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Cultivar Semanal

Aphid expands insecticide resistance

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Aphids develop resistance to insecticides.

Scientific review details biochemical and genetic basis of resistance in Myzus persicae

05.03.2026 | 08:29 (UTC -3)

Cultivar Magazine

Photo: Russ Ottens, University of Georgia

The green aphid, *Myzus persicae*The plant accumulates resistance to more than 80 active ingredients and defies chemical control in various agricultural crops. This finding is part of a review that systematizes the main biochemical and genetic mechanisms associated with the phenomenon.

This species colonizes over 500 hosts and transmits more than 100 plant viruses, including Potato virus Y and Potato leafroll virus. The combination of direct damage from sucking and viral dissemination amplifies economic losses in different production systems.

Central axes of resistance

The research describes two central axes of resistance. The first involves metabolic detoxification. The second results from alterations in the insecticide target site. In many cases, both act simultaneously within the same clone.

In the metabolic field, enzymes such as cytochrome P450, carboxylesterases, glutathione S-transferases, and UDP-glycosyltransferases enhance the ability to neutralize insecticidal molecules. Gene amplification of E4 and FE4 esterases represents one of the best-documented examples. Some clones exhibit up to 80 tandem copies of these genes. The

enzymes then function as biochemical reservoirs, sequestering organophosphates and carbamates before they reach the nervous system.

Alterations in the target site reinforce the picture. The S431F mutation in the ace2 gene reduces the sensitivity of acetylcholinesterase to organophosphates and carbamates. Mutations in the voltage-dependent sodium channel, such as L1014F (kdr) and M918T/L (super-kdr), limit the action of pyrethroids. In the case of neonicotinoids, the R81T substitution in the beta1 subunit of the nicotinic receptor decreases the affinity for the insecticide.

Neonicotinoid resistance also involves overexpression of cytochrome CYP6CY3. The gene can appear in dozens of copies.

Studies cited in the review show that the combination of CYP6CY3 amplification and R81T mutation results in high levels of resistance, exceeding those observed when each mechanism acts in isolation.

Newer insecticides also face selective pressure. For sulfoxaflor, resistant populations exhibit overexpression of CYP380C40 and UGT344P2. In the case of ketoenols such as spirotetramat, the A2226V mutation in the acetyl-CoA carboxylase gene reduces insecticide binding to the target. The review reports populations with resistance more than 100 times greater compared to susceptible strains.

Multiple mechanisms

The study highlights that multiple mechanisms tend to accumulate in clonal lines. This accumulation generates genotypes with cross-resistance to different chemical groups. Monitoring based on a single marker loses efficiency in the face of this complexity.

In addition to structural mutations, the work describes regulatory layers. Gene amplification of esterases and CYP6CY3 is modulated by epigenetic processes, such as DNA methylation. In the absence of selection pressure, lineages can reduce expression and recover some susceptibility. Upon re-exposure, expression returns to elevated levels.

Adaptive costs

Resistance imposes adaptive costs. Clones with high esterase production exhibit lower reproductive rates, reduced survival in harsh winters, and a diminished response to alarm pheromones. kdr mutations are associated with longer generation times and behavioral changes. These costs influence population dynamics across growing seasons.

The review indicates that management strategies require the integration of tools. Molecular methods, such as PCR-RFLP, qPCR, and dCAPS-PCR, allow the detection of mutations such as S431F, L1014F, M918T, R81T, and A2226V. For metabolic resistance, gene copy quantification and biochemical assays serve as complementary indicators.

The authors advocate an approach combining rotation of modes of action, judicious use of insecticides with different targets, and the incorporation of biological control and resistant cultivars. The central logic is based on the principle of reducing continuous selective pressure on the same molecular mechanisms.

More information at doi.org/10.1016/j.pestbp.2026.107049

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Syngenta ends global production of the herbicide paraquat.

The decision comes after a loss of competitiveness due to generic drugs.

04.03.2026 | 09:01 (UTC -3)

Cultivar Magazine, based on information from Syngenta

Syngenta has announced it will end global production of the herbicide paraquat by the end of June. The decision comes after generic manufacturers have made inroads

into the market in several countries. The product has been banned in Brazil since 2020.

Following an asset review, the company has initiated a program to discontinue manufacturing of the product at its Huddersfield facility in the United Kingdom. This location houses the company's only global plant dedicated to the active ingredient. A smaller, multi-product unit will also close.

The company will evaluate new investments in the complex to enable the production of advanced solutions. The United Kingdom is home to more than 2 employees of the multinational company, distributed across six units, focusing on research, development, production, and

supply.

Launched over 60 years ago by Imperial Chemical Industries (ICI), which eventually became Syngenta after several mergers, paraquat has gained widespread use in weed control. Its main commercial brand is Gramoxone.

Currently, Syngenta markets paraquat in only a few markets. The product represents less than 1% of the group's global sales.

According to Mike Hollands, president of Syngenta in the UK and global head of Production and Supply, the measure directs resources to areas that generate greater value for the business and its customers.

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Spodoptera frugiperda loses sensitivity to insecticide in Argentina.

The surviving population fed with Vip3Aa20 corn required a dose of chlorantraniliprole 21 times higher.

06.03.2026 | 14:23 (UTC -3)

Cultivar Magazine

population of Spodoptera frugiperda in northern Santa Fe, Argentina, he lost sensitivity to chlorantraniliprole ., an insecticide used to control pests in corn and soybeans. The result emerged from a study by researchers at the National Institute of Agricultural Technology (Inta). Researchers warn about the management of the species in a scenario of high selection pressure.

The study evaluated the toxicological response of a population of *Spodoptera frugiperda* A survivor of the Vip3Aa20 technology. The insects originated from Reconquista, in Santa Fe, in September 2025. The study compared this population with materials from Marcos Juárez, in Córdoba, and from La Cocha, in Tucumán.

Reduced sensitivity

The results showed a strong reduction in sensitivity. The average lethal concentration in the Reconquista population was 21 times higher than that recorded in Marcos Juárez and 9 times higher than that observed in La Cocha. At the doses evaluated, the populations of Córdoba and Tucumán reached 100% mortality. The Reconquista population reached a maximum of 83%, even at 80 ppm.

This finding gains weight after the loss of effectiveness observed in the last cycles of the Bt Vip3Aa20 protein, incorporated into corn in 2011 for the control of *Spodoptera frugiperda*According to the materials,

higher-than-expected damage in some regions increased the reliance on chemical control. In this context, chlorantraniliprole gained prominence due to its action on lepidopteran pests and its widespread use in soybeans, which increased selection pressure throughout the year.

The moment requires adjustment.

The study indicates that the current situation calls for immediate adjustments in pest management. Recommendations include shortening monitoring intervals, especially during warmer periods, and implementing interventions only when population dynamics justify application.

Chemical control tends to be more effective when small larvae, between L1 and L2, predominate, exposed on the leaf blade, with 10% to 20% of plants showing grade 3 damage on the Davis scale.

Researchers also highlight the need to improve application technology. Droplet size, coverage, spray stability, and drift reduction all influence the outcome. Control differences can range from 95% to 20%, depending on the management adopted. Another key guideline involves rotating modes of action. The recommendation is to avoid repeat applications within approximately 30-day windows and to discard consecutive applications of active ingredients with the same site of action.

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Cecília Melo takes on a global role at Bayer.

Executive leaves her position as director of insecticide portfolio for Latin America and will now work in Germany.

06.03.2026 | 10:15 (UTC -3)

Cultivar Magazine

Executive Cecília Melo began her role as "Global Segment Manager / Director of Nematodes" at Bayer in March 2026. The position is based in Monheim am Rhein,

North Rhine-Westphalia, Germany.

The move comes after nearly four years leading the insecticide portfolio management for Latin America. In that role, Cecília Melo served from June 2022 to March 2026, in São Paulo.

With over 20 years of experience in marketing, Cecília Melo brings with her 15 years of experience in agribusiness.

At Bayer, the executive has 11 years of experience. Before becoming the director of insecticide portfolio for Latin America, she held positions such as Field Marketing Lead and cooperative strategy manager.

Before Bayer, Cecília Melo worked at Monsanto as a market access manager between December 2012 and April 2015. In that role, she led the channel access

strategy for soybean and corn crops.

In terms of academic background, the executive holds a degree in business administration with a focus on marketing management (Faculdade Metropolitana de Curitiba). She has several specializations, both in Brazil and abroad.

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Agricultural Market - March 6, 2026

War in Iran boosts soybean, corn and wheat prices.

06.03.2026 | 08:22 (UTC -3)

Vlamir Brandalizze - @brandalizzeconsulting

The war in Iran has driven up oil prices and supported international markets for soybeans, corn, and wheat. This

movement boosted soybean oil, supported grains in Chicago, and improved prices in Brazil, despite negative pressure on soybean premiums.

In soybeans, contracts rose 6 to 10 points in the last trading session on Thursday. WTI surpassed US$80 per barrel. Brent stayed above US$85 and is targeting US$90. In Chicago, soybeans are approaching US$12 per bushel in the July contract. The market formed support above US$11,60 in short-term maturities. On the B3 (Brazilian Stock Exchange), the benchmark price exceeds US$26.

Soybean harvesting in Brazil has reached 52%. Mato Grosso leads with 82%. Paraná accounts for 47%. Mato Grosso do Sul and Goiás are at 40%. Bahia reaches 35%. In

Rio Grande do Sul, work has not yet begun. There are also late-planted crops in the North, in parts of Goiás and Maranhão, planted in January and February.

The marketing of the old crop reached 168,5 million tons out of a total of 171,5 million tons harvested. This volume is equivalent to 98,2% of production, close to the average of 98,5%. In the new crop, sales reached 37,5%, below the 46,5% of a year ago and the average of 45%. The crop estimate still varies from 175 million to 178 million tons. It should have a volume closer to 175 million tons, with a chance of a slight increase depending on late-planted areas.

Corn situation

In the corn market, oil also provided support. In Chicago, the March contract was above US$4,40 per bushel. The July contract surpassed US$4,60. July 2027 is already around US$5. In Brazil, buyers are appearing for July onwards. On the B3 (Brazilian Stock Exchange), short positions exceed R$73 per sack.

The first corn harvest has reached 47%. The planting of the second crop has reached 85%. Mato Grosso has surpassed 90%. Paraná is above 80%. Mato Grosso do Sul exceeds 75%. Goiás is advancing beyond 85%. Even so, 15% of the area remains to be planted, equivalent to almost 2,5 million hectares or more. The commentary indicates that the ideal window has already passed.

Wheat situation

In the wheat market, Chicago is also registering a strong increase. The March contract is trying to hold at US$5,80 per bushel. September is already trading above US$6. Long-term contracts, expiring in 2027, are attempting to reach US$6,40 to US$6,50. In Brazil, wheat from Rio Grande do Sul is exceeding R$1.100 per ton. In Paraná, it surpasses R$1.200 per ton.

Brazilian wheat exports totaled 236,7 tons in February. In the same month last year, the volume reached 628,3 tons. In the accumulated period of January and February, shipments reached 607,3 tons. Imports totaled 215 tons in February and

719,2 tons in the first two months of the year. Last year, the accumulated total for the period reached 1,297 million tons.

Wheat producers, however, remain cautious about the new planting. The uncertainty has intensified with the surge in urea prices, a key input for the crop, amidst rising oil prices and the conflict in the Middle East.

Rice situation

In the rice sector, the harvest in Rio Grande do Sul has begun to gain momentum and is currently at 5% to 7%. The Brazilian harvest is expected to be below 11 million tons, compared to 12,8 million tons last year. The first harvested

areas in Rio Grande do Sul show good quality, with product from the Western Border region ranging between 60 and 62 whole grains. Commercial rice in the region is worth R$ 55. Parboiled rice ranges between R$ 48 and R$ 50.

Bean situation

In the bean market, prices have lost momentum after the surge in February. The premium carioca bean, grade 9, is priced between R$ 335 and R$ 360. Buyers report deals between R$ 340 and R$ 345. Sellers are asking between R$ 355 and R$ 365. Commercial beans are showing slight decreases of 1% to 2%, with prices ranging from R$ 305 to R$ 325. Black beans are also in a holding pattern,

with prices between R$ 190 and R$ 205. Retailers are waiting for a recovery in consumption before resuming purchases.

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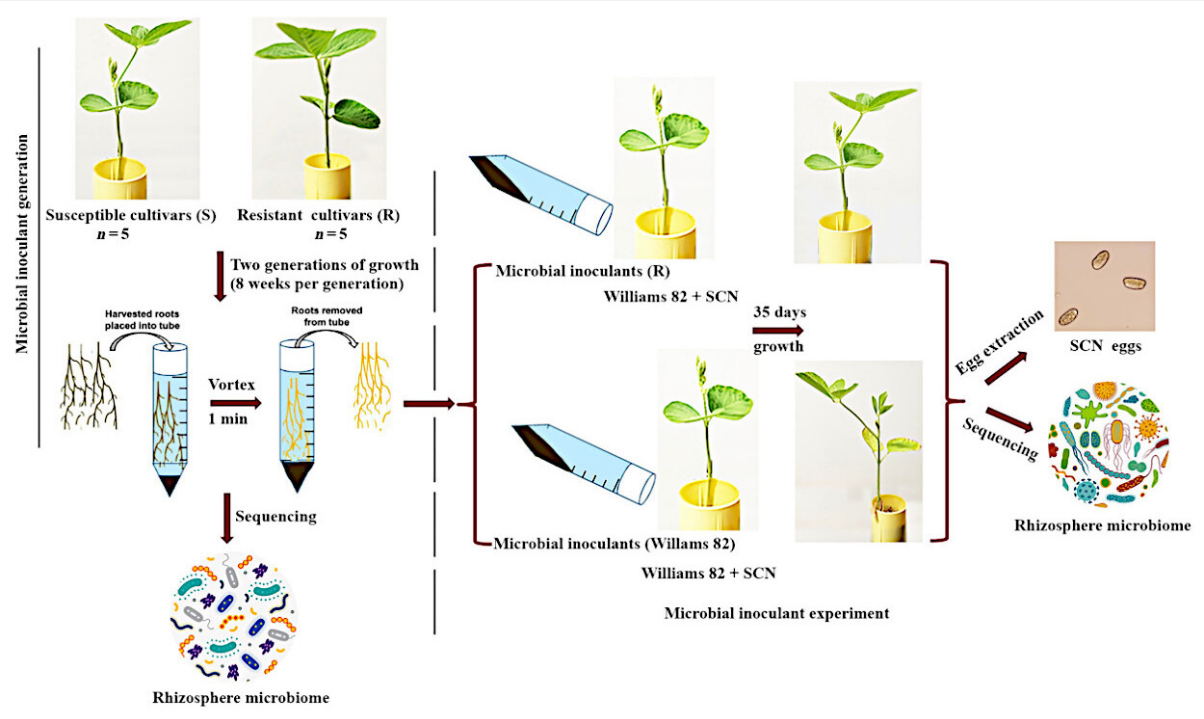
Rhizosphere microbiome enhances soybean resistance to soybean cyst nematode.

Resistant cultivars carried distinct microbial communities.

06.03.2026 | 08:06 (UTC -3)

Cultivar Magazine



Soybean cultivars resistant to soybean cyst nematode (SCN). *Heterodera glycines* These microbiomes recruit different rhizosphere microbiomes than those observed in susceptible materials. These microbiomes also reduced the pathogen population when researchers transferred them to the susceptible cultivar Williams 82. The result indicates potential for using the microbiome to enhance the management of SCN.

Researchers evaluated 10 soybean cultivars. The group gathered five resistant and five susceptible varieties to SCN. The team cultivated the plants for two generations in a growth chamber and then analyzed bacteria and fungi from the rhizosphere by amplicon sequencing.

The data showed a higher population of SCN in the five susceptible cultivars than in the five resistant ones. Statistical analysis also indicated a significant effect of plant genotype and resistance trait on the composition of microbial communities. Genotype explained a larger share of the variation.

Microorganisms in crops

Among the microorganisms associated with resistant cultivars, the study highlighted bacterial taxa of *Phenylobacterium*, *Pseudoduganella* and from the Comamonadaceae family. In the fungi group, the genus *Arthrobotrys* It

appeared among those enriched in resistant plants. According to the authors, these groups may participate in nematode suppression through direct action or through interaction with the host plant.

In the transfer phase, the researchers produced microbial inoculants from the rhizosphere of resistant cultivars and applied this material to soil intended for Williams 82, a susceptible cultivar. After 35 days, the treatments with inoculants from the resistant cultivars significantly reduced the population of SCN compared to the control, which received inoculant from Williams 82 itself.

The effect, however, did not match the level of suppression observed in genetically resistant cultivars. The study

also did not record a significant difference in shoot length and shoot fresh weight of Williams 82 between treatments. For the authors, this reinforces that the microbiome contributes partially to resistance and acts in conjunction with the plant's genetics.

Rhizosphere analysis

Analysis of the rhizosphere of Williams 82 after inoculation detected small but significant changes in the composition of bacterial and fungal communities. Among the groups enriched in the treatments with resistant cultivar inoculants, bacteria from the class Actinobacteria and the genus [missing genus name] appeared. *Candidatus Xiphinematobacter*in addition

to the fungus *Biatora*.

The authors note that the host plant can remodel the microbiome over time. This process can reduce the persistence and effectiveness of the inoculant. Therefore, the work suggests further studies with reapplication, inoculant mixing, or other formulations to extend the stability of the effect in the field.

More information at doi.org/10.1094/PBIOMES-07-25-0049-R

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USDA opens public consultation on genetically modified corn DP51291

Agency evaluates request to extend deregulation of event.

06.03.2026 | 07:24 (UTC -3)

Cultivar Magazine

The United States Department of Agriculture (USDA) has opened a public

consultation on the request to deregulate the DP51291 genetically modified corn. The petition came from Pioneer Hi-Bred International, owned by Corteva. The genetically modified corn combines insect resistance and tolerance to glufosinate ammonium. These same traits have already been deregulated for another corn variety from the company, DP23211.

After reviewing the application, the USDA prepared a preliminary assessment of plant pest risk similarity. Technicians concluded that DP51291 does not present a greater risk than DP23211. The documents were open for public consultation for 30 days starting March 6, 2026. The deadline for submitting contributions is April 6, 2026, under process APHIS-2025-0411.

In the European Union, DP51291 has already undergone a safety assessment by the European Food Safety Authority (EFSA). EFSA analyzed the crop for import, processing, and use in food and feed. The scope did not include cultivation within the bloc. The panel concluded that DP51291 maize is as safe as the conventional comparator and as the non-GMO varieties tested, both for human and animal health and for the environment.

According to EFSA, the event was developed for the control of pests susceptible to *Diabrotica virgifera virgifera* and for tolerance to glufosinate-based herbicides. The modification introduced the expression cassettes ipd072Aa, pmi, and mo-pat. The authority also noted that molecular and bioinformatic analyses did

not identify issues requiring a new food or feed safety assessment.

The European Parliament, in a resolution of 8 October 2025, cited the European Commission's decision of 22 September 2025 authorising the placing on the market of products containing, consisting of, or produced from maize DP51291. The text also notes that the Standing Committee and the Appeals Committee did not issue an opinion in the votes of June and July 2025.

The insecticidal protein IPD072Aa, expressed in the event, comes from *Pseudomonas chlororaphis*In a study cited in the report, it showed high activity against *Diabrotica virgifera virgifera*The authors reported that the protein binds to receptors in the insect's gut that are

different from those used by current commercial traits, and that this action leads to the death of cells in the larva's midgut.

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Resistance of the coffee leaf miner threatens chemical control in coffee crops.

A study involving 36 populations indicates failure rates exceeding 50% for chlorpyrifos, deltamethrin, and profenofos.

05.03.2026 | 16:17 (UTC -3)

Cultivar Magazine

O coffee leaf miner (Leucoptera coffeella)

The use of four neurotoxic insecticides in Brazilian crops poses a risk of control failure. Researchers measured mortality rates below 80% in a significant portion of populations exposed to label doses. The greatest concern was chlorpyrifos, deltamethrin, and profenofos. More than half of the tested populations showed low efficacy with these products in recent research.

The study evaluated 36 field populations collected in commercial coffee-growing areas across nine Brazilian states. Collections took place in Minas Gerais, Espírito Santo, São Paulo, Bahia, Goiás, the Federal District, Rio de Janeiro, and Pernambuco. The experiment exposed caterpillars to contact with filter paper discs

treated with insecticidal solutions. Mortality readings were taken after 48 hours.

The risk of control failure reached 34,3% of the populations for abamectin. The rate reached 62,9% for chlorpyrifos. Deltamethrin and profenofos each registered 51,4%. The criterion adopted a minimum mortality rate of 80% to indicate control at the field level.

The authors also estimated resistance levels using the median resistance ratio (RR50). Abamectin ranged from 175 to 26.478 times. Chlorpyrifos ranged from 44,2 to 1.816 times. Deltamethrin ranged from 45,2 to 27.603 times. Profenofos ranged from 11,1 to 33,2 times. The study classified resistance as low below 100 times. The moderate range was between

100 and 500. The high range was between 501 and 5.000. The very high range exceeded 5.000.

Some populations showed the highest extremes. Santa Teresa recorded an RR50 of 27.603 for deltamethrin. Garanhuns recorded an RR50 of 26.478 for abamectin. Rio Paranaíba II recorded an RR50 of 1.816 for chlorpyrifos.

The study investigated enzymatic activity in six populations selected by selection pressure profiles. Acetylcholinesterase (AChE) showed the lowest activity in Rio Paranaíba II. Glutathione S-transferase (GST) reached the highest activity in Rio Paranaíba I, followed by Carmo do Paranaíba. Phosphotriesterase (PhTE) remained low and did not vary between

populations in the statistical test.

This work was developed by Daianna P. Costa, Carlos G. da Cruz, Ryan FS e Silva, Liliane E. Visôtto, Jesús E. Gomez, Marisol Giraldo-Jaramillo, and Flávio L. Fernandes.

More information at doi.org/10.1002/ps.70677

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Agroconsult raises its estimate for Brazilian soybean production to 183,1 million tons.

Field assessments indicate an increase of 850 tons over the initial projection.

05.03.2026 | 15:24 (UTC -3)

Cultivar Magazine, based on information from Carol Silveira

Photo: Fabrizio Zini

Agroconsult has revised its forecast for Brazilian soybean production in the 2025/26 crop year to 183,1 million tons, according to partial results from field assessments. This volume exceeds the previous season's harvest by 6,4%.

The new projection adds 850 tons to the number released at the beginning of the expedition in January. The estimated average productivity reaches 62,5 sacks per hectare. The planted area remains at 48,8 million hectares, a growth of 2,1% compared to the previous harvest.

Estimates improved in most states, even with challenging weather. According to André Debastiani, production could grow even more. The lack of rain in Rio Grande do Sul and the excess rainfall in January

and February in Mato Grosso, Goiás, and Minas Gerais reduced the productivity and quality of the grains. If the rains persist, the final weight of the soybeans may decrease and affect the national average.

By February 26th, the harvest had reached 44% of the planted area in the country. During the same period last year, the figure was 52%.

Nine states have a productive potential above 62 sacks per hectare: Mato Grosso, Mato Grosso do Sul, Goiás, Paraná, Santa Catarina, São Paulo, Minas Gerais, Rondônia, and Bahia.

In Mato Grosso, average productivity is projected at 66 sacks per hectare, close to the record of 66,5 sacks from the previous harvest. Excessive rainfall in early

February limited some of the potential and is causing concern about the weight and quality of the grains.

In Goiás, the delay in harvesting dominates the scene. About 60% of the area is still waiting for the soybeans to be removed from the field. Even so, the estimated productivity reaches 67 sacks per hectare, slightly below the record of 68 sacks from last season.

Mato Grosso do Sul stands out, with a projected yield of 62,5 sacks per hectare. In Paraná, the average could reach 67 sacks, a new state record. Adequate rainfall and efficient pest and disease management have supported this performance.

In São Paulo, the estimate reaches 63,5 sacks per hectare. Minas Gerais projects 66,5 sacks, with harvesting accelerated to ensure the planting of the second crop. Rondônia estimates 62,5 sacks, while Bahia could reach 68 sacks per hectare.

Among the states with productivity between 55 and 62 sacks per hectare are Tocantins, with 59,5 sacks, and Maranhão, Piauí, and Pará, each with 60 sacks per hectare.

The state of Rio Grande do Sul recorded the only consolidated losses, estimated at 2 million tons. Irregular rainfall between January and February, mainly in the south and the Missões region, compromised the productive potential.

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Study identifies multiple resistance in Amaranthus tuberculatus in the USA.

Research points to a combination of metabolic mechanisms and mutations in the target.

05.03.2026 | 14:35 (UTC -3)

Cultivar Magazine

Photo: Bruce Ackley, Ohio State University

Researchers in the United States have identified populations of *Amaranthus tuberculatus* with multiple resistance to different herbicides. The phenomenon involves metabolic mechanisms and mutations at the site of action of the products. The study evaluated accessions collected in the state of Wisconsin and recorded resistance to up to five herbicides.

The weed showed varying levels of resistance to 2,4-D, atrazine, glyphosate, fomesafen and mesotrioneOne of the accessions analyzed showed low to moderate resistance to all five herbicides evaluated.

Resistance mechanisms

Researchers have identified two main types of resistance mechanisms. The first occurs at the herbicide's site of action. In this case, mutations or alterations in gene expression reduce the binding of the product to the target. The second mechanism involves metabolic processes that reduce the herbicide concentration in the plant before it reaches the target.

Among the metabolic mechanisms, the study highlights the role of cytochrome P450 and glutathione S-transferase (GST) enzymes. These enzymatic systems increase the detoxification of herbicides. This process can generate cross-

resistance to different molecules.

The results indicated that the accession designated A101 exhibits resistance to 2,4-D mediated by P450 and GST. The same accession showed resistance to mesotrione associated with the same metabolic systems. Glyphosate resistance involved a combination of mutation in the EPSPS gene and increased expression of this gene.

The research also identified mutations linked to fomesafen resistance. In this case, the ?G210 deletion in the PPX2 gene reduced the herbicide's effectiveness.

Indirect selection

The authors highlight that some populations showed resistance even without a history of use of certain herbicides in the area. This result suggests indirect selection caused by other products that stimulate metabolic detoxification systems.

Further information at doi.org/10.1002/ps.70672

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BASF announces Ridivex herbicide in the United States

New product combines three active ingredients for post-emergence weed control in corn.

05.03.2026 | 13:08 (UTC -3)

Cultivar Magazine, based on information from Pace Sagester

BASF has announced the Ridivex herbicide for post-emergence weed control

in corn crops in the United States. The formulation combines three active ingredients. The company is targeting the technology for managing resistant populations and protecting the productive potential of crops.

The product is still awaiting registration with the United States Environmental Protection Agency before it can be marketed. While the process is under evaluation, the company is releasing technical information to guide producers and consultants.

Ridivex combines diflufenzopyr, dicamba, and pyroxasulfone. The mixture promotes control of already emerged weeds and has a residual effect in the soil. The technology aims to keep areas free of competition

during critical stages of corn development.

According to BASF, the herbicide controls more than 200 species of broadleaf weeds. The formulation also enhances the transport and performance of dicamba through diflufenzopyr. The company reports visible results within four hours of application.

The residual effect is effective against more than 80 species of broadleaf weeds and grasses. Control can last up to eight weeks after application. This effect is due to the presence of pyroxasulfone.

The formulation also includes a "safener" to increase selectivity to the crop. BASF states that the product allows for low-dose application and uses a lower dicamba load compared to competing technologies.

Company-sponsored trials in 2024 evaluated the herbicide's performance in seven locations across the United States. The tests involved states in the Midwest and South. Ridivex achieved high levels of control six weeks after application.

The technical recommendation calls for application in early post-emergence of corn, between stages V2 and V5, with a limit up to V8 or until plants reach 36 inches in height. The suggested dose is up to 8 ounces per acre, with the possibility of adjustments in cases of larger or resistant plants.

BASF recommends a spray volume of 15 gallons per acre. The product can be incorporated into tank mixtures with herbicides such as atrazine, mesotrione, or

glyphosate to broaden the control spectrum.

The company states that pressure from resistant weeds is increasing in corn-producing areas. This scenario demands more applications and combinations of products. BASF positions Ridivex as a tool to simplify management and increase the efficiency of weed control in the field.

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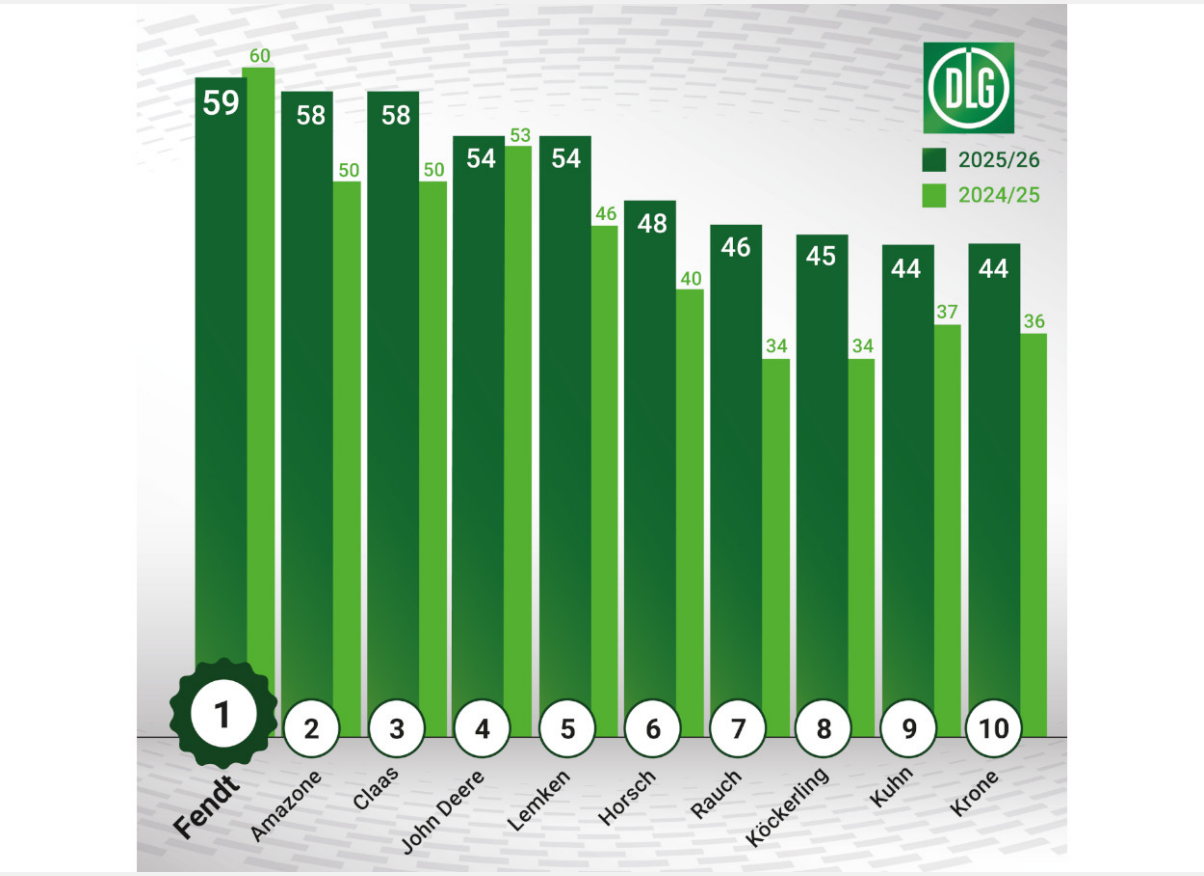
Fendt leads ranking of images of agricultural machinery in Germany.

DLG ImageBarometer 2025/26 survey places company in first position for the 19th consecutive year.

05.03.2026 | 12:52 (UTC -3)

Cultivar Magazine, based on information from Fendt



German farmers have once again placed Fendt at the top of the agricultural technology brand image ranking in the DLG ImageBarometer 2025/26 survey. The company achieved 59 points and led among ten manufacturers evaluated. This result marks the brand's 19th consecutive year in first place.

The annual study by the German Agricultural Society (DLG) analyzes brand strength in the sector. The assessment considers brand recognition, customer loyalty, perceived performance, and overall image, including innovation and communication.

Regional analysis also highlighted Fendt's leadership. In northern Germany, the brand scored 62 points, an increase from

the 59 recorded in the previous edition. In the south of the country, the company's region of origin, it maintained 63 points, repeating the best result of the previous year.

The survey gathered responses from 674 farmers. The evaluated properties have an average area of ??338 hectares. Approximately 90% of those interviewed practice conventional production. About 80% have technical training, a university degree, or advanced professional certification. The average age of the group is 52 years. Data collection took place between October 2025 and January 2026.

Since 1996, the ImageBarometer has measured farmers' perceptions of agribusiness manufacturers. The brand index results from the sum of four sub-

indicators. Each can reach up to 25 points, totaling a maximum score of 100.

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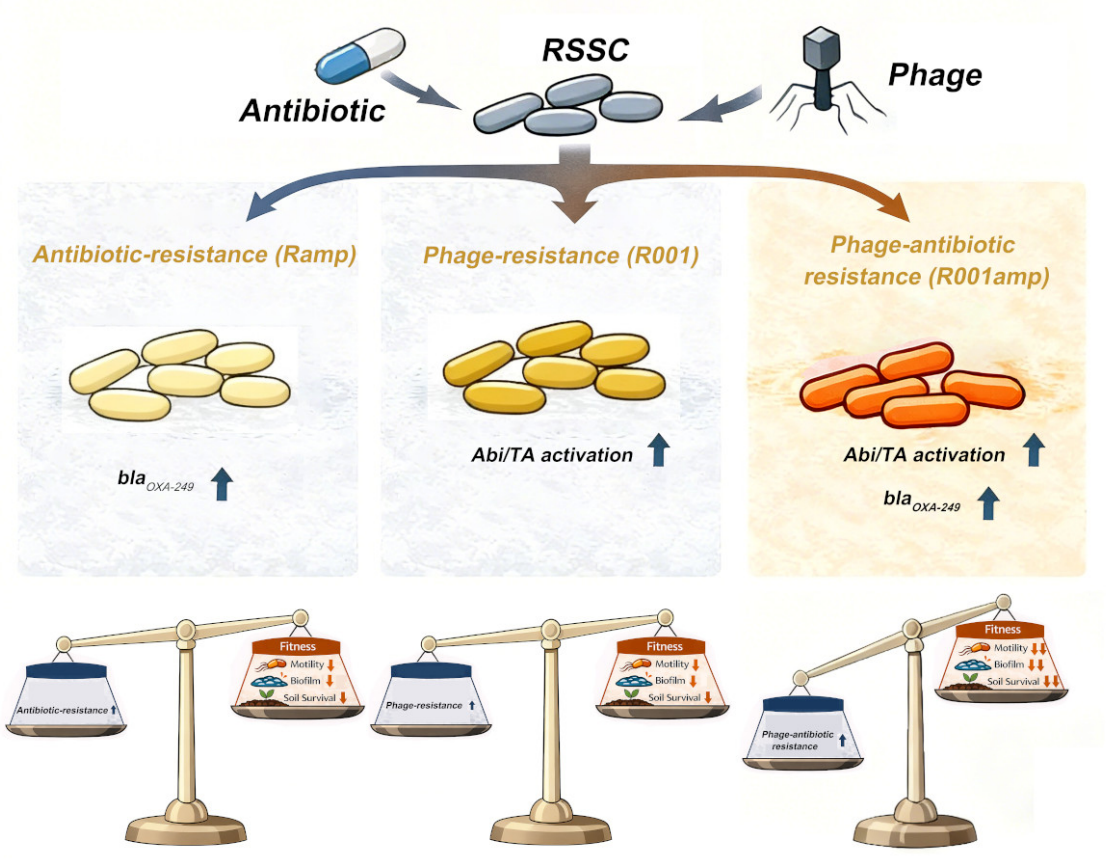
Bacterial wilt bacteria reduce virulence by evolving resistance.

Study identifies adaptive costs in Ralstonia solanacearum and points to the use of bacteriophages as a control strategy.

05.03.2026 | 10:37 (UTC -3)

Cultivar Magazine



The bacterium Ralstonia solanacearum

The bacterial wilt agent can develop resistance to bacteriophages and antibiotics at the cost of reduced virulence-related traits. This finding comes from a recent study.

Researchers have isolated a new bacteriophage from the rhizosphere of tobacco plants showing symptoms of the disease. The virus, named YIMV22001R, infects strains of the complex. *Ralstonia solanacearum* and showed potential as a biological control agent. Genomic analysis revealed double-stranded DNA with 65.707 base pairs and an absence of genes associated with virulence or antibiotic resistance.

Resistant mutants

The team evaluated bacterial mutants resistant to bacteriophage, resistant to the antibiotic ampicillin, and simultaneously resistant to both. The growth of the resistant strains did not differ from the original strain. However, the mutants showed a significant reduction in motility, biofilm formation, and soil survival. The most intense decrease occurred in the mutants with dual resistance.

Bacterial motility influences host colonization and disease progression. Biofilm formation also favors bacterial survival in the xylem and on plant surfaces. A reduction in these characteristics indicates a loss of

ecological fitness following the evolution of resistance.

The researchers also observed cross-resistance to some antibiotics. Ampicillin-resistant strains acquired additional tolerance to chloramphenicol, ceftriaxone, and cephalexin. Gene expression analysis showed increased activity of the blaOXA-249 gene, associated with resistance to beta-lactam antibiotics.

Abortive infection

Resistance to bacteriophages occurred through the activation of a defense mechanism called abortive infection. In this process, the infected bacterial cell activates defense genes and interrupts its

own multiplication. This strategy prevents viral replication and protects the bacterial population.

Despite this defense mechanism, the authors highlight that the evolution of resistance imposes biological costs on the bacteria. These costs include reduced mobility, decreased biofilm formation, and reduced survival in the soil. These losses can reduce the pathogen's ability to cause disease.

More information at doi.org/10.3390/agriculture16050595

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Biotrop has a change in sales coordination for Latin America.

Agricultural engineer Laura Landucci takes on the role and leads the development of partnerships and entry into new markets.

05.03.2026 | 07:55 (UTC -3)

Cultivar Magazine

Biotrop has appointed Laura Landucci as "Sales Coordinator Latam - Strategic Alliances." The executive will lead the

development and management of strategic alliances in the region, operating in countries ranging from Argentina to Mexico.

The professional participates in structuring new markets and coordinates export and regulatory entry processes. The work is carried out alongside multidisciplinary teams that integrate areas such as regulatory affairs, supply chain, marketing, and market development.

Coordination also involves strategic management of the bio-input portfolio by country. This activity includes defining technical and commercial positioning in partnership with distributors and local partners, considering the agronomic and regulatory particularities of each market.

Laura is an agricultural engineer graduated from the Luiz de Queiroz Higher School of Agriculture, specializing in plant protection and with experience in strategic marketing in agribusiness. She works with bio-input portfolio management, product launches, technical brand positioning, and campaign development.

Prior to Biotrop, she accumulated over six years of experience at Bayer in roles related to marketing, market development, and commercial strategy for seed treatment and soybean biotechnology. She also led customer relationship projects, organized technical events, and implemented knowledge transfer initiatives in the field.

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New scenario for the Tomato spotted wilt virus threatens tomatoes and peppers.

Study identifies strains capable of breaking genetic resistance in both crops.

05.03.2026 | 07:40 (UTC -3)

Cultivar Magazine

Photo: DSMZ

Tomato and bell pepper production faces a new phytosanitary risk. Researchers have identified strains of *Tomato spotted wilt virus* (TSWV) capable of overcoming resistance genes in both crops simultaneously. The finding alters the view on management strategies and may require a review of agronomic practices in producing areas.

The work involved scientists from the Leibniz Institute DSMZ, the Italian National Research Council, and BASF - Nunhems. The team analyzed virus isolates collected from crops and confirmed, for the first time, the presence of variants with double resistance breakdown in tomatoes and peppers.

TSWV is among the most destructive viruses for vegetables. The pathogen infects more than a thousand plant species and causes significant losses in several producing regions. In severe outbreaks, entire crops experience a sharp drop in productivity and significant economic losses.

Virus control

Virus control typically combines two main measures. Producers use resistant cultivars and adopt vector management, targeting thrips. In tomatoes, resistance derives from the Sw-5 gene. In peppers, protection depends on the Tsw gene. Each crop responds to distinct viral proteins.

This mechanism supported a strategy considered safe for years. Producers alternated the cultivation of resistant tomatoes and peppers in the same region. This practice would reduce the selection pressure on the virus.

Double resistance-breaking

The new study points to a different scenario. Researchers found virus isolates capable of overcoming both of the plant's defense systems. These variants have been named double resistance-breaking (D-RB).

The isolates analyzed came from Italian crops. Samples collected from resistant

pepper plants showed typical symptoms of viral infection. Subsequent tests confirmed that the same virus also infects tomatoes carrying the Sw-5 gene.

Genetic analysis

Genetic analysis revealed specific mutations in viral proteins. Alterations in the NSm movement protein allow the virus to overcome tomato resistance. Some strains also carry amino acid substitutions associated with breaking down the virus's defenses in bell peppers.

Among the findings, scientists identified a substitution called D122G in the NSm protein. This alteration appeared in Italian isolates and had already been associated

with resistance breakdown in other countries.

The results suggest a direct impact on agronomic management. Alternating resistant cultivars or cultivating the two vegetables in close proximity may favor the selection of these more aggressive viral variants.

Researchers recommend systematic monitoring in areas where tomatoes and peppers coexist in the same production system. Molecular diagnostic programs can quickly identify strains with the potential for double resistance breakdown.

Further information can be found at doi.org/10.1016/j.virol.2026.110820

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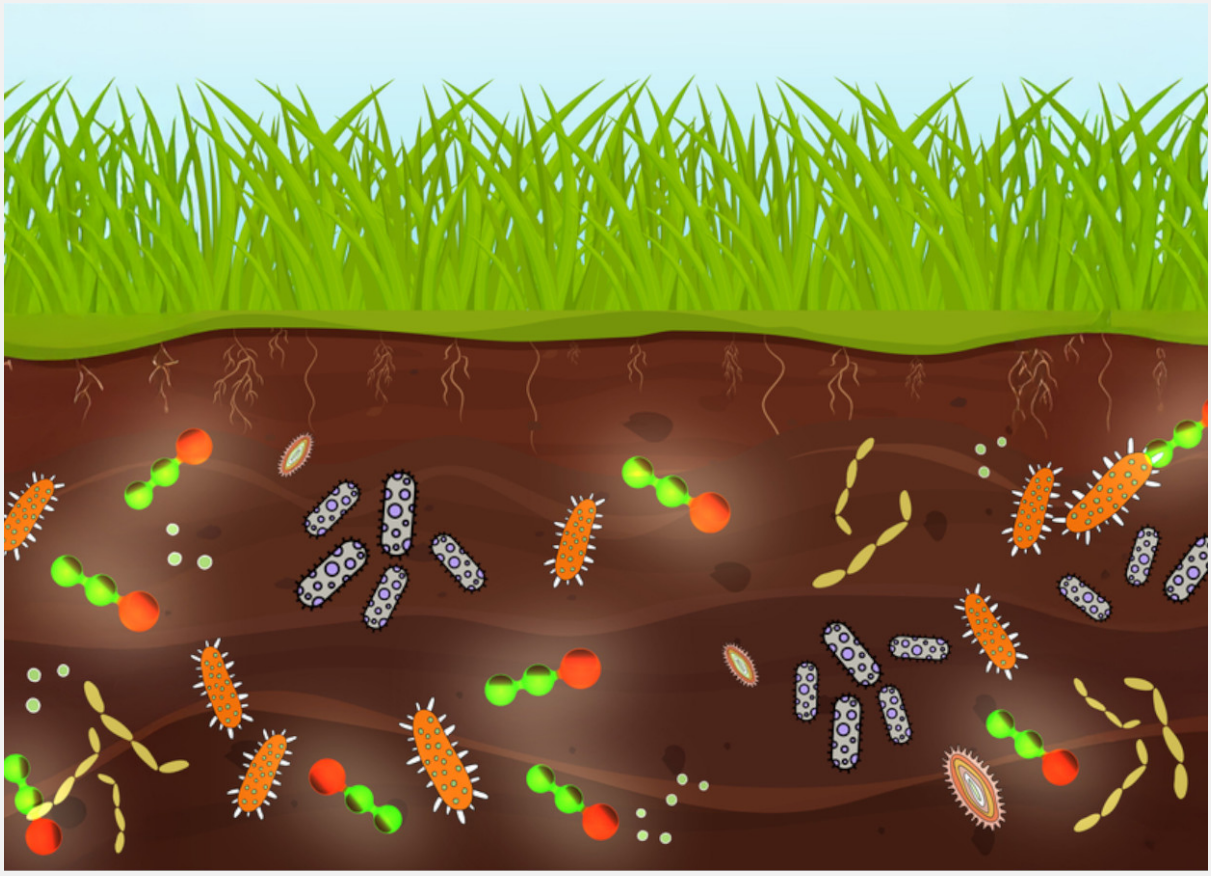
Nitrous oxide from fertilizers can affect soil bacteria.

MIT study indicates that the gas may affect the health of agricultural crops.

04.03.2026 | 15:53 (UTC -3)

Cultivar Magazine



Nitrous oxide (orange and green molecules) produced in plant roots can harm certain soil bacteria, according to a new study - Image: Christine Daniloff, MIT

Nitrous oxide (N2O) released into the soil after the use of nitrogen fertilizers can harm bacteria that aid plant growth. Research conducted by scientists at the Massachusetts Institute of Technology (MIT) shows that the gas inhibits rhizosphere microorganisms and alters the composition of microbial communities near the roots.

The rhizosphere is home to millions of microorganisms. These organisms compete and cooperate. Many increase plants' access to nutrients and help defend against pathogens.

The study indicates that N2O, in addition to acting as a potent greenhouse gas, also interferes with the metabolic processes of soil bacteria. The substance reacts with

vitamin B12 and inactivates the cobalamin-dependent methionine synthase enzyme. This process blocks the production of the amino acid methionine, which is essential for cell growth.

Reduced growth

Experiments show that bacteria capable of producing N2O can reduce the growth of neighboring species sensitive to the gas. The team used the bacteria *Pseudomonas aeruginosa* as a model. Microorganisms dependent on the N2O-sensitive enzyme showed limited growth when exposed to the gas or when grown alongside bacteria that produce the substance.

The researchers also analyzed bacteria associated with the roots of *Arabidopsis thaliana*Some of these species depend exclusively on the N2O-sensitive enzyme. In laboratory tests, several showed a sharp reduction in growth in environments with high concentrations of the gas.

Genomic analyses indicate that approximately 30% of bacteria with sequenced genomes may suffer toxic effects from N2O. This result suggests that the gas can influence the organization of microbial communities in the soil.

Agricultural areas

In agricultural areas, N2O peaks frequently occur after the application of nitrogen

fertilizers, rainfall, irrigation, or freeze-thaw cycles. These events raise the concentration of the gas in the soil for days or weeks.

The authors consider the results a first step. The tests were conducted in a laboratory. The team plans to investigate agricultural soils to verify if the effect occurs in the field.

The data indicate that managing the timing of fertilizer application and events that increase N2O can influence soil microbiota. Controlling these emissions may open up new strategies for preserving microorganisms beneficial to crops.

Further information at doi.org/10.1128/mbio.02699-25

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Study reviews genetic gains in wheat yield.

Analysis of trials indicates progress linked to maintaining the adaptation of cultivars.

04.03.2026 | 15:14 (UTC -3)

Cultivar Magazine

Patricio Grassini, a professor at the University of Nebraska-Lincoln, was one of the participants in the study.

Genetic improvement has increased wheat yields by 73 kg per hectare per year. But

almost half of this advance did not come from increased productive potential. The gain also results from work on maintaining the adaptation of cultivars to the agricultural environment, according to a study by a group of international scientists.

Researchers analyzed data from multi-site trials conducted in Argentina, the United States, the United Kingdom, and France. The dataset included 849 cultivars evaluated across 17 locations, with 13.003 combinations of cultivar, site, year, and fungicide management.

Two sources

The results indicate two distinct sources of yield gain. The increased yield potential of

modern cultivars accounted for 40 kg/ha per year. Meanwhile, breeding programs focused on maintaining adaptation contributed 33 kg/ha per year by preventing the yield decline observed in older cultivars.

This process occurs because older cultivars lose performance over time. Changes in climate, pathogens, management, and soil conditions cause a phenomenon called "yield erosion." The release of new varieties compensates for this loss of adaptation.

In the trials analyzed, the productivity of the reference cultivars decreased by 33 kg/ha per year when treated with fungicide. Without fungicide, the decrease reached 64 kg/ha per year, indicating increased

susceptibility to foliar diseases over time.

chemical control

The analysis also identified a strong impact of chemical disease control. On average, fungicide application increased yield by 1.285 kg/ha, equivalent to 20% of the productivity of untreated plots.

The researchers used the average of the ten most productive cultivars in each trial year as an indicator of yield potential. The study found no relevant climatic trend that would explain changes in productivity over the evaluated period.

Bias in studies

The central conclusion points to a frequent bias in studies of genetic progress. Direct comparisons between old and modern cultivars under current conditions may overestimate gains in yield potential, as they ignore yield erosion in older varieties.

Wheat occupies 217 million hectares worldwide and provides about 20% of the calories and protein consumed by the global population. Continuous productivity gains reduce the pressure for agricultural expansion and emissions associated with land use.

The authors emphasize that breeding programs need to pursue two simultaneous objectives. One seeks to increase productive potential. The other maintains genetic adaptation in the face of

evolving diseases, management practices, and environmental factors.

More information at doi.org/10.1038/s41467-026-69936-6

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Valtra prepares network to expand effective use of technology in the field.

Meeting held at Embrapa Soja brings together dealers and multipliers to align portfolio, technical training and commercial approach.

04.03.2026 | 14:42 (UTC -3)

Cultivar Magazine

Between March 2nd and 5th, Valtra will hold a meeting with dealers, multipliers, and members of the sales force at the Embrapa Soja headquarters in Londrina. The location helps set the tone for the event. Instead of an agenda restricted to product presentations, the brand associates the updating of its portfolio with an environment recognized for the generation and dissemination of agronomic knowledge, bringing together mechanization, management, and operational performance.

The meeting takes place at a time of renewal for Valtra's product lines in Brazil, which is preparing new products on different fronts, from soil preparation to planting, from spraying to harvesting, and is already signaling important changes in

the tractors and machines that will reach the market in the coming weeks, aligned with the brand's global positioning.

In addition to previewing new releases to the network, the meeting also serves to align how these machines should reach the producer. As tractors, planters, sprayers, and harvesters incorporate more features in terms of cabin, transmission, onboard electronics, and automation, the need for a network prepared to explain not only what the equipment offers, but also how this technical content can be converted into practical use and results in the field, also grows.

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This is where Valtra focuses its training for dealers and multipliers. According to the brand's Marketing Director, Fábio Dotto, the goal is to align knowledge between the internal team, partners, and sales force, combining product solutions, commercial differentiators, and value selling. The guidance is for the salesperson to have a more consultative approach, with the background to discuss agricultural operations before presenting the machine. "We want our consultant to talk about the land, to talk about the plant, before talking about the tool," he states.

The phrase summarizes the training logic. First, the agronomic fundamentals are covered; then, this content is connected to the brand's solutions in tractors, planters, sprayers, and harvesters. The intention is for the professional to be able to relate each machine to the reality of the property and the needs of the operation, instead of limiting the conversation to a description of specifications.

For the producer, this type of approach gains importance in a scenario where equipment is increasingly incorporating more technology. The potential gain lies in the available resources, but also in how they are understood and applied. A new transmission, for example, needs to be presented not only for its configuration, but also for its effect on power utilization,

speed consistency, and operational efficiency. Cabin features affect ergonomics, function control, and the quality of the workday. Electronic and automation solutions can contribute to repeatability, control, and precision, provided they are correctly configured and used.

Valtra frames this line of argumentation within the concept of value selling. The proposal is to show the farmer how the embedded technology can translate into productivity, efficiency, and cost reduction. Instead of a discourse focused solely on the technical specifications, the brand seeks to guide its network to relate the equipment to the performance of the activity and the operational return.

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Another aspect discussed at the meeting was the role of multipliers within dealer groups. The function of these professionals is to keep knowledge active throughout the year, disseminating the information passed on in training internally and helping to technically level the teams. In a market with frequent launches and more complex machines, this link tends to be important to maintain consistency in recommendations and delivery.

Valtra's Commercial Director, Cláudio Esteves, defines the initiative as a moment of preparation for specialists from

dealerships across the country. According to him, the meeting serves to present new products and get the network ready to deliver these products to the market.

The Valtra network meeting reinforces a message that accompanies the recent evolution of agricultural mechanization, where the competitiveness of a machine depends not only on what it has on board, but also on the network's ability to guide its use, connect technology to operation, and transform innovation into effective results in the field.

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AGCO's OutRun Tillage wins the 2026 Davidson Award.

Autonomous solution expands operations beyond harvesting and reinforces goal of full autonomy by 2030.

04.03.2026 | 10:28 (UTC -3)

Cultivar Magazine, based on information from Bob Blakely

AGCO announced that its PTx Trimble OutRun Tillage solution received the Davidson Prize at the Commodity Classic in San Antonio. This award marks the second consecutive year of recognition for the OutRun platform, following its win in 2025 with the OutRun Grain Cart.

Awarded by the American Society of Agricultural and Biological Engineers in partnership with the Association of Equipment Manufacturers, the Davidson Prize highlights innovations selected from among the winners of the AE50. Each year, up to three technologies with the potential to impact productivity, efficiency, or safety in the field receive the award.

OutRun Tillage is among the winners of the AE50 award in 2026. The solution

extends AGCO's autonomy beyond harvesting and into tillage operations. The retrofit kit allows for completely operator-free tillage on existing tractors. Producers can plan, monitor, and manage operations remotely. The technology contributes to time savings and addresses labor challenges.

According to Eric Hansotia, president and CEO of AGCO, the consecutive achievements reinforce the company's gradual strategy toward autonomy. Each advancement leverages already validated technologies and brings producers closer to the goal of farm-wide autonomy.

AGCO has set a goal to enable autonomy throughout the entire production cycle by 2030. The strategy prioritizes commercial

solutions compatible with current fleets. The OutRun Grain Cart addressed bottlenecks in harvesting. The OutRun Tillage brings autonomy to autumn and spring operations and facilitates execution at the appropriate time.

In 2026, AGCO brands won seven AE50 awards across their Fendt, Massey Ferguson, and PTx portfolios.

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Tobacco exports hit a record high in 2025.

Shipment volume grows 23,23% and boosts revenue, despite a 7,6% drop in the average price per ton.

04.03.2026 | 10:06 (UTC -3)

Cultivar Magazine, based on information from SindiTabaco

Photo: Felipe Krause

Brazil reached its highest ever recorded revenue from tobacco exports in 2025.

Data from the Ministry of Development, Industry, Trade and Services (MDIC/ComexStat) indicates revenue of US$ 3,389 billion. This result surpasses the 2024 total by 13,85%, when the sector totaled US$ 2,977 billion. The performance also exceeds the previous record, from 2012, of US$ 3,272 billion.

The increase was mainly due to the rise in export volume. The country exported 561.052 tons to 121 countries. This amount exceeds the 455.221 tons of 2024 by 23,23%.

The difference between volume growth and revenue growth stems from the drop in the average price per ton. In 2024, the average price reached approximately US$6.540 per ton. In 2025, it fell to

approximately US$6.040, an estimated reduction of 7,6%.

“The numbers show very consistent growth in exports in 2025, driven mainly by a significant increase in volume. We are selling more, but at a lower average value,” says the president of the Interstate Tobacco Industry Union (SindiTabaco), Valmor Thesing.

According to the official, the result reinforces Brazil's leadership in global trade. "Over the last five years, we have maintained an annual average of approximately 515 tons and US$2,6 billion in foreign exchange. This stability is directly linked to the Integrated Tobacco Production System," he emphasizes.

The Integrated System is supported by the Integration Law, which regulates contracts between industry and producers, defines volumes, type of tobacco, and provides technical management guidelines. "Integration aligns planting with global demands in quantity and quality. Brazil has led world exports since 1993," he points out.

In 2025, Europe accounted for 41% of the exported value. The Far East concentrated 36%. Africa/Middle East accounted for 8%. North America and Latin America each registered 6%. Eastern Europe accounted for 3%.

Among the main importers are Belgium, China, and Indonesia. Belgium led with US$733,4 million, followed by China

(US$576,5 million) and Indonesia (US$280,4 million).

The Southern Region accounted for 96% of national production and 98% of exports. Shipments from the region reached US$ 3,315 billion, a 14,91% increase over 2024.

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New Holland presents the Defensor 4000 sprayer at Expoagro 2026.

The model expands operational capacity and incorporates advanced precision agriculture features.

04.03.2026 | 09:54 (UTC -3)

Cultivar Magazine, based on information from Facundo Cabrera

New Holland presents the Defensor 4000 self-propelled sprayer at Expoagro 2026 in Argentina. The model expands operational capacity and integrates technologies focused on application efficiency and waste reduction.

The vehicle features a 6,7-liter, 272 hp FPT NEF engine. It includes the Eco Mode management system, which aims for a better balance between performance and fuel consumption. Independent all-wheel drive enhances traction and ensures a ramp capacity of up to 30%.

The Defensor 4000 has a 4.000-liter tank and a 36-meter boom, with 35 cm spacing between nozzles. This configuration allows for covering more hectares per workday and maintaining uniformity in application. The active and independent pneumatic

suspension on all four wheels contributes to stability on uneven terrain.

In precision agriculture, the model incorporates the IntelliSpray II system, which performs section-by-section, nozzle-by-nozzle control and manages pressure and flow rate. The IntelliHeight XRT automatically adjusts the spray button height in real time. The IntelliView 12 monitor centralizes spraying parameters. The machine also operates with the FieldOps platform, which allows for real-time monitoring of operational data, performance, and location.

The cabin features pressurization, air conditioning, and an activated carbon filter. The package includes ergonomic improvements and systems that facilitate daily operation.

MODELO	DEFENSOR 4000
MOTOR	
Motor	FPT NEF 6 / 6,7 Litros
Potência do Motor	272 cv
Nível de Emissão	Tier 3 (MAR-I)
Capacidade do Tanque de Combustível	450 l
TRANSMISSÃO	
Transmissão	Transmissão hidráulica eletrônica 4x4 integral independente
Modo Cruise Control	Manutenção constante de velocidade - Com velocidade predefinida
Eco Mode	Gestão automática de rotação - Melhor performance com mais economia
Velocidade Máxima para Deslocamento	50 km/h
SISTEMA DE PULVERIZAÇÃO	
Barra de Pulverização	Aço carbono
Comprimento da Barra	Opções de barra que vão de 30 m | 36 m
Barra Úmida de Pulverização	Aço Inox
Altura de trabalho	0,50 m a 2,50 m
Espaçamento entre Porta-Bicos	50,8 cm | 35 cm (opcional)
Seções da Barra	IntelliBoom - Corte automático de 9 seções | IntelliSpray II - Corte automático bico a bico
Pulverização de Bordadura	Bico de cerca integrado
Sistema de Recirculação	Preenchimento da barra e homogeneização de calda (opcional*)
Tanque de Produto	4.000 l
Sistema de Abastecimento	Fluxômetro de abastecimento e monitor integrado
Sistema de Agitação	Agitador de calda hidráulico - 3 pontos de agitação
Tanque de Água Limpa	400 l
Bomba de Produto	Bomba centrífuga em aço inox - Vazão nominal de 746 l/min com controle PWM
Iluminação de Trabalho	Iluminação de trabalho e pulverização em LED
Câmeras de Trabalho	3 câmeras de trabalho
Abertura Simultânea das Barras	Tecla AutoFold - Abertura automática das barras
Sistema de Estabilização de barras	Eletro-hidráulico ativa no quadro central
SUSPENSÃO	
Suspensão	Pneumática Ativa - Independente nas 4 rodas, com ajuste automático de pressão conforme condição de trabalho
Variação da Bitola	Eletro-hidráulico por pistão
Protetor Inferior	Peito de aço (standard)
Rodado	Pneus VF380/90R46 com opcional de fabricante
DIMENSÃO	
Vão Livre	1,73 m
Bitola	3,05 m a 3,99 m
Peso Seco	13.185 kg (barra de 36 m)
POSTO DO OPERADOR	
Cabine	Climatizada, pressurizada e com filtro de carvão ativado
Ergonomia	Banco, volante, console e monitor totalmente ajustáveis
Controlador Eletrônico da Pulverização	INTELLIVIEW ™ 12 (ISOBUS)
AGRICULTURA DE PRECISÃO	
Antena e Piloto Automático	CYGNUS ™
Controle Automático de Altura de Barra	INTELLIHEIGHT ™ XRT COM QUADRO CENTRAL ATIVO (STANDARD)
Controle Inteligente de Aplicação Bico a Bico	INTELLISPRAY ™ II - Frequência de pulsação de até 20 Hz, com recirculação integrada (opcional)
Comunicação entre Máquinas	INTELLIFIELD ™ (mediante desbloqueio vitalício)
Sistema de Manobra de Cabeceira Automática	INTELLIFIELD ™ (mediante desbloqueio vitalício ou assinatura anual)
Telemetria Avançada	Compartilhamento de dados em tempo real, acesso remoto e monitoramento a distância | Portal FieldOps
***O SISTEMA DE RECIRCULAÇÃO SOMENTE É DISPONIBILIZADO JUNTO AO SISTEMA INTELLISPRAY II**	

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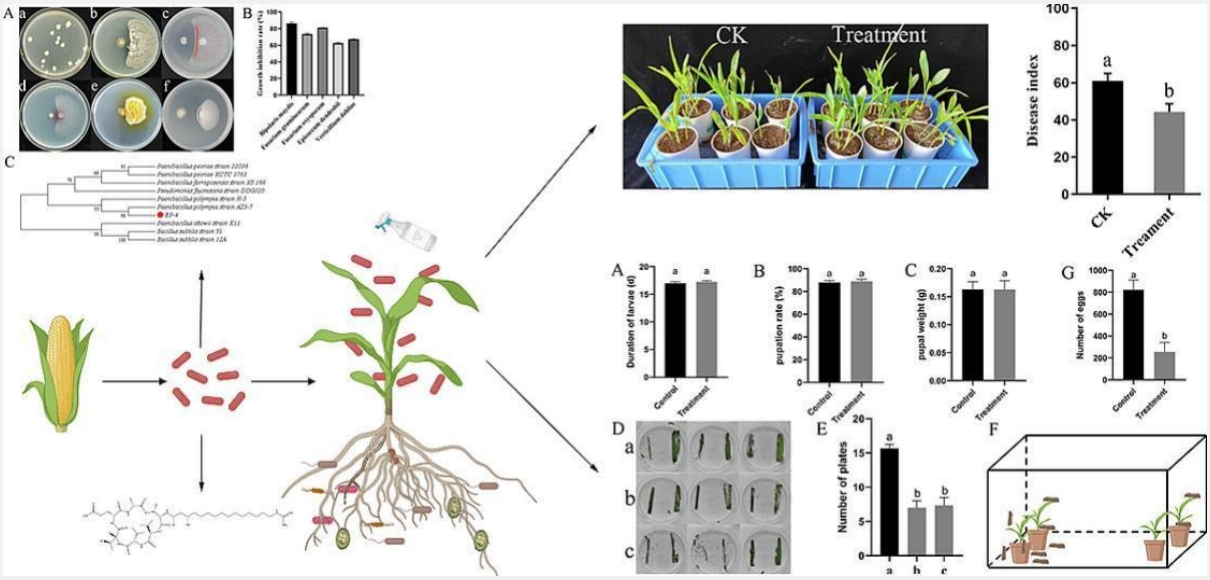
Bacteria reduces leaf spot and affects fall armyworm.

Paenibacillus polymyxa EP-4 shows promising results in maize cultivation.

04.03.2026 | 08:27 (UTC -3)

Cultivar Magazine



Endophytic bacteria *Paenibacillus polymyxa* EP-4 reduced leaf spot caused by *Bipolaris maydis*and decreased the feeding and oviposition preferences of *Spodoptera frugiperda* In corn. Research

has demonstrated simultaneous action against the fungus and the insect under controlled conditions. This information comes from a study by Chinese researchers.

In in vitro assays, the EP-4 strain inhibited 85,29% of the growth of *Bipolaris maydis* The bacteria also reduced the development of *Fusarium graminearum*, *Fusarium oxysporum*, *Epicoccum dendrobii* e *Verticillium dahliae*The treatment caused damage to the cell membrane and leakage of DNA.

In a greenhouse, foliar spraying with *Paenibacillus polymyxa* EP-4 reduced the leaf spot index in corn inoculated with *Bipolaris maydis*The treated plants showed a smaller area of ??lesions compared to

the control.

In tests with *Spodoptera frugiperda*The incorporation of the bacteria into the diet did not alter larval duration, pupal weight, or pupation rate. However, leaves treated with EP-4 showed lower consumption by caterpillars. Food preference decreased significantly. Spraying also reduced the number of eggs laid on the treated plants.

Metabolomic analysis identified 281 differential metabolites after pretreatment with EP-4 and inoculation with *Bipolaris maydis*Among them, brassinolide and quercetin. In the challenge with *Spodoptera frugiperda*329 differential metabolites emerged, such as naringin and parthenolide. The two treatments shared 343 metabolites, including caffeine

and 2-undecanone.

Transcriptomic analysis detected 631 differentially expressed genes after inoculation with *Bipolaris maydis*In treatment with *Spodoptera frugiperda*The number reached 3.268 genes. Some of the genes were related to the biosynthesis pathways of flavonoids and phenylpropanoids.

In the rhizosphere, pre-application of *Paenibacillus polymyxa* EP-4 altered the microbial community. After inoculation with *Bipolaris maydis*The genres have increased. *Pseudomonas* e *burkholderia*In treatment with *Spodoptera frugiperda*they grew *Azotobacter* e *Mesorhizobium*.

More information at doi.org/10.1016/j.pestbp.2026.107047

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Bayer announces 2025 results

The agricultural sector was driven by corn and vegetables.

04.03.2026 | 07:25 (UTC -3)

Cultivar Magazine

Bayer ended 2025 with 1,1% growth in global sales adjusted for exchange rates and portfolio. Group revenue totaled

€45,575 billion. EBITDA before special items fell 4,5% to €9,669 billion. Net income was negative €3,620 billion, impacted by provisions related to litigation. The company projects stable sales and results in 2026, on an adjusted exchange rate basis.

The Crop Science division recorded sales of €21,622 billion in 2025. This represents a 1,1% increase on an adjusted basis. The performance was driven by corn. The Corn Seed & Traits segment grew 13,2% year-on-year, with gains in all regions. The company attributed the result to product performance, increased planted area, and the resolution of a licensing agreement with Corteva in North America.

Without the effect of the agreement, growth in corn would be just under 10%.

The company reported that approximately €300 million boosted fourth-quarter results from licensing revenue. Another €450 million is expected to impact soybeans in the first quarter of 2026.

The vegetable seed sector grew by 7,5%, with price and volume increases in almost all regions.

Herbicides remained stable, with an increase of 0,5%. Glyphosate-based products repeated the level of the previous year, with a positive variation of 0,1%.

Fungicides fell 4,8%, with declines in North America and Asia-Pacific. Insecticides decreased 12,2%, following the expiration of the registration of Movento (spirotetramate) in Europe. Soybean seeds and traits fell 7,7%. Cotton declined

22,9%. The company attributed the performance to the cancellation of the registration of dicamba-based products in the United States.

Crop Science's EBITDA before special items totaled €4,188 billion. This represents a 3,2% decrease. The margin was 19,4%, stable compared to 2024. The result reflected growth in corn and savings from efficiency programs. Regulatory pressures, incentive expenses, and strategic actions affected performance.

Profitability improvement

The company has moved forward with its profitability improvement program for the

agricultural division. The strategy includes portfolio rationalization and asset review. The company announced the discontinuation of nearly 200 crop protection products and divestments in active ingredients. The plan anticipates margin gains exceeding €1 billion over the five-year cycle.

Prospects for 2026

For 2026, Bayer projects growth of between 0% and 3% in global sales, on a currency and portfolio-adjusted basis. EBITDA before special items is expected to range between €9,6 billion and €10,1 billion. Free cash flow is expected to be negative between €1,5 billion and €2,5 billion, with an outlay of approximately €5

billion related to litigation.

In the agricultural division, the company forecasts growth of 1% to 4% on an adjusted basis. EBITDA margin before special items is expected to reach between 20% and 22%. The company indicated a focus on cost discipline, pricing, and portfolio simplification.

For glyphosate, the company projects a 2% to 6% drop in sales in 2026. Bayer cited reduced tariffs on Chinese imports in the United States and a decline in generic drug prices below the historical median. The company stated that it will continue to adjust prices according to market conditions.

The company also reported a reduction in net financial debt to €29,843 billion at the

end of 2025, a decrease of 8,5% compared to the previous year. Free cash flow totaled €2,084 billion. The proposed dividend was €0,11 per share.

Five-Year Framework

The Crop Science division structures its strategy within the Five-Year Framework, focusing on sales growth, margin expansion, and sustainable cash generation. The goal is to return EBITDA margins before special items to the 20% range over the cycle, strengthening operational resilience and maximizing value capture from innovation.

The company plans to launch ten products with potential sales exceeding 500 million euros over the next ten years. Among the

solutions under development, the system stands out. Preceon Smart Corn, aimed at short-stature corn, and the platform Vyconic for soybeans tolerant to next-generation herbicides. The company is also preparing to launch the herbicide Icafolin-methyl, with a new mode of action for post-emergence control in large crops.

€ million	2021	2022	2023	2024	2025
Bayer Group financial KPIs					
Sales	44,081	50,739	47,637	46,606	45,575
EBITDA[1]	6,409	13,515	10,632	8,712	1,708
EBITDA before special items[1]	11,179	13,513	11,706	10,123	9,669
EBITDA margin before special items[1]	25.4%	26.6%	24.6%	21.7%	21.2%
EBIT[1]	3,353	7,012	612	(71)	(1,077)
EBIT before special items[1]	7,295	9,257	7,589	5,436	5,108
Net income (from continuing and discontinued operations)	1,000	4,150	(2,941)	(2,552)	(3,620)
Earnings per share (from continuing and discontinued operations) (€)[1]	1.02	4.22	(2.99)	(2.60)	(3.68)
Core earnings per share (from continuing operations) (€)[1]	6.51	7.94	6.39	5.05	4.91
Free cash flow	1,415	3,111	1,311	3,107	2,084
Net financial debt	33,137	31,809	34,498	32,626	29,843
Return on capital employed (ROCE) (%)	3.8	7.7	0.7	–0.1	–1.4
Research and development expenses[2]	5,412	6,572	5,371	6,209	5,769
Dividend per share (€)	2.00	2.40	0.11	0.11	0.11
Bayer Group nonfinancial KPIs[3]					
Number of smallholder farmers in low- and middle-income countries supported by products, services and partnerships (million)	49	52	53	52	53
Number of women in low- and middle-income countries who have their need for modern contraception satisfied due to interventions supported by Bayer (million)	41	44	46	51	68
Number of people in underserved[4] communities whose self-care is supported by interventions from Bayer (million)	46	49	51	53	82
Scope 1 and 2 greenhouse gas emissions (million metric tons)	3.17	3.03	3.00	2.96	2.79
Scope 3 greenhouse gas emissions from relevant categories (million metric tons)[5]	9.06	10.32	9.72	8.82	9.10
Offsetting of remaining Scope 1 and 2 greenhouse gas emissions (million metric tons)	0.30	0.45	0.60	0.71	0.91
Employees					
Number of employees[6] (Dec. 31)	99,637	101,369	99,723	92,815	88,078
Personnel expenses (including pension expenses and restructuring measures) (€ million)	11,798	12,619	10,691	12,451	11,725

Key data – Crop Science

€ million	Q4 2024	Q4 2025	Change (%)[1] Reported	Change (%)[1] Fx & p adj.	2024	2025	Change (%)[1] Reported	Change (%)[1] Fx & p adj.
Sales	**5,385**	**5,396**	**+0.2**	**+6.3**	**22,259**	**21,622**	**–2.9**	**+1.1**
Change in sales[1]								
Volume	–0.4%	+5.6%			+0.1%	+1.2%		
Price	–1.9%	+0.7%			–2.1%	–0.1%		
Currency	–2.1%	–6.1%			–2.3%	–4.0%		
Portfolio	0.0%	0.0%			0.0%	0.0%		
Sales by region								
Europe/Middle East/Africa	570	620	+8.8	+13.8	4,521	4,493	–0.6	+1.4
North America	2,014	1,975	–1.9	+7.4	9,268	8,890	–4.1	–1.2
Asia/Pacific	650	534	–17.8	–9.5	2,219	2,103	–5.2	+0.3
Latin America	2,151	2,267	+5.4	+8.2	6,251	6,136	–1.8	+4.5
EBITDA[1]	**788**	**(2,586)**	**.**		**3,966**	**(1,585)**	**.**	
Special items[1]	(129)	(3,352)			(359)	(5,773)		
EBITDA before special items[1]	**917**	**766**	**–16.5**		**4,325**	**4,188**	**–3.2**	
EBITDA margin before special items[1]	17.0%	14.2%			19.4%	19.4%		
EBIT[1]	**(170)**	**(2,317)**	**.**		**(2,756)**	**(2,532)**	**.**	
Special items[1]	(409)	(2,359)			(4,416)	(3,956)		
EBIT before special items[1]	**239**	**42**	**–82.4**		**1,660**	**1,424**	**–14.2**	
Net cash provided by operating activities	**3,651**	**3,129**	**–14.3**		**3,197**	**1,793**	**–43.9**	
Cash flow-relevant capital expenditures	402	382	–5.0		1,162	1,009	–13.2	
Research and development expenses[2]	717	392	–45.3		2,611	2,013	–22.9	

Fx & p adj. = currency- and portfolio-adjusted
[1] For definition see A 2.3 "Alternative Performance Measures Used by the Bayer Group."
[2] After special items and depreciation/amortization/impairments

Sales by strategic business entity

€ million	Q4 2024	Q4 2025	Change (%)[1] Reported	Change (%)[1] Fx & p adj.	2024	2025	Change (%)[1] Reported	Change (%)[1] Fx & p adj.
Crop Science	**5,385**	**5,396**	**+0.2**	**+6.3**	**22,259**	**21,622**	**–2.9**	**+1.1**
Corn Seed & Traits	1,454	1,739	+19.6	+28.5	6,559	7,149	+9.0	+13.2
Herbicides[2]	1,317	1,204	–8.6	–2.9	5,493	5,279	–3.9	+0.5
of which glyphosate-based products[2]	618	642	+3.9	+10.3	2,672	2,552	–4.5	+0.1
Fungicides	786	687	–12.6	–8.9	3,157	2,888	–8.5	–4.8
Soybean Seed & Traits	767	778	+1.4	+5.7	2,475	2,214	–10.5	–7.7
Insecticides	431	353	–18.1	–13.9	1,640	1,369	–16.5	–12.2
Vegetable Seeds	213	225	+5.6	+14.0	772	788	+2.1	+7.5
Cotton Seed	159	128	–19.5	–15.8	585	442	–24.4	–22.9
Other[2]	258	282	+9.3	+21.0	1,578	1,493	–5.4	–1.6

Fx & p adj. = currency- and portfolio-adjusted
[1] For definition see A 2.3 "Alternative Performance Measures Used by the Bayer Group."
[2] Starting in 2025, we now report our Industrial Turf & Ornamental business outside the United States under Herbicides, glyphosate-based products (previously: Other). This resulted in an effect of approximately €20 million for full-year 2025. The prior-year figures are presented accordingly.

Products and activities of the divisions

Indication/application/business	Core activities and markets	Main products and brands[1]
Crop Science		
Herbicides	Chemical crop protection products to control weeds	Adengo™, Alion™, Atlantis™, Conviso™, Harness™, Laudis™, Roundup™, Sakura™
Corn Seed & Traits	Seeds and traits for corn	DEKALB™, RIB Complete™, SmartStax™ PRO, Vitala™, VT Double™ PRO, VTPRO4™, Trecepta™, Preceon™
Soybean Seed & Traits	Seeds and traits for soybeans	Asgrow™, Intacta RR2PRO™, Intacta 2 Xtend™, Monsoy™, XtendFlex™
Fungicides	Biological and chemical products to protect crop plants against fungal diseases	Ambition™, Antracol™, Delaro Complete™, Fox™, Iblon™, Infinito™, Luna™, Nativo™, Prosaro™, Serenade™, Xivana™, Xpro™
Insecticides	Biological and chemical products to protect crop plants against harmful insects and their larvae	Confidor™, Curbix™, Flipper™, Movento™, Sivanto™, Vayego™, Velum/Verango™, Vynyty Citrus™
Cotton Seed	Seeds and traits for cotton	Bollgard™ 3 XtendFlex™, Deltapine™, Thryvon™
Vegetable Seeds	Vegetable seeds	DeRuiter™, Seminis™
Digital Agriculture	Digital applications for agriculture	Climate FieldView™, ForGround™
Other	Seeds and traits for oilseed rape/canola, rice, wheat and other crops. Products for consumer lawn and garden use and forestry, golf courses, railway tracks and landscape applications. Biological and chemical seed treatment products to protect against fungal diseases and pests	Arize™, Dekalb™, Gaucho™, Roundup™, TruFlex™

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Potassium deficiency reduces mycorrhizal colonization.

Long-term study shows that nitrogen and phosphorus shape soil communities.

03.03.2026 | 15:20 (UTC -3)

Cultivar Magazine

Potassium (K) deficiency reduced arbuscular mycorrhizal fungi (AMF)

biomass in roots by up to 50% in a 70-year experiment in managed pasture in Austria. Nitrogen (N) and phosphorus (P) primarily influenced soil communities. Potassium determined root colonization. The data broaden the understanding of K's role in mycorrhizal symbiosis in agroecosystems.

The experiment began in 1946, with three annual cuts and continuous removal of biomass. Treatments included isolated or combined omission of N, P, and K, in addition to plots with liming and organic fertilization. The prolonged absence of replenishment generated nutritional deficiencies and imbalances in the soil.

Soil arbuscular mycorrhizal fungi (AMF) biomass increased under nitrogen deficiency. The absence of phosphorus

slightly reduced this biomass. Potassium deficiency, however, did not significantly alter AMF in the soil, but it did significantly reduce biomass in the roots. This effect occurred mainly when nitrogen was available.

Quantification

The authors quantified arbuscular mycorrhizal fungi (AMF) using lipid biomarkers and 18S rRNA gene sequencing. Soil communities responded to N and P deficiencies. Root communities responded to K deficiency. Microbial composition varied between soil and roots.

The arbuscular mycorrhizal (AMF) families showed specific responses. Under

phosphorus deficiency in the soil, there was a reduction in the rhizophyll group and an increase in the ancestral group. Under potassium deficiency in the roots, there was also a reduction in rhizophylls, with a relative increase in ancestral families. The Glomeraceae family, dominant in the roots, showed a decrease in the absence of potassium.

The study also identified a strong association between soil AMF composition and plant community. pH and dissolved inorganic nitrogen explained a significant portion of the variation in plant and fungal communities. Liming raised the pH and increased AMF biomass in the soil, especially in plots without mineral fertilization.

The results indicate that potassium plays a central role in root colonization by arbuscular mycorrhizal fungi (AMF). Prolonged deficiency of this nutrient alters the functional structure of the fungi, with potential impacts on nutrient cycling and the productivity of managed pastures.

Further information at doi.org/10.1111/nph.70969

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Kepler Weber announces the end of merger negotiations.

Disagreement over voting commitment led to the offer expiring.

03.03.2026 | 09:49 (UTC -3)

Cultivar Magazine

In an unexpected move, Kepler Weber informed the market of the termination of merger negotiations with A-AG Topco

Limited, known as GPT. According to the company, the offer became invalid after a condition for signing the agreement was not met.

According to a relevant fact disclosed on March 3, GPT formally notified the company of the expiration of the transaction proposal. The signing of the "Merger of Shares Agreement" was contingent upon two conditions being met by 18 PM on March 2, 2026.

The board of directors approved the draft agreement (read hereThe situation, therefore, has improved.

However, GPT and Trígono did not conclude negotiations regarding the voting commitment. The document stipulated support for the transaction and related

resolutions at an extraordinary general meeting. Without the signature within the stipulated deadline, the offer lost its effectiveness.

With the withdrawal of the proposal, the operation will not proceed. Deliberations and actions related to the intended transaction will cease to have effect.

The board of directors reported that it has taken steps to make the transaction viable. The company has hired financial and legal advisors. It has conducted rounds of negotiations with GPT. It has requested a "fairness opinion" on the proposed exchange ratio. It has reviewed the terms and approved the signing of the draft agreement at an extraordinary meeting held on March 1, 2026.

The administration reiterated its economic, financial, and operational strength, even in the face of an adverse sectoral cycle.

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Native parasitoids attack Amrasca biguttula eggs

Anagrus vulneratus and Anagrus sp. near vulneratus emerge from quarantine pest eggs

03.03.2026 | 09:18 (UTC -3)

Cultivar Magazine

Anagrus sp - doi.org/10.3390/insects17030269

Two native parasitoids have begun attacking leafhopper eggs. Amrasca biguttula in Florida, United States. The sighting occurred in an okra field in Homestead. The species *Anagrus vulneratus* e *Anagrus* sp. near *vulneratus* They emerged from the eggs of the invasive pest. The finding indicates potential for biological control.

Amrasca biguttula It is listed as a quarantine pest in the United States. The insect infests crops such as cotton, okra, eggplant, sunflower, and hibiscus. Nymphs and adults suck sap from the underside of leaves. The attack causes yellowing, curling, and marginal necrosis. In cotton, losses range from 19% to 49%. In okra, losses reach 50%.

Authorities detected the species in Florida in December 2024. The plague spread through the Caribbean and southeastern US. Hibiscus nurseries under infestation received a trade ban order.

Females emerged

Researchers collected infested okra leaves in September and October 2025 at the University of Florida's Tropical Research and Education Center. Five female okra plants were found. *Anagrus* emerged from eggs of *Amrasca biguttula*The team performed morphological and molecular identification. The analyses included sequencing of the COI and ITS2 markers.

Four specimens corresponded to *Anagrus vulneratus*One copy corresponded to *Anagrus* sp. *near vulneratus*Both species belong to the complex *Anagrus* epos. Both occur in North America. There is no record of these species in the Old World, the origin of the leafhopper.

Host switching

The data indicate a change of host. The wasps were possibly exploiting native leafhoppers of the genus. *Dust*The abundance of eggs of *Amrasca biguttula* This may have facilitated the transition.

The literature points to egg parasitoids as the main natural enemies of *Amrasca biguttula*Species of the genus *Anagrus*

They attack eggs embedded in the veins of the leaves. This action reduces the population growth of the pest.

The authors recommend further studies. The team intends to measure parasitism rates and compatibility with integrated management programs. The work also highlights limitations of public DNA databases in identifying Mymaridae.

More information at doi.org/10.3390/insects17030269

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Wagner Janjacomo takes over portfolio management at Syngenta.

The executive has nearly two decades of experience in the field and is focused on innovation in crop protection.

03.03.2026 | 08:25 (UTC -3)

Cultivar Magazine

Wagner de Proença Janjacomo has assumed the position of director of

portfolio and strategic alliances at Syngenta. The executive has nearly two decades of experience in the field and in the commercial and marketing areas.

According to him, the new role opens up opportunities to develop skills and explore innovative business models. This move comes amidst transformations in the crop protection market. Janjacomo highlighted the need for a disruptive vision to identify and implement solutions that have not yet been explored.

Having been with the company for over 10 years, he held positions such as commercial director of the Cerrado Oeste unit, customer marketing manager, and cotton crop marketing manager. Prior to that, he worked at FMC for over seven

years, focusing on sales in the Cerrado and Bahia regions.

An agricultural engineer from the State University of Maringá, he completed a degree in business management with an emphasis on strategy at the Getulio Vargas Foundation.

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Study identifies proteins that promote the spread of mosaic virus.

Interaction between sHSPs and P3N-PIPO protein enhances SCMV replication in susceptible genotype.

03.03.2026 | 07:33 (UTC -3)

Cultivar Magazine

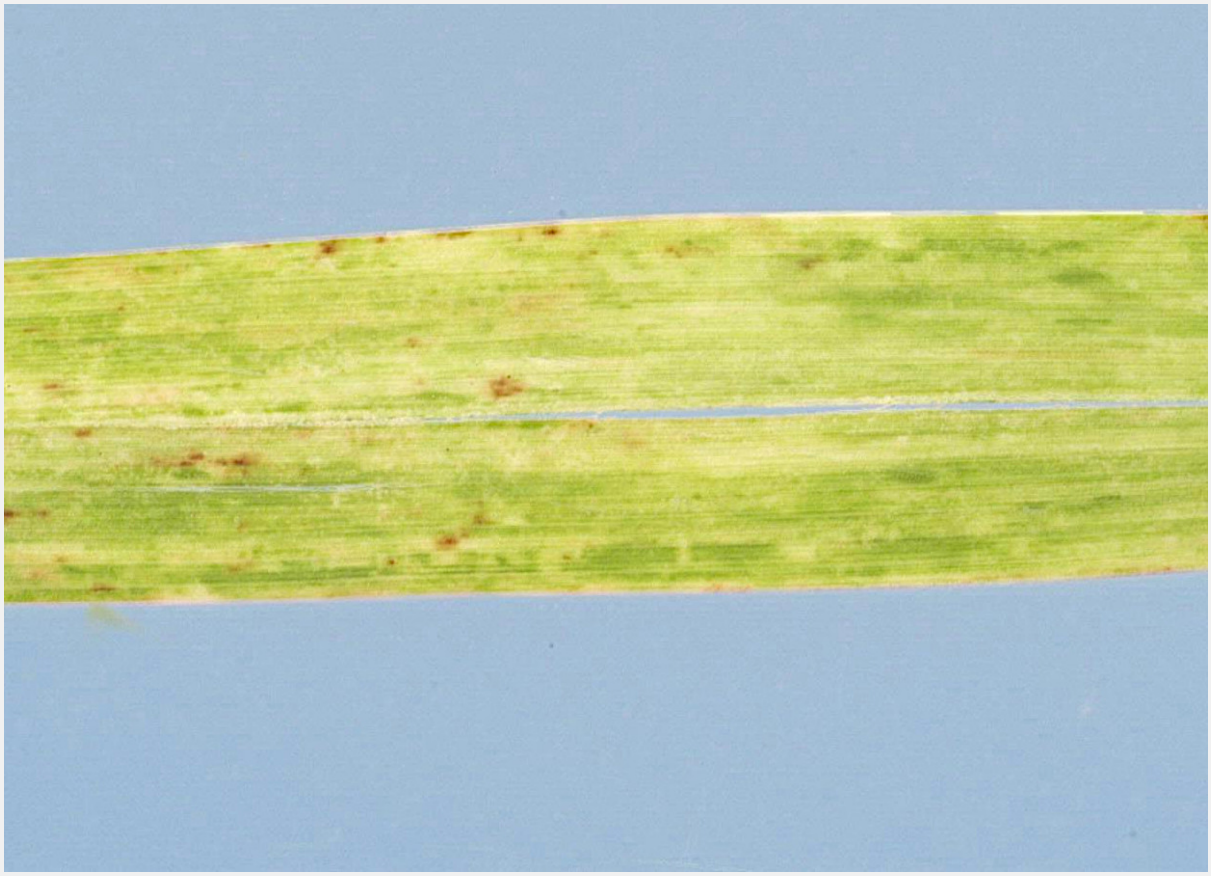

Photo: Jeffrey W Lotz

Researchers have identified two sugarcane proteins that facilitate the replication of sugarcane mosaic virus (SCMV). The study indicates that the small heat shock proteins ScHSP17.5 and ScHSP17.9A interact with the viral protein P3N-PIPO and amplify the accumulation of the pathogen in susceptible plants. The results suggest new targets for genetic improvement programs.

The study compared two contrasting genotypes. The susceptible cultivar Badila showed a peak in viral replication 18 hours after inoculation. The resistant genotype FG1, a somatic mutant derived from Badila, suppressed replication in the first few hours and eliminated the virus up to 192 hours after inoculation.

Absolute quantification revealed a viral load approximately 2.000 times higher in Badila at the peak of infection compared to FG1 during the same period. In Badila leaves, researchers observed typical mosaic symptoms and a high concentration of viral RNA. FG1 did not show detectable symptoms.

Transcriptome analysis at five time points during infection identified over 53 differentially expressed genes. FG1 rapidly activated genes linked to defense, metabolism, and redox regulation. Badila concentrated repressive and delayed changes.

Gene co-expression

Gene co-expression analysis highlighted modules associated with viral load. In FG1, genes linked to reactive oxygen species detoxification and cell signaling gained expression at the critical moment of infection. Among them, ScPER5, ScNAC29, and ScCIPK21 acted as central genes in the network.

In Badila, genes from the small heat shock protein family gained expression during the same period in which the virus reached its highest replication rate. ScHSP17.5 emerged as a central node in the susceptibility-associated module.

Interaction trials

Protein-protein interaction assays confirmed that ScHSP17.5 and ScHSP17.9A interact specifically with the viral movement protein P3N-PIPO. There was no interaction with the capsid protein or with the isolated P3 protein. Functional tests in *Nicotiana benthamiana* They showed up to a 2,43-fold increase in viral replication when the two sHSPs were co-expressed.

The authors propose that SCMV recruits host heat shock proteins to stabilize viral complexes and promote virus accumulation. In contrast, FG1 activates mechanisms linked to redox regulation and cell signaling early on, thus restricting infection.

More information at doi.org/10.1111/mpp.70229

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BrasilAgro promotes Eduardo Marrey to commercial director.

Executive takes over sales strategy in Brazil and abroad.

02.03.2026 | 14:37 (UTC -3)

Cultivar Magazine, based on information from Marcelo Nadalon

BrasilAgro announced the promotion of Eduardo Marrey to the position of

commercial director. The executive, who has been with the company for ten years, leaves his position as executive manager and joins the board of directors. He will lead the sales strategy in Brazil and abroad.

“This new challenge expands my responsibility in a central area of ??the company's strategy. The focus remains on commercial discipline, predictability, and capturing value from agricultural production, in line with the company's positioning,” says Marrey.

Marrey, an agricultural engineer who graduated from the Luiz de Queiroz Higher School of Agriculture, began his career at Bunge, where he worked for almost three years. He also worked at Agrifirma Brasil

Agropecuária and at Corretora Unicot.

Since 2016 at BrasilAgro, the executive has participated in the marketing strategy for agricultural production, contract management, and customer relations. He aligned the commercial front with the company's business model, based on the efficient management of rural assets.

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Caterpillars adjust the rhythm of their vibrations to communicate with ants.

Species with high myrmecophily replicate complex rhythmic patterns.

02.03.2026 | 14:16 (UTC -3)

Cultivar Magazine

Photo: Vibrant Lab, Turin

Butterfly caterpillars modulate the rhythm of their vibrations to communicate with ants and enhance integration within colonies. Species with a greater dependence on ants reproduce complex rhythmic patterns similar to those of their hosts. The adjustment includes isochronous pulses and a double-mesh pattern.

Researchers from the University of Warwick, the University of Turin, and the Forest Research Institute analyzed vibroacoustic signals from two ant species and nine butterfly species from the Lycaenidae family. The recordings included species with varying levels of myrmecophily (symbiotic and mutualistic association between ants and other

organisms).

Vibrations that propagate

Caterpillars produce vibrations that propagate through the soil, plants, or nest walls. Ants use vibrations to coordinate alarm, defense, and social organization. The study evaluated pulse timing, intervals between sequences, and rhythmic structure.

The results indicate that all species analyzed use an isochronous pattern (phenomena that occur at equal time intervals). This pattern maintains regularly spaced pulses. However, only ants and caterpillars with high myrmecophily

exhibited a double rhythm, characterized by alternating long and short intervals.

The most dependent caterpillars replicated two central characteristics of the ants: isochrony and double time signature. The study identified temporal convergence between these groups. Species with intermediate or weak association exhibited simpler or more variable rhythms.

Four categories

The study grouped the butterflies into four categories: non-myrmecophily, low, medium, and high. Species with a high degree of myrmecophily, such as *Phengaris alcon* e *Plebejus argus*They shared a rhythmic organization more

closely resembling that of ants than species with weak or nonexistent associations.

In addition to rhythmic structure, the study measured the regularity of the signals. Caterpillars with high myrmecophily showed greater precision in the isochronous pattern than the ants themselves. The result suggests fine-tuning of the signal to facilitate recognition within the nest.

Highly dependent caterpillars also exhibited longer intervals between pulse sequences compared to ants. The authors associate this pattern with possible energy savings or reduced detection by unwanted organisms.

Intermediate level

Species with an intermediate degree maintained an isochronous rhythm, but with a slower pulse time. These groups interact with multiple ant species. The pattern suggests a more generalist signal.

Species with low or no myrmecophily exhibited similar temporal characteristics. The rhythm maintained a simple structure. The study indicates that rhythmic modulation intensifies as the level of ecological integration with ants increases.

The authors indicate that the temporal organization of signals enhances communication efficiency in subterranean environments, where vibrations compete with constant noise. This work expands the

understanding of interspecific communication and suggests that rhythm is a central component in the interaction between caterpillars and ants.

More information at doi.org/10.1111/nyas.70223

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Frisia acquires soybean crushing plant in Ponta Grossa

LDC's unit processes 3,4 tons per day and reinforces its vertical integration strategy until 2030.

02.03.2026 | 11:09 (UTC -3)

Cultivar Magazine, based on information from Luis Fernando Duarte

Frísia Cooperativa Agroindustrial has signed a contract to acquire a soybean crushing plant in Ponta Grossa. The plant processes 3,4 tons per day. The industrial complex belongs to Louis Dreyfus Company. Current employees will remain at the facility.

According to the cooperative's superintendent, Mario Dykstra, the purchase expands vertical integration and adds value for cooperative members. He states that the unit is part of the 2025-2030 Strategic Plan. The strategy includes integrating the receipt of raw materials, industrialization, and marketing of by-products. The measure seeks to increase efficiency, strengthen competitiveness, and guarantee autonomy in the market.

Located on a 58,08-hectare site, the unit encompasses grain reception, processing, and storage, with a static capacity of 300 tons. The complex includes soybean preparation, oil and meal extraction, degumming and bottling of lecithin, and a refinery.

The crushing plant will primarily direct the production of degummed soybean oil towards the manufacture of biofuels. The meal will serve the domestic market and exports. The plant will also produce lecithin and soybean hulls, destined for the food industries for human consumption and animal feed.

The operation is contingent upon approval from the Administrative Council for Economic Defense and the transfer of licenses and authorizations. The

cooperative anticipates completing the process by the second half of 2026.

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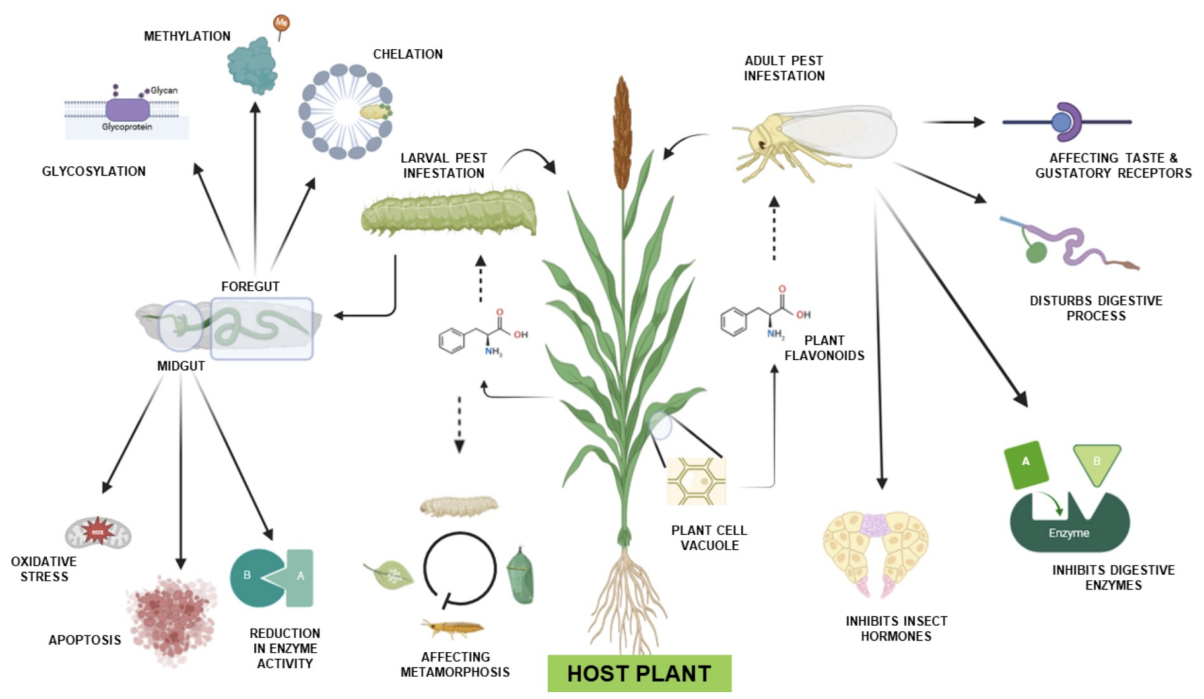
Flavonoids are emerging as an alternative to chemical insecticides.

Plant compounds reduce the feeding, growth, and survival of pests.

02.03.2026 | 09:51 (UTC -3)

Cultivar Magazine



doi.org/10.17221/56/2025-PPS

Flavonoids are gaining ground as an alternative to synthetic insecticides in the

control of agricultural pests. A scientific review points to the direct action of these metabolites on the digestion, growth, and survival of insects.

Flavonoids are part of the secondary metabolism of plants. These compounds act as a biochemical barrier against herbivores. The literature describes antifeedant and antibiosis activity. The metabolites reduce food intake, interfere with nutrient absorption, and inhibit growth and metamorphosis.

Experiments confirm the potential. Increasing the concentration of flavonoids in an artificial diet reduced the survival of *Nilaparvata lugens*Field tests recorded control of *Spodoptera litura* with effectiveness comparable to chemical

pesticides.

Studies also report action on digestive enzymes. Quercetin decreased lipase, protease, and alpha-amylase activities in the digestive tract of the diamondback moth. Other flavonoids affected hormones linked to molting and development, leading to mortality in different larval stages.

Molecular docking analyses reinforce the evidence. Compounds such as rutin, quercetin, vitexin, and kaempferol interacted with the beta-glucosidase enzyme of Spodoptera frugiperda. The binding affinity showed a level similar to that of commercial insecticides.

In addition to their direct action, flavonoids participate in hormonal regulation in plants. These compounds interact with jasmonic

acid, salicylic acid, and ethylene. This interaction intensifies defense responses and increases resistance to herbivores.

Research is advancing in formulations. Plant extracts with high flavonoid content are already being used in emulsifiable concentrates tested against aphids and whiteflies. Some botanical products have achieved superior efficiency to synthetic insecticides in controlled trials.

Despite the progress, bottlenecks limit widespread adoption. Researchers point to the absence of standardized extraction protocols, short shelf life, and the need for more field trials. The review indicates that flavonoids have the potential to be integrated into integrated pest management programs and reduce

dependence on synthetic molecules.

More information at

doi.org/10.17221/56/2025-PPS

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Study maps host hopping in begomoviruses

Research points to a 63-nucleotide fragment as a determinant for infection in tomatoes.

02.03.2026 | 08:21 (UTC -3)

Cultivar Magazine

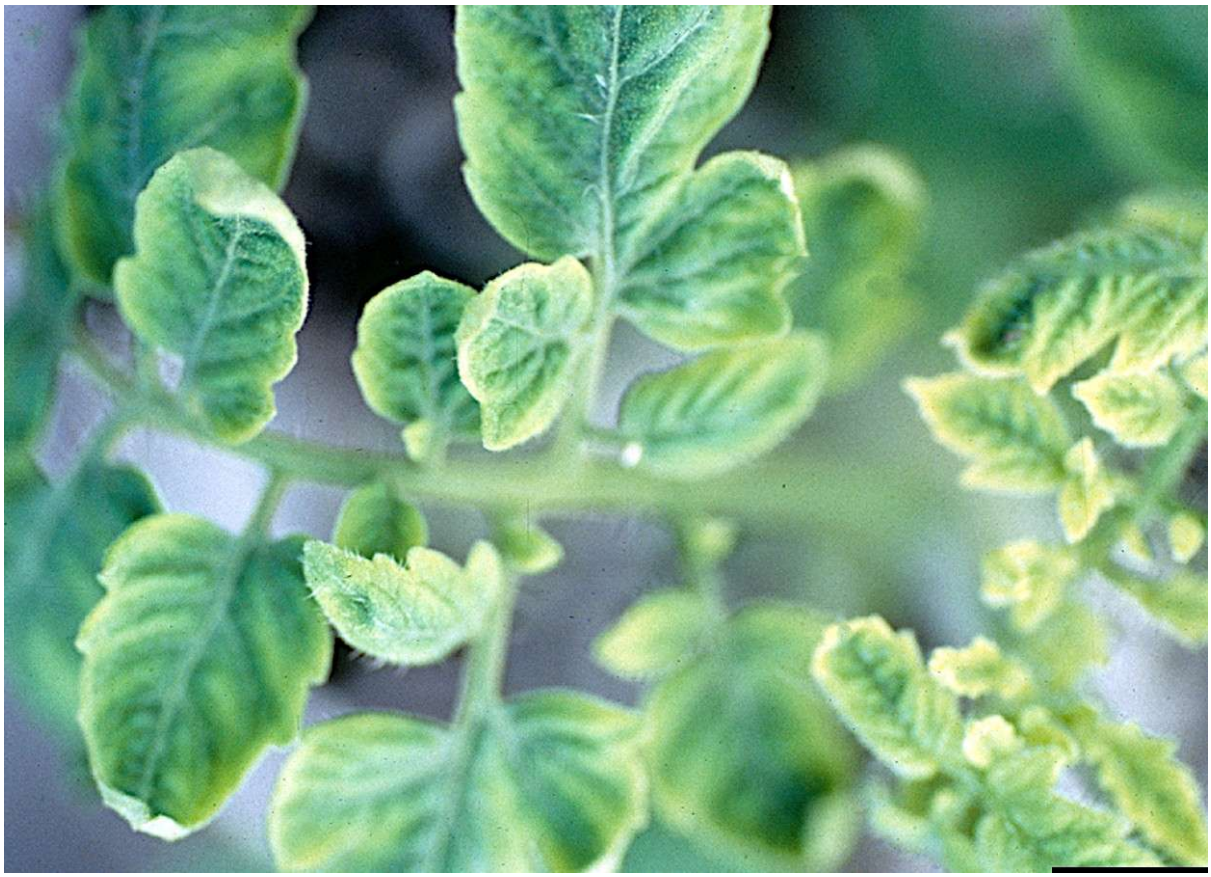

Photo: Florida Division of Plant Industry

Begomovirus complex viruses expand or lose hosts through small alterations in the genome. A study identified a 63-nucleotide fragment in the C-terminal region of the TrAP/REn proteins as responsible for the ability of Tomato leaf curl New Delhi virus (ToLCNDV) to infect tomatoes.

Researchers analyzed three variants: one that infects only cucumber (ToLCNDV-C), another that infects tomato and cucumber (ToLCNDV-T&C), and a third restricted to tomato (ToLCKV-T). Agroinoculation assays showed that the exchange of the TrAP/REn region between the variants altered the host range.

The ToLCNDV-C variant, originally unable to infect tomatoes, began infecting the crop after receiving the TrAP/REn region

from the ToLCNDV-T&C variant. The infection rate reached 6 positive plants out of 17 inoculated. The reverse switch reduced infection efficiency in tomatoes and cucumbers.

The analysis detailed that the determinant for host gain is concentrated in a specific 63-nucleotide fragment at the C-terminal of TrAP/REn. Isolated point mutations prevented infection in tomatoes. Only the replacement of the complete fragment restored the ability to infect.

Protein interaction

The authors also evaluated the interaction of these viral proteins with plant factors using a yeast two-hybrid assay. Results

indicated differences in the interaction with host proteins such as PCNA and AGO1. The tomato-adapted variant showed a distinct interaction pattern compared to the cucumber-restricted variant.

Further experiments indicated that the TrAP/REn protein, in conjunction with the B-DNA genomic component, promotes infection in non-habitual hosts. The ToLCKV-T variant, typical of tomatoes, infected cucumbers to a limited extent when it received TrAP/REn from ToLCNDV-T&C and the corresponding B-DNA. However, viral accumulation remained low and no visible symptoms were observed.

Host jump

The results indicate that host jumping does not depend on a single isolated gene. Adaptation involves complex interactions between viral proteins and plant cellular factors. The study reinforces that small recombinations or mutations can alter the range of infection and favor the emergence of new variants with an impact on crops such as tomatoes and cucurbits.

The study used isolates collected in India in 2022 and combined infectious cloning, inoculation via *Agrobacterium*Transmission via whitefly and quantification by real-time PCR were performed. The clone sequences were deposited in GenBank.

Further information can be found at doi.org/10.1111/mpp.70202

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Pioneer launches fungicide solution for corn.

AI-powered tools, tolerant hybrids, and the Forcivo fungicide promise to boost productivity in the United States.

02.03.2026 | 07:23 (UTC -3)

Cultivar Magazine, based on information from Derek Burleson

Pioneer announced the launch of its Fungicide Timing Solution in the United States. This integrated package supports

corn producers in determining the ideal time for fungicide application based on data and artificial intelligence. The proposal aims to reduce uncertainties in the management of foliar diseases and protect yield potential.

The solution brings together three components: the Granular Insights Fungicide Timing digital tool, with AI-driven analysis; Pioneer brand corn hybrids with genetic tolerance to diseases; and the Forcivo fungicide from Corteva, with three modes of action.

According to the company, the tool continuously assesses the risk of disease in each plot throughout the growing season. The system integrates local climate data, field conditions, management

practices, and hybrid tolerance. Based on this information, it generates objective recommendations on when and where to apply the fungicide.

According to Trenton Brisby, innovation marketing manager in agronomy, the model uses advanced data science to predict the onset of diseases and indicate the ideal application window according to the specific conditions of each area.

Pioneer hybrids incorporate tolerance to key foliar diseases. The genetics contribute to slowing the progression of diseases, protecting yield, and extending the application window.

Forcivo combines three active ingredients: flutriafol, azoxystrobin, and fluindapyr. The product delivers broad-spectrum control

and prolonged residual activity. Applications made within the window indicated by the tool helped protect plants at critical stages.

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Organomineral requires fine-tuning in application.

Higher prices and record volumes of fertilizers are driving the search for operational efficiency on the farm.

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Cultivar Magazine, based on information from Kassiana Bonissoni

The rise in prices of chemical fertilizers intensifies the search for alternatives that maintain nutritional efficiency and control costs. In this scenario, organomineral fertilizers are gaining ground. This technology combines mineral nutrients and an organic fraction. Technical literature classifies the product as a physical mixture or combination of mineral and organic fertilizers. The organic fraction interacts with the physical, chemical, and biological properties of the soil and influences nutrient dynamics over time.

Piccin Equipamentos advises that organomineral fertilizers require specific operational handling. Their physical characteristics alter the flow and stability of the dosage. Douglas Fahl Vitor, agronomist and head of innovation at the

Piccin Group, states that the input exhibits distinct behavior in the field and demands an understanding of the soil and the application method.

Regulation also impacts operation. Normative Instruction No. 61/2020 defines requirements for organomineral fertilizers. For solid products, it establishes a minimum organic carbon of 8%, a maximum moisture content of 20%, and a minimum cation exchange capacity (CEC) of 80 mmolc/kg. The moisture content exceeds usual standards for granular mineral fertilizers. This factor influences fluidity, risk of caking, and flow stability in the dosing system.

physical differences

In the field, physical differences appear in particle size, density, and uniformity. Organomineral fertilizers can arrive in powder, crumb, or granulated form. Even in granulated form, they can exhibit greater variation in size and shape. The diversity of raw materials explains the fluctuation. This variation interferes with the flow and regularity of the flow rate from the reservoir to the distribution system.

According to Fahl, higher humidity and lower uniformity increase the likelihood of tunneling, bridging, and discharge fluctuations. He warns that producers should not repeat adjustments used with chemical fertilizers. This practice tends to lead to irregular application and loss of efficiency.

The operation requires more sensitive adjustments. In broadcast equipment, the product response changes with variations in humidity and particle size. In in-line systems, consistency depends on flow stability and rate control on the conveyor or dosing unit.

Specific blades

Piccin recommends specific spray blades for organic, corrective, and organomineral fertilizers in broadcast application. The company points out that, in localized application, dose stability depends on the correct adjustment of the system speed. Calibration needs to occur more frequently. Changes in humidity between batches and storage conditions impact the

actual application rate.

The effective working range depends on the adjustment between dose, speed, and distribution pattern. The company reports that small variations in settings and product can reduce the predicted range and compromise uniformity. The result includes areas with deficiency and excess within the same plot. This effect increases intra-area variability and makes management decisions more difficult.

Distributor configuration

In the engineering section, Fahl cites the Piccin Precision Conveyor as a system developed to maintain regularity in the

transport and distribution of different classes of inputs. He states that the distributor's configuration can alternate between mineral fertilizers and soil amendments or organomineral fertilizers, in addition to options for under-canopy and localized application.

The presence of chemical fractions and contact of residues in the equipment require post-operation cleaning and preventive maintenance. Recommendations include periodic inspections of tracks, discs, blades, floor, bearings, and wear components, as well as use within the conditions indicated by the manufacturer.

In the medium and long term, the performance of organomineral fertilizers depends on their interaction with the soil

and the history of management practices. Technical publications from Embrapa indicate that organic matter influences physical, chemical, and physical-hydric properties and acts as a substrate for soil biota.

Fahl highlights the advancement of soil diagnostics based on clay type. This approach increases the accuracy in reading nutrient retention, water dynamics, and interaction with soil amendments and fertilizers. He states that producers can adjust dosages, choose nutrient sources, and increase operational efficiency.

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