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Cultivar Semanal ®

Stem breakage and grain rot challenge soybean producers

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Stem breakage and grain rot continue to challenge soybean farmers

Research is progressing, but there is still a lack of consolidated solutions for the two main recent phytosanitary problems of soybeans

20.06.2025 | 09:38 (UTC -3)

Cultivar Magazine, based on information from Lebna Landgraf

Photos: Leila M Costamilan

The crop cracks. The stem gives way at the slightest touch. This is stem breakage, a problem increasingly cited by soybean producers. A few meters away, pods with darkened, deformed grains add to the losses. Grain rot is making a strong comeback in regions with hot, humid climates. The situation is worrying. The exact causes are still eluding science. But recent advances are beginning to indicate ways to address it.

Researcher Cláudia Godoy, from Embrapa Soja, warns: breakage and rot are not the same thing. Although they appeared simultaneously in northern Mato Grosso, they do not share a common origin. “There is material that breaks and does not rot. And there is also the opposite,” she

explains.

Stem breakage

Stem breakage occurs in plants with a high production load. It affects more sensitive cultivars, especially when sown under high rainfall and temperature. The symptom usually appears during grain filling. The plant breaks at the slightest touch, leaving the producer without reaction. Reports date back to 1994. It reappeared in 2006 in Paraná and, more recently, in 2020 in Mato Grosso. In 2023, it once again frightened soybean farmers in Paraná.

The strongest hypothesis points to abiotic causes, linked to interactions between genetics and the environment. No

relationship with pests or diseases has yet been proven. Without a defined cause, there is no recommended chemical control. Possible management? Careful selection of less susceptible cultivars.

Grain rot

Grain rot has a much older history. Described in global literature decades ago, it has intensified in areas of the Mid-North of Mato Grosso and Rondônia. In these regions, early planting, the use of early cultivars and the rainfall regime increase humidity during harvest. This combination favors rot.

The disease results from a complex of fungi. Among the most common are *Diaporthe longicolla*, *D. ueckeri* e *Fusarium* spp.. The infection compromises germination, increases the percentage of damaged grains and generates discounts in marketing above 8% rot.

To combat this, Embrapa coordinates research networks. Tests with cultivars at different times and locations have already

yielded public results, available on the institution's website. The focus is on genetics. The selection of resistant materials appears as a long-term solution.

Fungicides have also been tested. Some have shown partial effectiveness. They do not eliminate the problem, but they help reduce its incidence. According to Cláudia Godoy, chemical control should be complementary, especially in more sensitive cultivars.

There is another complicating factor. In years with climate stress – such as irregular rainfall and heat during grain filling – the symptoms become confused. Pod abortion, green seeds, early germination and rot may have a physiological origin. But when samples are

sent for diagnosis, opportunistic fungi appear, confusing the real cause.

“The presence of *Diaporthe* ou *Fusarium* does not guarantee that they are the culprits”, emphasizes Cláudia. The laboratory analysis needs to be accompanied by a field evaluation and history of the area. Without this, there is a

risk of management errors.

Change in scenario

The most recent research reinforces the idea that the scenario has changed. Not so much because of the diseases themselves, but because of the new growing conditions. Harvests in more humid environments, different cultivars, practices that alter the microclimate of the crop. “The pathosystem remains the same. What has changed is the production system,” summarizes the Embrapa Soja team.

The most recent harvest has brought relief. Lower rainfall in parts of the Cerrado has reduced damage from the rot. But experts

warn: the risk remains. Continued use of sensitive materials and favorable weather could reignite outbreaks.

For the next cycle, the recommendation is clear. Choose resistant cultivars. Monitor the climate. Use fungicides judiciously. And, above all, differentiate physiological from phytopathological causes. The crop will thank you. And so will the producer.

More information on the subject can be found in the magazine Cultivar Grandes Culturas 308 (subscribers only)

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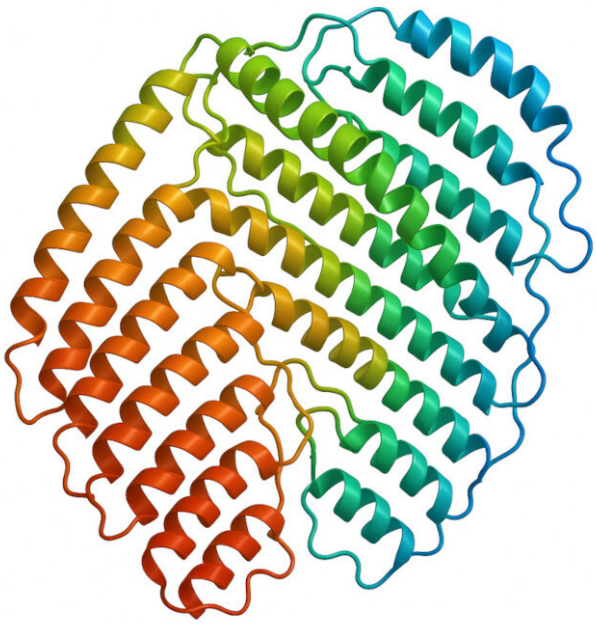
Scientists amplify Vip3A in Bacillus thuringiensis

Researchers increase secretion of Vip3A protein, paving the way for more potent pesticides

17.06.2025 | 16:14 (UTC -3)

Cultivar Magazine



Researchers have developed a strategy to increase the effectiveness of

bioinsecticides based on the bacteria ***Bacillus thuringiensis* (Bt)**. The study revealed that manipulating enzymes involved in the degradation of the bacterial cell wall can greatly increase the secretion of the Vip3A protein.

Vip3A belongs to the group of insecticidal vegetative proteins produced by Bt during its growth phase. Unlike the well-known Cry toxins, synthesized in the sporulating phase, Vip3A acts by another mechanism. It does not present cross-resistance with Cry and has a broad spectrum against lepidopterans.

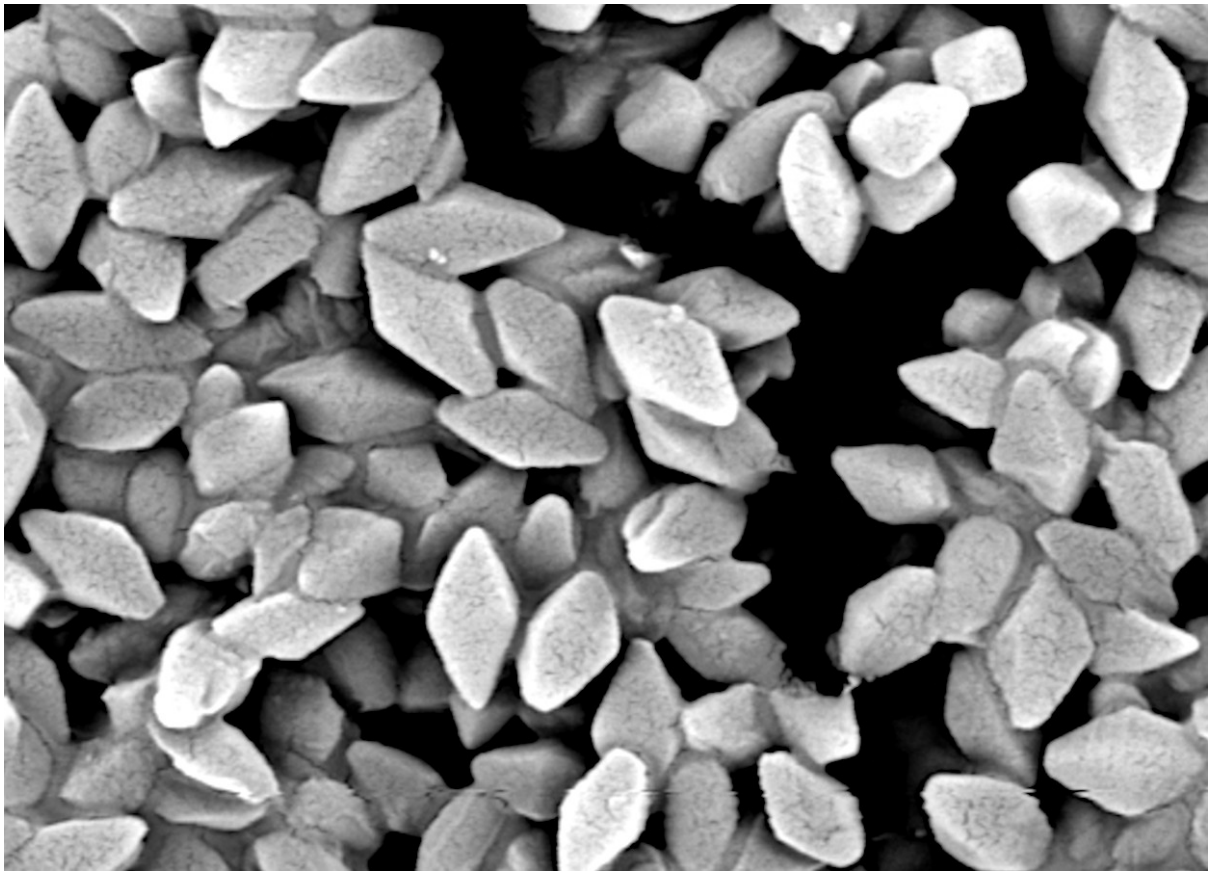
The challenge faced by the scientific community was the retention of Vip3A inside the bacterial cell, even after the use of strong genetic promoters. The solution

now found was to intervene in the protein secretion system, focusing on enzymes called cell wall hydrolases (CWHs).

Among these enzymes, the murein transglycosylase MltE stood out. Its overexpression weakened the bacterial cell wall and increased the release of membrane vesicles, structures that transport proteins such as Vip3A to the external environment. The result was a significant increase in the concentration of the toxin in the fermentation broth within 12 hours.

Tests with caterpillars of *Spodoptera exigua* showed the impact of this innovation. The culture broth of the strain modified with MltE, diluted four times, was able to cause up to 70% functional

mortality in the larvae after only half a day of fermentation. In comparison, a strain previously modified by another method needed 36 hours to achieve a similar effect.



In addition to efficiency, the new method proposes a reduction in fermentation time. This represents a considerable gain for the

industrial-scale production of bioinsecticides, potentially reducing costs and increasing competitiveness compared to synthetic products.

The research also reinforces a line of studies on membrane vesicles in Gram-positive bacteria. Until recently, it was considered that this group did not produce such structures due to the thickness of the cell wall. However, the work with Bt suggests that changes in the enzymatic balance of the wall may favor the formation of vesicles, with implications beyond agricultural toxicology.

The team also observed that proteins other than Vip3A – such as phospholipase C and hemolysin HBL – increased their presence in the vesicles of the modified

strain, suggesting that the technique could be useful for the production of several recombinant proteins.

The study did not identify involvement of phage genes or other extrinsic cellular stress mechanisms, as occurs in other bacteria. This indicates that modulation of CWHs alone can induce vesicle formation in Bt, opening new biotechnological possibilities.

The team suggests that different types of CWHs exert distinct effects on the cell wall, depending on where they act. Hydrolases that break glycosidic or amide bonds, such as MltE, BioL and YgiM, favored the secretion of Vip3A. Enzymes such as EnvC and YkfC, which act on peptide bonds, showed the opposite effect.

The authors propose that the process of vesicle and protein release may be linked to the dynamics of cell division and the restructuring of the bacterial wall. Although further studies are needed, the hypothesis is that certain enzymes "open up space" physically in the cell wall, facilitating the formation and release of vesicles.

More information at doi.org/10.1016/j.pestbp.2025.106515

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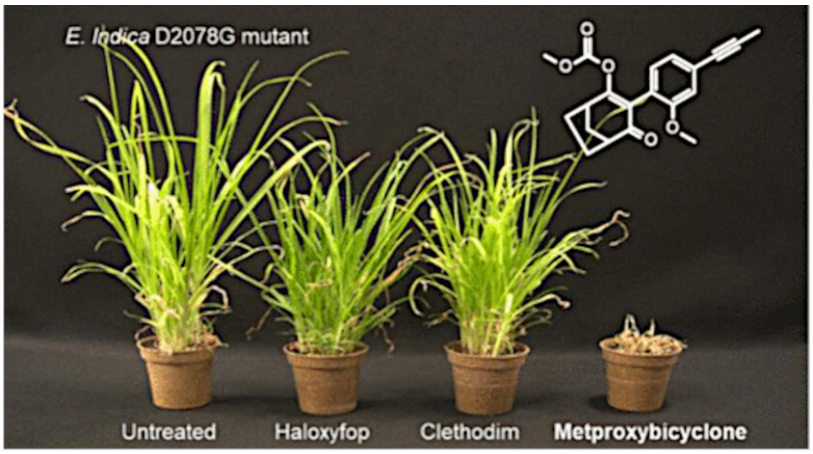
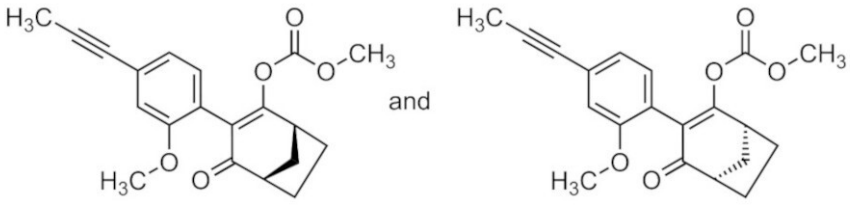
Metproxybicyclone herbicide inaugurates fourth generation of ACCase inhibitors

Syngenta product emerges as response to weed resistance

17.06.2025 | 14:22 (UTC -3)

Cultivar Magazine, based on information from Syngenta





Syngenta has announced that its new herbicide, metproxybicyclone, has been classified in a new subclass of ACCase inhibitors. The decision was made by the Herbicide Resistance Action Committee (HRAC) and the Weed Science Society of America (WSSA). According to the company, this is the first innovation in this chemical group in almost two decades.

The molecule represents the fourth generation of this class of herbicides. The third, led by pinoxaden, also from Syngenta, entered the market in 2006. The gap between launches highlights the difficulties in developing effective and safe solutions against resistant weeds.

According to Camilla Corsi, the company’s global director of research and

development, the new product responds to a growing problem. Herbicide resistance already occurs in 273 weed species, in more than 100 crops and 75 countries. About 40% of these species are grasses.

Metproxybicyclone was developed to address this challenge in soybean and cotton crops in South America, especially in Argentina and Brazil.

The herbicide is expected to be launched in Argentina in 2026, following regulatory approvals. The molecule was designed to control grasses resistant to widely used herbicides, such as glyphosate and clethodim.

In Brazil, the Brazilian Institute of Environment and Renewable Natural Resources (Ibama) issued a Temporary

Special Registration for research in May 2024. Main features:

Registrant: Syngenta Crop Protection Ltd., CNPJ: 60.744.463/0001-90

Product trademark: A23434

Product registration number: 40732/23

Chemical name of active ingredient: [3-(2-methoxy4-prop-1-ynyl-phenyl)-4-oxo-2-bicyclo[3.2.1]oct-2-enyl] methyl carbonate

Common name of active ingredient: metproxybicyclone

Approved indication for use: The research aims to test the product in controlling the main weeds (invasive plants that develop in undesirable

places) in conditions that allow the use of this product in non-agricultural environments, such as fence lines, industrial areas, highway margins, railways, oil pipelines, terminals and high voltage substations and thus obtain agronomic efficacy reports, physical, chemical, environmental, ecotoxicological and toxicological studies aiming at the submission of the product for new registrations

Preliminary toxicological classification: Class I - extremely toxic

Preliminary environmental classification: Class I - highly hazardous to the environment

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ADM and Pyco enter into joint venture for cottonseed processing

Companies unify operations in Lubbock and promise efficiency gains and supply stability

20.06.2025 | 08:24 (UTC -3)

Cultivar Magazine, based on information from Jackie Anderson

ADM and Pyco Industries have entered into an agreement to form a joint venture that will combine their cottonseed

processing operations in Lubbock, Texas. The new venture will be majority-owned by Pyco and governed by a six-member board, three appointed by each company.

The two companies will move their processing facilities in the city to the new structure. The official launch is scheduled for the third quarter of 2025.

According to John Grossmann, president of ADM's North American Agricultural Services and Oilseeds unit, the initiative is part of a global simplification strategy and promises operational gains.

“We will continue to serve our customers while improving efficiency,” he said.

Robert Lacy, president of Pyco, highlighted the impact on cooperative members and end buyers: “we want to strengthen our

competitiveness and ensure regular supply of essential products to the market”.

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Bioceres announces changes to its board of directors

Executives with experience in investments and finance replace names linked to the company's recent trajectory

20.06.2025 | 08:15 (UTC -3)

Cultivar Magazine, based on information from Paula Savanti

Bioceres Crop Solutions has announced changes to its board of directors. Effective June 24, 2025, Noah Kolatch and Scott Crocco will join the board. The appointments occur in parallel with the departure of Gloria Montaron Estrada and Keith McGovern, who will step down on the same date.

Kolatch is a private equity firm with Jasper Lake LLC, a private equity firm. Previously, he was a partner at Solel Partners, an equity and credit-focused asset manager. Crocco has over 30 years of experience in finance and operations. Previously, he served as CFO of Air Products & Chemicals and Imperial Dade, where he led restructurings and strategic expansion.

Gloria Montaron Estrada has been part of the company since before its IPO. She served as legal director and then as a board member, contributing to acquisitions and the IPO. McGovern joined the Board after the acquisition of Marrone Bio and contributed with an operational focus and farmer-centric vision.

Additionally, Milen Marinov, current Chief Commercial Officer, will take the place of Enrique Lopez Lecube on the Board, who remains on the executive team as Chief Financial Officer.

The changes stem from amendments to convertible bond issuance agreements signed in 2022 with Jasper Lake Ventures, Redwood Enhanced Income and Solel-Bioceres SPV.

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Paraná confirms cases of greening and reinforces control measures

State prepares emergency operation to contain the spread of the disease in citrus groves

19.06.2025 | 17:27 (UTC -3)

Cultivar Magazine

Cases of citrus greening have been confirmed in Doutor Ulysses and Cerro Azul, in the Ribeira Valley, Paraná State. In response, the State Agriculture System (Seagri) issued guidelines on mandatory measures to combat the disease.

HLB, caused by the bacteria ***Candidatus liberibacter***, severely compromises the production of citrus fruits. The state's response seeks to contain the spread of the disease before it reaches a larger scale.

The government has scheduled a meeting between state representatives and the affected municipalities for Monday (23/6). The meeting will take place at the headquarters of the Secretariat of Agriculture and Supply (Seab), in Curitiba.

On the 30th, a new edition of Operation Big Citrus begins, now focused on the Ribeira Valley. Coordinated by Adapar, the initiative has already shown good results in other regions of Paraná. The objective is to maintain the health of the orchards with inspection and specific eradication actions.

Technicians from IDR-Paraná will also intensify monitoring of the Asian psyllid (***diaphorina citri***), vector of the disease. Traps will be installed in productive areas. So far, the insect has not been found in the region.

The disease affects several citrus species, as well as plants such as myrtle, *Fortunella* spp. And *poncirus* spp.. Citrus farming has a significant economic weight in the Ribeira Valley, especially due to the

production of poncã.

Renato Blood, director of Adapar, explained that, in case of confirmation of contamination, only the diseased plant will be eradicated. According to Blood, control is possible with quick action and collaboration from farmers.

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Multiple resistance in Conyza bonariensis puts pressure on management

Buva survives glyphosate and chlorimuron with genetic mutations and accelerated metabolism

19.06.2025 | 15:07 (UTC -3)

Cultivar Magazine

In the agricultural heart of Rio Grande do Sul, an old enemy reinvents itself. ***conyza bonariensis***, the buva, already dribbled the glyphosate. Now it also surpasses chlorimuron-ethyl (chlorimuron ethyl). The discovery came after analyses with biotypes collected in crops of soybean in the northwest of the state. The data indicate combined genetic and metabolic resistance, a warning to technicians and producers.

The study reveals that the biotypes tolerate up to 49 times the recommended dose of glyphosate. Against chlorimuron, the resistance factor exceeds 4900 in some cases. These numbers indicate a loss of practical efficiency in the field.

Genetic sequencing revealed three mutations: Pro106Thr in the EPSPS gene,

linked to glyphosate; Pro197Arg and Trp574Leu in the ALS gene, associated with resistance to chlorimuron. In addition, tests with the malathion inhibitor demonstrated that accelerated metabolism, via cytochrome P450, participates in the breakdown of the herbicide.

In the trial, five biotypes were evaluated. Four were resistant to chlorimuron. Three were also resistant to glyphosate. Biotype II, with the Pro197Arg mutation, also showed cross-resistance to four other ALS inhibitors, such as imazethapyr and flucarbazone.

The proliferation of the species is impressive. As the scientists involved in the project pointed out, a single plant can release 800 seeds into the wind. Currently,

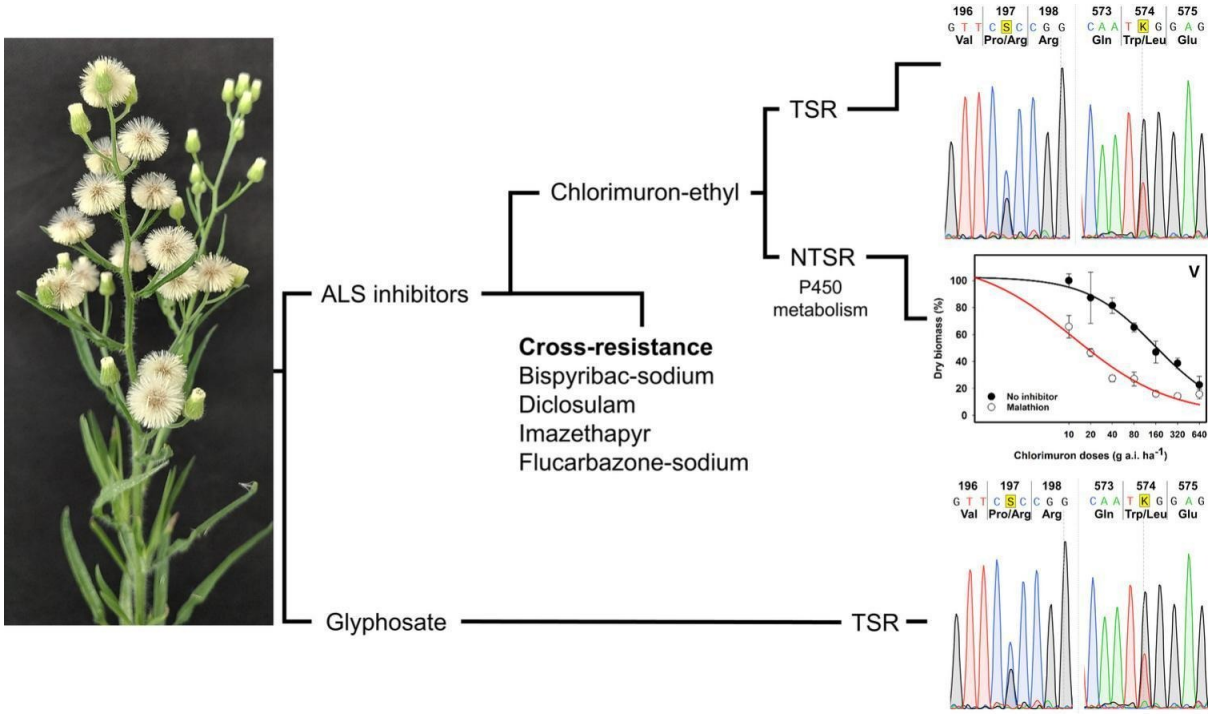
infested areas cover more than 7 million hectares in Brazil. This represents about 30% of the area planted with soybeans, in addition to increasing the cost of control by about US$ 400 million per harvest.

Traditional herbicide rotation strategies lose strength in the face of multiple resistance. According to researchers, management needs to incorporate rapid molecular tests and the adoption of plant cover crops. Knowing the type of mutation present can guide more effective choices.

The study rules out an increase in the number of copies of the ALS and EPSPS genes as the cause of resistance. However, it points to increased gene expression in some biotypes. The combination of mechanisms – genetic and metabolic – raises a warning sign about

the increasing complexity of chemical control.

More information at doi.org/10.1016/j.pestbp.2025.106501



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Micropep and Corteva enter into agreement on micropeptide pesticides

Exclusive global partnership with Corteva in peptide library for biocontrol and biofungicides

19.06.2025 | 10:15 (UTC -3)

Cultivar Magazine, based on information from Sarah Shkargi

Micropep Technologies has entered into a research and development agreement with Corteva to develop micropeptide-based

biocontrol solutions. The agreement, signed within the Corteva Catalyst program, provides for a multi-year collaboration and exclusive rights for the US company to apply a defined library of peptides in biocontrol and biofungicide products.

Corteva invested in the French startup in 2024. With the new partnership, scientific teams from both companies will conduct joint studies that could lead to commercial products.

The move marks the first industrial validation of the Krisalix platform, a peptide discovery system that combines advanced algorithms and high-throughput bioassays to identify bioactive molecules for crop protection.

According to the companies, the micropeptides developed by Krisalix have novel modes of action, a high safety profile and proven efficacy in the field. The molecules help manage resistance and provide sustainable alternatives that complement existing chemical tools. The platform also allows for scalable production and competitive costs.

Mikael Courbot, Micropep’s CTO, said the agreement with Corteva furthers the company’s mission to deliver biological solutions at scale. Tom Greene, Corteva’s senior director and global leader of Catalyst, said the technology complements the company’s biologicals portfolio and reinforces its commitment to sustainable agriculture.

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How to identify Leptodelphax maculigera and Dalbulus maidis

By Glauber Renato Stürmer, CCGL – Central Gaúcha Cooperative Ltda.

18.06.2025 | 17:14 (UTC -3)

Morphological differences for species identification *Dalbulus maidis* e *Leptodelphax maculigera* (Stürmer, GR 2023)

Leafhoppers of the families Cicadellidae and Delphacidae are common in grasses and form a recognized important group of insect vectors of viruses and mollicutes, causal agents of diseases in several plant species, including corn crops.

The corn leafhopper ***Dalbulus maidis*** is from the Cicadellidae family. They are phytophagous insects and are the most diverse group of Membracoidea (superfamily), with around 21 thousand described species. The African leafhopper (***Leptodelphax maculigera***) is from the Delphacidae family, a family of leafhoppers containing around 2 thousand species, distributed worldwide.

The Delphacidae family commonly occurs in monocotyledons (grasses, shrubs and

trees), with the ability to be vectors of phytopathogens, mainly viruses. However, there are species that transmit phytoplasmas and cause diseases, especially in sugarcane and rice (*Eumetopina flavipes*, *Javesella discolor*, *Nilaparvata lugens*, *Saccharosydne saccharivora*). For example, the brown leafhopper (*N. lugens*) is a very destructive insect pest in rice, with 18 symbiotic bacteria described that can be transmitted.

Within the Delphacidae family, there are leafhoppers of the genus Leptodelphax, which, worldwide, have the following species: *Leptodelphax dymas* (Fennah 1961), *Leptodelphax maculigera* (Stal 1859) and *Leptodelphax cyclops* (Haupt 1927). In Africa, *Leptodelphax dymas* is responsible for the transmission of Napier

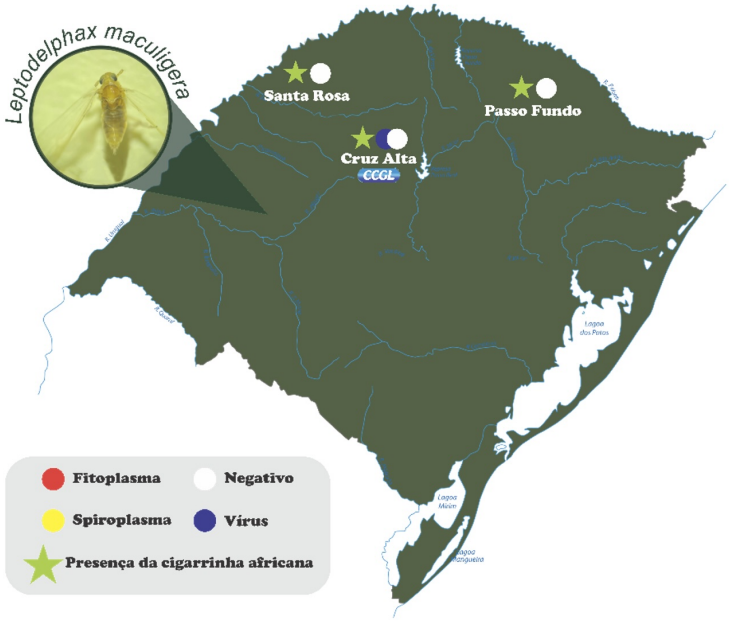
grass stunt (NGS), which is a phytoplasma of the genus "Candidatus", extremely harmful to elephant grass crops. And, recently, *Leptodelphax maculigera* was identified as a transmitter of MRFV in cultivated plants, and potentially a vector of the stripe virus in corn crops in Brazil.

Monitoring leafhoppers using sticky traps in wheat-cultivated areas (Sturmer, GR, 2023)

In Brazil, it was recently found in the states of Goiás, Rio Grande do Sul, Paraná, Santa Catarina, São Paulo and Mato Grosso do Sul, and in the state of Rio

Grande do Sul, *L. maculigera* was verified in the municipalities of Cruz Alta, Passo Fundo and Santa Rosa. In these locations, it was captured in yellow adhesive traps.

This capture occurred in areas of tiguera corn, cultivated corn and wheat crops. This species shows its adaptability and has as hosts not only corn, but also kikuio grass (*pennisetum clandestinum*), sugar cane (*Saccharum officinarum*), setaria grass (*setaria sphacelata*), brachiaria (*brachiaria* sp.), elephant grass (*Pennisetum purpureum*), on weeds in bean and wheat crops and citrus orchards.



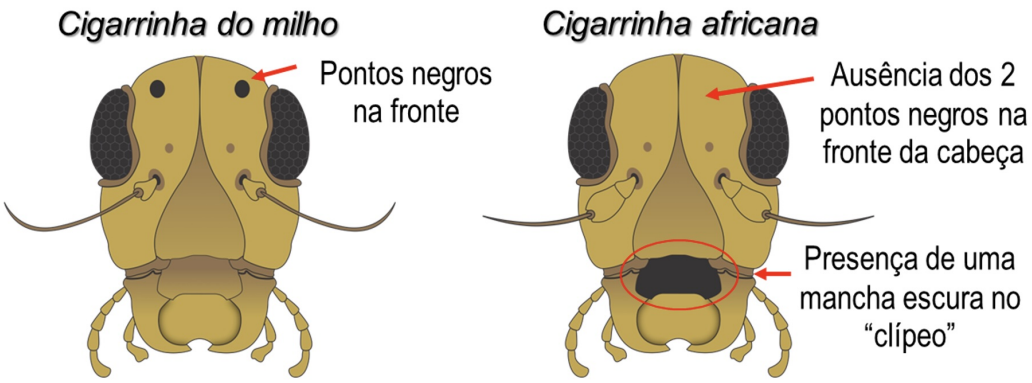
Locations where individuals of *Leptodelphax maculigera* in the State of Rio Grande do Sul (Stürmer, GR, 2023)

In this context, it is demonstrated that *L. maculigera* It is an oligophagous species, that is, it feeds on a relatively restricted number of host plants from different genera within the same family, and in this case the insect is associated with the poaceae family, economically important plants in Brazil.

However, the similarity with other species of leafhoppers such as *Dalbulus maidis*,

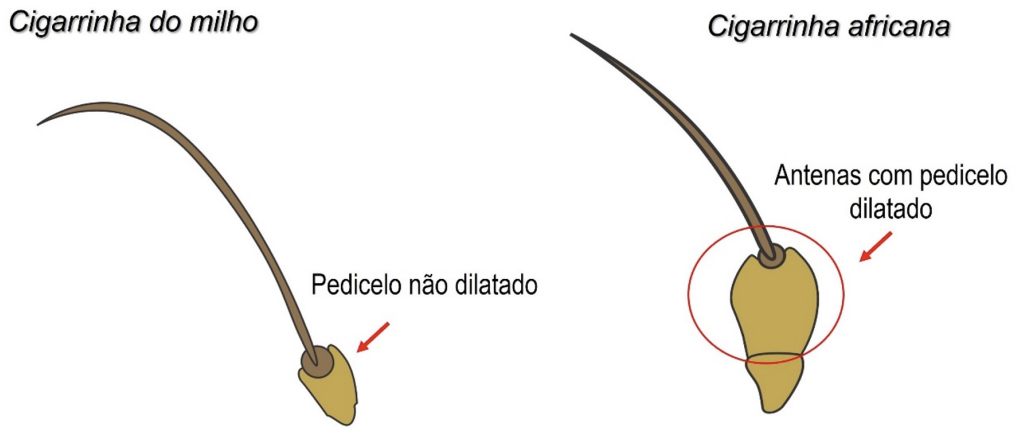
can lead to misidentification of its occurrence in the areas - or non-detection. In this context, knowing some morphological characteristics of the African leafhopper can help in correct monitoring and avoid possible identification errors.

the species *L. maculigera* It has a straw color, hyaline wings and black eyes, and is 0,4 cm smaller when compared to *D. maidis*. The corn leafhopper (*D. maidis*) is characterized by dark dots on the head, while in the African leafhopper (*L. maculigera*) there is a dark spot on the clypeus (region located on the lower part of the head), characteristic of this species.



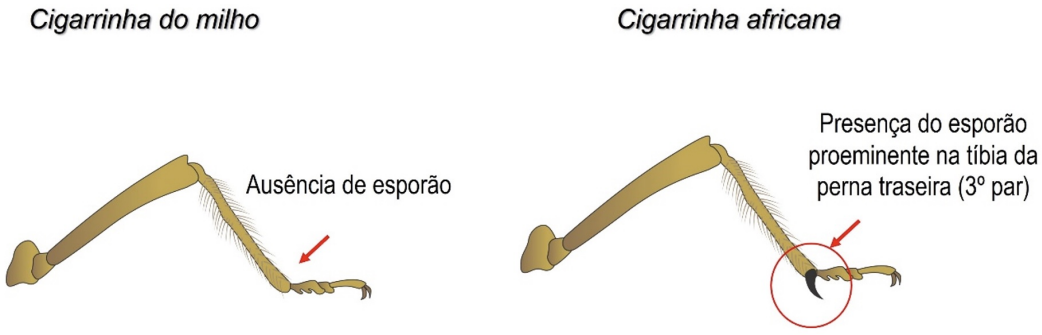
Morphological differences of the anterior surface of the head of the corn leafhopper (*Dalbulus maidis*) and African leafhopper (*Leptodelphax maculigera*) (Stürmer, GR 2023)

A striking feature that differentiates the African leafhopper from the corn leafhopper is the antenna. The African leafhopper has an antenna with a clearly visible dilated pedicel. The pedicel is close to the insertion of the antenna on the insect's head. The antenna *D. maidis* It does not have a dilated pedicel, being tapered throughout its entire length.



Differences in the morphology of the corn leafhopper antenna (*Dalbulus maidis*) and African leafhopper (*Leptodelphax maculigera*) (Stürmer, GR 2023)

Another characteristic of the Delpachidae family, which can be used to differentiate the two species, is found in the third pair of legs (the furthest from the head), with tibiae with a mobile apical spur.



Morphological differences between the legs of the corn leafhopper (*Dalbulus maidis*) and African leafhopper (*Leptodelphax maculigera*) (Stürmer, GR 2023)

The occurrence of the African leafhopper has raised concerns regarding the imminent risk of it being an insect vector for the pathogens of corn stunt, that is, the red stunt phytoplasma (“Candidatus Phytoplasma asteris”, Subgroup 16SrI-B); the pale stunt spiroplasma (*Spiroplasma kunkelii*); the maize rayado fno virus (MRFV) and the striate mosaic virus (MSMV), all transmitted by *Dalbulus maidis*.

The work carried out to date has already indicated, through molecular analyses, that several specimens of the African leafhopper captured were infectious with MRFV in Rio Grande do Sul, Santa Catarina, Paraná and São Paulo. However, the possibility of infection in corn crops and the risks related to the bacteria

still need to be confirmed.

In short, *Leptodelphax maculigera* It is a species of insect of the Delphacidae family, found in various regions of the world; it feeds on plant sap, mainly grasses. Therefore, it is necessary to observe the following aspects in order to create robust information and avoid creating unnecessary panic about the problem of the African leafhopper in corn crops.

1. Identify *L. maculigera* to understand the size of the problem in Brazil and what its percentage is in relation to *D. maidis* (main problem in corn crops)
2. Know the potential of *L. maculigera* as a bacteriophage in corn crops

3. Know its development in different hosts, being able to verify its possible adaptation to the corn cultivation system
4. Monitoring crops and symptoms with analysis to confirm infectivity in plants
5. Integration of management tactics *D. maidis* should also be implemented for areas with the presence of *L. maculigera*.

In this context, the African leafhopper is yet another pest capable of feeding on and causing damage to corn crops. Therefore, correct monitoring, adequate management and IPM techniques must be employed to minimize impacts on the productivity and quality of corn crops.

By **Glauber Renato Stürmer**, *CCGL – Central Gaucha Cooperative Ltd.*

Article originally published in issue 298 of Cultivar Grandes Culturas Magazine

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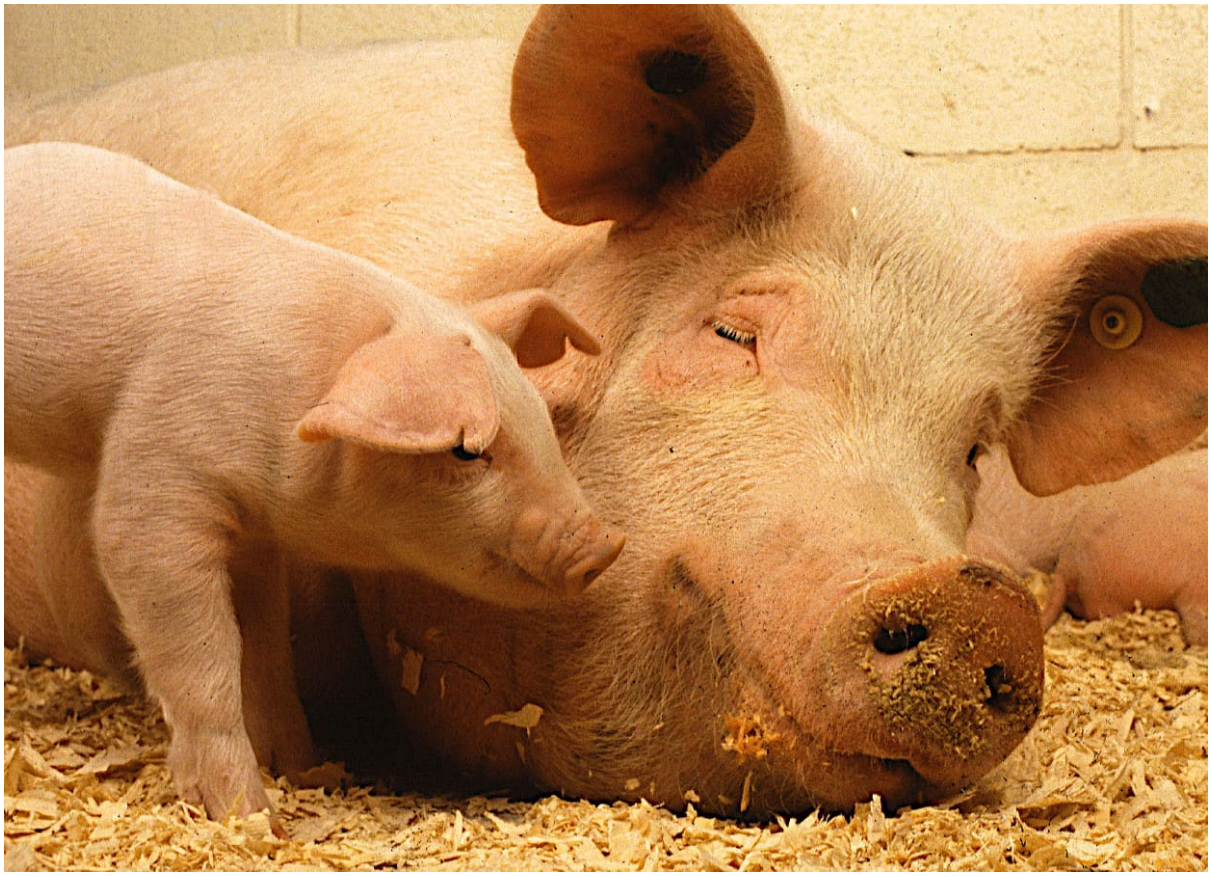
Antibiotics in crops pose a challenge for food safety

Veterinary drug residues persist in soil, migrate to plants and raise awareness of risks

18.06.2025 | 15:37 (UTC -3)

Cultivar Magazine



Global production of antibiotics exceeds 200 tons per year and part of this volume passes through the natural cycle, reaching crops and threatening the base of the food chain.

Almost 80% of these drugs are fed to livestock. Between 30% and 90% of the ingested dose returns to the environment in feces or urine, which fertilize or irrigate crops and close an invisible cycle of contamination.

Effluents from livestock farms exhibit concentrations that exceed 2500 µg/L, while municipal or hospital wastewater reaches tens of micrograms per liter. Fluoroquinolones, sulfonamides and tetracyclines dominate the scenario.

In fertilized areas, tetracycline survives in the soil for up to 105 days; fluoroquinolones and sulfonamides maintain average half-lives of between 30 and 40 days in sediments. Adsorption varies with pH, ??clay content and organic matter, a factor that prolongs the permanence of the compound and makes it difficult to predict routes.

Contamination reaches the plant through irrigation with reused water, direct application of manure, and other means. Each route deposits active molecules in the roots, stems, and, finally, in the fruits intended for human consumption.

The bioaccumulation index (BCF) varies from 0,003 to 24, depending on the plant species, the concentration in the medium and the duration of exposure. Hydrophilic

compounds ascend through the xylem with the sap; more lipophilic molecules are retained in the roots. pH adjustments alter the ionic state of the drugs and modulate absorption.

Leafy vegetables such as lettuce and spinach transfer antibiotics to the leaves more efficiently than root crops. Potatoes

and carrots tend to concentrate residues in the subterranean system, a critical issue when consumed without careful peeling.

The same compounds that protect animals reduce plant mass, chlorophyll and root length at high doses. Levofloxacin emerges as the most phytotoxic agent; amoxicillin occupies the opposite end of the scale. Interestingly, trace concentrations can stimulate growth, a phenomenon that is still poorly understood.

For the consumer, the danger lies in continued exposure. Studies on peanuts have recorded a moderate hazard ratio (HR); values ??above 0,05 indicate concern. Cooking reduces the burden, but does not eliminate the problem. Surveillance requires standardized extraction and chromatography methods

capable of tracking nanograms per gram of food.

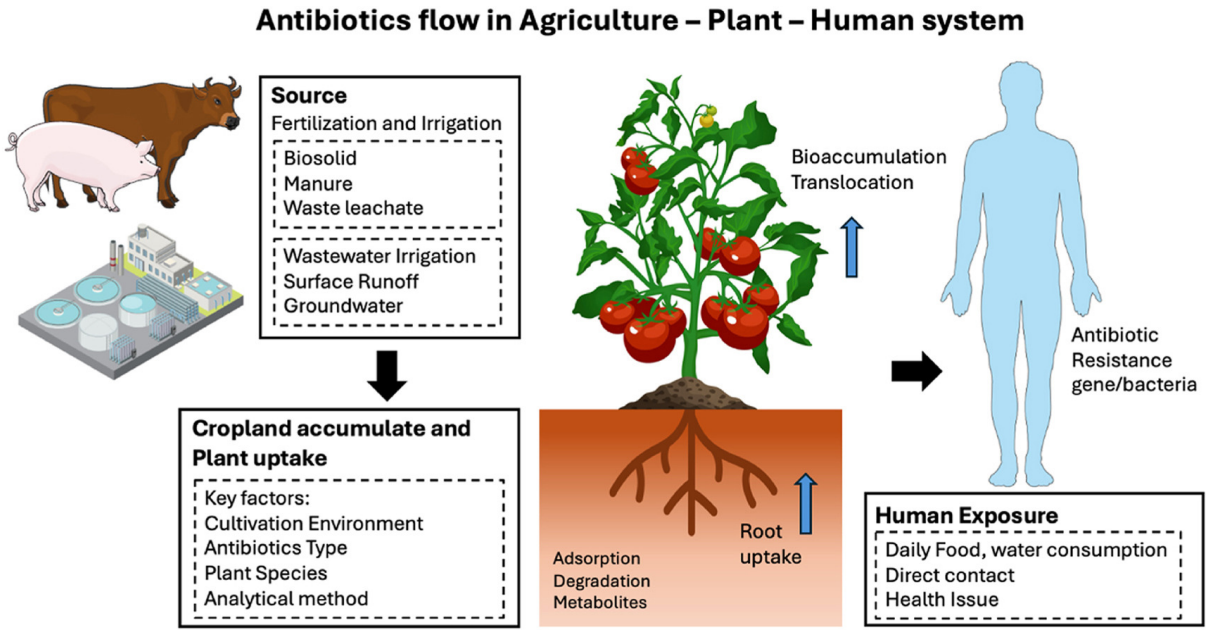
More seriously, resistance genes (ARGs) are already appearing inside vegetables that are subjected to reused water. These genetic fragments can reach the human microbiota and compromise future therapeutic arsenal. The World Health Organization associates thousands of deaths each year with infections by multidrug-resistant bacteria, a reality that can become more powerful when the vegetable garden becomes a silent vector.

Solutions exist, but they are expensive. Stabilization ponds remove up to 96% of antibiotics by sorption in the sludge. Advanced oxidation processes mineralize almost all the waste, but require energy and expensive catalysts. Composting and

anaerobic digestion reduce manure loads, but results vary depending on temperature and microbial composition.

More information on

doi.org/10.1016/j.aac.2025.05.002



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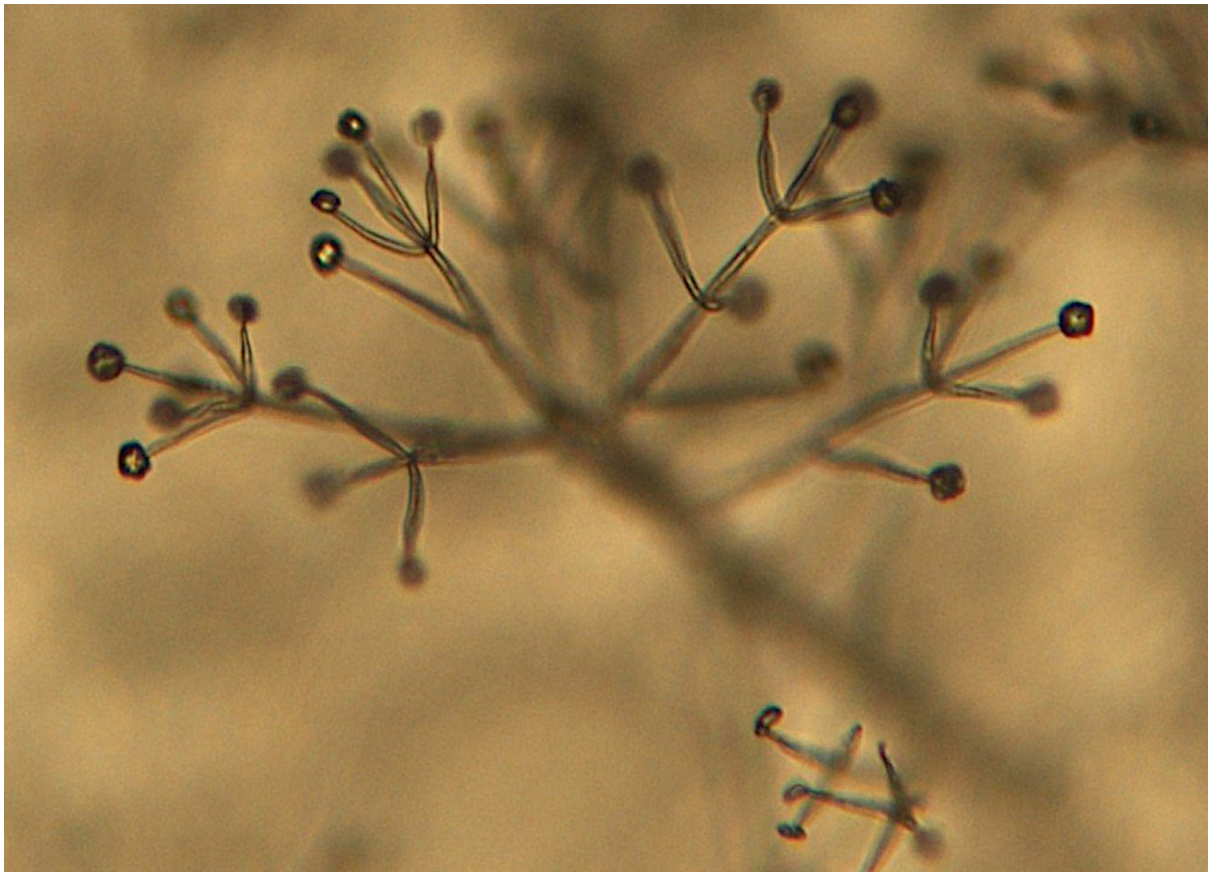
Verticillium dahliae cuts “cry for help” from plants

Verticillium wilt fungus eliminates protective bacteria with the Av2 effector

18.06.2025 | 14:23 (UTC -3)

Cultivar Magazine



Verticillium dahliae invaded tomato pots and silenced the plant's microbial protection network. Researchers at the University of Cologne revealed that the fungus secretes Av2, a small 73-amino acid effector that inhibits the growth of tomato species *Pseudomonas* antagonists and facilitates fungal colonization.

The team generated a mutant without Av2. The pathogen lost strength. Infected plants exhibited less stress, recorded reduced fungal biomass and gained 30% more leaf area compared to tomatoes exposed to the wild-type isolate.

Sequencing of the stem microbiome showed the key to the phenomenon. Without Av2, the abundance of *Pseudomonas* spp. jumped from 20% to

50% in the internal bacterial consortium. Diversity fell, a sign that the protective group dominated the niche and blocked disease progression.

Plate tests confirmed the biochemical duel. Av2, at a concentration of 8 µM, completely contained four species of the genus — *P. laurentiana*, *P. plecoglossicida*, *P. crudilactis*, *P. vancouverensis*. Eleven other isolates continued to grow, suggesting evolutionary resistance in two distinct clades of *Pseudomonas*.

The fungus also profited outside the plant. In a gnotobiotic system, Av2 did not alter the disease when the soil remained sterile. The gain in virulence only emerged after reintroduction of 10% non-sterilized soil, reinforcing the role of the protein in remote

control of the microbiota.

Av2 bears curious evolutionary signature. Homologues appear in species of *Fusarium*, and analysis indicates horizontal transfer. Even so, the single amino acid change — V73E — did not modify the antimicrobial potency, nor the perception by the V2 resistance gene in tomato cultivars.

What is the scenario on the field? ***dahliae verticillium*** still persists in short rotation soils and exploits the slow formation of suppressive areas. By blocking the chemical “cry for help” emitted by the roots, it prevents *Pseudomonas* spp. accumulate and form protective legacies for future harvests.

The discovery broadens the view of an invisible war being waged in the rhizoplane. If beneficial microorganisms can evolve resistance to Av2, biocontrol programs could exploit immune strains and reduce reliance on fungicides. The study also suggests monitoring Av2 variants in soil to predict wilt outbreaks.

More information at doi.org/10.1101/2025.06.09.658588

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Legislature reestablishes exemption from registration for bioinputs produced on the farm

According to parliamentarians, the measure represents progress for producers

18.06.2025 | 10:32 (UTC -3)

The National Congress rejected a presidential veto to the Self-Control Law (Law 14.515/2022) and reestablished the exemption from registration for biological inputs produced within rural properties. The rule applies exclusively to own use and prohibits the commercialization of these products.

According to parliamentarians, the measure represents a step forward for small and medium-sized producers who are committed to sustainable and lower-cost practices. With the decision, the article that exempts bioinputs from being registered with the competent agency when produced on the user's rural property comes into effect again.

The reinstated device reads as follows:

Art. 24. Agricultural inputs produced or manufactured by rural producers for their own use are exempt from registration, and the sale of said inputs in any form is prohibited.

Sole paragraph. In the case of chemical products classified as pesticides or products for veterinary use, the Ministry of Agriculture, Livestock and Food Supply shall establish, in a specific act, the agricultural inputs to which the exemption from registration provided for in the caput of this article shall not apply.

For Congressman Pedro Lupion (PP-PR), president of the Parliamentary Front for Agriculture (FPA), the measure contributes to the autonomy of farmers and reduces

bureaucracy in the sector. Senator Tereza Cristina (PP-MS) reinforced that the new law does not compromise health safety.

Click here for more information about the Self-Control Law (Law 14.515/2022)

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Case IH Quadtrac 715 wins two Red Dot 2025 awards

788 hp tractor wins in “commercial vehicles” and “innovative design” categories

18.06.2025 | 07:35 (UTC -3)

Cultivar Magazine, based on information from Silvia Kaltofen

Case IH Quadtrac 715 Tractor

Case IH’s 715-horsepower (788 hp) Quadtrac 778 tractor won in the “commercial vehicle: product design” and “innovative design” categories of the Red Dot Design Award 2025.

Launched in 2023, the model inaugurated a new identity for the Quadtrac family. A tapered hood, high waistline and clean surfaces facilitate maintenance and increase visibility. The Heavy-Duty suspension, developed to reduce vibrations and speed up operation, received special mention from evaluators.

Red Dot’s criteria include aesthetics, sustainability and real impact on the user. The 715 ticked all the boxes. By awarding the design, the committee signals that agricultural design has moved beyond

brute force.

“Pushing boundaries defines Quadtrac – in power, efficiency and capability. This award shows that we also push boundaries in tractor design,” said David Wilkie, CNH’s head of industrial design.

The Quadtrac 715 leads the Case IH tractor line.

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Financial crisis and debt in the countryside raises alarm in MT

Aprosoja MT expressed concern about the situation in the state

17.06.2025 | 17:02 (UTC -3)

Aprosoja MT, edition of Cultivar Magazine

Photo: Bruno Lopes

The Mato Grosso Soybean and Corn Producers Association (Aprosoja MT)

expressed concern about the increase in rural debt in the state and throughout Brazil. According to the entity, the combination of falling commodity prices, record increases in costs per hectare, restricted credit and high interest rates has put pressure on producers' finances.

In Mato Grosso, the so-called “Scissors Effect” – when revenues fall but costs remain high – has intensified. The average price of a bag of soybeans, which reached R$191,50 in 2022, is now below R$110 in several regions. At the same time, the average cost per hectare exceeds R$7.100, requiring a minimum productivity of 62 bags just to cover production costs.

Furthermore, Aprosoja MT highlights the increase in requests for judicial recovery

by farmers and complains about difficulties in accessing credit, aggravated by measures such as the increase in IOF and the taxation of LCAs. The volume of rural credit destined for the state fell by 27,6% compared to the previous cycle.

The solutions advocated by the entity include securitization of debts, creation of emergency lines with compatible interest rates, review of the barter model, implementation of price support mechanisms and review of financial charges. Aprosoja MT also demands compliance with the Rural Credit Manual by financial institutions and the formulation of public policies that are more appropriate to the new reality of the sector.

The association emphasizes that producers do not want to default, but seek

conditions to continue producing, investing and generating jobs. According to the entity, the lack of rapid and structural actions can compromise agricultural production, income generation and the economy of hundreds of municipalities in Mato Grosso.

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Leafminer in tomato: damage and management

By Franciely da Silva Ponce and Claudia Ap. de Lima Toledo

17.06.2025 | 16:52 (UTC -3)

The tomato (*Solanum lycopersicum* L.) is one of the most important vegetables in Brazil and the world, generating billions of dollars annually. The main pest of the crop currently is *Absolutely all* or tomato moth. However, there are sucking insects such as the whitefly (*Bemisia tabaci*) and thrips that cause losses mainly by transmitting viral diseases. In tomato cultivation, the so-called leafminer flies may also occur *Liriomyza huidobrensis* (Diptera: Agromyzidae), *L. sativae*, *L. trifolii*, and *L. brassicae*. Among these *L. sativae* stands out as an economically important pest in tomato crops.

Liriomyza huidobrensis was considered an important pest in South America until the 1970s. However, with the outbreaks of tomato leafminer (*Absolutely all*) and use

of insecticides to control the tomato moth, the population of *L. huidobrensis* low. However, exposure to these insecticides led to the evolution of resistance. In addition, the use of insecticides reduced the population of natural enemies of leafminer larvae, thus causing outbreaks of secondary pests. Worldwide, the species *Liriomyza huidobrensis* stands out for being an economically important pest in crops. The reduction in productivity can reach up to 15%. This is because the miners promote a reduction in the photosynthetic area of ??the plants, therefore reducing the production of photoassimilates, which compromises productivity.

The damage caused by leafminers greatly affects tomato plants, with 18% of the leaf

area affected by mines representing a reduction in photosynthesis of up to 60%. Symptoms of infestation range from the formation of mines to the appearance of rounded, white punctures caused by the feeding and deposition of eggs.

The leafminer fly is a polyphagous pest, and is reported as an important pest in several crops such as melons (*Cucumis melo* L.), pumpkin (*Curcubita maxima* L.), cucumber (*Cucumis sativus* L.) potato (*Solanum tuberosum* L.) and several weeds, which makes pest control difficult in the agroecosystem.

The leafminer fly is a secondary pest. However, it has increasingly assumed the role of a key pest due to population outbreaks, due to the selection of

populations resistant to chemical insecticides, which makes pest management difficult.

Galleries made by larvae inside the leaf - Photo: Franciely da Silva Ponce

Pest characteristics

Adults are about 2 mm long, with a grayish to black coloration with yellow spots. The eggs are small, 1,0 mm long and 0,2 mm wide, and grayish white or translucent

yellowish in color. The eggs are laid inside the leaf tissue or epidermis of the fruits, which facilitates tissue infestation.

After three days, the eggs hatch, giving rise to larvae that feed on the tissue of the leaves and fruits. The larvae are small (2 to 3 mm) and yellowish in color. They are found feeding inside the leaf tissue, leaving galleries through the leaf, and are easy to recognize in the field. The larval stage lasts 5 to 7 days and they pupate on the surface of the leaves, in the soil or inside the leaves. The infestation occurs from the seedling stage, and can be observed in all stages of plant development.

Sampling, level of control and economic damage

The occurrence of leafminers can be detected by observing adults in the cultivation area, as well as by the presence of mines on the leaf surface. For monitoring, plastic trays with water and detergent can be used under the foliage of plants distributed randomly in the cultivation area. The larvae abandon the mines to pupate in the soil, thus falling from the leaves and being collected in the trays. The use of yellow sticky traps is another simplified form of monitoring, indicating the occurrence of the pest in the area.

Sampling should be carried out weekly, by inspecting the leaves of the upper third of the plant, observing the presence of holes in the epidermis, or mines. In plots of up to 10 ha, 73 sampling points are recommended, for an assertive control positioning. For tomato plants, the action level occurs when 25% of the leaves evaluated show signs of the pest. The level of economic damage for *L. huidobrensis* is 3,24 larvae per leaf sampled.

Leafminer larva - Photo: Claudia Aparecida de Lima Toledo

Control placement

To control leafminers in tomatoes, measures that exist in integrated pest management (IPM) must be adopted, which advocates the combined practice of several management tactics. The aim is to reduce the pest population to acceptable levels. Management techniques present in

IPM include: biological control, cultural control, environmental manipulation, pheromones and chemical control.

The main management tactic used for leafminers is chemical control, which is mainly aimed at the larval stage of the pest. However, this control tactic is difficult due to the biology of the pest, which has a short cycle, high fecundity, small size and a pupal stage in the soil, as well as the habit of the immature phase that feeds on the inside of the leaf. The pest's feeding habit provides it with protection inside the leaves, requiring the use of systemic and highly toxic insecticides. Systemic insecticides with translaminar properties are more effective in controlling leafminers. The use of these products can compromise several aspects, such as the

sustainability of the agroecosystem, selection of resistant populations, causing an increase in production costs and compromising the crop's production chain.

Currently we have about 59 commercial insecticides among the insecticides used for the control of *Liriomyza* sp. in tomato plants (click here to see which ones), the main active ingredients used being: acephate, chlorpyrifos, deltamethrin, spinetoram, abamectin, milbemycin, cartap hydrochloride, cyromazine and cyantraniliprole. Cyromazine has a residual effect of 20 days, followed by abamectin and spinosad. Of these, abamectin is the most specific, with less effect on natural enemies.

However, the high reproductive potential, short life cycle and frequent applications of insecticides have facilitated the selection of resistant populations, influencing pest management.

There are numerous natural enemies capable of regulating leafminer fly species in the field, including parasitoids. Among the predators, species of lacewings, earwigs, wasps, ants and beetles feed on leafminer fly larvae and/or pupae.

Considering the diversity of natural enemies, as well as their importance as pest control agents, *L. huidobrensis* It is necessary to adopt management strategies that preserve this beneficial entomofauna in the field, mainly by adopting insecticides that are more

selective for these natural enemies.

The cost of control will depend on the level of pest infestation, the number of applications made with the same product during the tomato cycle, and the value of the product.

The management of leafminer flies in tomato crops should be directed towards diversifying control tactics, as recommended by IPM, seeking to reduce selection pressure and increase the efficiency of available tools. Advocating the adoption of IPM tactics is of utmost importance to reduce the losses caused by the pest, in addition to reducing outbreaks, which directly impacts costs.

By **Franciely da Silva Ponce** *e* **Claudia Ap. de Lima Toledo** *(FCA/UNESP)*

Article published in issue 138 of Revista Cultivar Hortaliças e Frutas

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The future of tractors lies in new energy routes

Agritechnica 2025 will showcase technologies ready to replace diesel in the fields

17.06.2025 | 13:50 (UTC -3)

Cultivar Magazine, based on information from Malene Conlong

Fendt e107 V Vario Tractor

The countdown to diesel has already begun in Germany's fields. Around two billion liters of the fuel still power tractors and combine harvesters every year. But climate plans that require carbon neutrality by 2045 are tightening the noose. In light of this, Agritechnica 2025 promises to be a decisive stage in the energy transition in agriculture. The event will take place in Hanover in November.

The exhibition will bring real solutions. Machines ready to operate with new energy sources. Engineers, farmers and manufacturers will seek answers to an urgent question: what will be the viable alternative to the traditional diesel engine?

There are options. None are simple.

One of the most conservative approaches is to adapt what already exists. Combining diesel engines with partial electrification, such as hybrid systems. The environmental gain, however, is modest. Fossil diesel is still present. Emissions have barely changed.

Another possibility involves more climate-friendly liquids. Pure vegetable oil (P100), biodiesel, hydrogenated vegetable oil (HVO) and synthetic fuels all fall into this category. But each requires technical care and has practical limitations.

Vegetable oil, for example, requires modifications to the engine. Its viscosity hinders performance without adjustments. HVO, on the other hand, has clear advantages: it can be used in conventional engines, with the manufacturer's

authorization. It does not require any changes. It mixes well with fossil diesel. However, there is a problem: competition for this resource is growing in other sectors, such as transportation and construction. And current production cannot meet demand.

Further on the horizon, synthetic fuels appear as a promise of carbon neutrality. Made from water and CO2 using electricity, they come in liquid (power-to-liquid) or gaseous (power-to-gas) versions. But they are expensive. They consume excessive energy. They lack scale and economic viability.

Gases such as methane and hydrogen are also part of the debate. They work in adapted engines, but require large and heavy tanks. The energy density per liter is low. For a full day in the field, the space required compromises operation. In addition, gases only become sustainable when produced with renewable energy — which still weighs on the pocketbook.

And what about electricity? Electric tractors are gaining ground in lower power

levels, up to 130 horsepower. They can be charged during work breaks. They are well suited for light tasks. But for the giants of agriculture, challenges remain. The batteries would have to weigh tons. They would increase the cost and soil compaction. Today, they are impractical for combine harvesters and heavy tractors.

Hydrogen fuel cells, which generate electricity on board, also face limitations. The technology is complex, expensive and space-consuming. Autonomy remains limited.

So what remains? A mosaic of possibilities. Multifuel engines, which accept diesel, biodiesel and vegetable oils in different proportions, emerge as a flexible alternative. But not a definitive one.

The truth is that the field is still searching for its new universal engine. And it may not find just one. Solutions will need to adapt to the needs of each farm, crop and region. Success will depend as much on technology as on infrastructure, costs and incentives.

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Nezara viridula reveals intestinal specialization when feeding on corn

Research reveals molecular mechanisms of the green stink bug, offering targets for control

16.06.2025 | 17:37 (UTC -3)

Cultivar Magazine

Chinese researchers have uncovered how the intestines of ***Nezara viridula*** divides functions among its segments to deal with food and toxins present in corn. Gene expression analysis in the M1, M2 and M3 sections of the insect's midgut revealed a system organized along three axes: metabolism, defense and regeneration. These findings offer clues about possible molecular targets for ecological management strategies for the pest.

The M1 region, located in the anterior portion of the intestine, concentrates nutrient digestion and detoxification. Genes associated with carbohydrate, lipid and amino acid metabolism show high activity. Signs of secondary metabolite biosynthesis and signaling pathways, such as calcium and cAMP, indicate precise

regulation of digestion. The high expression of receptors such as TACR and HTR suggests a relevant role in the response to food stimuli.

The intermediate portion, M2, assumes structural and immunological functions. Pathways related to cell junctions, phagocytosis and cell-matrix interaction dominate this section. Genes such as ITGA8 and MUC5 are more active in this area, reinforcing the hypothesis that the segment acts as a physical barrier and a point of communication between cells, in addition to participating in defense against pathogens.

The M3 segment, located at the end of the midgut, shows activity focused on cell renewal. Pathways associated with

senescence and the cell cycle stand out, along with the expression of genes linked to the biosynthesis of structural components. The high activity of genes such as GLA and NAGA in galactose metabolism pathways also suggests a role in the final processing of nutrients before excretion.

Data integration with advanced bioinformatics tools such as GSEA and ReporterScore allowed us to accurately identify the metabolic pathways and regulatory signals active in each segment. Topological analysis revealed complex functional networks, with specific interconnected modules that explain the insect's adaptability to plant food.

This model of functional compartmentalization, classified as “metabolism–defense–regeneration”, helps to understand how *Nezara viridula* adapts to the chemical defenses of plants. The presence of specific neuroactive receptors and digestive enzymes in different regions of the intestine reveals an evolutionary specialization that favors the pest's nutritional flexibility.

In addition to clarifying fundamental aspects of the digestive physiology of hemipterans, the study suggests promising targets for selective control of the pest. Interference in genes such as TACR, HTR, GLA or NAGA can compromise essential functions in specific regions of the intestine, paving the way for new-generation insecticides with lower

environmental impact.

The systematic approach adopted—which combines expression analysis, functional enrichment, and network mapping—serves as a model for investigations in other agricultural species. The dataset provides a solid basis for future functional experiments and for the development of biotechnological tools aimed at rational insect control.

More information at doi.org/10.3390/insects16060634

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Crop diversification doubles soil carbon fixation

USP research reveals that diversified management and direct planting can double carbon sequestration in agricultural soil

16.06.2025 | 16:59 (UTC -3)

Angela Trabbold, Cultivar Magazine edition

Photo: Clenio Araujo/Embrapa

A study conducted by the University of São Paulo (USP) shows that crop diversification can more than double soil carbon sequestration. The study is part of the Nature Based Solutions (NBS) project, within the Research Centre for Greenhouse Gas Innovation (RCGI).

In experimental areas in the Cerrado and Pampas, the adoption of diversified systems - compared to monocultures such as soy and cotton - increased CO? capture to more than 0,6 tons per hectare/year. The practice includes direct planting with multiple species, which keeps the soil covered year-round and reduces losses due to erosion.

Led by Professor Cimélio Bayer of the Federal University of Rio Grande do Sul

(UFRGS), the study also found that carbon sequestration persists even after 30 to 40 years of adopting conservation practices, contrary to the expectation of depletion in 20 years. Soil samples were collected up to one meter deep, increasing the accuracy of the results.

Now, researchers are evaluating how this carbon accumulation can improve agricultural productivity, water retention and nutrient availability, with the potential to strengthen the long-term sustainability of agricultural production.

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ZF launches OptiDamp torsional damper on the Brazilian market

Component is compatible with different types of transmissions, including CVT, powershift and torque converters

16.06.2025 | 16:34 (UTC -3)

Fernanda Giacon

ZF is introducing OptiDamp to the Brazilian market, a torsional shock absorber

specially developed for use in agricultural and construction machinery in severe operations. The new product is designed to meet the growing demands for efficiency, robustness and sustainability in the field and on construction sites.

Silvio Furtado (pictured), Vice President of Commercial Vehicle Solutions and Industrial Technology at ZF South America, explains that the equipment will initially be imported from Germany, but states: “as soon as there is demand in the domestic market, the idea is to nationalize it.” Integrated between the engine and transmission, OptiDamp can be applied to machines with maximum torque of up to 3.000 Nm.

The component acts as an intelligent vibration control system, reducing the impact of torsional stresses that occur during the operation of tractors and construction machinery. The result is smoother operation, with less noise and wear, which translates into longer service life for transmission system components and a better experience for the operator.

The technology also contributes to energy efficiency strategies, such as downsizing and downspeeding, which are common in the automotive sector. In other words, it allows automakers to adopt smaller, more fuel-efficient engines and operate at lower loads, without sacrificing performance, durability or operator comfort. This results in more sustainable machines that are more cost-effective over time.

“OptiDamp offers concrete gains in durability, comfort and sustainability. It is a solution with great potential for the Brazilian market, especially in the agriculture and construction sectors, which require high operational reliability,” he emphasizes.

Designed to withstand severe operating conditions, OptiDamp combines high-strength steel springs with a sealed viscous damping system. This architecture ensures high performance during load variations and low resistance when the engine operates stably.

The new system provides a significant reduction in torsional vibrations, improves acoustic and operational comfort with a direct impact on noise, vibration and

harshness (NVH) characteristics. It increases the durability of the transmission system and, with the use of integral and permanent lubrication of the system, eliminates the need for preventive or corrective maintenance of the shock absorber itself, throughout its useful life.

Furthermore, it is an environmentally friendly solution, made from recyclable materials, which enables its remanufacturing and contributes to reducing environmental impact. The combination of all these factors results in a more efficient total operating cost for the user.

Compatibility and smart integration

Compatible with different types of transmissions, including CVT, powershift and torque converters, OptiDamp can be easily integrated into a variety of engines and powertrains.

“The development involved direct collaboration with automakers, which ensures its practical application in the most diverse realities in the sector,” says Furtado. The solution also offers optimized performance when combined with ZF’s own transmissions, such as Terramatic, Eccom, CPower and Ergopower, expanding the range of integrated solutions for customers in the off-road

segment.

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Nufarm resumes operations in Brazil

Australian company promises 15 new products in the next five years

16.06.2025 | 15:21 (UTC -3)

Cultivar Magazine, based on information from Nufarm's press office

Nufarm is back in Brazil. After four years out of the pesticide market, the eighth

largest global crop protection company is resuming its activities in the country with a renewed proposal: offering integrated crop and seed protection solutions, combining innovation and partnership with Brazilian farmers.

The return marks a strategic shift. The brand, which once ranked seventh among the largest in the sector in Brazil, plans to launch 15 new products by 2030. The focus is on chemical and biological pesticides for crops such as soybeans, corn, cotton, sugarcane, sorghum, canola and carinata.

The first new feature has already arrived. It's called Evolvance (click here for more information). Developed to control nematodes, the bioinput "acts preventively,

stimulating the plant's physiology and offering broad-spectrum protection," according to information from the company. Crops such as soybeans, corn and cotton should benefit directly from the technology.

Fernando Arantes Pereira, Brazil portfolio leader at Nufarm, explains that the company's return coincides with a global change.

“We want to offer solutions that are connected to the real challenges in the field, such as rising costs, climate change and sustainability demands,” he says. Nufarm is now incorporating its seed division — Nuseed — into a joint operation under a unified brand.

With this merger, the company will now operate in a more comprehensive manner. Arantes emphasizes that the focus is no longer just on post-patent pesticides. The company intends to invest in innovation and expand producers' access to more effective, sustainable technologies adapted to the Brazilian reality.

Nufarm's history with Brazil is not recent. The company began its activities in the country in 2002, after acquiring Agripec Química e Farmacêutica S.A. The strategy, at the time, aimed to consolidate its presence in one of the largest agricultural markets in the world. In just a few years, the company reached US$ 504 million in revenue.

In 2019, however, the Australian company sold its assets in Brazil and other South American countries to the Japanese Sumitomo Chemical. The decision was part of a global restructuring. Since then, it has maintained a presence in the country only through Nuseed, offering seeds of canola, sorghum, millet, carinata and sugarcane varieties for challenging environments.

Carlos Balbi, CEO of Nufarm Seeds, says that the integration of the divisions is a response to the challenges that farmers face. “Producers need efficiency, sustainability and profitability. Nufarm now brings together these solutions under a single proposal,” he explains.

The innovation plan includes partnerships with local companies, universities and

Brazilian consultancies. The goal is to validate the products developed and ensure their adaptation to the different agricultural regions of the country. The company has already initiated research and development projects focused on these validations.

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The role of biofuels in Brazilian agriculture

By Paulo Vilela, AGCO Engineering Director

16.06.2025 | 10:42 (UTC -3)

Brazilian agribusiness has been a leader in the search for solutions that combine productivity and sustainability. One of the

promising paths for this transformation is the increasing adoption of alternative fuels in agricultural machinery, contributing to a more efficient and environmentally responsible field.

Brazil has a privileged energy matrix. Ethanol, for example, is already a consolidated reality in urban mobility and has immense potential in the countryside. Biomethane, derived from waste from corn and sugarcane mills, also presents itself as a strategic alternative: in addition to being sustainable, it can be produced on the farms themselves, which increases the energy security of the producer and reduces their dependence on the volatility of diesel.

At AGCO, we are committed to leading this energy transition with a farmer-centric approach, supported by technological innovation and driven by the purpose of decarbonizing agriculture in a viable and efficient way. Today, our machines already operate with electronic engines that meet the most demanding emissions standards, such as MAR-1, and we are already actively working on the next phase, MAR-2, with a focus on reducing Nox (nitrogen oxides that contribute to air pollution) and particulate matter present in the gases released by the engine during fuel combustion.

Our engineering department is dedicated to developing machines that operate with renewable fuels. However, the energy transition requires much more than just

changing the fuel; viability depends on each component of the machine, which needs to be adjusted: transmissions, hydraulic systems, refrigeration and on-board electronics. It is a true reengineering of the entire machine.

Infrastructure is also still a challenge. For biomethane to become a viable option, producers will need to invest in biodigesters, storage systems and gas transportation. AGCO has worked alongside strategic clients to overcome these obstacles, offering technical consultancy and developing solutions.

We know that Brazilian rural producers make calculations and invest, but they want security and returns. That is why we maintain projects in partnership with large

farmers, with field tests under real operating conditions and detailed analysis of performance, consumption, durability and economic viability.

Another key factor is training. Technology is evolving rapidly and ensuring that farmers and their teams know how to operate these new systems is an essential part of delivering value. Our training and after-sales support programs are an important part of this journey, as farmers need to understand and master the new technology to get the best results from it.

Therefore, the energy transition is inevitable. We are seeing significant progress in the blending of biodiesel with traditional diesel, with prospects of reaching B20 in the coming years. At the

same time, the use of ethanol in agricultural machinery is expected to grow. AGCO is preparing for all these scenarios, developing solutions for a diversified and resilient agricultural energy matrix. Brazil has everything it needs to be a protagonist in this process. After all, cleaner, more efficient and innovative agriculture is good for the producer, for the planet and for all of us.

By **Paulo Vilela***, AGCO's director of engineering*

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Steyr Terrus CVT tractors gain technology packages

Machines from 288 to 340 hp receive three levels of connectivity

16.06.2025 | 07:58 (UTC -3)

Cultivar Magazine, based on information from Silvia Kaltofen

Steyr Terrus CVT Tractor

The Steyr Terrus CVT line, consisting of the 6290 (288 hp), 6315 (313 hp) and 6340 (340 hp) models, advances to deliver more practicality to owners and operators. The manufacturer has introduced three technology packages that simplify the choice of features according to the requirements of each farm. They combine with the Evolution or Excellence sets, speeding up ordering and increasing resale value.

Tech Pack 1 includes the Infomat 1200 touchscreen mounted in the armrest and makes the tractor ready for a second monitor. Tech Packs 2 and 3 add additional automation and a higher level of precision for the Steyr Guide autopilot.

Every Terrus CVT comes with Connectivity Included. The service connects the tractor

with no recurring fees for the life of the modem. When a new Terrus is integrated into a customer’s account, existing compatible machines can receive the feature. FieldOps delivers near real-time operational and agronomic data via app or web.

Another improvement is the joystick on the armrest. In addition to hydraulic valves, the control now activates the front and rear lifts. Using the Infomat 1200, the operator can define functions depending on whether front, rear or combined implements are used.

Steyr Terrus Tractor

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Scientific review explains how seeds break dormancy

Molecular and biomechanical mechanisms regulating seed germination

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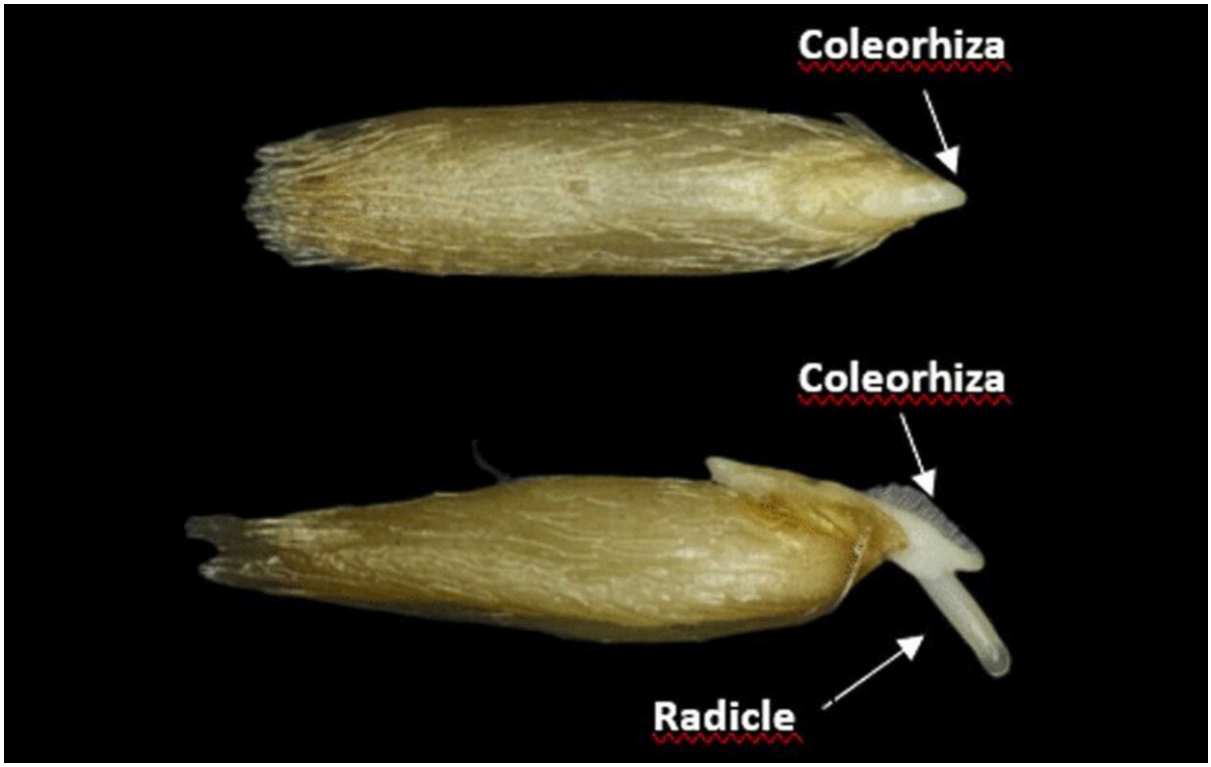

During germination, seeds face biomechanical and molecular challenges

to initiate embryo growth. A recent study by researcher Angel J. Matilla, from the University of Santiago de Compostela, gathered evidence detailing how this process depends on interactions between hormones, internal pressure, and cell wall (CW) modifications.

Endosperm expansion pressure is the driving force behind seed coat rupture and radicle protrusion. This force results from water absorption and cell wall loosening, especially in the micropyle region. Expansins (EXPs), mannanases (MANs) and transglycosylases (XTHs) are the main agents involved.

These enzymes promote the relaxation of CWs, reducing the mechanical resistance of the seed coat. In the model *Arabidopsis*

thaliana, the expansin AtEXP2, activated by regulators NAC25/NAC1L and the hormone gibberellin (GA), is crucial for endosperm cell expansion. Mutants defective in this gene show delayed germination.

The study also highlights the importance of microtubules in directing cell expansion. These structures align cellulose microfibrils, guiding cell growth. The formation of these microtubules, from the synthesis of beta-tubulin, is inhibited by abscisic acid (ABA), reinforcing their inhibitory role in germination.

Another aspect is the role of the endosperm as an environmental sensor. It responds to external and internal signals, such as light and hormones, and releases

enzymes that facilitate the rupture of the CW. The presence of the endospermic cuticle, associated with tannins and regulated by GSO1/GSO2 kinases, also modulates permeability and protects the embryo.

In the agricultural context, understanding these mechanisms allows advances in genetic improvement and seed biotechnology. Genes such as AtMAN5 and LeMAN2, associated with the degradation of mannose polymers, become targets to increase vigor and uniformity in seedling emergence.

Furthermore, epigenetic factors such as histone methylations and acetylations modulate the expression of key genes such as DOG1 and ABI5, which regulate

dormancy and the transition to active growth.

More information at doi.org/10.1016/j.plantsci.2025.112612

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Lettuce: understand what tipburn is, why it occurs and how to minimize it

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Tipburn, also known as tip burn or edge burn, is a physiological disorder that affects lettuce crops. It occasionally causes serious losses in production areas. This problem usually appears when there is a nutritional imbalance in the environment; or when solar radiation levels (and, consequently, air temperature) are high, which normally occurs in crops that take place during the summer and spring months. Or when environmental conditions limit the plant's transpiration.

Such disorder affects the visual quality and useful life of the product, making it unviable to sell due to consumer rejection, resulting in economic losses for the producer.

What is tipburn

O *Tipburn* It is a physiological disorder caused by calcium deficiency. It can occur due to the absence of the mineral in the environment. Or in situations where this element is present and available, but is not adequately distributed in the plant tissues.

Calcium is an essential macronutrient for maintaining the cell wall and membrane structure. It acts as a cementing element that aims to ensure the integrity of these structures. Plants can make cell walls more rigid or plastic; and membranes more or less permeable depending on the concentration of calcium. Therefore, when its supply is insufficient (due to deficiency) or inadequate (due to poor internal

distribution), there is weakening and rupture of the cell wall and membranes, resulting in the leakage of cellular contents and, consequently, tissue necrosis. This necrosis is called *Tipburn*.

In lettuce (*lactuca sativa*), such necrosis of the edges is especially striking due to the presence of lactiferous vessels filled with latex, which is a plant product with a milky appearance, secreted in the leaves and stems of plants of the genus *lactuca*. Latex is responsible for the bitterness of the leaves. The higher its concentration (lower water content in the tissues), the more unpleasant the taste of the leaf will be.

Thus, when the cell ruptures and its contents leak due to the absence of calcium, latex is released into the

surrounding tissue, causing the parenchyma to collapse and the xylem elements to become occluded. The affected area quickly loses turgor and scattered mesophyll cells become necrotic.

Calcium is transported from the root to the leaves via water transport in the xylem, through the transpiration flow. When stored at its destination to fulfill its structural function, it is rarely remobilized, and is therefore considered a non-mobile element or one with limited mobility in the plant. In other words, we can say that calcium can only be supplied by transpiration and not through storage or allocation, which means that its deficiency occurs primarily at the points of growth (meristematic zones).

Since the larger, older lettuce leaves (located on the outside of the rosette) transpire more, they tend to accumulate more calcium than the smaller, younger leaves (located on the inside of the rosette). Therefore, the symptoms of *Tipburn* They usually appear on the leaves and occupy the most internal positions of the plant.

Tipburn in smooth lettuce (on the left) and curly lettuce (on the right)

why does it occur

As mentioned, there are three most widespread situations to which the occurrence of *Tipburn*: calcium deficiency, high levels of solar radiation and air temperature, and environmental conditions that limit plant transpiration.

The first situation, which is easy to understand, is due to the pure absence of the element calcium in the production system. If it is not present, this nutritional deficiency will result in problems in the formation of the cell wall, which will result in its rupture and, consequently, in the formation of necrosis in the tissues. This situation is the least frequent and also the easiest to solve.

The second and third situations presuppose the presence and availability

of calcium in the production environment. However, as they deal with specific and momentary microclimatic characteristics of the crop, they are unpredictable and somewhat more complex to understand and diagnose.

In the second situation, where the levels of solar radiation (and, consequently, the air temperature) in the environment are high, the rapid growth of the plant induced by these conditions may not be accompanied by the absorption capacity of the root system and the flow of water and calcium through the conducting vessels. Thus, there will be a delay between the demand at the growth points (edges of young leaves) and the ability of the root to capture and distribute it through the vascular system. This mismatch generated

by abiotic stress, which is likely to occur in spring and summer crops, will result in insufficient deposition of calcium on the edges of young leaves and, consequently, *Tipburn*. Several studies carried out on this topic have shown that an increase in light intensity results in a greater occurrence of this disorder in lettuce (Gaudreau et al., (1994); Wissemeier and Zühlke (2002); Sago (2016); Knoop (2019)). For Bárcena et al. (2019), high light intensity increases the growth rate of plants, which may affect the occurrence of Tipburn.

The third situation is the opposite of the second one presented. In this case, instead of an accelerated demand (and consequently a flow between soil-plant-atmosphere that is not met), there are circumstances where the flow is

completely interrupted or reduced to negligible levels. As already seen, the transport and ascent of calcium in the plant occurs as a function of transpiration. Therefore, when lettuce plants are subjected to conditions that interrupt (or reduce to very small rates) transpiration through the closure of the stomata, the following will occur: *Tipburn*.

According to Saure (1998), there is a positive correlation between high relative humidity (RH) and the occurrence of Tipburn. In 1976, Tibbitts and Bottenberg found that growth rate increased dramatically for lettuce grown under 85% RH, compared to lettuce grown under 50% RH. This may suggest that increasing RH affects the *Tipburn* through its effects on plant growth rate. Knoob (2019) observed

in a study that in treatments where lettuce was subjected to a combination of high light intensity and high RH, and the occurrence of *Tipburn* was more severe. When RH is high, the vapor saturation pressure deficit is low, therefore reducing the transpiration rate.

This situation can occur when, for example, on days with high relative humidity, there is no vapor saturation deficit between the stoma and the environment, which results in stomatal closure. With the flow interrupted, calcium does not reach the meristematic points where it is required and thus, we can also observe the occurrence of *Tipburn*.

How to minimize the problem

Although lettuce can be grown year-round, it is considered a temperate vegetable and tends to adapt better to mild temperatures, with an average of between 15 and 24ºC. Therefore, the biggest challenges related

to the occurrence of *Tipburn* will occur in crops grown during the hottest periods of the year and with high light intensity (spring and summer months).

For these periods, it is recommended to use cultivars that are tolerant to edge blight both in field cultivation and in protected cultivation.

There are no recommended management procedures that guarantee the prevention of Tipburn. However, for field crops, where environmental control is limited, the problem may be reduced by harvesting before the plant is fully mature, so that symptoms do not develop sufficiently to affect the marketability of the lettuce.

For crops grown in protected environments, where microclimate

management is possible, procedures such as: maintaining adequate humidity near the root system; maintaining a vapor pressure deficit in the greenhouse atmosphere provided by the movement of air over the plant canopy; and controlling radiation levels with the use of shade screens so as not to allow plants to grow at excessively accelerated rates, seem to minimize the occurrence of *TipBurn*.

It is important to note that in crops grown in warmer periods (average temperatures above 20ºC), early bolting may also occur, another physiological disorder that makes lettuce unviable for sale. In this case, cultivars that are also tolerant to bolting should be chosen. The so-called early bolting, in addition to inducing the plant to flower early, stimulates the production of

latex, a substance that makes the leaves bitter.

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