March 21, 2026 N º 71

Cultivar Semanal ®

Bacteria causes false chlorosis

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New bacterial disease in corn complicates diagnosis

The pathogen causes chlorosis similar to iron deficiency and can increase costs in the field

20.03.2026 | 08:53 (UTC -3)

Schubert Peter, Cultivar Magazine

Photo: Ken Obasa

A new bacterial disease in corn and sorghum, identified in Texas, United

States, causes visual symptoms similar to iron deficiency. This condition can lead to misdiagnosis and cause producers to apply micronutrients ineffectively. The causal agent involves the bacterium *Pantoea agglomerans*.

In 2023, researchers observed lime-green leaf discoloration with interveinal chlorosis in spontaneous grasses in northwest Texas—a region known as the Panhandle. Shortly afterward, identical symptoms appeared in corn and sorghum crops. Affected plants showed delayed development. There was a reduction in reproductive growth. In severe cases, plants did not reach the reproductive stage.

The distribution of symptomatic plants was irregular across the areas. This pattern indicated a biological origin. Analyses of plant tissue and soil ruled out iron deficiency. In some cases, plants with symptoms showed higher iron content than healthy plants.

Isolated microorganism

Researchers isolated the microorganism after ruling out fungi and other agents. Isolation required a specific culture medium for phytoplasmas. Tests using microscopy, antibiotics, and DNA sequencing confirmed the presence of *Pantoea agglomerans*.

The study details the new disease, called Pantoea-induced interveinal chlorosis

(PIC). The pathogen demonstrated the ability to reproduce symptoms in inoculated plants, fulfilling Koch's postulates. Infected plants exhibited chlorotic leaves, shortened internodes, and delayed development. Some did not form ears or produced structures with few grains.

Diseased plants show yellowing between the veins and reduced size. In sorghum, malformed panicles or panicles without grains appear.

Unusual behavior

The research also points to unusual behavior in the bacteria. The identified isolate shows possible genetic variation within the species *Pantoea agglomerans*.

Phylogenetic analyses indicate proximity to other lineages, but with relevant differences.

A relevant point involves iron metabolism. Laboratory tests indicated elevated production of siderophores by the pathogen. These molecules sequester iron in the cellular environment. The nutrient remains present, but unavailable to the plant. This explains the chlorosis without actual deficiency.

In practice, the symptom leads to misinterpretation. Interveinal chlorosis, typical of iron deficiency, leads to the recommendation of corrective fertilization. In this case, the application does not solve the problem. The cost of production increases without agronomic return.

Confirmed locations

The disease has already been confirmed in about half of the counties in the Texas Panhandle. Recent records indicate its presence in central and southern regions of the state as well. Its occurrence in wild grasses suggests alternative reservoirs.

Researchers emphasize the need for accurate diagnosis. The recommendation involves laboratory analysis before any nutritional intervention. Correct identification avoids unnecessary expenses and guides future management strategies.

There is still no clear definition of the dissemination mechanisms. Researchers are investigating possible transmission

routes in the field. Understanding these processes should guide control measures and reduce economic impacts on corn and sorghum crops.

Further information at doi.org/10.1094/PHP-07-25-0184-RS

(A) Bright lime-green leaf symptoms on Johnson grass (black arrowheads) at the edge of a road in Moore County, TX; **(B)** Interveinal chlorosis associated (red arrowheads) in Johnson grass; **(C)** in young corn plants (black arrowheads) at the edge of a cornfield

(D) Sorghum plants in the maturation phase; **(E)** Corn plants in the reproductive phase, showing interveinal chlorosis; **(F)** Close-up view of young sorghum plants with interveinal chlorosis.

(G) Stunted corn plants (white arrowhead) next to asymptomatic plants; **(H)** A cluster of stunted sorghum plants (white arrowheads) without panicles, surrounded by asymptomatic sorghum plants; **(I)** Enlarged image of mature sorghum plants with underdeveloped and wilted panicles (white arrowheads) - Photos: Ken Obasa and Dennis Coker

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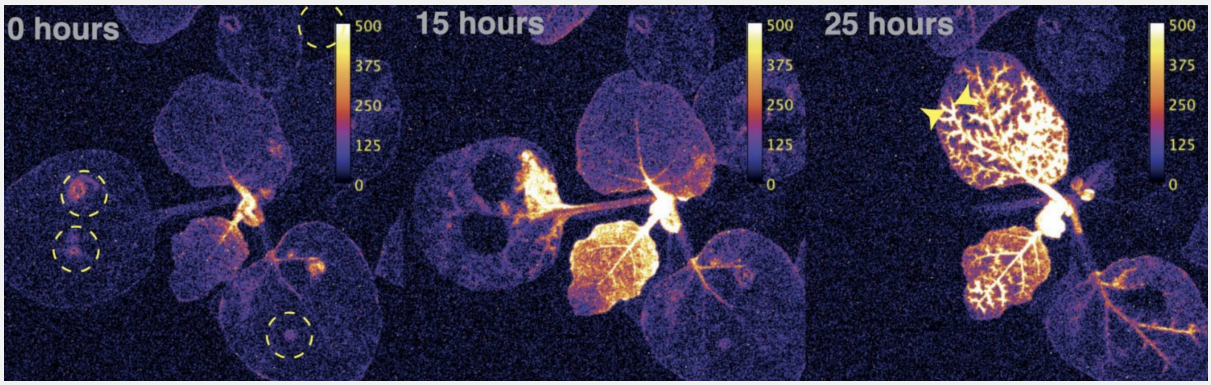
Self-luminescent plants reveal their defense in real time

Arabidopsis and Nicotiana express salicylic and jasmonic acid signals under light

20.03.2026 | 10:30 (UTC -3)

Schubert Peter, Cultivar Magazine



Genetically modified model plants have begun emitting light during the activation of defense responses. The system allows for non-invasive visualization of the dynamics of the hormones salicylic acid (SA) and jasmonic acid (JA) in plant tissues.

The study used the species *Arabidopsis thaliana* and *Nicotiana benthamiana* as experimental platforms. The researchers introduced a fungal bioluminescence pathway into the genome of these plants, based on the conversion of caffeic acid into luciferin by heterologous enzymes.

Genetic construction

Genetic engineering coupled phytohormone-responsive promoters to luciferase genes. For jasmonic acid response, the pORCA3 promoter was used *catharanthus roseus*. For salicylic acid, the promoter pWRKY70 of *Arabidopsis thaliana*.

Activation of these hormonal pathways induced light emission detectable by conventional cameras. The system showed up to a 53-fold contrast in signal intensity.

Mechanical damage tests in< i>Nicotiana benthamiana induced a rapid response from the jasmonic acid axis. Light emission occurred locally between 2 and 3 hours after injury.

Bacterial infections generated differentiated responses. Infiltration with *Pseudomonas savastanoi* and *Pectobacterium carotovorum* activated distinct luminescence patterns. The first case reflected a local response. The second showed a systemic signal in non-inoculated leaves.

In *Arabidopsis thaliana*, infection by *Pseudomonas syringae* pv.*tomato* DC3000 induced a gradual increase in jasmonic acid signaling in lateral roots. The salicylic acid response, however, showed pathogen-dependent behavior.

Insect attacks also modulate the system. Infestation by *Trialeurodes vaporariorum* (greenhouse whitefly) induced light emission associated with salicylic acid, with points located at the feeding sites.

Signs varied

During development, the signals varied between tissues. Jasmonic acid-sensitive lines exhibited greater luminescence in floral structures. Salicylic acid-responsive

lines concentrated the signal in the leaf vasculature.

This approach eliminates the need for exogenous substrates or light excitation. The system produces luciferin endogenously, allowing for continuous monitoring of plant physiology.

Technology expands the capacity for functional phenotyping in plants. The method can support breeding programs focused on resistance to pests and diseases, as well as enabling studies under field conditions with low operational costs.

Further information at doi.org/10.1038/s41467-026-70075-1

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Agricultural Market - March 20, 2026

War and China raise fertilizer prices and put pressure on costs.

20.03.2026 | 09:26 (UTC -3)

Vlamir Brandalizze - @brandalizzeconsulting

The war in the Middle East is keeping oil prices high and putting pressure on agricultural inputs. WTI crude is around

US$95 a barrel, while Brent crude is above US$100. This movement is increasing costs and supporting commodities.

China has announced controls on fertilizer exports. The country seeks to guarantee domestic supply in the face of high energy costs. The measure reduces global availability. Iran remains a risk factor. Russia maintains firm prices. Urea has risen about 40% in a month. Indications reach US$660 per ton, compared to recent US$400. Nitrogen, phosphate, and potassium fertilizers remain under pressure.

In the United States, the Federal Reserve kept interest rates between 3,5% and 3,75%. In Brazil, the Selic rate fell to 14,75% per year. The cut does not alter

the effective cost to the producer. Freight costs increased in March. Diesel went from less than R$ 6,00 to up to R$ 10,00 per liter, depending on the region. The increase affects harvesting, industry, and retail.

Soybean harvesting is progressing. The country has reached 64%. Mato Grosso has reached 98%. Mato Grosso do Sul is at 76%. Paraná, 72%. Goiás, 69%. Bahia, 52%. Rondônia, 82%. Rio Grande do Sul starts with 4% to 5%. The harvest is projected at 175 to 178 million tons. The USDA's estimate of 180 million tons is losing strength.

Trading remains slow. The current crop has 44% traded, below average. The previous crop reached 99%. Chicago is

trading between US$11,50 and US$11,80 per bushel. US$12 is acting as resistance. Soybean meal is supporting the oilseed. Global demand increases during the Northern Hemisphere winter.

The sector awaits a decision on biodiesel. The proposal indicates an advancement from B15 to B17. This measure would reduce diesel imports by 1,2 billion liters.

Corn situation

Corn prices remain strong in Chicago. May contracts are trading above US$4,60. July 2027 contracts are near US$5,00. Demand for animal feed is increasing. The planting of the second corn crop in Brazil has reached 98%, outside the ideal window.

The first crop is 62% harvested. The available supply totals approximately 28,2 million tons. Buyers are working to secure supplies until June.

Paraguay is expected to offer less corn. The smaller second corn crop and the growth of ethanol production are increasing local consumption. This scenario reduces imports to Brazil.

Wheat situation

Wheat prices remain firm. Chicago indicates a range between US$6,10 and US$6,60. Uncertain weather conditions in the northern hemisphere are supporting prices. Ukraine and Russia are facing cold weather and delayed germination. Global

demand is growing, both for food and animal feed.

In Brazil, imported wheat reaches R$ 1.500 per ton. The domestic product ranges from R$ 1.090 to R$ 1.250. Mills buy in the short term. Interest rates limit stock formation.

Rice situation

Rice harvesting is progressing well. The country has reached approximately 22%. The harvest is projected at 11 million tons. Rio Grande do Sul is at 21%, Santa Catarina at 40%, and Tocantins at 6%. Prices are showing stability, with recent adjustments.

Bean situation

Bean prices remain stable. The best quality carioca beans range from R$ 320 to R$ 360 per sack. Commercial beans are priced between R$ 300 and R$ 330. Black beans remain between R$ 175 and R$ 195. Retailers are passing on costs and preparing to restock for April.

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Predatory mite maintains population under pyrethroids in apple orchards

Study reveals tolerance of Amblyseius andersoni and variation between strains

20.03.2026 | 07:41 (UTC -3)

Schubert Peter, Cultivar Magazine

Predatory mite populations of *Amblyseius andersoni* persist in apple orchards even

after repeated applications of pyrethroid insecticides. The result contradicts expectations of a negative impact on natural enemies. This finding comes from field and laboratory experiments conducted in northeastern Italy.

Field trials were conducted in orchards of Granny Smith and Golden Delicious cultivars, with up to six insecticide applications. Treatments included deltamethrin, lambda-cyhalothrin, tau-fluvalinate, and etofenprox. Evaluations monitored the density of predatory mites over time. The data indicated no significant effect of the insecticides on the populations. The observed fluctuations were due to time, not treatment.

Dominant species

The species *Amblyseius andersoni* dominated the community of phytoseiid pests in the evaluated orchards. In some cases, other species occurred marginally. Even under chemical pressure, the predator density remained stable. The result suggests tolerance to pyrethroids under real management conditions.

The study also evaluated the effect of deltamethrin in the laboratory. Five strains of the predator were included in the tests. Three came from biological control companies. Two came from commercial orchards, one conventional and the other organic. Exposure occurred at the maximum recommended dose for field

use.

The results showed strong variation between strains. One commercial strain showed total mortality after exposure. The others maintained high survival rates, with no difference compared to the control. The contrast indicates diversity of susceptibility within the species.

Variation in fertility

Fecundity also varied among strains. The insecticide did not reduce oviposition in surviving females. The differences occurred between genetic origins, not due to the direct effect of deltamethrin. Commercial strains exhibited higher egg production compared to those collected in

the field.

Laboratory data reinforce the interpretation of field trials. Populations present in orchards tolerate exposure to insecticide. This tolerance may support biological control even with the use of pyrethroids.

Management context

The work also discusses the context of pest management. Pyrethroids exhibit low selectivity for natural enemies. Even so, their use has grown due to invasive pests in Europe, such as *Halyomorpha halys*. Pressure for chemical control has increased in producing regions.

Historically, pyrethroids have had negative effects on predatory mites. Previous

studies have recorded reduced survival and fecundity. The new result indicates a change in the scenario. Current populations may exhibit adaptation or selection over time.

The persistence of *Amblyseius andersoni* helps explain the absence of secondary outbreaks of phytophagous mites in treated areas. The predator maintains the natural regulation of pests. The ecological balance of the orchard is preserved even with chemical applications.

The authors highlight the importance of evaluating different strains in toxicological studies. Results based on a single population may lead to limited conclusions. Intraspecific variability alters the response to insecticides.

Further information at
doi.org/10.3390/insects17030338

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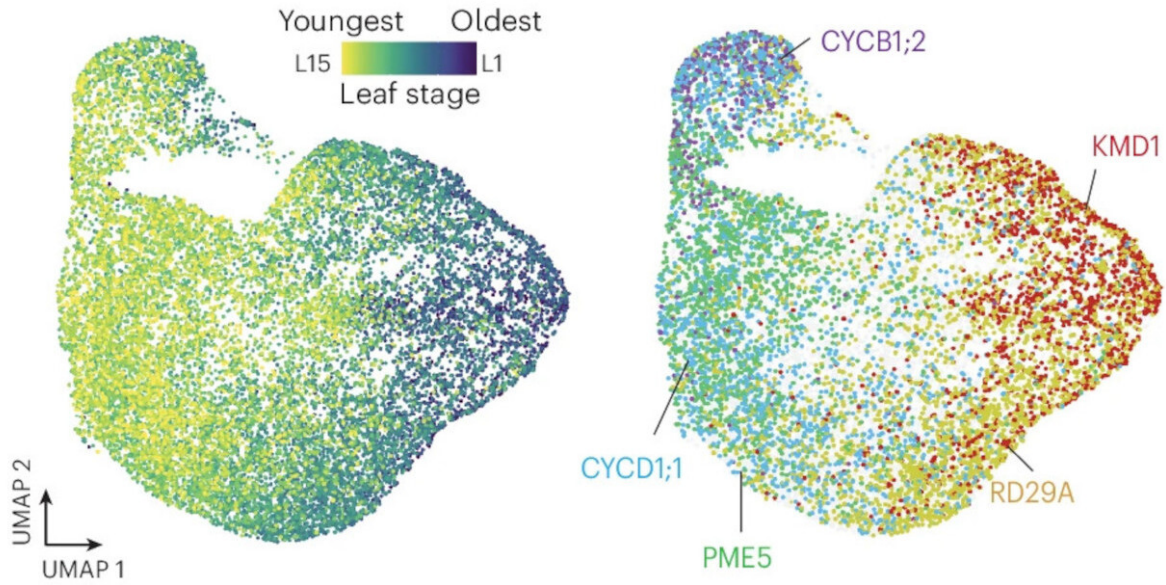
Water stress accelerates leaf aging

Transcriptional changes depend on drought intensity and reduce shoot growth.

19.03.2026 | 13:02 (UTC -3)

Schubert Peter, Cultivar Magazine



doi.org/10.1038/s41477-026-02254-3

Water stress anticipates transcriptional programs linked to leaf aging in *Arabidopsis thaliana*The process occurs proportionally to the intensity of the

drought and limits the growth of the aerial part. Data indicate a central role for the mesophyll in the response.

Researchers analyzed 1.226 leaves at different stages and levels of water deficit. The study generated a transcriptomic atlas with approximately 1 million cell nuclei. The analysis identified nine cell types.

Maturation and senescence

Water stress induced genes associated with maturation and senescence. The effect occurred in a dose-dependent pattern. The response correlated with a reduction in shoot area. The mesophyll concentrated relevant transcriptional

changes.

Young leaves under drought conditions began to exhibit gene expression profiles typical of older leaves. Genes linked to leaf growth decreased in expression. Genes associated with senescence increased in expression.

Growth restriction followed a "stress avoidance" strategy. Plants reduced leaf expansion and increased water use efficiency.

Hormonal responses

The study also evaluated hormonal responses. Signals such as salicylic acid, abscisic acid, and brassinosteroids induced aging genes. Cytokinins and

gibberellins showed the opposite effect.

Experiments with controlled stress gradients confirmed a proportional response. Increased intensity reduced shoot growth. Genes linked to photosynthesis decreased in expression with stress.

Gene expression in the mesophyll showed a strong correlation with plant size. A set of 858 genes showed a direct association with biomass variation.

The FRO6 gene emerged as a regulator. Overexpression in the mesophyll increased biomass and leaf area under drought conditions. The effect did not occur under stress-free conditions.

Further information at doi.org/10.1038/s41477-026-02254-3

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Endophytic fungi increase aphid populations on bell peppers.

The effect depends on the strain and cultivar.

18.03.2026 | 16:18 (UTC -3)

Schubert Peter, Cultivar Magazine

Photo: Jim Baker, North Carolina State University

application of *Trichoderma harzianum* in bell peppers increased the population of the green aphid (*Myzus persicae*The fungus increased the insect's survival, fecundity, and growth rate. Projections indicate a population up to 380 times larger after 60 days.

The study evaluated two endophytic fungi, *Trichoderma harzianum* e *Chaetomium cupreum*, isolated or in mixture. Trials with age-stage life table analysis and two sexes were performed. The work used red bell pepper of the capia type (Capsicum annuum).

Trichoderma harzianum

Trichoderma harzianum increased the intrinsic growth rate of *Myzus persicae* The infestation rate was 0,42 per day. The control showed 0,32 per day. The finite infestation rate reached 1,52/d, higher than the control's 1,37/d. Fecundity reached 87,67 nymphs per female. The control recorded 42,90.

The fungus also reduced the population doubling time of *Myzus persicae* for 1,67 days. The control required 2,20 days. The combination with *Chaetomium cupreum* It produced an intermediate effect.

Population projections were based on 10 nymphs of Myzus persicae. After 60 days, plants treated with *Trichoderma harzianum* They reached approximately 231 billion individuals. The control group reached 611

million. The mixing group reached 2,69 billion. *Chaetomium cupreum* Isolated, it maintained values ??close to the control range.

The population increase occurred with greater adult longevity and a longer reproductive period of *Myzus persicae*The fungus improved the quality of the host plant.*Capsicum annuum*The study suggests greater availability of nutrients in the phloem.

Chaetomium cupreum

Chaetomium cupreum had a limited effect on *Myzus persicae*Population parameters did not differ from the control. The fungus did not significantly alter insect

performance.

Results indicate a risk in using growth-promoting microorganisms without prior evaluation. Beneficial fungi may favor sucking pests such as... *Myzus persicae* The effect depends on the strain and cultivar of *Capsicum annuum*.

Further information at doi.org/10.3390/insects17030323

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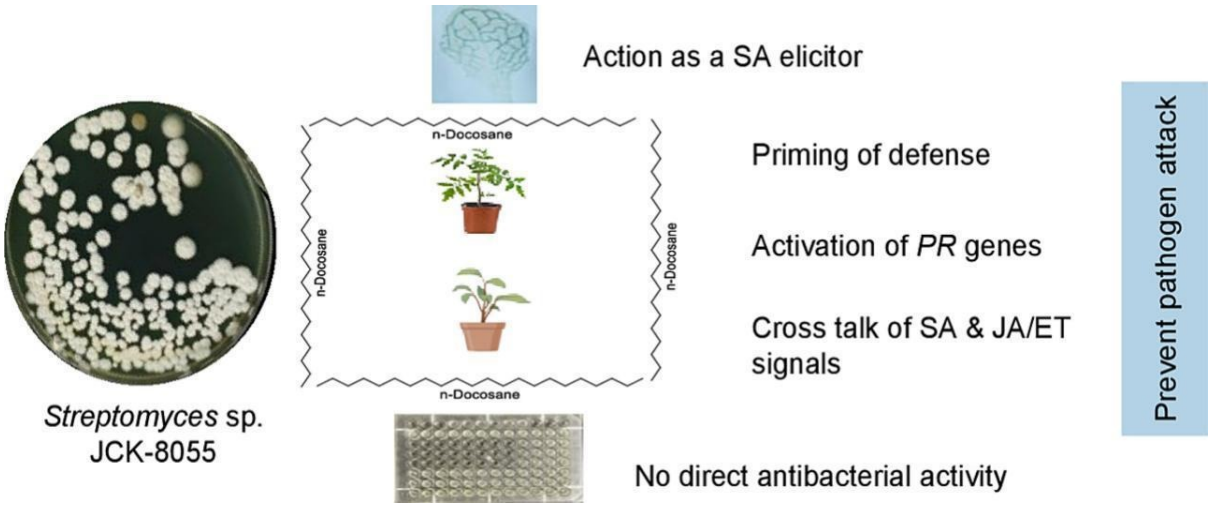
Docosane helps control bacterial diseases in tomatoes and apples.

Streptomyces metabolite acts by inducing resistance.

18.03.2026 | 14:01 (UTC -3)

Schubert Peter, Cultivar Magazine



Docosane, a metabolite of *Streptomyces* sp. JCK-8055 induces plant resistance and reduces bacterial wilt in tomatoes and fire blight in apples at low doses. The compound does not have a direct antibacterial action. Disease suppression

occurs through activation of the plant's defense pathways. The results are from a recent study.

The study identifies docosane as a resistance inducer. The team isolated the compound by bioassay-guided fractionation and confirmed its structure by GC-MS. The metabolite activated defense markers in *Arabidopsis thaliana* and reduced symptoms in tomato and apple trees.

In tomatoes, bacterial wilt control reached approximately 80% at doses of 0,6, 6, and 60 ng/mL. The 6 ng/mL dose showed greater consistency. At 600 ng/mL, efficiency dropped to around 10%. There was no phytotoxicity. In apples, docosane controlled fire blight with 80,77% at 6

ng/mL and 34,62% at 0,6 ng/mL, with performance close to commercial products.

Resistance induction

In vitro tests did not indicate inhibition of *Ralstonia solanacearum* e *Erwinia amylovora*The effect occurs via induction of resistance. Gene expression analyses indicate simultaneous activation of salicylic acid, jasmonic acid, and ethylene pathways. The maximum response occurred two days after inoculation, with an increase in PR1, PR2, PR3, LOXD, ETR4, and ACO1 genes.

A dose of 6 ng/mL promoted coordinated activation of the pathways. The pattern

suggests synergy between defense signals. Higher doses generated intense, but unbalanced, activation, with less disease control. This behavior indicates an optimal dose window for resistance inducers.

Nanometric concentrations

The study reinforces the potential of resistance inducers in the management of bacterial diseases. Docosane acts at nanometric concentrations and reduces dependence on antibiotics. The application followed the pathogen's infection route: soil application for tomatoes and foliar spraying for apples.

Researchers highlight gaps for field use. Data on environmental stability, persistence, and formulation are lacking. Further evaluations should include hormonal levels, duration of protection, and interaction with growing conditions.

More information at doi.org/10.1016/j.pestbp.2026.107081

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PotatoEurope 2026 highlights ventilation in storage.

Event in Germany brings together technical solutions to maintain potato quality.

18.03.2026 | 10:22 (UTC -3)

Cultivar Magazine, based on information from Malene Conlong

Potato storage management will be the focus at PotatoEurope 2026. The event

takes place on September 9th and 10th in Rittergut Gestorf, near Hannover, Germany. The program highlights ventilation systems and strategies for maintaining quality throughout storage.

The expansion of storage capacity keeps pace with the demand for continuous supply. Producers serve markets for fresh consumption, processing, and seeds. The scenario includes favorable prices during marketing. Investments in storage infrastructure are becoming economically viable. Technical management is taking on a central role.

Bulk storage

Bulk storage remains dominant in industrial processing. Potato chips, starch, and ready-to-eat products utilize this model due to its lower cost and high operational efficiency. However, high stacks increase the risk of pressure damage. This factor can reduce commercial quality.

Bulk ventilation systems vary according to the air movement of the fans and the distribution through ducts. Structures above the floor are suitable for lower-cost projects and adaptations. Semicircular metal ducts and wooden structures are frequently used. This model is also suitable for temporary uses, such as grains.

Underground systems create a flat surface. Loading and unloading operations become more agile. Initial costs increase, but maintenance is reduced. Usable volume is not lost. The position of the ducts, at an angle perpendicular to the loading, improves ventilation of freshly harvested product.

Fully perforated floors utilize concrete slabs with openings. Air flows uniformly from the base. Long panels widen the channels. Ventilation walls guide the flow. Individual adjustments are made via dampers.

Storage in boxes

Storage in crates is predominant for table and seed potatoes. The system allows for batch separation. The operation facilitates filling in the field or at the processing plant. Small volumes can be retrieved with precision.

Natural ventilation uses openings without mechanical assistance. Energy consumption is reduced. Thermal control depends on external conditions. Ambient ventilation with towers projects high-speed air over the boxes. The flow passes through the containers and exits through exhaust fans. Rows maintain a spacing of between 10 and 20 centimeters.

Forced airflow systems in closed enclosures utilize axial fans. Air enters through the base of the pallets. The speed

should not exceed 5 meters per second. Flow control ensures uniformity between stacks.

Open boxes operate using either pressure or suction. Double rows are positioned in front of the ventilation wall. The spacing varies between 0,4 and 0,6 meters. The suction system creates negative pressure. The pressure system works in the opposite direction.

Technical programming

The technical program includes panels, forums, and demonstrations. Experts present research, trends, and field practices. Trials with new cultivars and machinery displays are also part of the

agenda. Robotics is also featured in the presentations. The event brings together producers, industries, and technology companies from various countries.

Created in 1987, PotatoEurope alternates its editions between Germany, Belgium, the Netherlands, and France. The organization in Germany is the responsibility of the DLG.

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PI AgSciences has a new global leader in fungicides.

Paulo Queiroz takes over the position; he has over 30 years of experience in crop protection.

18.03.2026 | 09:11 (UTC -3)

Cultivar Magazine

Paulo Queiroz has begun his role as "Global Head of Fungicides Portfolio" at PI AgSciences. This role includes strategic

leadership of the global fungicide portfolio.

The executive has over 30 years of experience in the crop protection industry. His career includes experience in marketing, product management, and market development. His focus is on fungicides, herbicides, and insecticides.

Queiroz has worked in relevant crops. The list includes soybeans, corn, cotton, and sugarcane. His experience encompasses markets in Brazil and global operations.

Prior to his new role, he held the position of "Senior Global Product Manager" at PI Industries Ltd between 2025 and 2026. He also led portfolio marketing at Adama Brazil in 2024.

His career includes stints at FMC Corporation, BASF, Bayer, and Dow

AgroSciences. At BASF, he led teams in Latin America and global teams. At FMC, he managed fungicide and herbicide portfolios in Brazil.

His academic background includes a degree in agronomic engineering from Esalq. The executive also completed a specialization in strategic marketing at FGV.

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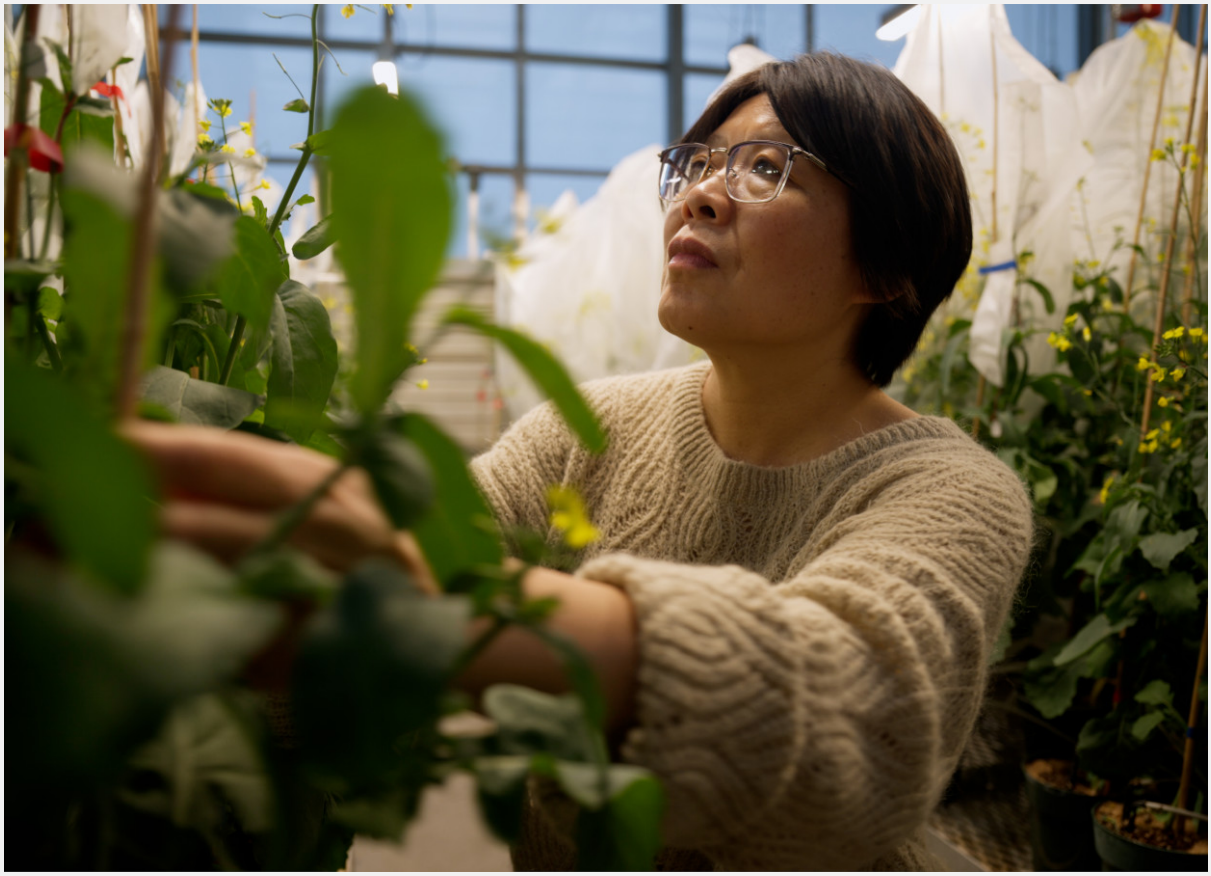
BASF invests €17 million in canola improvement in Canada.

Expansion in Saskatoon increases capacity, accelerates genetic gains, and integrates new technologies.

18.03.2026 | 08:16 (UTC -3)

Cultivar Magazine, based on information from Verena Kempter



BASF Agricultural Solutions has announced a €17 million investment to expand the Canola Breeding Centre of Innovation in Saskatoon, Canada. Construction will begin in the spring of 2026 and continue until the end of 2027.

The project expands breeding capabilities and includes advanced automation. The company seeks to accelerate genetic gain and integrate new traits.

The unit will receive infrastructure for controlled growth environments and highly automated pipelines. This strategy enables genomic selection at scale. Breeding decisions become more precise, and innovation cycles are shortened.

BASF also plans a new, state-of-the-art greenhouse. The space will support future

InVigor hybrid programs. The expansion will increase yield, disease protection, and field performance.

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Nonanoic acid inhibits Phytophthora capsici

Natural compound affects cell membrane and energy metabolism of the pathogen.

18.03.2026 | 08:02 (UTC -3)

Schubert Peter, Cultivar Magazine

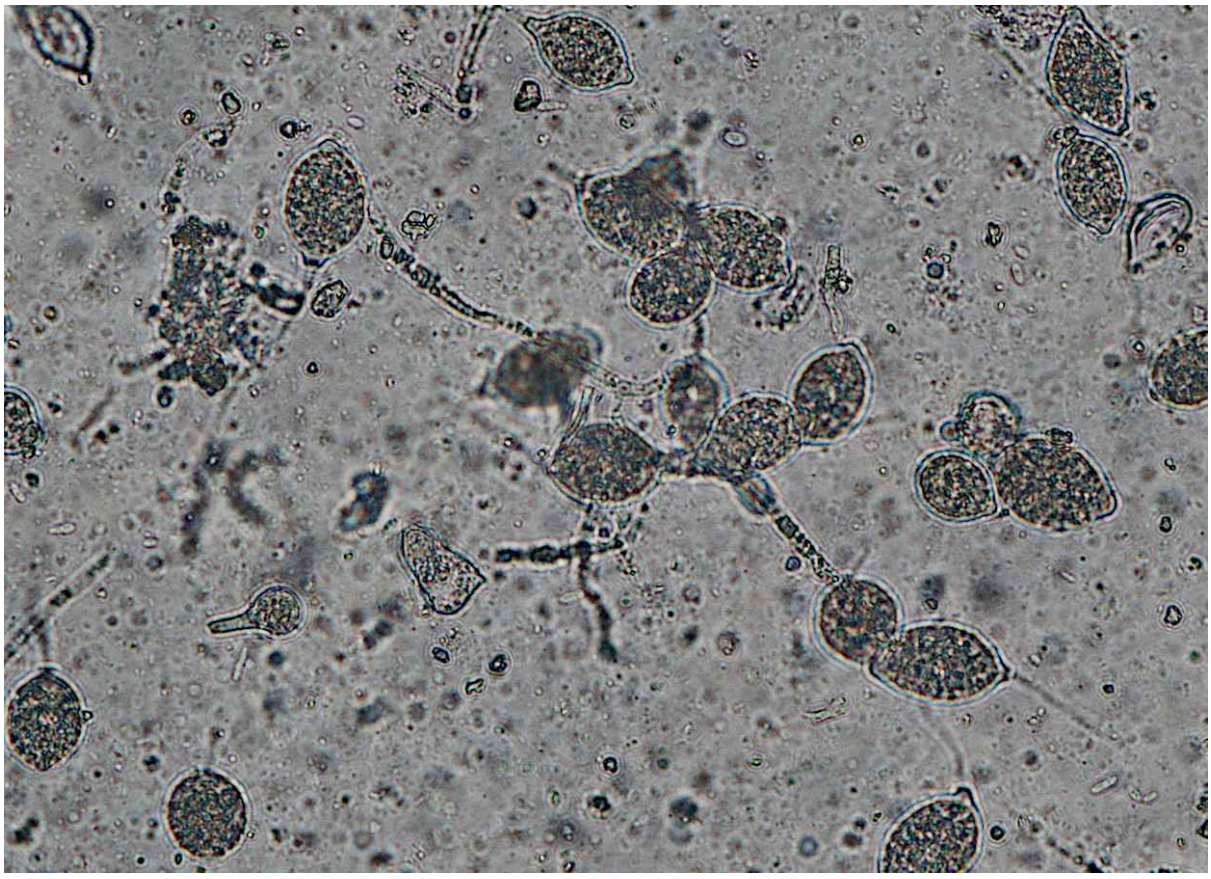

Photo: Paul Bachi, University of Kentucky

Nonanoic acid reduces the growth and viability of the oomycete. *Phytophthora capsici*Study points to direct action on cell

membranes and essential metabolic pathways. There is a strong anti-oomycete effect.

The compound inhibited mycelial growth, sporangium formation, and zoospore release. The average effective concentration reached 15,54 micrograms per milliliter. A dose of 85 micrograms per milliliter blocked sporangium germination and reduced zoospore germination.

Tests on vessels indicated preventive and curative action. Ultrastructural observations revealed severe damage to the cell membrane. The compound limited the development and spread of the pathogen.

Integrated transcriptome and metabolome analyses identified alterations in cellular

transport and energy metabolism. There was an impact on ABC transporters and purine pathways. These effects compromised membrane transport and energy balance. The process led to inhibition of growth and cell death.

More information at doi.org/10.1002/ps.70735

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ICL opens specialty fertilizer plant in India.

The unit expands local supply and reduces the impact of geopolitical tensions on supply.

18.03.2026 | 07:12 (UTC -3)

Cultivar Magazine, based on information from Peggy Reilly Tharp

ICL announced the opening of a specialty fertilizer plant in Maharashtra, India. The facility expands local production and

strengthens supply security in a market dependent on imports.

The initiative comes amid geopolitical instability. The closure of the Strait of Hormuz is causing logistical delays and affecting the global availability of fertilizers. The move seeks to mitigate risks to food supply and security.

The plant will produce water-soluble fertilizers. The unit occupies approximately 28 square meters. The project replicates a production model adopted in Israel. The structure increases reliability in supply and diversifies production routes in the face of global restrictions.

The company has been operating in India for over three decades. The local operation generates approximately US$250 million

annually. The new plant is part of an expansion strategy in high-growth markets.

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Bio-inputs are advancing and entering a consolidation phase.

The sector is gaining ground over chemicals, facing challenges, and projecting global growth through 2030.

17.03.2026 | 17:57 (UTC -3)

Cultivar Magazine

“We are in the midst of a bio-inputs revolution.” This statement was made by the president of the National Association

for the Promotion and Innovation of the Biological Industry (Anpii Bio), Thiago Delgado, at the opening of the 3rd Market Intelligence Workshop, held this Tuesday (March 17th) in Campinas. With more than 200 registered participants, the event opened the participation of non-members for the first time.

According to Delgado, the bio-inputs market is experiencing a moment of consolidation, advancing into spaces traditionally occupied by chemical products. "There is a movement of acquisitions, the entry of new technologies, and segments where biological products are already the producer's preferred choice, such as nematicides," he highlighted.

The executive also highlighted the changing regulatory landscape. According to him, the sector is discussing its own legislation, more aligned with the specificities of bio-inputs. "We are moving away from the logic of the agrochemical law to build an appropriate regulation that includes products with multiple functions, expands quality control, and provides greater legal certainty," he stated.

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Among the challenges, Delgado cited diagnostic failures in sales, lack of knowledge on the part of producers, communication difficulties, obstacles in

biofactories, and competition between public and private research. "The future lies in specialization," he summarized.

In the international arena, Ignacio Moyano Córdoba, Vice President of Business Development for Latin America at Dunham Trimmer, presented market data and projected growth of up to 9,7% in biologicals between 2025 and 2030. Currently, the segment is led by biocontrol, which represents 55% of the market, followed by biostimulants (28%) and biofertilizers (17%). When segmented by crop, grains and cereals lead in usage with 31%. North America and Europe remain the most mature regions.

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According to Córdoba, the main barrier to the adoption of bio-inputs is still the lack of information. In a survey conducted by the Food and Agriculture Organization of the United Nations (FAO) with 3,4 producers, 57% pointed to this factor as a limiting one. "Adoption depends on information, training, and consistent results," he stated. For the industry, this implies expanding local validations, technical support, and agronomic interaction.

Cleber Vieira, managing partner of Agroconsult, addressed the challenges faced by Brazilian producers and the

outlook for the 2026/27 harvest. According to him, international conflicts continue to impact strategic supply chains, such as sugarcane, coffee, soybeans, cotton, and fertilizers.

“This is a complicated year. We don’t have all the answers yet, but there are guidelines to get through 2026 without increasing losses and to allow for a recovery in 2027,” he assessed.

Anpii Bio's operations director, Larissa Bonotto, highlighted that the use of bio-inputs requires a change in management practices and a higher level of technical expertise in the field. “Biologicals are not for those who want to do the bare minimum. It demands knowledge, care in handling, transportation, mixing, and

application. Given the current scenario, producers who want to make it profitable will have to evolve," she stated.

According to her, the context of pressure on margins could boost adoption. "It's a challenging time, but also an opportunity to advance and consolidate the sector's development," she added.

The program concluded with a roundtable discussion on the bio-inputs market, its relationship with agricultural commodities, and the outlook for the coming years.

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Amaranthus tuberculatus leads the ranking of worst weeds in the USA.

A survey conducted at an agricultural event brought together nearly 430 producers.

17.03.2026 | 17:10 (UTC -3)

Cultivar Magazine, based on information from Emily Unglesbee

Photo: Amy Sullivan, GROW

The plant *Amaranthus tuberculatus* It topped the ranking of worst weed during the Commodity Classic 2026 in San Antonio, Texas. The selection gathered votes from nearly 430 producers from the United States and Canada.

The result emerged on the first day. Producers from the Midwest marked the interactive map with the highest number of indications for the species. In the end, *Amaranthus tuberculatus* He garnered 146 votes and led in states such as Indiana, Illinois, Iowa, Michigan, Minnesota, Missouri, Ohio, South Dakota, and Wisconsin.

Amaranthus palmeri It came in second place, with 83 votes. The species showed the widest geographic distribution and led

in states in the South, Southeast, and parts of the Midwest. *kochia scoparia* He came in third place, with 49 votes, concentrated in the Great Plains and Western regions.

The data follows a similar trend to the 2025 survey by the Weed Science Society of America. In the previous survey, *A. palmeri*, *K. scoparia* e *A. tuberculatus* They occupied the second, third, and fourth positions.

The final map compiled 18 species identified as major problems. Illinois, for example, had seven different species among the most cited. This data indicates a diversity of pressure and a need for comprehensive management.

The "other" category came in fourth place. It included species such as *Sicyos angulatus*, *senna obtusifolia*, *Abutilon theophrasti* e *cirsium arvense*. *Sorghum halepense* It ranked fifth, with distribution from Texas to South Carolina.

Conyza canadensis It occurred frequently in the Northeast and parts of the Midwest. *Annual ryegrass* Its presence was concentrated in the Southeast and Mid-Atlantic. Species of the genus Ambrosia predominated in the Great Lakes region.

The survey also indicated a lower presence of *Chenopodium album*The species led the WSSA ranking in 2025, but came in 11th place at the event, with six votes.

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Soybean cyst nematode leads soybean crop losses in the United States in 2025.

Data indicate the impact of soil pathogens and reinforce the need for chemical management.

17.03.2026 | 15:01 (UTC -3)

Schubert Peter, Cultivar Magazine

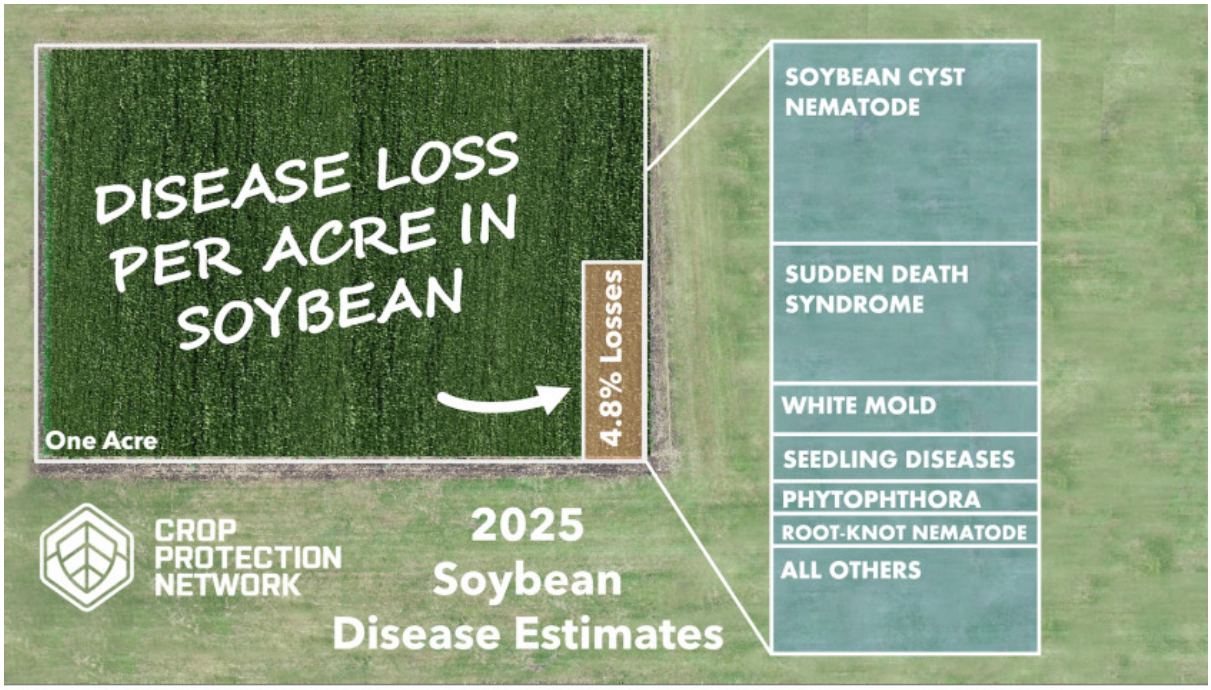

Image: Brandon Kleinke, Iowa State University

The 2025 soybean crop registered a 4,8% loss in yield potential in the United States.

In Ontario, Canada, the loss reached 4,5%. The survey covered 29 US states. The data comes from the Crop Protection Network, a collaborative entity between agricultural universities in the US and Canada.

The soybean cyst nematode (*Heterodera glycines*The pathogen led the losses. It caused a reduction of 70,1 million bushels. Sudden death syndrome, associated with *Fusarium virguliforme*, occupied the second position. White mold, caused by *Sclerotinia sclerotiorum*, appears next.

Seedling diseases also reduced yield. The complex involves *Fusarium* spp., *Pythium* spp., *Phomopsis* spp. And *rhizoctonia* spp.. Losses totaled 16,1 million bushels.

Red root rot, associated with *Calonectria ilicicola*It continued. The damage reached 7,7 million bushels. Illinois and Indiana suffered the greatest impacts.

Climatic conditions influenced the scenario. Damp soils limited the reproduction of *Heterodera glycines*The same environment favored *Fusarium virguliforme*.

Northern states accounted for 79% of the losses. The region concentrated a large part of the production. Foliar diseases were not among the main factors reducing yield in this area.

Further information can be found at doi.org/10.31274/cpn-20260306-0

Photo: Craig Grau

Fungicide efficiency in seedlings

Early disease management utilizes seed treatment with different active ingredients. Evaluations consider compounds such as azoxystrobin, carboxin, etaboxam,

fludioxonil, fluopiram, fluxapyroxad, ipconazole, mefenoxam, metalaxyl, oxathiapiproline, penflufen, pydiflumetofen, sedaxane, and thiabendazole.

Effectiveness varies depending on the pathogen. Compounds such as mefenoxam and metalaxyl show high effectiveness against... *Pythium* spp. And *Phytophthora soyae*.

Fludioxonil and sedaxane perform well against *rhizoctonia* Fluxapyroxad and pydiflumetofen contribute to the control of spp. *Fusarium* spp..

The response depends on the dose and placement. The rate applied to the seed alters performance. Less sensitive populations reduce the effectiveness of some active ingredients.

The combination of active ingredients broadens the spectrum. The strategy seeks simultaneous control of different soil pathogens.

More information at doi.org/10.31274/cpn-20190620-015

Control of foliar diseases

Chemical control of foliar diseases utilizes active ingredients from different groups. Among them: azoxystrobin, pyraclostrobin, fluxapyroxad, bixafen, prothioconazole, difenoconazole, tebuconazole, flutriafol, boscalid, and fluazinam.

Efficiency depends on the timing of application. The level of disease in the field

affects the outcome.

Diseases such as target spot (*Corynespora cassiicola*), cercosporiosis (*Cercospora kikuchii*) and brown spot (*Septoria glycones*) exhibit variable responses to fungicides.

Pathogen resistance reduces the performance of QoI group fungicides. This effect occurs in populations of *Cercospora kikuchii* e *Corynespora cassiicola*.

Controlling white mold (*Sclerotinia sclerotiorum*This requires application between R1 and R2. Late applications reduce efficiency.

Cercospora leaf spot requires precise adjustments. Applications outside the ideal timeframe reduce control.

The results are based on a single application at the recommended dose. Performance varies depending on environment and disease pressure.

Further data can be found at doi.org/10.31274/cpn-20190620-014

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APPS elects board of directors for the 2026-28 term.

Paulo Pinheiro assumes the presidency with a focus on representation and the regulatory agenda.

17.03.2026 | 10:11 (UTC -3)

Cultivar Magazine, based on information from Daniel Navarro

The São Paulo Association of Seed and Seedling Producers (APPS) elected its board of directors for the 2026-28 term.

Businessman Paulo Pinheiro assumes the presidency with a focus on expanding the sector's representation and strengthening its institutional role.

Pinheiro replaces Ricardo Cunha, CEO of Sementes Lagoa Bonita. Cunha led the process of revitalizing the organization over the past two years and will now serve as vice-president. Andréia Bernabé remains on the executive board.

Pinheiro, an agricultural engineer, has accumulated experience in different links of the seed supply chain. His career includes marketing, management, and business structuring.

The new management prioritizes expanding the membership base and addressing critical issues, such as the

impacts of tax legislation. The group also intends to intensify dialogue with regulatory bodies and increase its presence in strategic agendas related to competitiveness, sustainability, quality, and legal security.

According to Pinheiro, São Paulo concentrates a significant portion of seed production in the country. The organization seeks to guarantee the participation of companies in decisions that impact their businesses.

The board of directors includes Itamar Alves de Oliveira, administrative director; Sérgio Zeferino Batista, financial director; and Juliano Rodrigo Coro, director of services and solutions. The Fiscal Council comprises Thiago Mendonça, José Pereira da Silva Filho, and Marcos Antoniali.

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Study reveals DNA subcompartments in corn.

Discovery points to new layer of genetic regulation with potential impact on crop breeding.

17.03.2026 | 07:53 (UTC -3)

Schubert Peter, Cultivar Magazine

Photo: Tony Oliveira, CNA

Researchers have identified two distinct subcompartments in maize euchromatin, with differences in spatial organization and DNA replication timing. This finding broadens our understanding of plant genome architecture and suggests new avenues for genetic manipulation of crops.

The work involved a team from Florida State University and North Carolina State University. The authors applied high-resolution genomic sequencing and three-dimensional microscopy to map DNA replication in the cell nucleus.

Two subcompartments

The analysis revealed a division of euchromatin into two subcompartments.

One group replicates early and exhibits high gene activity. The other replicates at an intermediate stage and shows distinct structural characteristics.

The data indicate a direct relationship between replication time and gene activity. Regions with early replication concentrate active genes and more accessible chromatin. Regions with intermediate replication exhibit greater compaction and lower relative activity.

The study also showed a separate spatial organization of these subcompartments within the core. Hi-C and 3D FISH techniques confirmed adjacent, but slightly overlapping, nuclear territories along the interphase.

Chromosomal interactions

The frequency of chromosomal interactions follows the same pattern. Regions with the same replication time interact more with each other. Early replication segments exhibit more intense long-range interactions.

The authors highlight that the classic model of homogeneous euchromatin does not explain this organization. The maize genome exhibits frequent alternation between regions of early and intermediate replication along the chromosomes.

The discovery suggests a new layer of regulation in the plant genome. Manipulating the timing of replication could

influence gene expression and agronomic traits.

More information at doi.org/10.1093/plcell/koag042

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Syngenta invests US$130 million in AI center.

A UK-based unit will bring together 300 scientists and accelerate sustainable solutions.

17.03.2026 | 07:14 (UTC -3)

Cultivar Magazine, based on information from Syngenta

Syngenta has announced a US$130 million investment in a new agricultural

bioscience research center in the United Kingdom. The Biostar unit will be located in Jealott's Hill and is expected to be operational in 2028. According to the company, the project integrates biological, chemical, and digital science with intensive use of artificial intelligence.

The center will bring together approximately 300 scientists already working in the area. The structure aims to accelerate product discovery and development. The company intends to expand sustainable solutions for farmers and reinforce the United Kingdom as a global innovation hub.

The initiative focuses on new approaches to crop protection. The research includes anticipating resistance, responding to

environmental signals, and analyzing interactions between pests, pathogens, plants, and soil. The approach uses real-world data, advanced analytics, and AI.

The program also includes tracking compounds in plants and soils, optimizing degradation, and ensuring environmental safety. The industrial-scale implementation of biological processes is integrated into the strategy to reduce costs and expand access in the field.

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Volkswagen and Amaggi begin testing a truck powered by B100.

Evaluation with Meteor will cover up to 10 km per month in grain transportation.

16.03.2026 | 14:32 (UTC -3)

Cultivar Magazine, based on information from Volkswagen.

Volkswagen Trucks and Buses has begun testing B100 biodiesel in partnership with

Amaggi. The project uses 100% renewable fuel of plant origin. The evaluation is taking place in real-world grain transportation operations in the Midwest and North of the country.

A Meteor 29.530 Highline 6x4 truck travels Amaggi's logistics routes for 12 months. The vehicle covers between 8 and 10 kilometers per month. The operation uses nine-axle combinations. The route connects Sinop to Matupá and continues to Mirituba.

The tests measure vehicle performance, fuel consumption, component wear, maintenance impact, and operational reliability. The data guides future applications of renewable fuel in heavy transport operations.

Soybean fuel

The B100 used in the evaluation comes from soybeans. Amaggi produces the biodiesel at a plant located on a farm in the municipality of Lucas do Rio Verde. Fuel is supplied from a single source to ensure standardization throughout the test.

This initiative is part of Volkswagen Trucks and Buses' decarbonization strategy. Studies by ANP, Abiove, and EPE indicate a reduction of up to 90% in CO2 emissions compared to fossil diesel.

Rodrigo Chaves, vice president of engineering at the automaker, affirms progress in validating the fuel. According to him, the project aims to improve the

performance, efficiency, and operational reliability of the vehicles.

side project

Another test with the B100 recorded 100 kilometers driven in five months. The project involves EcoRodovias and Volkswagen Trucks and Buses. The operation takes place at the Ecovias Noroeste Paulista concessionaire.

The fleet includes four trucks: one Meteor 29.530, two Delivery 11.180, and one Constellation 17.190. The vehicles perform services such as towing and water tanker trucking.

The data indicates technical availability exceeding 95%. The index points to a low

incidence of maintenance. The companies will maintain the project until August, when it will complete 12 months of assisted operation.

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Bioceres reports a loss of US$179 million after asset foreclosure.

Company negotiates financing and restructures operations.

16.03.2026 | 13:38 (UTC -3)

Cultivar Magazine

Bioceres reports today that it recorded a loss of US$179 million following the judicial foreclosure of assets linked to the Pro Farm group. The auction took place on January 20, 2026. Creditors

submitted a bid of US$15 million for the assets given as collateral. The net book value reached approximately US$194 million. The difference generated impairment (knowledge that an asset is worth less than what is recorded on the balance sheet).

The data comes from a filing with the Securities and Exchange Commission (SEC) in the United States. It was compiled using Form 6-K, a mandatory periodic report for private foreign issuers that have securities listed on US stock exchanges.

The assets involved encompass operations in the United States and Europe. The company classified these activities as discontinued operations in its

financial statements. The remaining business focuses on activities in Argentina and the group's technology platforms.

The company disputes the conduct of the execution process. Management believes the procedure did not occur under appropriate commercial conditions. The company reported that it has initiated legal action and filed counterclaims against creditor representatives. The process has not yet reached a formal conclusion. Bioceres is negotiating a transition agreement with holders of the secured notes.

Other factors

The market environment has put pressure on recent performance. International prices for agricultural commodities have fallen. Credit conditions in Argentina have also restricted investments in the field. This scenario has reduced revenues and increased pressure on working capital in the input sector.

Even under these circumstances, the company reported maintaining its market share in three main product lines: crop protection, plant nutrition, and seeds with integrated solutions. The consolidated gross margin reached 40% for the fiscal year, repeating the result from the previous period.

The financial statements indicate significant doubt about going concern. The

company is seeking debt refinancing with Argentine financial institutions. The strategy includes asset sales and raising long-term financing.

One of the subsidiaries, Rizobacter Argentina, refinanced corporate bonds in February 2026. The operation extended maturities and indicated access to the local debt market. Management is also preparing a three-year financial plan. The objective involves increasing profitability and generating cash flow.

According to management, the company intends to improve operational performance and strengthen discipline in working capital management. The group is betting on its technological base in seeds and biological inputs, as well as commercial relationships with producers,

as pillars for financial recovery.

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Cell wall protein emerges as a target against powdery mildew in cucurbits.

Silencing the ECM33 gene reduces the growth of Podosphaera xanthii and decreases disease symptoms.

16.03.2026 | 12:35 (UTC -3)

Schubert Peter, Cultivar Magazine

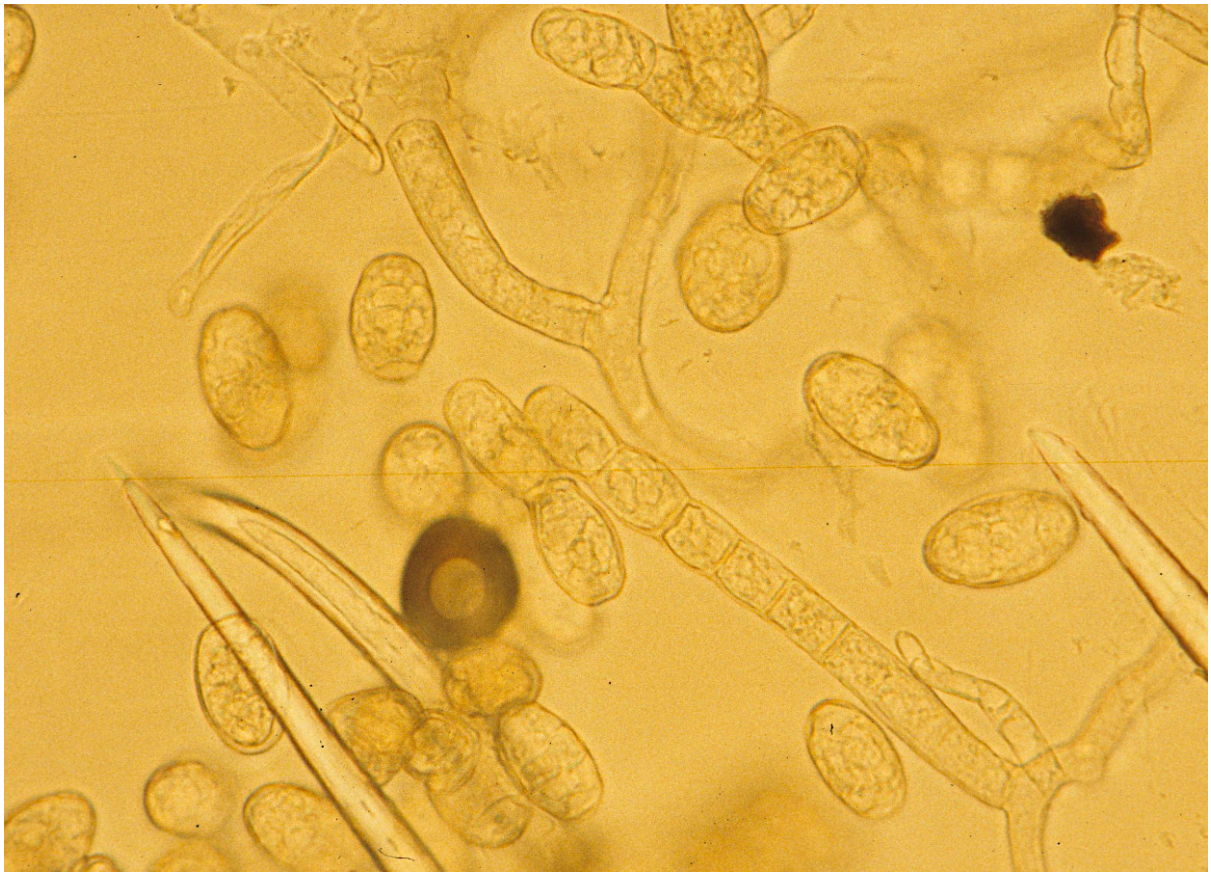

Photo: Gerald Holmes, Strawberry Center

Researchers have identified a protein essential for the integrity of the fungal cell wall. *Podosphaera xanthii*The pathogen causes powdery mildew in cucurbits. The study points to the ECM33 gene as a promising target for disease control using RNA interference. Experiments with RNA spraying reduced powdery mildew severity by about 75% in melon plants.

This study evaluated the function of the PxECM33 protein in the fungal cell wall structure. This structure forms the interface between the pathogen, the host plant, and the environment. The cell wall mainly contains chitin, glucans, and mannans, components associated with structural integrity and interaction with the host.

Structural analysis

Structural analysis indicated that the protein possesses characteristics of proteins with leucine-rich repeats. The three-dimensional model suggested the presence of binding pockets for cell wall carbohydrates. Binding assays confirmed interaction with mannans, chitin, and beta-glucans.

The authors also applied RNA interference techniques to reduce the expression of the PxECM33 gene. Silencing caused a significant decrease in fungal growth and disorganization of the cell wall. Electron microscopy revealed separation between the inner and outer layers of the pathogen's cell wall.

The structural changes increased the exposure of chitin and glucans. These components function as signals recognized by the plant's immune system. The process activated host defense responses.

Spray-induced gene silencing

The researchers also evaluated the strategy known as SIGS (spray-induced gene silencing). This method applies double-stranded RNA molecules directly to the leaves. After spraying, the fungus absorbs the RNA, silencing the target gene.

Growth chamber and greenhouse trials confirmed the effectiveness of the approach. Melon plants treated with dsRNA targeting the PxECM33 gene showed a significant reduction in pathogen growth and less leaf area covered by powdery mildew.

Other fungi

The study also assessed the conservation of the gene in other fungi. The analysis identified orthologs of ECM33 in several phytopathogenic ascomycetes. Among them are species associated with important agricultural diseases.

The absence of homologs in plants, animals, and bacteria reinforces the

protein's potential as a selective target for fungal control. According to the authors, the discovery paves the way for RNA-based crop protection strategies.

Further information can be found at doi.org/10.1093/hr/uhag101

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AGCO receives award for digital parts platform.

AGCO Parts Shop B2B achieves recognition at the Digital Engineering Awards 2026.

16.03.2026 | 07:55 (UTC -3)

Cultivar Magazine, based on information from Bob Blakely

AGCO received the “Commendable Prize” in the “Engineering The Change” category

during the Digital Engineering Awards 2026. The recognition highlights the work of the AGCO Parts Shop B2B Digital Technology team. The award ceremony took place in Boston, United States.

The award recognizes initiatives involving technological transformation. This achievement places the team among global groups with digital innovation applied to the agricultural sector. The initiative is part of the "Digital Transformation of the Year" segment of the award.

The AGCO Parts Shop B2B platform brings together digital tools for parts orders by dealerships. The system replaces previous company applications. The solution consolidates processes into a

single environment. The interface offers real-time order tracking. The system increases order accuracy. The technology also increases delivery speed and access to the product portfolio.

The platform already operates in the Europe, Middle East, Asia, and Pacific regions. The North American launch begins in October 2026. The initiative alters the interaction between dealerships and the company's parts division. The Farmer First strategy guides the project. The objective involves supporting the dealership and ensuring the rapid delivery of critical parts to the producer.

Stefan Caspari, Senior Vice President of Customer Success and North America Ag at AGCO, cited team dedication and

internal collaboration as factors in the result.

The work involved integration between after-sales teams and digital transformation. The project increased platform usage. The process also improved order accuracy and operational efficiency.

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Syngenta signs agreement for agricultural research.

Partnership with QuantumBasel seeks to accelerate innovation in crop protection.

16.03.2026 | 07:00 (UTC -3)

Cultivar Magazine, based on information from Syngenta

Syngenta has announced a partnership with the quantum computing hub QuantumBasel to expand its research capabilities in crop science. The initiative

investigates applications of quantum computing in the development of agricultural technologies.

Developing crop protection products requires a deep understanding of complex molecular interactions. Classical computers provide approximations of this behavior. According to the company, quantum computing paves the way for simulations with superior precision and detailed analysis of molecular behavior. This capability can generate new avenues for molecule discovery and agricultural innovation.

The collaboration brings together experts and infrastructure in Basel, Switzerland. The model integrates quantum algorithms and hardware from QuantumBasel with

scientific teams and research and development programs from Syngenta. Initial projects focus on deepening knowledge of molecular behavior applied to crop science.

About quantum computing

Quantum computing uses the laws of quantum mechanics to process information in a way that differs from conventional computers.

In a normal computer, everything is done with bits. A bit can only be 0 or 1 (on or off). In a quantum computer, qubits (quantum bits) are used. A qubit can be 0 and 1 at the same time thanks to a

phenomenon called superposition.

In practice, to navigate a maze: a regular computer will try one path at a time, hit a wall, go back and try another, until it finds the exit.

A quantum computer "enters" all the paths of the maze at the same time. It doesn't test them one by one; it maps all the possibilities at once.

However, at this moment, the technique in general is in a hybrid stage. Called NISQ (Noisy Intermediate-Scale Quantum). Current quantum computers are "noisy" and make many mistakes. Therefore, companies focus on hybrid algorithms: the quantum computer solves a small and complex part of the problem, and the classical computer does the rest.

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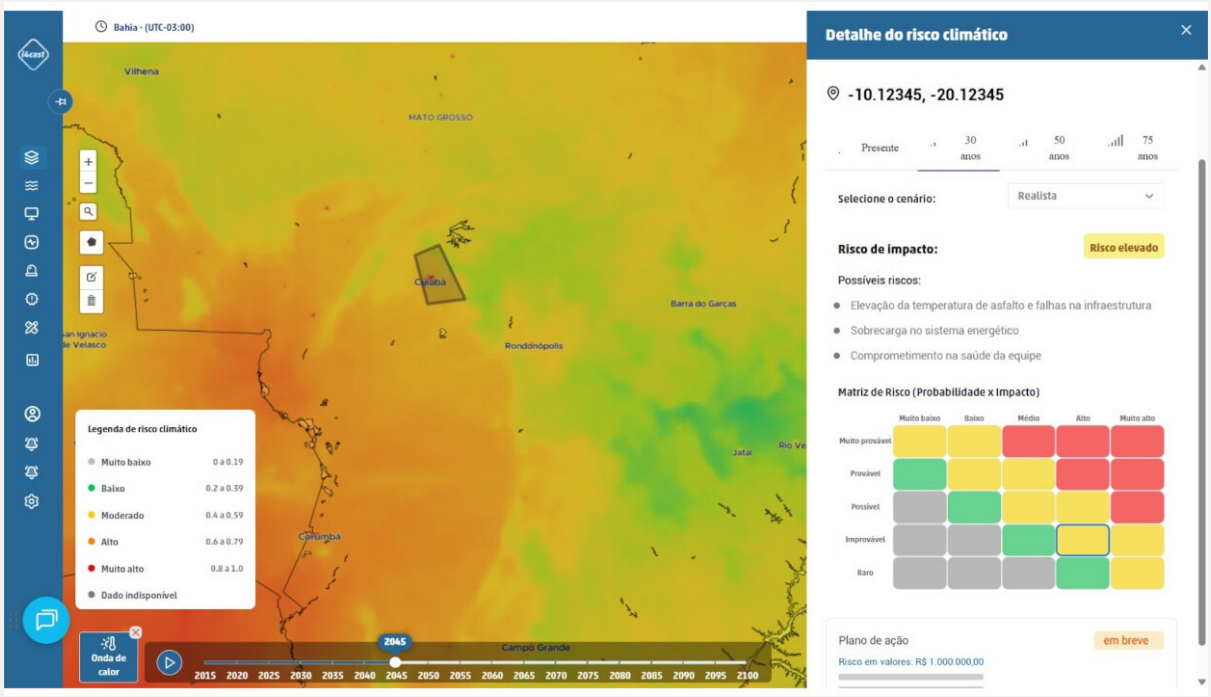
i4sea receives investment and aims for expansion in agriculture.

Brazilian startup focused on climate intelligence expands its operations.

16.03.2026 | 06:37 (UTC -3)

Cultivar Magazine, based on information from Patrícia Stedile



i4sea has received new investment from Lighthouse and is preparing to expand into

new markets, including large-scale agricultural operations. The startup was founded in Salvador, Brazil. It works with climate intelligence and advanced weather forecasting models. The new capital should support its entry into sectors dependent on accurate forecasts to gain efficiency, productivity, and operational safety.

The company began its operations in the port sector. Now, it is targeting energy, rail and road transport, large logistics chains, and agriculture. According to Lighthouse, the intensification of weather events has increased operational risk for companies and expanded the demand for customized forecasts.

The i4sea platform gathers relevant climate information for each operation. The system integrates historical data, real-time measurements, hyperlocal forecasts, historical analyses, and occurrence records. The proposal involves supporting planning and decision-making based on business intelligence.

Founded in 2015 by oceanographers affiliated with the Federal University of Bahia, i4sea refines global forecast data and generates hyperlocal models with meter-level precision. Updates occur hourly. The tool combines locally taken measurements with global models. According to Mateus Lima, founder and CEO, artificial intelligence adjusts the data in real time and generates more accurate scenarios for the following 24 hours.

The company reports an accuracy rate close to 93% in its alerts. It also cites a 46x ROI at Santos Brasil and a 27x ROI at Vattenfall's North Sea operation.

In agriculture, the application involves optimizing spraying, harvesting, and movement. Lighthouse's thesis considers the increase in extreme events and the growing demand for climate intelligence. The investment firm has supported startups since 2017. It has approximately 20 invested companies and a portfolio valued at around R$ 150 million, focusing on the North and Northeast regions of Brazil.

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Fue diseñada para ser leída en teléfonos móviles.
Se publica los sábados.

Grupo Cultivar de Publicações Ltda.

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