sclerotinia disease in the pots, the application of microcapsules increased enzymatic activity in the soil and microbial diversity. According to the scientists, the results indicate the potential of the G4Ms formulation as a biocontrol agent against soybean sclerotinia disease caused by *Sclerotinia sclerotiorum*.

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Traditional cacao from Peru reveals four new strains

Study using SNP markers identifies genetic groups in Amazonian indigenous crops and points to their use in conservation and breeding

07.07.2026 | 07:52 (UTC -3)

Schubert Peter, Cultivar Magazine

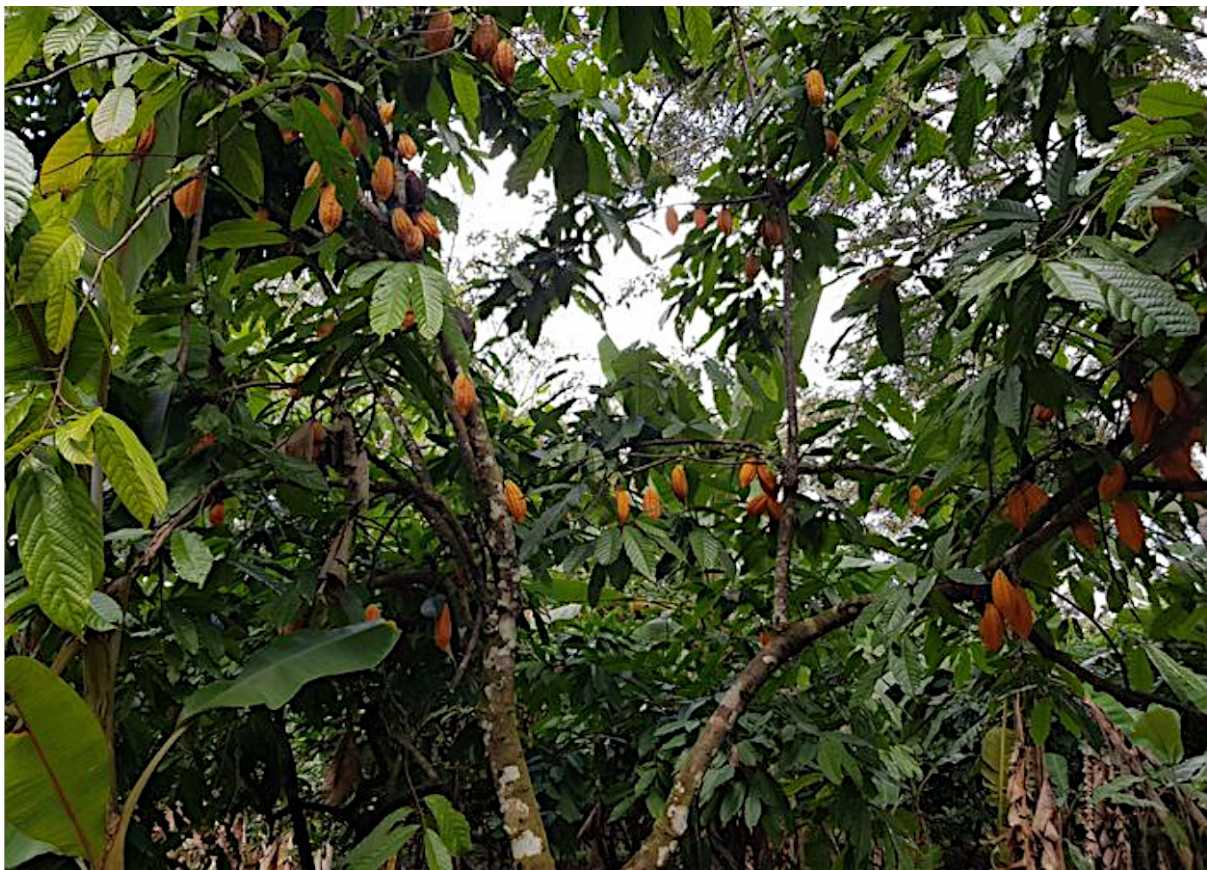


Photo: Lambert Motilal / University of the West Indies - CC-BY 4.0

Researchers have identified four new genetic lineages in traditional cacao trees grown in indigenous and Amazonian areas of Peru. The study analyzed 390 *Theobroma cacao* trees from eight Peruvian departments and used 192 SNP markers to assess genetic identity, differentiation between groups, phylogeny, and ancestry (DOI [10.1371/journal.pone.0351690](https://doi.org/10.1371/journal.pone.0351690)).

The new populations were associated with four clades. Clade I was named Chuncho 1. Clade II was named Awajun. Clade III was named Porcelana. Clade IV was named Chuncho 2. The data indicate a relationship between these lineages and known genetic groups of cacao. Chuncho 2 showed an association with Contamana. Chuncho 1 showed an association with

Púrus. Awajun and Porcelana showed an association with Nacional.

The research evaluated materials from the departments of Amazonas, Ayacucho, Cajamarca, Cusco, Madre de Dios, Piura, San Martín, and Ucayali. The sampled trees were approximately 50 years old, according to traditional knowledge of the farmers. The material represents unimproved traditional lineages and primary wild or semi-wild germplasm.

Genetic mix

Researchers found variable genetic mixing among the materials. The samples contained pure members of the new populations and individuals with ancestry

combined with Amelonado, Contamana, Criollo, Curaray, Guiana, Iquitos, Marañón, Nacional, Nanay, and Púrus. The result reinforces the presence of regional diversity in Peruvian cocoa. Each region maintained its own genetic composition, even with genetic relationships between departments.

Four clades comprised 313 of the 390 trees analyzed. This total corresponds to 80,3 percent of the samples. Clade I included 45 samples, mainly from Cusco and Ayacucho. Clade II included 52 samples, predominantly from Amazonas. Clade III included 99 samples, with a strong presence of Amazonas and Piura. Clade IV included 117 samples, predominantly from Cusco and Ayacucho.

The identity analysis found 25 groups of duplicate samples. Most of these groups occurred within the same department. This pattern indicates local propagation of genotypes, possibly due to recurrent use of selected plants by farmers. Piura, Ayacucho, and Cusco concentrated the highest frequency of duplicates.

Database

The study also compared the Peruvian samples with a database from the Cocoa Research Centre at the University of the West Indies. This database contains more than 27 samples from 32 countries. Only one match appeared: sample CCA015, from Condorcanqui, in Amazonas, corresponded to the cultivar CCN 51.

The ancestry of CCN 51 received a new interpretation in the study. The cultivar presented an estimated composition of 15 percent Amelonado, 13 percent Criollo, 25 percent Iquitos, and 45 percent Awajun. According to the researchers, this result changes the interpretation of the genetic origin of the material and relates a significant part of its ancestry to one of the new Peruvian lineages.

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Corteva appoints Fabiano Argenta to regional leadership position.

Agronomist will lead Row Crops' marketing and tactical marketing team in the Southern Region.

06.07.2026 | 16:12 (UTC -3)

Cultivar Magazine



Agricultural engineer Fabiano Argenta (pictured) has been promoted to the

position of regional Marketing "leader" at Corteva Agriscience. With extensive experience in market development and the biotechnology industry, he will be based in Passo Fundo (RS).

In her new role, Argenta will be responsible for leading the marketing efforts for the Row Crops area in the states of Rio Grande do Sul, Santa Catarina, and Paraná, as well as managing the regional tactical marketing team. Her responsibilities include implementing sales campaigns, incentive plans, developing and launching innovations, as well as creating the regional marketing plan, expanding market access, and strengthening the commercial strategy in the territory.

Prior to the promotion, she worked as a Key Account Manager (KAM), responsible for the commercial management of Corteva's partner cooperatives in the North and Northeast regions of Rio Grande do Sul.

Throughout his career, he has worked for agribusiness companies such as Syngenta, where he worked for over five years, Ihara, where he remained for over two years, and Dow AgroSciences, where he held leadership positions in marketing.

Argenta holds a degree in Agronomy and a master's degree in Phytotechnics from the Federal University of Rio Grande do Sul (UFRGS).

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Parasitic beetle that attacks ants reveals unusual brain

Microtomography shows expansion of areas linked to olfaction and coordination in *Paussus favieri*

06.07.2026 | 15:52 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Sergio Ibarra – CC BY-NC 4.0

The beetle *Paussus favieri* has a brain with olfactory and motor coordination areas in proportions unusual among insects studied so far. The finding results from the first three-dimensional description of the brain of this species, made by researchers using X-ray microtomography. The insect lives inside the nests of the ant *Pheidole pallidula* and depends on chemical, structural, and behavioral adaptations to remain in the host colony (DOI 10.3390/insects17070701). The species does not exist in Brazil.

Research by Italian scientists analyzed three specimens of *Paussus favieri*. Two were males and one was female. The insects were collected in Spain, near Tarifa, in nests of *Pheidole pallidula*. Two

specimens underwent microtomography. One male also underwent classical histological analysis with hematoxylin and eosin staining.

Antennal lobes

The study showed significant development of the antennal lobes. These regions process chemical information. In females, the antennal lobes accounted for approximately thirty-six percent of the relative volume of the main neuropils. In males analyzed by microtomography, they accounted for approximately thirty-two percent. The average exceeded that recorded in the species used for comparison, including *Tribolium castaneum*, *Aethina tumida*, *Drosophila*

melanogaster, *Apis mellifera*, and *Schistocerca gregaria*.

Researchers link this result to the importance of chemical perception for the species. *Paussus favieri* exploits chemical cues from its host ant. The beetle uses trails associated with the venom gland of *Pheidole pallidula* queens to locate colonies. It can also acquire the queens' chemical signature through direct contact.

Central body

The central body also showed a high proportion. This region is part of the central brain complex and participates in functions related to the coordination of movements, navigation, and complex behaviors in

insects. In *Paussus favieri*, the central body accounted for more than twelve percent of the relative volume of the principal neuropils in both sexes evaluated.

The expansion of this area may be related to the beetle's repertoire within the nest.

The species uses defensive secretions directed by the elytra (Coand? effect) and acoustic signals. Studies cited in the article indicate the ability to mimic the sounds of worker ants and queens of the host ant.

This strategy allows the parasite to solicit trophallaxis and explore vibrational communication channels of the colony.

The optic lobes had a relatively smaller share compared to the reference species.

The reduced visual capacity is consistent

with a lifestyle associated with the ground and the interior of nests. The optic lobes represented 35.4 percent of the volume of the main neuropils in females and more than 41 percent in males, before the average comparison with other regions.

Pedunculate bodies

The stalked bodies, linked to sensory integration and learning in insects, had a smaller relative volume than in *Tribolium castaneum*. The female presented about fourteen percent. The male presented about twelve percent. The researchers associate this reduction with the specialized ecology and restricted diet of *Paussus favieri*, composed of larvae, pupae, and tender individuals of *Pheidole*

pallidula.

Microtomography also revealed asymmetries not previously described for the species. One involved the optic lobes. The other occurred in the pedunculated bodies. In males, the left medial lobe showed greater extension and protruded over the central body. In females, this characteristic did not appear in the same way. The study also recorded asymmetry in the male's antennal lobes, with the right lobe larger than the left.

Scientists highlight the need for further analysis with more specimens. The species has low availability in the field and restricted phenology. Even so, the data indicate a relationship between extreme ecological specialization and brain organization. The work opens a basis for

research on the neuroanatomy of
myrmecophilous beetles and on the
evolution of parasites of social insects.

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Suzano announces changes in executive leadership

Reorganization accompanies the creation of Arbex, a joint venture with Kimberly-Clark

06.07.2026 | 15:29 (UTC -3)

Beatriz Imenes, Cultivar Magazine edition



Suzano, a global pulp producer, announced changes in its leadership as part of a strategic reorganization resulting from the creation of Arbex, a joint venture

formed with Kimberly-Clark.

Pablo Machado (pictured), who has led Suzano's operations in Asia since 2021, assumes the executive vice presidency of Consumer Goods, based in Brazil, succeeding Luís Bueno, while also maintaining responsibility for the company's global strategy. Malu Pinto (pictured), executive vice president of Sustainability and Communication, will also lead the executive vice presidency of People and Management, Health and Safety, and Facilities, previously headed by Caroline Carpenedo. Both continue to report to Suzano's CEO, Beto Abreu.

Bueno and Carpenedo assume the executive vice-presidency of Operations and the executive vice-presidency of

People, Sustainability, Communication and Corporate Brand at Arbex, respectively.

The Arbex board will also include Pablo Cadaval Santos, who leaves his position as director of Research and Innovation at Suzano and assumes the executive vice-presidency of Technology at Arbex. All three executives will report directly to Ehab Abou-Oaf, CEO of Arbex and formerly president of Family Care International and Professional operations at Kimberly-Clark.

Due to changes in Suzano's vice-presidency, Miguel Sieh, previously Director of New Business, will now lead Suzano's operations in Asia, reporting to Leonardo Grimaldi, Executive Vice President of Commercial and Logistics for Pulp and Asia Business.

Based in Europe and responsible for the production, marketing and sales of toilet paper, napkins, paper towels and facial tissues in more than 70 countries, Arbex was created this month to combine Suzano's expertise in pulp and paper with Kimberly-Clark's global leadership in hygiene and personal care products.

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Failure to collect recyclables reduces the motivation of foraging ants

A study with *Cataglyphis velox* shows a 25-fold increase in the interval before the next foray in search of food

06.07.2026 | 11:58 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Zach Lieberman - AntWeb - CC BY-SA 30

A single trip without food reduced the motivation of *Cataglyphis velox* foraging ants to initiate a new exit from the nest. The effect appeared in a field experiment conducted near Seville, Spain, with ants trained to travel a route to a feeder. After a trial without reward, most individuals remained longer inside the nest before returning to foraging. The average interval increased from 45 seconds to 1.208 seconds, an increase of about 25 times (DOI 10.1242/jeb.252524).

This study evaluated how failure alters the subsequent behavior of desert ants. These insects rely on visual navigation and path integration during foraging. Worker ants learn routes to food sources and retrieve these memories throughout their foraging

life, especially when they find a reward. Even so, journeys without food are part of the routine for species adapted to environments with scarce and dispersed resources.

Research format

Researchers trained *Cataglyphis velox* worker ants on a five-meter artificial route to a container of biscuit crumbs. Each ant received an individual tag after collecting food for the first time. Before the tests, the individuals needed to complete at least five consecutive trips with a maximum latency of one minute between each trip.

In the first experiment, trained ants followed a test route with an empty feeder.

Researchers recorded the time spent searching for food, the return to the nest without food, and the latency until the next outing. In 14 ants evaluated, the unsuccessful trip caused a strong increase in time spent inside the nest. Three individuals did not reduce their activity after the first failure. One of them increased its latency after a second attempt without food. Another remained for more than an hour without leaving after the second failure. The third made seven unsuccessful trips before changing its behavior.

Staying away from the nest

The study also assessed whether the effect could result solely from the longer time spent away from the nest. To this end, the researchers conducted a second test with a prolonged journey, but with food available at the end of the route. The ants collected the crumb, but their return to the nest was blocked for about nine minutes. The average latency increased from 22 seconds to 357 seconds after this experiment. The increase occurred, but remained below that observed after the journey without food.

The comparison indicated a greater effect of food collection failure on motivation. The prolonged duration of the journey influenced subsequent behavior, but failure produced a more intense response.

According to the researchers, the result suggests a motivational control mechanism. Successful worker bees would tend to resume foraging more quickly. Worker bees without reward would avoid unnecessary effort.

Influence of temperature

Scientists also tested the influence of temperature. Ants stayed for nine minutes in containers in the sun or shade.

Afterward, they returned to the nest with food. Exposure to the sun, with an average temperature of 45,39 degrees Celsius, did not increase latency compared to the shaded condition. There was also no

significant correlation between temperature and time until the next exit. The result indicates little influence of short thermal exposure on the decrease in motivation observed in the failure tests.

The ants largely maintained the direction of the foraging sector after the failure. Among 14 individuals subjected to the journey without food, only one oriented itself more than 90 degrees away from the direction of the feeder after leaving the nest again. The researchers relate this pattern to sector fidelity, a behavior in which the worker ant maintains a search area based on previous successes.

The study concludes that *Cataglyphis velox* adjusts its foraging motivation according to the outcome of the previous trip. The absence of food reduces the

impulse to venture out more strongly than a long trip with a reward. Elevated temperature, under the tested conditions, did not explain the effect.

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Farmers report low impact of fire ants on production

A study surveyed producers in eight states with Atlantic Forest biome and indicates a low perception of losses

06.07.2026 | 09:13 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo by Johnny N Dell / Bugwood

Farmers in the Atlantic Forest report frequent presence of fire ants on rural properties, but attribute low or moderate impacts on agricultural production to these insects. This conclusion appears in a study by Brazilian researchers based on a questionnaire applied to producers in eight Brazilian states. The research evaluated perceptions about productivity, costs, control methods, and health problems related to the stings (DOI 10.3390/insects17070698).

This study analyzed ants of the genus *Solenopsis*, focusing on *Solenopsis invicta* and *Solenopsis saevissima*. These species occur in the Atlantic Forest and occupy open areas, urban centers, and cultivated fields. In Brazil, there is still little data on

damage caused by fire ants. Most of the available information is concentrated in records from the Northern Region.

Rain Forest

The research sought to fill this gap in the Atlantic Forest, a biome with strong human occupation and extensive agricultural activity. The researchers applied a questionnaire with questions about the profile of farmers, characteristics of their properties, occurrence of nests, perceived damage, management practices, and the effects of stings.

Most respondents reported the regular presence of fire ants on their properties. Even so, 70,8 percent of farmers stated

that they did not observe a negative impact on production. Another 18,2 percent reported losses of up to 10 percent in their crops. A smaller group, of 11 percent, indicated damage between 11 percent and 70 percent.

Direct evaluation

Direct impact assessment also revealed low perception. On a scale of zero to ten, where zero indicates no impact and ten indicates constant impact, 40,6 percent of farmers scored zero. Most respondents also reported annual spending of less than \$17 on fire ant control.

The properties assessed ranged in size from 0,1 hectares to 55 hectares.

Cultivable areas varied from 30 square meters to 350 square meters. Most farmers were between 40 and 60 years old. Men represented 70,1 percent of those interviewed. Completion of secondary education was the most frequent level of schooling, at 29,9 percent.

Vegetables and fruits predominated among the reported agricultural activities. Most producers declared more than 15 years of experience. Conventional management predominated in 66,2 percent of the properties, with the use of agrochemicals. Unregistered organic management appeared in 22,1 percent of cases. Organic management registered in the National Registry of Organic Producers

appeared in 11,7 percent.

Moderate occurrence

Farmers reported a moderate occurrence of nests. Most indicated fewer than ten nests per property. Almost half of the nests, 49,4 percent, were located within cultivated areas. Other records indicated nests less than five meters, less than ten meters, or more than ten meters from the crops.

Mechanical control emerged as the most commonly used method. Sixty percent of farmers removed the nests manually.

Another 21,3 percent did not use any control method. Insecticides were cited by 6,5 percent. Alternative methods, such as

applying hot water with detergent, appeared in 12,2 percent of responses.

Most farmers, 69,9 percent, said they repeated the nest removal process once until the structure was eliminated. Another 19,6 percent repeated the process twice. A further 7,8 percent repeated it three to four times. Only 2,6 percent performed more than five repetitions.

Frequency of bites

Stings were highly frequent among those interviewed. The study recorded that 85,1 percent of farmers had been stung by fire ants. Among them, 49,4 percent reported stings at least once a month. Another 16,9 percent reported weekly stings. A further

7,7 percent reported daily stings.

The most common reaction was itching.

Only 0,6 percent of those interviewed reported hospitalization due to the stings.

Among the farmers who were stung, 86,7 percent said they spent money on medication at least once a year. In 65 percent of cases, the medical expense was less than \$17.

The main concerns involved visitors, ant control, and movement in infested areas.

The possibility of stings from visitors appeared in 36,4 percent of responses.

Ant control appeared in 20,9 percent.

Avoiding infested areas appeared in 18,2 percent. Home invasions appeared in 17,3 percent. Psychological stress appeared in 7,3 percent.

Difference in perception

Researchers highlight the difference between the perception recorded in the Atlantic Forest and the impacts reported in regions where *Solenopsis invicta* invades new environments. In countries such as the United States, Australia, and China, the species causes high control costs and losses in agricultural systems. In the Atlantic Forest, the data indicated a lower perception of economic and sanitary damage among the farmers interviewed.

The study suggests a hypothesis for this difference. In the Atlantic Forest, assemblages of fire ants in agricultural areas frequently include **Solenopsis saevissima**, a native species. This

condition may favor coexistence with natural enemies and local competitors. However, the researchers caution that this hypothesis was not tested in the study.

Methodological limitations

The study also highlights methodological limitations. The research used an online questionnaire, supported by in-person contacts. This format broadens geographic coverage but may exclude farmers with less digital access. Voluntary participation may also attract producers with a greater interest in the topic.

The results form an initial basis for monitoring, management, and public

policies. The researchers advocate for continued vigilance, as habitat fragmentation, changes in land use, and climate change may favor the expansion of fire ants in the Atlantic Forest.

The work was developed by Victor Hideki Nagatani, Tiago Henrique Nascimento Dativa Vieira, Kelly Carina Braga Bernardo, Samira Daniele Gardziulis Maia Reis, Nathália Sampaio da Silva, Gabriela Procópio Camacho, Otávio Guilherme Moraes Silva, Dietrich Gotzek, and Maria Santana de Castro Morini.

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Epazote oil outperforms neem against the fall armyworm

A study indicates a 62% mortality rate in *Spodoptera frugiperda* larvae exposed to a 5% concentration

05.07.2026 | 14:51 (UTC -3)

Schubert Peter, Cultivar Magazine



Photo: Marina Pessoa / Embrapa

The essential oil of *Dysphania ambrosioides* — a plant known as epazote or mastruz — demonstrated insecticidal activity against *Spodoptera frugiperda* larvae in a laboratory trial in the United States. Treatment at a 1% concentration reduced caterpillar weight gain and caused 100% mortality over a ten-day evaluation period (DOI 10.1016/j.procyto.2015.05.001).

The research evaluated the essential oil incorporated into an artificial diet. The caterpillars received the treated food seven days after hatching. The researchers compared seven groups: control with water, 1% wormwood oil, 5% wormwood oil, 1% neem oil, 5% neem oil, control with 1% Tween 80, and control with

5% Tween 80. Each group had 50 larvae.

Expressive result

The most significant result occurred in the group treated with 5% wormwood oil. At the end of the period, 31 out of 50 caterpillars had died. This group also showed the lowest final average weight, at 7,8 milligrams. The difference compared to the other treatments was statistically significant, according to the analysis presented by the researchers.

Treatment with 1% wormseed oil did not cause mortality. Even so, it reduced caterpillar growth. The average final weight of this group reached 52,1 milligrams. The controls with water and Tween 80 showed

greater development. The control with water reached an average final weight of 289,0 milligrams. The control with 1% Tween 80 reached 269,3 milligrams. The control with 5% Tween 80 reached 203,0 milligrams.

Neem oil served as a natural reference in the assay. The 1% neem treatment resulted in three deaths. The 5% neem treatment showed no mortality. The final average weight reached 209,8 milligrams in the 1% neem group and 45,7 milligrams in the 5% neem group. According to the researchers, 5% neem oil outperformed the neem treatments in reducing larval growth and mortality.

Chemical analysis

Chemical analysis of the essential oil of wormseed identified major compounds.

The volatile profile showed 29,2% alpha-terpinene, 25,2% ascaridole, 18,0% isoascaridole, and 7,4% limonene.

Researchers highlight ascaridole isomers as compounds frequently associated with the insecticidal activity of wormseed essential oil.

The study used dried leaves of *Dysphania ambrosioides* grown in a greenhouse. The material underwent hydrodistillation for two hours. Afterwards, the essential oil was analyzed by gas chromatography coupled with mass spectrometry.

Spodoptera frugiperda larvae were kept under controlled laboratory conditions. The temperature was maintained at 22 degrees

Celsius, with a relative humidity of 40% and a 12-hour light cycle. Researchers recorded daily mortality and weight variation. Each caterpillar received a new Petri dish and a new portion of artificial diet each day.

The results indicate the potential of wormwood essential oil as a natural insecticidal ingredient. However, the researchers state that the study was preliminary and conducted in a controlled environment. They recommend further research to clarify the mechanism of action of the essential oil. They also indicate the need for trials under field or greenhouse conditions (on plants), due to the inherent limitations of tests conducted on artificial diets.

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