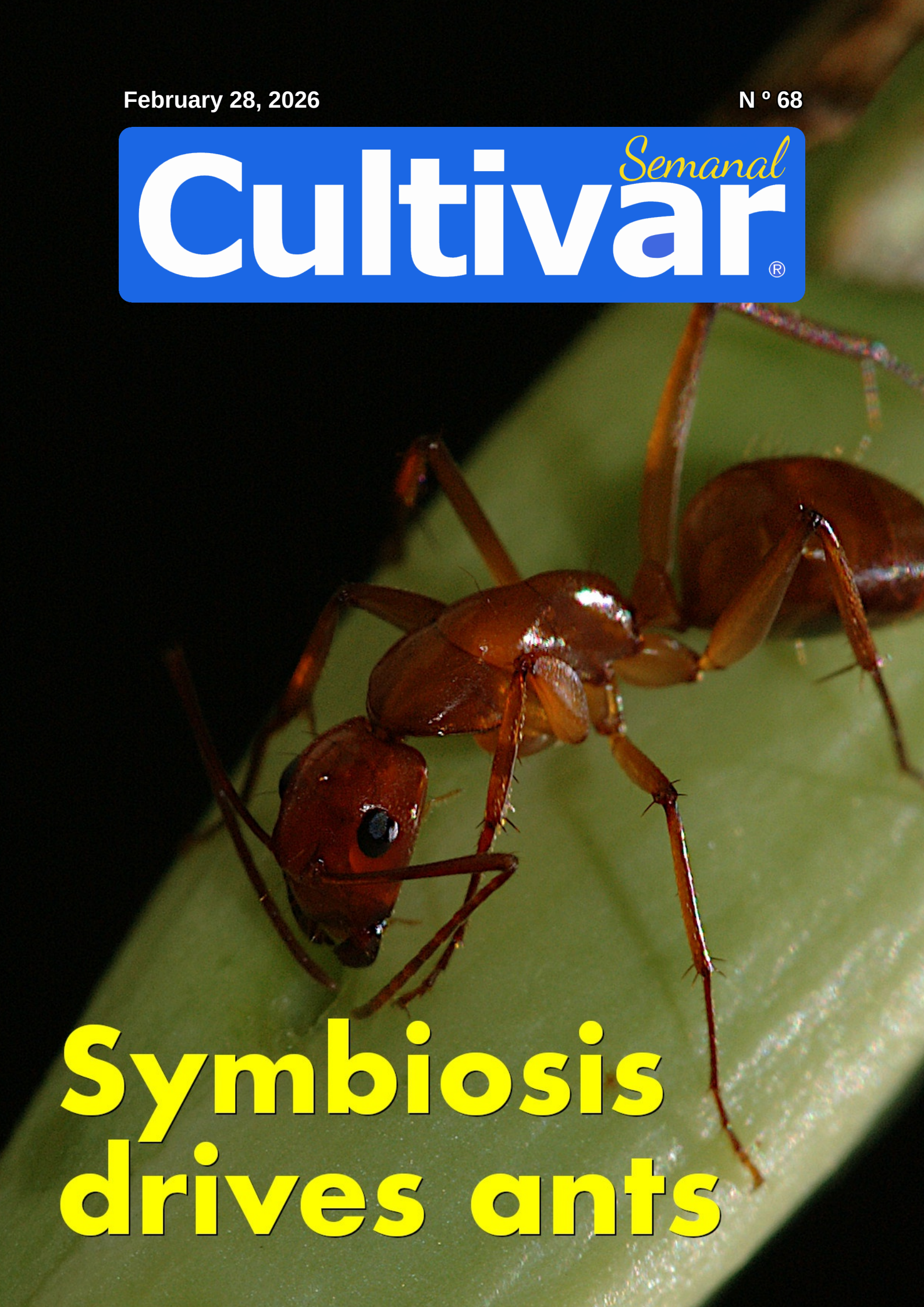
February 28, 2026 N º 68

Cultivar Semanal ®



Symbiosis drives ants

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Microorganisms shape the evolutionary success of ants.

Microbial symbioses support specialized diets, recycle nitrogen, and expand ecological niches.

26.02.2026 | 07:59 (UTC -3)

Cultivar Magazine

Photo: Susan Ellis

Nutritional symbioses with microorganisms have shaped the evolutionary success of ants. These microorganisms allow different lineages to exploit diets poor in essential nutrients. This association sustains the expansion of ants into multiple ecological niches and trophic levels. This finding is part of the work of Yi Hu and Corrie S. Moreau.

This research synthesizes recent advances in microbial diversity, nutritional functions, and mechanisms of symbiotic transmission in Formicidae. The analysis brings together genomic and experimental evidence. The focus is on nitrogen metabolism, vitamin supplementation, plant fiber degradation, and protein catabolism.

Ants are among the most diverse animal groups on the planet. They accumulate significant biomass in terrestrial ecosystems. They participate in nutrient cycling, soil disturbance, and the formation of micro-habitats. Over approximately 140 million years, they have expanded globally. Part of this expansion coincided with the diversification of angiosperms. In this process, multiple lineages migrated from carnivorous ancestors to herbivorous diets on at least 11 independent occasions.

Nitrogen imbalance

Diets based on extrafloral nectar, honeydew from hemipterans, pollen, and fungi impose nitrogen limitations. This nutrient is a component of amino acids and

structural proteins. The study indicates that symbiotic bacteria compensate for this imbalance. They recycle nitrogenous waste and synthesize essential amino acids.

In herbivorous ants of the tribe Camponotini, endosymbiotic bacteria of the genus *Blochmannia* They convert urea into ammonia via urease. Then, they produce essential amino acids. Experiments with urea labeled with nitrogen-15 demonstrate the incorporation of recycled nitrogen into the hemolymph of ants. Bacterial abundance increases during pupation. The expression of genes linked to nitrogen recycling peaks during critical developmental phases.

In the genre *Cephalotes*The symbiosis involves a bacterial consortium in the intestinal lumen. Different microbial groups perform complementary steps. Part of the community converts uric acid into urea. Other bacteria degrade urea and produce glutamate. From this compound, they synthesize essential amino acids. Food handling tests confirm the incorporation of recycled nitrogen into the tissues of ants.

The work also describes biological nitrogen fixation in fungus gardens cultivated by leafcutter ants. Bacteria of the genera *Klebsiella* e *Pantoea* They fix atmospheric nitrogen (N2). The fixed nitrogen sustains both the ants and the cultivated fungi. Acetylene reduction and enrichment tests with diatomic nitrogen-15

confirm nitrogen-fixing activity.

Complex B vitamins

In addition to nitrogen, symbionts provide B vitamins. In *Cephalotes*Genomic analyses indicate a collective capacity to synthesize almost all B vitamins. *Harpegnathos jumper*, the bacteria *Candidatus Tokpelaia hoelldobleri* It maintains the complete pathway for riboflavin. The pathway can meet the host's demand, as the host does not produce the vitamin autonomously.

The degradation of plant fibers is part of another functional axis. In larvae of *Cephalotes*, *enterobacterales* They degrade pectin through

polygalacturonases and specific metabolic pathways. In adults, *Xanthomonadales* They degrade xylan and chitin. In vitro assays validate some of these capabilities. The functional division varies according to the stage of development.

Predatory ants

Predatory ants also maintain specialized associations. In subfamilies such as Dorylinae and Ponerinae, microbiomes exhibit low diversity and high specificity. *Harpegnathos*Metagenomic analyses indicate genes linked to protein degradation and amino acid transport. Their exact function still requires experimental validation.

Regarding transmission, three modes emerge. Endosymbionts in bacteriocytes follow a strict vertical pathway. They migrate to oocytes during oogenesis. In intestinal microbiomes, transmission occurs through trophallaxis and social inheritance during colony founding. In larvae of *Cephalotes*The composition suggests preserved environmental filtering between species.

The work highlights gaps. Most studies focus on a few genera. Inferences based on metagenomics predominate. Large-scale functional experiments are lacking. Future research should integrate comparative genomics and physiological assays. Expanding to different castes and developmental stages could shed light on how metabolic complementarity sustains

entire colonies.

More information at doi.org/10.1146/annurev-ento-121423-013513

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Agricultural Market - Feb. 27, 2026

Soybean prices rise in Chicago even without China; and Brazil makes progress with its harvest.

27.02.2026 | 14:22 (UTC -3)

Vlamir Brandalizze - @brandalizzeconsulting

China's absence from global soybean purchases marks the week. The Lunar

New Year holiday ends on March 3rd. Even so, there was no significant recovery in business. Still, Chicago registered its best levels in months. The March contract traded near US$11,50. July approached US$11,80. The market is targeting US$12 in July, given firm fundamentals.

The harsh winter in the Northern Hemisphere is increasing demand for animal feed and oil. The market is awaiting stimulus for biofuels in the United States, a factor that could boost prices for soybean oil and corn ethanol.

In Brazil, the soybean harvest has reached 48%. Mato Grosso leads with 70%. Paraná accounts for 39%. Goiás varies between 33% and 35%. Rondônia reaches up to 45%. Bahia registers 28%. Rio Grande do

Sul is facing drought and heat, resulting in losses. The harvest may be closer to 175 million tons than 180 million, still above the 171,5 million tons of the previous cycle.

Sales of the current crop have reached 36,5%, down from 44% in the same period last year. In February, shipments are expected to approach 6 million tons of soybeans and almost 2 million tons of soybean meal, with the possibility of a record for the complex.

No **corn**Chicago reacts after indications of a 2 million hectare drop in planted area in the United States. The first Brazilian crop is 42% harvested. The second crop has reached 62% planting, with delays in some areas outside the ideal window. Producers still hold approximately 26 million tons to

negotiate.

O **wheat** Prices are rising abroad amid uncertainties about the harvest during a harsh winter. In Paraná, prices range from R$ 1.150 to R$ 1.200. In Rio Grande do Sul, deals are being made between R$ 1.080 and R$ 1.100. Exports and imports are down compared to last year.

O **rice** February closes with minor adjustments in Rio Grande do Sul, between R$ 55 and R$ 60, below cost. Exports exceed the volume from the beginning of last year. In **bean**The price of carioca coffee exceeds R$ 350 per sack in the 9+ grade variety. Black coffee is once again around R$ 200. Lower supply is sustaining the price increase.

By **Vlamir Brandalizze** -

@brandalizzeconsulting

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Study maps neural projections of Myzus persicae antennae.

3D reconstruction reveals connections with the antennal lobe, subesophageal ganglion, and thoracic neuromeres.

27.02.2026 | 11:17 (UTC -3)

Cultivar Magazine

Photo: David Cappaert

The central projections of the sensory neurons of the antennae of Myzus persicae They reach multiple regions of the central nervous system. The mapping included the antennal lobe, antennal mechanosensory and motor centers, subesophageal ganglion, and thoracic neuromeres. The study used mass staining, immunohistochemistry, confocal microscopy, and three-dimensional reconstruction. The results broaden the understanding of the anatomical organization of the aphid's olfactory system.

Myzus persicae It causes economic losses in agriculture. The insect uses olfactory signals to locate hosts and escape predators. Understanding the neural architecture linked to olfaction contributes

to interpreting how the insect processes chemical stimuli.

Researchers dissected 30 adult individuals. Six central nervous systems allowed for complete dissection. Four samples received efficient labeling with the Micro-Ruby neural tracer. The team combined the tracer with anti-synapsin antibody to delineate neuropil. Images were obtained using a confocal microscope. The group generated a three-dimensional atlas with the aid of Amira software.

Main projections

The antennal nerve fibers projected primarily to the ipsilateral antennal lobe

and to the antennal mechanosensory and motor center. Projections also reached the subesophageal ganglion and the prothoracic, mesothoracic, and metathoracic neuromeres. Two parallel bundles ran along the ventral nerve cord. One bundle innervated three thoracic neuromeres. The other concentrated fibers in the prothoracic neuromere, where it formed a defined neuropillar structure.

In the antennal lobe, the axons outlined glomeruli. Synapsin staining did not show clear glomerular boundaries. The neural tracer allowed visualization of more defined contours. The pattern coincides with previous records in *Acyrthosiphon pisum*.

Secondary projections

The study identified secondary projections. One fiber originated from the antennal lobe and reached the protocerebral region. Another fiber connected the ipsilateral antennal lobe to the contralateral one. The authors also recorded a projection from the antennal lobe to the calyx. This region is involved in olfactory memory processes in insects. The team also observed two somas in the subesophageal ganglion.

The fibers posterior to the antennal lobe reached the antennal mechanosensory and motor center, an area associated with the control of antennal movements. Some fibers descended to the subesophageal ganglion, the gustatory center. The

antennal nerve also projected to motor areas of the thoracic ganglia. The pattern indicates integration between sensory stimuli and motor responses.

The authors suggest using serial transmission electron microscopy to detail synaptic connections. The technique can reveal the fine organization of neural circuits. The three-dimensional map provides an anatomical basis for functional studies on olfactory processing in aphids.

Further information at doi.org/10.3390/insects17030249

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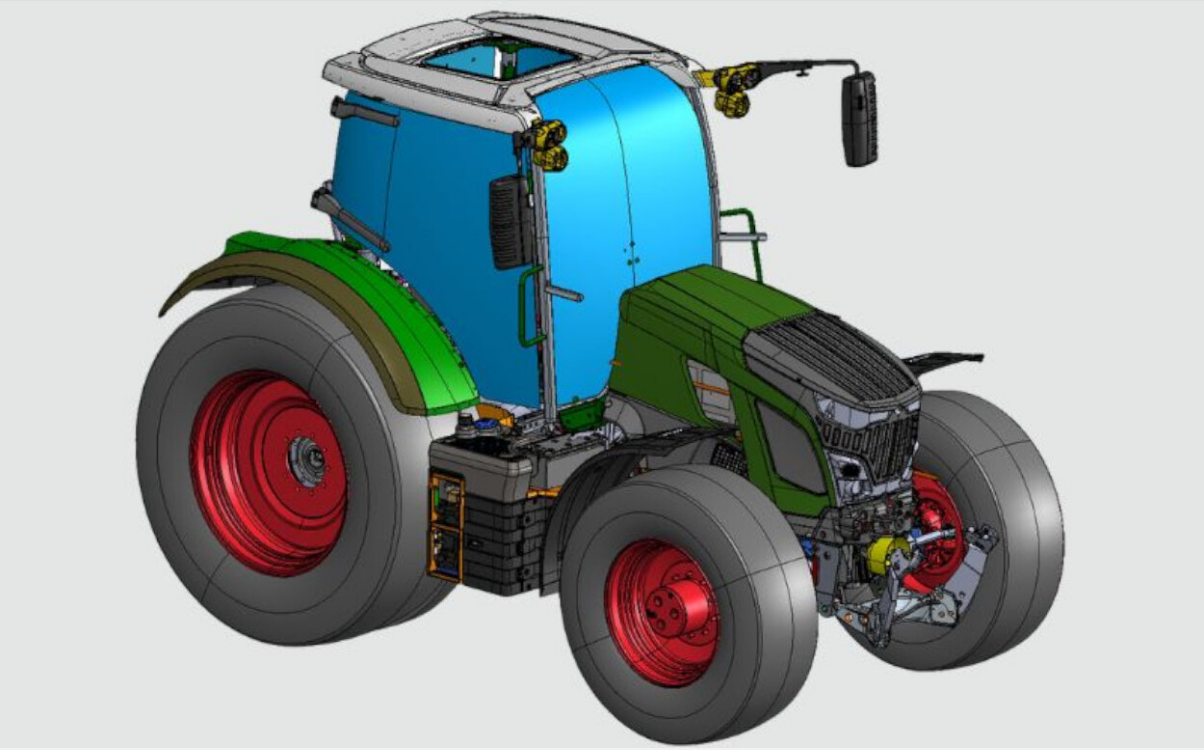
Agromec presents the E600, an electric variant of the Fendt 600 series.

Electric tractor promises up to 200 hp and continuous operation with batteries and range extender.

27.02.2026 | 10:07 (UTC -3)

Cultivar Magazine



Agromec has released details of the Agromec E600, a fully electric tractor based on the Fendt 600 Vario platform.

The machine enters the medium- to high-power electric tractor segment. It is scheduled to be offered in the Netherlands in 2026.

The model offers power ranging from 140 hp to 200 hp, depending on the version. The E600 uses an internal 170 kWh battery with a temperature control system, compatible with AC and DC (fast) charging.

The tractor includes a fronthead (front lift) and frontaftakas (front PTO) to operate implements directly in front of the machine. The maximum authorized gross weight is approximately 13.500 kg.

One of the standout features is the optional range extender. This device can increase power capacity—serving as an

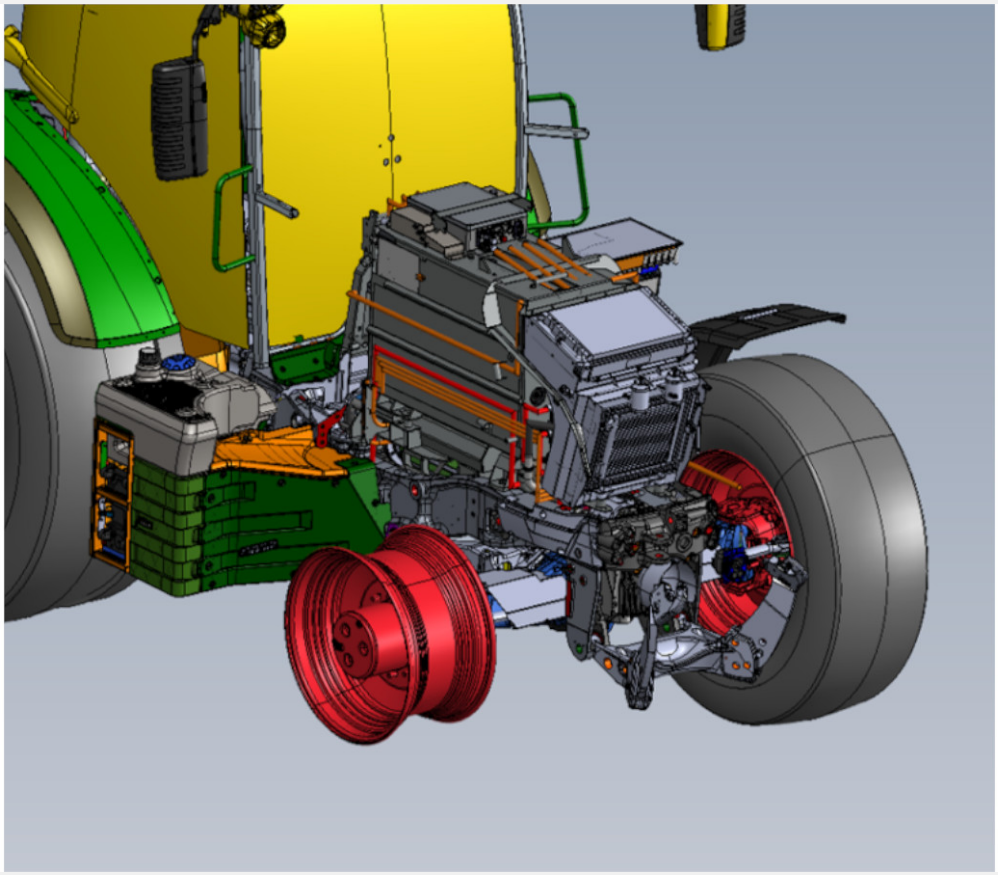
extra battery—and can also be used to charge other devices.

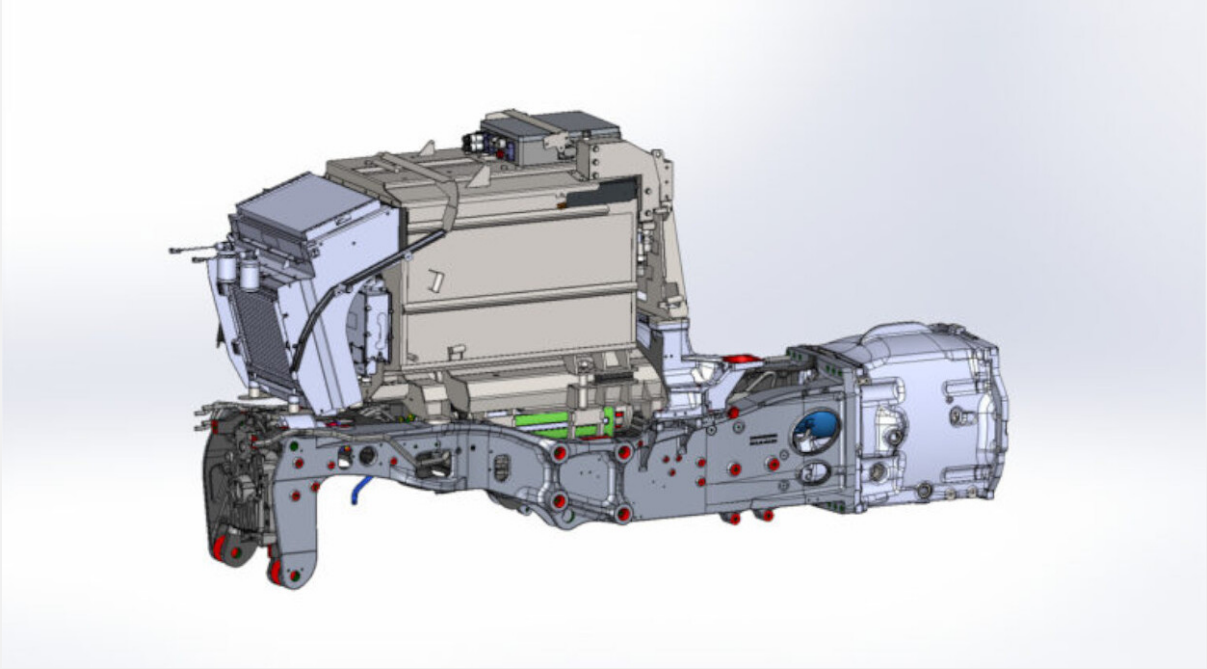
According to Agromec, the E600 was designed for 24-hour operation without loss of performance, even in intensive work. The control interface includes a digital panel, a 12-inch terminal, and multiple customization options for the operator.

The project combines Dutch engineering with European electrical technology, in partnership with Elma, a company specializing in electric drive systems.

The E600's technical basis is a conversion of the Fendt 600 Vario, with the diesel engine and conventional components replaced by an electric motor and high-capacity batteries.

The electric version uses the VarioDrive transmission with four-wheel drive and maintains controls similar to those of traditional Fendt tractors, making it easier for operators accustomed to diesel models to adopt. According to technical reports, the battery can be charged to 80% in about an hour with an external fast charger (CCS-2).





Technische gegevens

Algemeen		Agromec E600 140 pk	Agromec E600 180pk	Agromec E600 205 pk
Basismodel		Fendt 600 serie	Fendt 600 serie	Fendt 600 serie
Elektrisch vermogen in PK	pk	140 pk	180 pk	205 pk
Elektrisch vermogen in KW	kW	103 kW	132 kW	151 kW
Aandrijfmotor	Aantal	1	1	1
Type motor		ENGIRO 280W	ENGIRO 280W	ENGIRO 280W
Nominaal toerental	t/min	1900	1900	1900
Maximaal koppel	Nm	665 Nm	830 Nm	905 Nm
Interne accu				
Capaciteit	kWh	171	171	171
Laadtijd DC	uur	1 uur	1 uur	1uur
Aansluiting	type	Type 2 (AC) + CCS2 (DC)	Type 2 (AC) + CCS2 (DC)	Type 2 (AC) + CCS2 (DC)
Spanning	V	648 V Nominaal	648 V Nominaal	648 V Nominaal
Koeling		Actief incl. AC op accupakket	Actief incl. AC op accupakket	Actief incl. AC op accupakket
Cell type		NMC	NMC	NMC
Transmissie en aftakassen				
Type transmissie		TA 150	TA 150	TA 150
Maximum snelheid	km/h	40	40	40
Aandrijving aftakas		Fendt Vario Drive	Fendt Vario Drive	Fendt Vario Drive
Achterste aftakas		540 / 540E / 1000 / 1000E	540 / 540E / 1000 / 1000E	540 / 540E / 1000 / 1000E
Fronthef aftakas		1000	1000	1000
Hefinrichting en hydraulisch systeem				
Aandrijving hydraulisch systeem		Fendt Vario Drive	Fendt Vario Drive	Fendt Vario Drive
Pomp met verstelbaar slagvolume / optie 1 / optie 2	l/min	152 / 205	152 / 205	152 / 205
Bedrijfsdruk, regeldruk	bar	200+20	200+20	200+20
Max. # ventielen (voor/midden/achter) Power	Aantal	1/2/4	1/2/4	1/2/4
Max. # ventielen (voor/midden/achter) Power+	Aantal	1/2/5	1/2/5	1/2/5
Max. # ventielen (voor/midden/achter) Profi / Profi+	Aantal	2/3/5	2/3/5	2/3/5
Max. ontneembare hoeveelheid hydr.olie	Liter	65	65	65
Max. hefvermogen achterhefinrichting	daN	9.790	9.790	9.790
Max. hefvermogen fronthefinrichting	daN	4.418	4.418	4.418
Afmetingen en gewichten				
Standaardbanden voor		540/65 R28	540/65 R28	600/65 R28
Standaardbanden achter		650/65 R38	650/65 R38	710/70 R38
Cabinehoogte bij standaard bandenmaten, zonder Fendt Guide	mm	3.035	3.035	3.076
Cabinehoogte bij standaard bandenmaten, met Fendt Guide	mm	3.082	3.082	3.125
Totale breedte (bij standaard bandenmaten)	mm	2.550	2.550	2.550
Totale lengte basistrekker	mm	5.197	5.197	5.197
Maximale bodemvrijheid	mm	498	498	530
Wielbasis	mm	2.720	2.720	2.720
Leeggewicht	kg	8.250	8.250	8.250
Maximaal toelaatbaar gewicht	kg	13.500	13.500	13.500

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BASF expects to make €1,6 billion in profit in 2025.

The agricultural segment totaled €9,6 billion in sales and a margin of 22%.

27.02.2026 | 07:40 (UTC -3)

Cultivar Magazine

Markus Kamieth

BASF closed 2025 with a net profit of €1,619 billion. This figure exceeds the

2024 result by 24,7%. Free cash flow reached €1,3 billion. The company maintained its proposed dividend of €2,25 per share. The Agricultural Solutions segment recorded €9,6 billion in sales and €2,1 billion in EBITDA before special items, with a margin of 22%.

The group's earnings before interest, taxes, depreciation, and amortization (EBITDA) totaled €6,6 billion in 2025. This figure is down from €7,2 billion in 2024. Revenue totaled €59,7 billion, below the €61,4 billion of the previous year. Negative exchange rate effects pressured sales. The EBITDA margin before special items was 11,0%. In 2024, the index was 11,8%.

Cash flow from operating activities reached €5,6 billion. This amount was €1,3 billion lower than in 2024. The company

reduced investments in fixed assets and intangibles from €6,2 billion to €4,3 billion. The decrease in investments increased free cash flow to €1,3 billion, compared to €748 million in 2024.

Net debt will fall to €18,3 billion by the end of 2025. BASF intends to direct resources from portfolio measures to reduce indebtedness in 2026. The company projects annual cost savings of €2,3 billion by the end of 2026. In December 2025, the global workforce totaled 108.251 employees, a 3,2% decrease compared to the previous year.

Agricultural Solutions

In the agricultural solutions segment, sales fell 2,2% year-on-year to €9,587 billion.

EBITDA for the segment increased 16,1% to €1,925 billion. EBITDA before special items reached €2,081 billion, a 7,4% increase. The segment's cash flow was €1,505 billion.

In the fourth quarter, agricultural solutions saw a slight decline in sales. Higher volumes did not offset adverse exchange rate effects and slightly lower prices. In Europe, sales grew with higher volumes in herbicides. In North America, the result was close to that of 2024. In Asia and South America, Africa and the Middle East, sales declined due to exchange rates, prices and lower volumes, especially for insecticides and seeds.

The company has made progress in preparing for an initial public offering of its

agricultural business. The company aims for IPO readiness in 2027. The listing is expected to take place on the Frankfurt Stock Exchange. In January, BASF announced an agreement to acquire AgBiTech, a biological insect control company operating in Brazil, the United States, and Australia.

Projection for 2026

For 2026, BASF projects EBITDA before special items between €6,2 billion and €7,0 billion. The company estimates free cash flow between €1,5 billion and €2,3 billion. In the agricultural segment, the company forecasts a slight decrease in EBITDA before special items and a considerable reduction in cash flow. The projection

considers global GDP growth of 2,7% and chemical production of 2,4%.

Factsheet Q4/FY 2025

BASF Group[a]		Q4 2025	Q4 2024	Change (%)	FY 2025	FY 2024	Change (%)
Sales	million €	14,032	14,863	-5.6%	59,657	61,444	-2.9%
EBITDA	million €	1,019	1,109	-8.2%	5,618	6,211	-9.5%
Special Items in EBITDA	million €	-15	-325	95.4%	-936	-1,030	9.1%
EBITDA before special items	million €	1,033	1,434	-27.9%	6,554	7,240	-9.5%
Depreciation and amortization[b]	million €	1,171	1,532	-23.5%	3,984	4,400	-9.5%
Income from operations (EBIT)	million €	-153	-423	63.9%	1,634	1,810	-9.7%
Special items in EBIT	million €	-229	-903	74.6%	-1,253	-1,713	26.8%
EBIT before special items	million €	76	480	-84.1%	2,887	3,523	-18.1%
Net income from shareholdings	million €	1,382	-95	.	1,313	602	118.0%
Financial result	million €	-157	-148	-5.7%	-500	-552	9.4%
Income before income taxes	million €	1,073	-666	.	2,447	1,861	31.5%
Income after taxes from continuing operations		525	-769	.	1,540	1,288	19.6%
Income after taxes from discontinued operations		54	-2	.	185	165	12.2%
Income after taxes	million €	579	-770	.	1,726	1,453	18.8%
Net income	million €	560	-786	.	1,619	1,298	24.7%
Earnings per share[c]	€	0.63	-0.88	.	1.82	1.45	25.1%
of which from continuing operations		0.57	-0.87	.	1.63	1.29	27.2%
Adjusted earnings per share[c]	€	-0.34	0.59	.	2.24	3.51	-36.6%
of which from continuing operations		-0,41	0.51	.	1.89	3.09	-38.8%
Research and development expenses	million €	548	516	6.2%	1,995	1,969	1.3%
Personnel expenses	million €	3,206	2,622	22.3%	12,299	11,241	9.4%
Employees (December 31)		108,251	111,822	-3.2%	108,251	111,822	-3.2%
Assets (December 31)	million €	76,174	80,415	-5.3%	76,174	80,415	-5.3%
Investments including acquisitions[d]	million €	1,480	2,416	-38.8%	4,787	6,826	-29.9%
Equity ratio (December 31)	%	45.1%	45.9%	.	45.1%	45.9%	.
Net debt (December 31)	million €	18,329	18,781	-2.4%	18,329	18,781	-2.4%
Cash flows from operating activities	million €	3,635	3,456	5.2%	5,610	6,946	-19.2%
Free cash flow	million €	2,210	1,165	89.7%	1,342	748	79.5%

Segment data – Agricultural Solutions

Million €		2025	2024	+/-
Sales to third parties		9,587	9,798	-2.2%
of which Fungicides		2,838	3,014	-5.8%
Herbicides		3,059	2,965	3.2%
Insecticides		1,089	1,102	-1.2%
Seed Treatment		575	598	-3.8%
Seeds & Traits		2,026	2,119	-4.4%
Intersegment transfers		63	50	25.9%
Sales including transfers		9,650	9,848	-2.0%
EBITDA before special items		2,081	1,938	7.4%
Special items in EBITDA		-156	-279	44.3%
EBITDA		1,925	1,659	16.1%
EBITDA margin before special items	%	21.7	19.8	.
Depreciation and amortization[a]		583	675	-13.7%
EBIT before special items		1,500	1,270	18.1%
Special items in EBIT		-158	-286	44.9%
Income from operations (EBIT)		1,342	984	36.5%
Investments including acquisitions[b]		351	387	-9.2%
Segment cash flow		1,505	1,861	-19.2%
Assets (December 31)		14,243	15,377	-7.4%
Research and development expenses		990	919	7.8%

[a] Depreciation and amortization of property, plant and equipment and intangible assets (including impairments and reversals of impairments)
[b] Additions to property, plant and equipment and intangible assets

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BASF announces new global director of communications and government relations.

Thomas Biegi will take over the area starting in April and will report to the chairman of the board.

26.02.2026 | 13:42 (UTC -3)

Cultivar Magazine, based on information from Jens Fey

BASF has announced Thomas Biegi as its new global leader of corporate communications and government relations. He will assume the role on April 1, 2026. Biegi succeeds Nina Schwab-Hautzinger and will report to the Chairman of the Board of Executive Directors, Markus Kamieth.

Biegi, 47, serves as head of communications and government affairs at GSK in Germany. Previously, he was a senior vice president and head of Corporate Affairs at the biotechnology company MorphoSys. He participated in the company's transformation process and its acquisition by Novartis. The executive also held senior positions at Pfizer.

He holds a bachelor's degree in business administration and a master's degree in

media and communication studies from the Freie Universität Berlin.

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High temperatures impact the biological control of whiteflies.

Research identifies distinct thermal responses between Bemisia tabaci and parasitoids.

26.02.2026 | 10:35 (UTC -3)

Cultivar Magazine

Photo: Charles Olsen, USDA

Increased temperatures can reduce the effectiveness of biological control of whiteflies. Bemisia tabaciThe study evaluated the performance of the insect and two parasitoids in a thermal gradient from 20 ºC to 35 ºC and identified distinct physiological and molecular responses between the species.

The research analyzed development, survival, longevity, antioxidant activity, energy reserves, and transcriptomic profiles of *Bemisia tabaci*, *encarsia formosa* e *Eretmocerus hayati*The comparison highlighted ideal conditions at 26°C and a stress scenario at 32°C.

The results indicated a narrow temperature range, at 26 ºC, for the development and survival of the whitefly. *encarsia formosa*

Development accelerated at higher temperatures, but survival rates dropped sharply above 32°C. *Eretmocerus hayati* It maintained high survival rates and stable development up to 32°C and outperformed other species at 35°C.

Longevity decreased with increasing temperature for all three species. Under thermal stress, each insect exhibited specific alterations in antioxidant systems and metabolism. Transcriptome analysis revealed differential expression of genes linked to oxidative stress, energy metabolism, and response to thermal shock.

Scientists point to distinct heat tolerance limits and divergent adaptive strategies between the pest and its natural enemies.

The evidence provides a basis for adjustments in biological management in the face of climate warming.

Further information at doi.org/10.1002/ps.70676

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Dew anticipates flowering in plants.

Microdroplets on leaves generate nitric oxide and suppress ABA synthesis.

26.02.2026 | 08:20 (UTC -3)

Cultivar Magazine

Plants in the Brassicaceae family flower earlier after dew events. Microdroplets on the leaves trigger chemical reactions that

increase nitric oxide and reduce abscisic acid. The process anticipates the reproductive transition. The evidence combines molecular assays in *Arabidopsis thaliana* and analysis of 12.692.736 global flowering records. The data are from a study by scientists at the Chinese Academy of Sciences.

Researchers observed that the temperature increase alone does not explain the earlier flowering. Plants grown in greenhouses did not flower earlier due to temperature adjustment alone. The group proposed a link with atmospheric humidity. Warmer air retains more vapor. This condition favors the formation of dew earlier in the year.

The study tested the effect of dew on leaves of *Arabidopsis thaliana* Microdroplets form on trichomes. At these interfaces, water generates reactive oxygen species. The reactions produce hydroxyl radicals and hydrogen peroxide. The peroxide reacts with amine groups and forms nitric oxide (NO). The NO migrates into the cells and activates a redox cascade.

Exposure to dew

After 24 hours of exposure to dew, leaves showed a greater accumulation of NO. The activity of the nitric oxide synthase enzyme did not change. The result indicates an extracellular chemical origin of the NO in the microdroplets.

NO promotes S-nitrosylation of histone deacetylase HDA19 via GRXS17. The modification increases deacetylase activity. The complex represses genes for abscisic acid biosynthesis, such as AAO3 and ABA2. Plants treated with microdroplets exhibited a progressive decrease in ABA from approximately 5-6 ng/g to less than 2 ng/g between 7 and 15 days after the two-leaf stage. Plants initiated stem elongation and flowered approximately one week after treatment. Control plants maintained the vegetative phase.

Mutants with a mutation point in HDA19 that prevents S-nitrosylation did not reduce ABA or alter flowering time under dew. This data reinforces the role of redox

modification in controlling flowering.

in the field

At the field scale, the authors compiled 138.580 georeferenced observations of 478 species in 81 genera of Brassicaceae, between 1990 and 2023. The dataset totals 12.692.736 flowering events. Mixed models indicated dew point as the most relevant positive predictor of flowering frequency. The contribution of dew point reached 0,118, with P = 1,18 x 10??. The interaction between dew point and visibility also showed a positive effect. Precipitation, sea level pressure, and visibility alone exhibited negative associations.

Half of the flowering events occurred up to one week after a period with dew condensation in regional analyses in the Netherlands. The association persisted after controlling for photoperiod by latitude, longitude, and day of the year.

The authors propose that leaf microdroplets act as an additional modulator of flowering, alongside photoperiod and temperature. The mechanism may reach other leafy plants before flowering. The hypothesis suggests implications for management. Producers could test leaf mist to induce earlier flowering or increase production, according to the authors.

Further information at doi.org/10.1073/pnas.2527021123

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Kepler Weber closes 2025 with revenue of R$ 1,5 billion.

International business, replacement parts, and services are advancing and mitigating the contraction in the domestic market.

26.02.2026 | 07:33 (UTC -3)

Cultivar Magazine

Kepler Weber ended 2025 with net revenue of R$1,5 billion. This represents a 7,3% decrease compared to 2024. Net

profit totaled R$156,3 million for the year. The net margin reached 10,5%. In 2024, profit reached R$199,2 million, with a margin of 12,4%.

The company attributed the performance to a more restrictive investment environment, with less cost dilution and pressure on margins in segments more closely linked to rural credit.

Total EBITDA reached R$ 231,9 million in 2025, a 29,4% decrease compared to the previous year. The EBITDA margin was 15,6%. In 2024, the indicator reached R$ 328,7 million, with a margin of 20,4%.

International Business recorded the best performance in the segment's history over the last ten years, in terms of revenue and volume. The area generated R$ 237,7

million in revenue in 2025, a 19,4% increase. Argentina accounted for 23% of international revenue during the period, with a 16-fold increase over the previous year.

Replacement and Services also saw growth. Revenue reached R$ 310,9 million, a 10,1% increase year-on-year. The result reflected higher demand for renovations, modernizations, and higher value-added equipment.

The Farms segment, however, generated R$ 469,7 million in revenue, a decrease of 9,7%. Agribusinesses totaled R$ 405,2 million, a contraction of 17,8%. The company cited greater selectivity in investments, high financial costs, and pressure on margins as factors that impacted performance.

Ports and Terminals recorded revenue of R$ 66,9 million in 2025, a 41,0% reduction compared to 2024, influenced by the recognition profile of long-term contracts.

ANEXO I DEMONSTRAÇÃO DE RESULTADOS CONSOLIDADOS | Acumulado

(Em milhares de reais, exceto porcentagens)	12M25 (A)	AV%	12M24 (B)	AV%	AH% (A)/(B)
Receita Operacional Líquida	**1.490.300**	100,0%	**1.607.297**	100,0%	-7,3%
Custo dos Produtos Vendidos e dos Serviços Prestados	**(1.128.089)**	-75,7%	**(1.126.092)**	-70,1%	0,2%
Lucro Bruto	**362.211**	24,3%	**481.205**	29,9%	-24,7%
Despesas com vendas	(102.651)	-6,9%	(101.427)	-6,3%	1,2%
Perdas pela não recuperabilidade de ativos financeiros	(3.933)	-0,3%	290	0,0%	-1456,2%
Despesas gerais e administrativas	(96.429)	-6,5%	(100.807)	-6,3%	-4,3%
Outras receitas (despesas) operacionais líquidas	34.722	2,3%	9.923	0,6%	249,9%
Lucro (Prejuízo) Operacional	**193.920**	13,0%	**289.184**	18,0%	-32,9%
Despesas financeiras	(81.885)	-5,5%	(64.544)	-4,0%	26,9%
Receitas financeiras	76.600	5,1%	63.136	3,9%	21,3%
Resultado Antes do IR e da CSLL	**188.635**	12,7%	**287.776**	17,9%	-34,5%
Imposto de Renda e Contribuição Social Correntes	(27.337)	-1,8%	(73.192)	-4,6%	-62,7%
Imposto de Renda e Contribuição Social Diferidos	(5.028)	-0,3%	(15.401)	-1,0%	-67,4%
Imposto De Renda e Contribuição Social	**(32.365)**	-2,2%	**(88.593)**	-5,5%	-63,5%
Lucro Líquido	**156.270**	10,5%	**199.183**	12,4%	-21,5%

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Syngenta and MS Technologies announce Enlist E3 Expansion

New soybean variety expands number of active ingredients and aims for commercial launch in 2029.

25.02.2026 | 15:25 (UTC -3)

Cultivar Magazine

Syngenta and MS Technologies, LLC announced Enlist E3 Expansion soybeans during the Commodity Classic 2026 in the United States. The new technology

increases herbicide tolerance and is expected to reach the market in 2029, following regulatory approvals.

The company says the set of characteristics includes tolerance to glyphosate, glufosinate, 2,4-D choline, and multiple HPPD inhibitors.

The package also includes pre-emergent tolerance to HPPD inhibitors, such as mesotrione, bicyclopyrone, and isoxaflutole.

According to the companies, the technology combines productive potential with greater flexibility in weed management. The increased tolerance allows for the inclusion of molecules already used in corn, without increasing the complexity of the production system.

Following regulatory approval, Syngenta plans to release cultivars under the Golden Harvest and NK Seeds brands and license materials through GreenLeaf Genetics. MS Technologies intends to market through Stine Seed Company, Merschman Seeds, and Latham Hi-Tech Seeds, in addition to licensing through Peterson Genetics.

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Corteva expects to complete the spin-off in the fourth quarter of this year.

Company to separate seed and pesticide businesses

25.02.2026 | 14:26 (UTC -3)

Cultivar Magazine

Corteva projects completing the separation into two listed companies in the fourth quarter of 2026. The company confirmed the timeline during a Bank of America

conference held today. split He will create one company focused on crop protection and another dedicated to seeds and advanced genetics.

CEO Chuck Magro announced that the company will reveal the headquarters, leadership, and CEO of the new Corteva in the first half of the year. The net financial impact of doubling the board and leadership structure is expected to be close to US$100 million annually.

In the crop protection sector, Corteva assesses that the industry is going through a downturn, driven by supply rather than demand. The company forecasts market expansion in 2026, with growth in volume and pressure on prices.

The company maintains a $9 billion pipeline in crop protection. The portfolio includes half a dozen new active ingredients and several biologicals. Executives highlighted consistent growth in global demand and the potential for consolidation in the sector.

In the seed segment, the company highlighted its technology licensing strategy. Management reported that the net royalty position should reach neutrality in 2026, two years ahead of schedule. Five years ago, the negative balance was around US$700 million.

Corteva is also betting on hybrid wheat. The company plans to launch the technology in the United States in 2027. Management estimates a revenue potential of US$1 billion over the next

decade.

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AGCO presents innovations at Commodity Classic 2026

The company's brands bring practical solutions and expert guidance to producers.

25.02.2026 | 14:03 (UTC -3)

Beatriz Voltani, edition of Cultivar Magazine

AGCO presents its Fendt, Massey Ferguson and PTx brands at Commodity Classic 2026, in San Antonio, Texas, which runs until next Friday (27). More than 2.200 square meters of exhibition

space highlight the brands’ latest precision agriculture equipment, modernization innovations and advanced autonomy solutions, as well as opportunities for participants to connect with experts and learn about AGCO solutions.

"Commodity Classic provides us with the ideal environment to meet with professional farmers and help them explore the latest solutions that can boost their operations," said Mike Long, vice president of marketing at AGCO.

"Our booths bring together advanced equipment, modernization technology, and state-of-the-art autonomy, all designed for the real needs of farmers. We are excited for participants to experience these innovations firsthand and discover how

AGCO can support their productivity and success in 2026," he adds.

Fendt Presentation

Fendt highlights its latest advancements in power, precision, and autonomy with the launch of the Fendt 500 Vario Series, which combines compact size with performance, the FendtONE platform, and smart farming features for industry-leading versatility.

O Fendt 800 Vario Gen5 It redefines productivity with its premium comfort features, including a massage seat and UltraVision LED lighting, as well as offering exceptional maneuverability and fuel economy.

Equipped with the Trimble OutRun PTx grain wagon and soil preparation solutions, the tractor Fendt 1000 Vario Gen4 It showcases the future of agriculture with fully autonomous operations. Participants will also be able to check out the cleaning and automation performance updates for the Fendt IDEAL combine harvester.

Massey Ferguson Highlights

Massey Ferguson highlights its latest advancements in reliable and uncomplicated equipment, enhanced with intuitive and field-proven technological solutions such as implement management (TIM) and PTx FarmEngage.

The exhibition will feature MF 9S tractor Along with the 500R sprayer and planter, this demonstrates the brand's commitment to providing practical, high-performance equipment for all operations.

Massey Ferguson will also introduce MF Always Running, an integrated warranty program designed to provide ownership predictability, reduce risk, and maximize uptime for today's farmers.

PTx Products

The PTx booth will highlight innovative products from the Precision Planting and PTx Trimble brands. Key new products announced at the recent Winter Conference include the Precision Planting

ArrowTube, a seed guidance device, and the Precision Planting SymphonyVision Duo, an intelligent spraying system that enables full-area and targeted spraying in a single pass.

Also on display will be the PTx Trimble OutRun, an adaptive autonomous driving system designed to increase efficiency in the field. PTx experts will be available to discuss with producers improvements that can be implemented in their operations to achieve gains in productivity, cost savings, and efficiency.

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Case IH unveils new Optum tractors in the United States.

Manufacturer highlights increased power, automation, and soil conservation.

25.02.2026 | 11:24 (UTC -3)

Cultivar Magazine, based on information from Jessie Koerner

Case IH is showcasing new Optum tractors and the Nutri-Tiller 1000 series at

the Commodity Classic in Racine, Wisconsin, USA. The company highlighted increased power, connectivity, and soil conservation solutions.

The brand promoted the launch in North America of the new generation of Optum tractors. These tractors were launched during Agritechnica 2025 in Germany (see here e hereThe line offers three models with power ranging from 360 to 435 hp. The equipment caters to grain and livestock operations throughout the year.

The new models utilize a brand-new version of the Cursor 9 engine. The assembly delivers traction power and durability. The system operates at low idle speeds. This solution reduces fuel consumption. Thermal management

maintains the ideal operating temperature.

The independent front suspension enhances comfort and stability both in the field and on the road. The integrated tire inflation system allows for pressure adjustment directly from the cab. This feature improves traction and reduces soil compaction. The technology also extends tire life and promotes efficient transportation.

The tractors feature increased fuel capacity, transport speeds of up to 37 miles per hour, and a braking system designed for heavy-duty transport. The high-capacity hydraulic system meets the demands of demanding implements. The cab offers a quiet environment and access to real-time operational information via

Case IH FieldOps.

Nutri-Tiller

The Nutri-Tiller 1000 series expands the portfolio of soil preparation solutions. The equipment works with the strip-till concept. The tool reduces the number of passes and operating costs. The system creates a

uniform strip with an appropriate ridge shape. This practice promotes vigorous initial emergence and productive potential.

The Nutri-Tiller 1000 integrates FieldOps for managing guide lines and creating prescriptions. Active Implement Guidance keeps planting within the prepared rows. The Pro 1200 monitor centralizes control of operations.

The company also offers automation features for all stages of the harvest. FieldOps centralizes fleet data from different brands. The system allows remote access to information on machines, areas, and teams.

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Agrodefesa reinforces inspections against Amaranthus palmeri

A quarantine pest with a high dispersal capacity threatens crops and prompts inspections in Goiás.

25.02.2026 | 10:31 (UTC -3)

Cultivar Magazine, based on information from Agrodefesa

The Goiana Agricultural Defense Agency (Agrodefesa) has intensified the work of state agricultural inspectors in the field to prevent the entry and spread of Amaranthus palmeri in Goiás. The invasive species was recently registered in the São José do Rio Preto region, in São Paulo. Mato Grosso and Mato Grosso do Sul also have confirmed cases.

The president of Agrodefesa, José Ricardo Caixeta Ramos, advises farmers to pay closer attention to management practices on their properties.

Leonardo Macedo, the Plant Health Manager at Agrodefesa, explains that *Amaranthus palmeri* It is an exotic weed that grows rapidly and is highly aggressive. The species exhibits high resistance to

herbicides and a great capacity for dispersal.

Agrodefesa has expanded phytosanitary inspections in soybean and corn crops grown in succession. Inspectors are intensifying monitoring on farms and providing guidance to producers on pest identification and management.

The spread occurs mainly through contaminated agricultural machinery and implements, as well as mixing with other seeds. The agency recommends rigorous equipment sanitization, the use of certified seeds, and constant vigilance in cultivation areas to prevent the introduction of the pest into Goiás territory.

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Citrus redirects vascular development to contain HLB in the roots.

Single-core sequencing reveals delayed phloem formation and xylem reinforcement.

25.02.2026 | 08:24 (UTC -3)

Cultivar Magazine

Photo: Jeffrey W Lotz

The infection by *Candidatus Liberibacter asiaticus* (CLas), the agent of huanglongbing (HLB), causes citrus to reprogram the vascular system in the roots. The plant reduces phloem differentiation and intensifies the formation of xylem cells associated with defense. The process involves the activation of genes linked to lignification and phenylpropanoid metabolism.

Researchers at the Citrus Research Institute at Southwest University applied single-nucleus RNA sequencing to root tips of infected Rangpur lime. The team generated the first cellular atlas of the citrus root immune response to HLB.

The analysis identified 20 cell clusters and five main vascular types. The infection

induced a coordinated response in all cell types. Genes associated with transcription factors, pathogenesis-related proteins, and autophagy showed increased expression. Genes linked to cytoskeleton organization and membrane signaling showed a reduction.

Cellular trajectory

Cell trajectory analysis indicated a delay in the differentiation of cambium cells into phloem. The phloem constitutes the main niche of the pathogen. In parallel, the cambium directed differentiation towards the xylem. These cells exhibited enrichment of genes associated with stress response, phenylpropanoid metabolism, and lignin biosynthesis.

Staining with toluidine blue confirmed lignin accumulation in infected vascular tissues. The structural reinforcement suggests a physical barrier to bacterial growth.

The study also identified the transcription factor DOF2.4 as a potential regulator of the connection between vascular development and defense. Overexpression of CjDOF2.4 in transformed roots increased the expression of genes linked to lignin and flavonoids. The roots showed epidermal desquamation, irregular cell growth, and increased hydrogen peroxide. Genes associated with H2O2 degradation showed reduced expression.

Hormonal regulation

The infection also altered hormonal regulation. Genes linked to auxin and gibberellin showed reduced expression in cambium and phloem cells. Genes related to cytokinin and jasmonate showed increased expression. The hormonal balance indicates a redirection of development in favor of defense.

The results indicate that citrus limit the progression of CLas by suppressing more susceptible tissues and strengthening lignified cells. Cell mapping points to targets for molecular improvement, gene editing, and selection of rootstocks with greater tolerance to HLB.

Further information at doi.org/10.1093/hr/uhaf265

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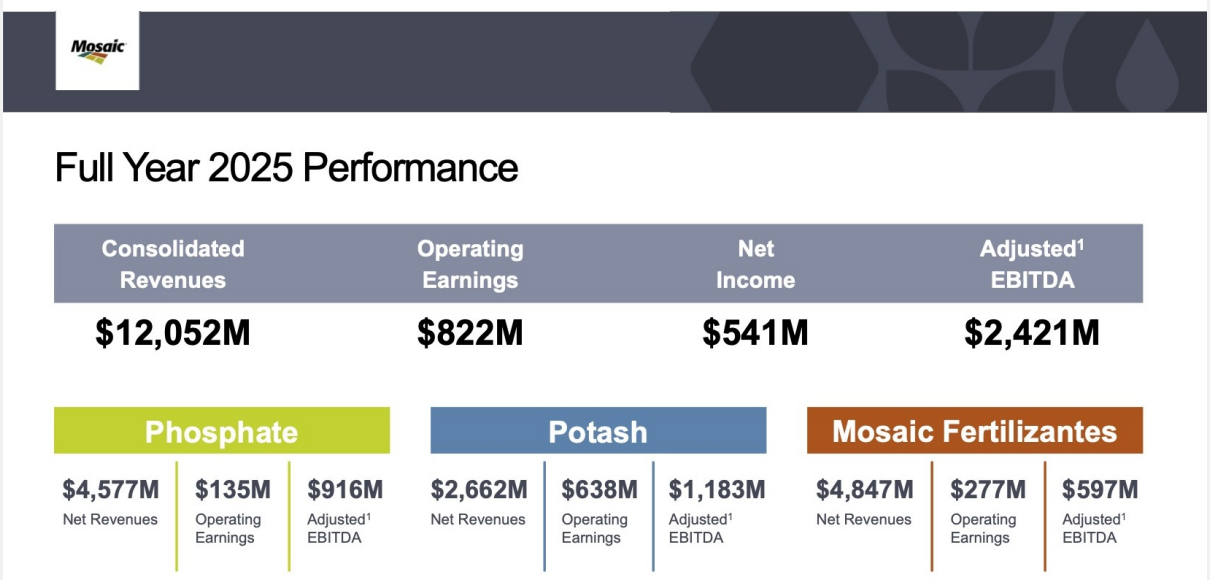
Mosaic announces 2025 results

Company reports a loss of US$519 million in the fourth quarter.

25.02.2026 | 07:24 (UTC -3)

Cultivar Magazine, based on information from Ben Pratt



Mosaic reported net income of US$541 million in 2025. Adjusted EBITDA totaled US$2,4 billion. In the fourth quarter, the company recorded a net loss of US$519 million, impacted by non-recurring items and weak demand in the United States.

Net revenue reached $12,1 billion in 2025, up from $11,1 billion in 2024. Diluted earnings per share closed the year at $1,70. In the fourth quarter, revenue reached $3 billion.

In the potash segment, Mosaic increased its adjusted EBITDA to US$1,18 billion in 2025, compared to US$944 million in the previous year. Total production reached 8,8 million tons. The company projects approximately 9 million tons in 2026.

Potassium sales totaled 9 million tons in 2025. The average MOP FOB mine price reached US$255 per ton, up from US$222 in 2024.

In the phosphate segment, revenue reached US$4,6 billion in 2025. Adjusted EBITDA fell to US$917 million, compared

to US$1,2 billion in 2024. The decline reflected higher costs and lower sales volumes.

Phosphate production totaled 6,3 million tons in 2025. In the fourth quarter, the company produced 1,7 million tons. Mosaic projects volumes equal to or greater than 7 million tons in 2026.

Mosaic Fertilizantes reported an operating profit of US$277 million in 2025, a 16% increase. Adjusted EBITDA rose 65% to US$567 million. In the fourth quarter, the segment had an operating loss of US$26 million.

The company estimates investments of approximately US$1,5 billion in 2026. Free cash flow was negative US$535 million in 2025, following capital outlays of US$1,36

billion.

For the first quarter of 2026, Mosaic projects phosphate sales between 1,7 million and 1,9 million tons. The company estimates DAP prices between US$640 and US$670 per ton. For potash, the projection indicates sales between 2 million and 2,2 million tons, with prices between US$255 and US$275 per ton.

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John Deere introduces new 8R and 8RX tractors with up to 540 hp.

New generation expands power range and incorporates JD14 with improved IPM.

25.02.2026 | 07:12 (UTC -3)

Cultivar Magazine, based on information from Jenni Badding

John Deere has announced the launch of six new 8R and 8RX models with power options up to 540 hp in the United States. The new generation expands the power range with versions of 440 hp, 490 hp, and 540 hp.

The manufacturer has been developing the 8 series for over 30 years. The company redesigned the new models based on customer demands. The increased power output addresses the search for greater operational capacity.

According to Michael Porter, John Deere's large tractor marketing manager, the new models allow planting up to 1.200 acres per day in short weather windows. The tractors operate with planters with more than 24 rows, large grain trailers, and medium seeders.

The tractors leave the factory prepared for autonomous soil preparation operations. The cab integrates a G5Plus monitor. The system accesses technologies such as AutoTrac Turn Automation, AutoTrac Implement Guidance, and AutoPath. The models feature Machine Sync and the option of JDLink Boost connectivity for capturing field and machine data.

JD14 engine

The 8R and 8RX models utilize the JD14 engine. The assembly delivers maximum power on demand. The Intelligent Power Management system has evolved with the option of peak power. This feature releases an additional 40 hp at 1.900 rpm and maintains maximum power up to

1.700 rpm. The system achieves up to 634 hp in hydraulic, PTO, transport, or external electrical supply applications.

The line incorporates an engine brake option. This feature reduces the need to use the main braking system. The solution enhances control when transporting heavy loads and on inclines.

Hydraulic system

The hydraulic system has gained greater pumping capacity. The design separates the power steering and brake pumps. The front axle received an upgrade to the Independent Link Suspension. The assembly supports greater weight and includes roll control. The vehicle reaches 60 km/h in transport.

The rear lift supports 24 pounds. The active downforce system maintains a constant depth on mounted implements. The rear PTO offers a 1.300 rpm option. The model accepts front hitch and front PTO.

The Reactive Command Steering system automatically centers the steering wheel.

The operator chooses three settings. The narrow chassis allows for a reduced turning radius. The manufacturer reports a turning radius more than 6 feet smaller than competitors.

The Electric Variable Transmission allows for the supply of electrical power to electrically driven planters. The operator connects the implement using a single plug. The line features new CommandX, CommandX Plus, and CommandX Pro controls. The system includes push-button start with PIN access.

Acceleration controls

The cabin includes new engine throttle controls and a convenience display for adjusting the radio, air conditioning, seat,

and phone. The design incorporates an inductive cell phone charger, independent electric armrest adjustment, and an option for a power-operated door.

The engine oil, coolant, and hydraulic fluid gauges are at eye level. The air filter and fuel and AdBlue fillers are located from the ground. The hydraulic oil change interval has been extended from 1.500 to 2.000 hours. The windshield wiper now has a 330º sweep. The main battery switch and jump start are located next to the door.

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John Deere expands automation in X9 and S7 combines to 2027.

Updates integrate systems, include six new crops, and increase productivity by up to 20%.

25.02.2026 | 06:55 (UTC -3)

Cultivar Magazine, based on information from Jenni Badding

John Deere has announced updates to its 2027 model year X9 and S7 combines and

its line of platforms in the United States. The manufacturer has incorporated new features for automation, threshing, grain handling, and operation.

Harvest Settings Automation now operates with six new crops: lentils, peas, rye, triticale, oats, and sunflowers. The system already supported corn, soybeans, wheat, barley, canola, and rice. The technology automatically adjusts concave opening, rotor rotation, fan speed, sieve opening, and straw walker opening. The operator sets limits for grain loss, foreign material, and broken grains. The system maintains the parameters within the defined limits based on the machine model, crop type, and geolocation.

Predictive Ground Speed ??Automation is also receiving updates. The system controls travel speed based on crop height and biomass. It uses satellite imagery before harvest and cameras installed in the cab during operation. The system considers terrain maps to adjust speed in sensitive areas. For 2027, the manufacturer includes Green Crop Detection. This feature identifies green plants in mature crops using a trained algorithm and greater processing capacity. The function adjusts speed in response to a greater variation in conditions.

Machines equipped with Predictive Ground Speed ??Automation now accept productivity targets defined by the operator. The system links speed and

grain quality. The adjustment aims to keep losses within acceptable levels. The manufacturer has integrated the speed and harvesting adjustment systems. This integration allows for a joint response to the parameters defined by the producer.

Upgrade packages

The company is launching Precision Upgrade Combine Automation packages. Customers who purchased the Select package on S7 or X9 models from model year 2025 or newer can upgrade to the Premium or Ultimate versions. Those who purchased the Premium version can upgrade to Ultimate. The kits unlock advanced automation features without the need for a new machine.

Among the new features, the 2027 model year X9 comes standard with a pre-cut opening in the clean grain elevator for HarvestLab installation. The X9 and S7 series can be fitted with JDLink Boost as standard. The receiver ensures satellite connectivity in areas without mobile signal. The system transmits data in real time to the John Deere Operations Center.

The manufacturer includes an option for an electrically operated ladder on the X9 and S7. The X9 receives a 35-foot discharge tube. This component increases the distance between the platform and the tube by 1,22 meters, allowing the machine to accept wider platforms. The company offers an optional 550-bushel grain tank on the X9. This component increases the interval between discharges and includes

reinforced final drive reducers.

In the platform line, the company is launching the CF27 with 27 rows and 20-inch spacing. The 2027 platforms can be automated to control the husking plates and the rear axle rotation. This feature aims to increase productivity and reduce grain losses.

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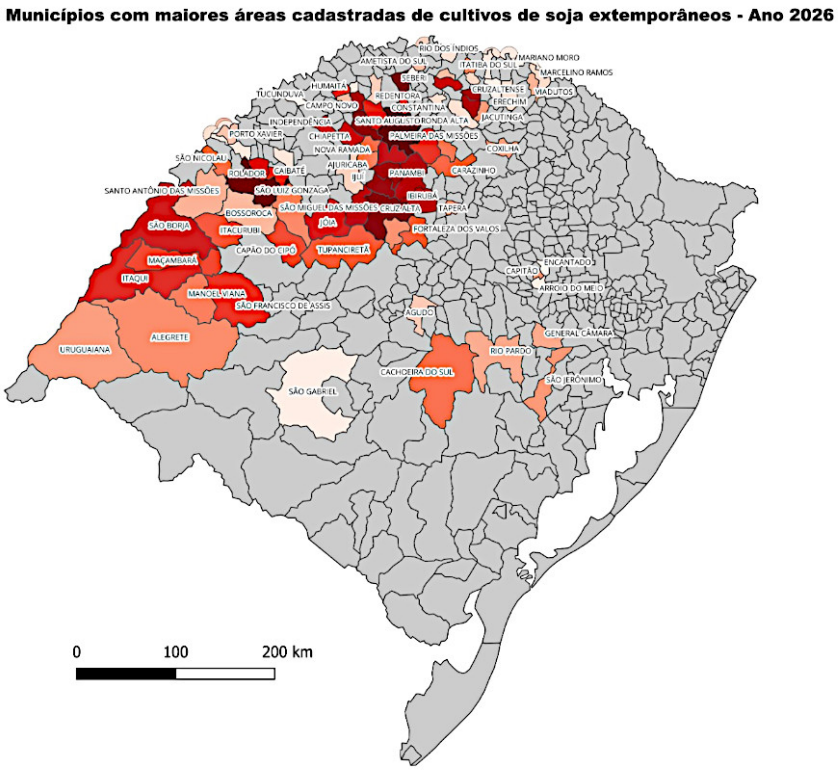
In Rio Grande do Sul, out-of-season soybeans are grown on nearly 38 hectares.

Planting was authorized by the Department of Agriculture following a request from the producers.

24.02.2026 | 15:05 (UTC -3)

Cultivar Magazine, based on information from the Department of Agriculture of Rio Grande do Sul.



The state of Rio Grande do Sul has 38 hectares cleared for soybean planting outside the official calendar. Producers had until February 15th to request and carry out the late planting with the Department of Agriculture (Seapi).

The calendar defined by the Ministry of Agriculture and Livestock for the 2025/26 crop season set the window between October 1, 2025, and January 28, 2026. The rules follow the National Program for the Control of Asian Soybean Rust.

Rain during the corn growing cycle and the late harvest motivated the requests. "The rainy period during the corn crop caused the cycle to lengthen, delaying the planting of soybeans, which occurs right after the corn harvest in the same area," says the

head of the Plant Health Defense Division of Seapi, Deise Feltes Riffel.

The authorized areas are distributed across 78 municipalities in Rio Grande do Sul. The highest concentration occurs in the Northwest and Missões regions. In total, 264 requests were approved. In the 2024/2025 harvest, the state registered eight requests.

The smallest area cleared is 0,8 hectares. The largest reaches almost 9 hectares.

Deise warns of the phytosanitary risk. "Producers need to be vigilant and carry out treatments for Asian soybean rust, as sowing outside the official calendar is a risk factor for the emergence of this pest, increasing costs," she says.

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Continuous selection increases whitefly resistance to thiamethoxam.

Demographic and transcriptomic analyses indicate adaptive cost and overexpression of P450 genes.

24.02.2026 | 14:03 (UTC -3)

Cultivar Magazine

Photo: W Billen, Pflanzenbeschaustelle

The whitefly Bemisia tabaci The strain developed 32,46 times greater resistance to thiamethoxam after 15 generations of continuous selection in the laboratory. The LC50 value increased from 3,31 mg/L in the susceptible strain to 107,35 mg/L in the selected strain. The study, by Chinese researchers, also recorded significant adaptive costs and cross-resistance.

Scientists selected a population of the MED biotype collected in Beijing. The susceptible strain remained unexposed to insecticides for two years. Then, the authors applied thiamethoxam via soil irrigation for 15 consecutive generations. At each cycle, they adjusted the concentration based on the LC50 determined by bioassay.

Inherited resistance

The realized heritability of resistance reached 0,183. The model indicated that approximately 10 generations under 50% mortality are sufficient to increase the LC50 tenfold. Under higher pressures, the number of generations drops to less than five when mortality reaches 90%. The result points to rapid evolution under high selection pressure.

Adaptive cost

The resistant strain showed delayed development and reduced longevity. The pre-adult period increased by 0,95 days. Average longevity decreased by 11,13 days for females and 5,95 days for males.

Oviposition duration decreased by 8,37 days. Fecundity decreased by 32,69 eggs per female.

Demographic parameters confirmed the adaptive cost. The intrinsic population growth rate fell from 0,1179 to 0,1090. The net reproduction rate decreased from 34,71 to 20,41. Relative fitness reached 0,92 based on re and 0,65 based on R0.

Cross-resistance

Bioassays indicated cross-resistance to other neonicotinoids. The resistant strain exhibited a resistance ratio of 27,80 times to clothianidin. It also showed 4,96 times resistance to imidacloprid and 3,85 times resistance to nitenpyram. The population

maintained relative susceptibility to dinotefuran, acetamiprid, and thiacloprid. The group also remained susceptible to abamectin, spinetoram, and deltamethrin.

Transcriptomic analysis identified 2.450 differentially expressed genes between the strains. The total included 1.477 genes with higher expression in the resistant population. The enriched pathways involved metabolism, response to xenobiotics, and ABC transporters.

Validation by qRT-PCR confirmed overexpression of 11 genes linked to detoxification. Eight belong to the cytochrome P450 family. The CYP4G15 and CYP6CM1 genes showed an increase of more than seven times. The study also recorded induction of one glutathione S-

transferase and two UDP-glycosyltransferases.

RNA interference

RNA interference reduced CYP4G15 expression by 43%. After silencing, mortality increased when resistant adults received thiamethoxam and clothianidin. Analysis of nicotinic acetylcholine receptor subunits did not detect mutations associated with resistance.

The authors link resistance to increased metabolic detoxification. The study suggests rotation with insecticides of other modes of action to counteract selection.

Further information at doi.org/10.1016/j.pestbp.2026.107037

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Jonas Cuzzi assumes the role of marketing director at PI AgSciences in Brazil.

Executive with over 20 years in agribusiness wants to strengthen the brand.

24.02.2026 | 07:54 (UTC -3)

Cultivar Magazine, based on information from PI AgSciences

Jonas Cuzzi takes over as marketing director for PI AgSciences in Brazil. The

executive has over 20 years of experience in agribusiness, with stints in sales and marketing at national and international companies.

A graduate of the Luiz de Queiroz School of Agriculture, he holds an MBA in marketing from the Getúlio Vargas Foundation. Throughout his career, he has built experience in strategy and business development at companies such as Adama, Syngenta, FMC, and Nitro.

In leadership positions, he led brand strategies, portfolio management, innovation, and execution. He also spearheaded initiatives focused on sustainable business growth.

At PI AgSciences, Cuzzi takes on the mission of strengthening the brand in

Brazil. The plan includes market development and portfolio consolidation. The executive will also lead the marketing area in building growth and expansion strategies.

“PI AgSciences has a unique and patented platform of products that help farmers achieve greater production stability and profitability. These are technologies that are still not widely available in the Brazilian market, but I believe they will become a reality for most producers in the short term,” says Cuzzi.

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PlantArcBio licenses genes to Helix Seeds.

Partnership targets Brazil and Argentina with a focus on hybrids adapted to the second crop season.

24.02.2026 | 07:23 (UTC -3)

Cultivar Magazine, based on information from PlantArcBio

PlantArcBio has signed a licensing agreement with Helix Sementes e Biotecnologia, part of the Agroceres Group, to develop and commercialize new corn varieties focused on increased productivity and drought tolerance in South

America. The initiative prioritizes Brazil and Argentina.

Under the contract, Helix licensed proprietary genes from PlantArcBio linked to yield gains and greater tolerance to water deficit. The company will incorporate the genes into elite maize germplasm and advance the development of commercial hybrids aimed at the main producing markets in the region.

PlantArcBio identified the genes using the DIP platform, which allows for the large-scale discovery of genes with consistent agronomic impact. In partnership with Rallis India, part of the Tata group, the company introduced these genes into corn. The results delivered significant and consistent productivity gains under

irrigation and also under water stress.

The collaboration with Helix brings validated technology to germplasm adapted to South American conditions. This move accelerates the advancement of competitive hybrids.

According to Dror Shalitin, CEO of PlantArcBio, combining genetic technology with Helix's commercial lines could result in high-performance hybrids with greater climate resilience.

Urbano Ribeiral Jr., CFO of the Agroceres Group, stated that drought-tolerant corn represents a significant advancement for Brazilian producers, especially given the climatic conditions of the second crop. He highlighted that the incorporation of these genes into elite germplasm supports the

development of hybrids for grain and silage, focusing on the main agronomic challenges in the field.

PlantArcBio works in the development of proprietary gene discovery and editing technologies and RNAi-based solutions to improve crop performance and sustainability. Helix is ??part of the Agroceres Group and conducts breeding and commercialization programs for maize genetics adapted to the conditions of Brazil and South America.

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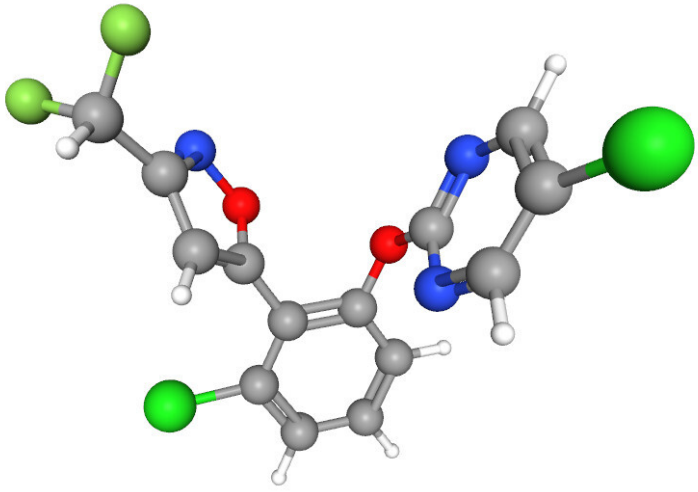
FMC obtains classification for herbicide with dual mode of action.

The Herbicide Resistance Action Committee classified rimisoxafen in Groups 12 and 32.

24.02.2026 | 07:08 (UTC -3)

Cultivar Magazine, based on information from FMC



FMC Corporation announced that the Herbicide Resistance Action Committee

has classified rimisoxafen (C14H7Cl2F2N3O2, CAS 1801862-02-1) as a dual-mode-of-action herbicide, falling under HRAC Groups 12 and 32. This is the committee's first such classification.

The recognition considers the molecule's ability to simultaneously inhibit phytoene desaturase (PDS) and solanesyl diphosphate synthase (SDPS), two critical biochemical pathways in weeds. According to the company, this dual mechanism hinders the survival and adaptation of weeds, creating a new tool in resistance management.

According to Seva Rostovtsev, executive vice president and chief technology officer, studies indicate control of *Amaranthus* spp.

The company is targeting rimisoxafen for large-scale crops such as corn, soybeans, cereals, legumes, and sunflowers. The product should expand the control of problematic broadleaf weeds, including resistant populations.

FMC plans to begin regulatory filings in strategic markets starting in 2026.

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Rovensa Next launches biofungicide and fertilizer in the North American market.

Typhoon expands disease control and Galactek increases productivity with a focus on integrated biosolutions.

23.02.2026 | 15:15 (UTC -3)

Cultivar Magazine, based on information from Elisa Lipperheide Vallhonrat

Rovensa Next announced the launch of two products in the North American market: the biofungicide Typhoon and the fertilizer Galactek. These solutions expand the company's portfolio and reinforce its strategy of integrated biosolutions to increase performance and profitability in the field.

Typhoon is used to control diseases in the field and in greenhouses. The product controls *Botrytis*, mildew, *Alternaria* e *Phytophthora*Recommended for resistance management, it does not require a re-entry interval or a pre-harvest interval. Allows application up to harvest and rotation with other fungicides.

Classified in section 25b of FIFRA, Typhoon contains potassium sorbate. The

recommendation includes use with an acidifier for greater effectiveness. Trials indicated powdery mildew control with doses between 50 and 100 oz/A.

Galactek functions as a soil conditioner and root promoter. Its formulation combines low molecular weight organic acids, a wetting agent, and Metabol-8 technology. The product increases nutrient availability, promotes root development, and enhances the metabolic efficiency of plants.

In processing tomatoes, Galactek increased the percentage of perfect fruits from 80,34% to 87,5%. Productivity rose from 62,5 to 67 tons paid per acre. Sugar content increased from 3,5% to 4,5%. In corn, trials in New York recorded gains of 3 to 4 bushels per acre, with areas

reaching up to 7 bushels under stress.

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Hormonal manipulation increases productivity and resistance in plants.

University of Colorado study restores cytokinin signaling in immune-enhanced plants.

23.02.2026 | 13:50 (UTC -3)

Cultivar Magazine

Photo: Colorado State University

Researchers at Colorado State University have identified a strategy to increase the reproductive yield of immune-activated plants without compromising disease resistance. The group restored cytokinin levels in autoimmune mutants of *Arabidopsis thaliana* and achieved increased production of siliques and seeds, as well as enhanced resistance to biotrophic and necrotrophic pathogens.

Plants activate defense mechanisms when they detect pathogens. This process involves hormones such as salicylic acid and jasmonate. Constant activation of immunity reduces growth and compromises yield. This phenomenon characterizes the trade-off between growth and defense.

Interaction between hormones

The team led by Cristiana T. Argueso investigated the interaction between immune hormones and cytokinins, responsible for cell division and regulation of the apical meristem. Experiments demonstrated that salicylic acid and jasmonate repress genes regulated by cytokinin. Constitutive activation of immunity suppressed cytokinin signaling and reduced reproductive growth.

The researchers crossed the autoimmune mutant snc1, which accumulates salicylic acid and exhibits reduced size, with the double mutant ckx3,5, which has less cytokinin degradation. The triple mutant,

named s35, showed partial restoration of reproductive growth.

The s35 variant maintained a reduced vegetative size. However, it recovered the number of siliques to the wild type level. Seed production exceeded that of the snc1 mutant by approximately 260%, although it remained below the Col-0 control. The plant exhibited a differentiated inflorescence pattern, described as "starburst," associated with alterations in the apical meristem.

Increased cytokines

Hormonal analyses confirmed an increase in trans-zeatin cytokines in s35. The mutant also maintained elevated levels of

salicylic acid. The combination altered the hormonal balance in the meristem and modified the reproductive architecture.

Phytopathological tests indicated that s35 preserved resistance to *Hyaloperonospora arabidopsidis* e *Pseudomonas syringae*, biotrophic pathogens. The genotype also showed greater resistance to *Botrytis cinerea*, necrotrophic fungus, in comparison to snc1. The result points to a mitigation of the classic antagonism between salicylic acid and jasmonate pathways.

Gene induction

Transcriptomic analysis revealed the induction of genes linked to nitrate

response and ROXY-type glutaredoxins in s35. The team detected redistribution of hydrogen peroxide in the meristem. The accumulation of reactive oxygen species near the meristematic tissue coincided with increased reproductive activity.

Fertilization with a 24-8-16 formulation increased the number of siliques in all genotypes. In s35, the fertilizer increased the weight and size of the seeds, which partially compensated for the reduction in the total number.

The authors advocate manipulating hormonal networks as an alternative to approaches based on isolated genes. Restoring cytokinin homeostasis in contexts of activated immunity can reduce yield penalties and increase resistance.

The group is evaluating the application of this strategy in crops such as wheat, corn, and soybeans, according to an institutional statement.

Further information can be found at doi.org/10.1016/j.cub.2026.01.060

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Bayer and John Deere connect FieldView to Operations Center in the USA.

New feature enables wireless sending of prescriptions to Gen4 and G5 monitors.

23.02.2026 | 13:25 (UTC -3)

Cultivar Magazine, based on information from Ben Eberle

Bayer and John Deere announced a feature that connects agronomic decisions to machine execution in the field in the United States. Starting this growing season, producers and consultants can wirelessly transfer prescriptions from FieldView to create Work Plans in the Operations Center. This eliminates the use of USB drives and manual steps that delay operations and increase the risk of errors.

Customers can now create prescriptions in FieldView and export them to the Operations Center at any time. The digital workflow connects agronomic data to machine execution. The process eliminates the need to download files, physically transport them to different areas, and manually configure monitors in the cab.

According to Jeremy Williams, leader of digital agriculture at Bayer Crop Science, the integration facilitates the use of innovation on every hectare. He states that producers and consultants are looking for simple and reliable ways to transform agronomic plans into action. The connection between FieldView and Operations Center reduces setup time and expands the use of solutions such as the Preceon Smart Corn System.

Chris Winkler, vice president of digital software and solutions at John Deere, states that customers are asking for more straightforward workflows and fewer steps in the cab. He highlights that wirelessly sending prescriptions and Work Plans to the Operations Center and connected Gen4 and G5 monitors simplifies

operations preparation and integrates platforms and equipment.

In addition to configuration, producers and consultants can use the Operations Center to monitor and evaluate the quality of work during operation. After completion, bidirectional connectivity with FieldView allows for analysis of product performance and supports decisions for the next crop season.

The feature caters to producers participating in the Preceon Ground Breakers program in the United States. The companies anticipate a broad rollout in the country in the coming weeks. Availability in other global regions is expected later this year. FieldView experts will present the new feature during the Commodity Classic in San Antonio, from

February 25-27.

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Valtra renews dealership in San Francisco

The update is part of an expansion strategy in Córdoba.

23.02.2026 | 13:05 (UTC -3)

Cultivar Magazine, based on information from Corina Tareni

Valtra has revamped the image of its official dealership in San Francisco, in the

province of Córdoba. The initiative is part of a strategy to strengthen the brand in a key region for agricultural production.

The service point operates under the management of Tamagnini SRL. The company updated the space according to global brand image and experience standards. The structure now offers a functional environment. The proposal aims to optimize service and strengthen the bond with customers.

The dealership occupies a strategic position in central Argentina. Emiliano Ferrari, senior sales manager for Valtra Hispanoamérica, highlighted the city's importance within the national production map. According to him, the renovation brings the brand closer to the producer

and reinforces its commitment to solutions adapted to each reality.

Diego Tamagnini, the company's owner, stated that the change marks a new step in the company's trajectory. He highlighted decades of work in the field and alignment with the brand's evolution in the region.

Tamagnini SRL began operations in 1935 as a mechanical workshop in Córdoba. The company expanded its operations as demand for machines and parts grew. Today it maintains a presence in Porteña, Córdoba, Rafaela, and San Francisco. The network ensures consolidated territorial coverage.

The renovation follows Valtra's strategy of adapting facilities to the standard of its products. The facade plays a central role

in the initial contact with the customer. The project adopts the One Step Less concept. The proposal prioritizes simplification and fluidity in customer service.

The Streamline style appears in the oblique lines that connect the portico and the entrance. The furniture is reminiscent of the brand's logo. The yellow color reinforces the visual identity. Hexagonal elements allude to nature and the manufacturer's origins.

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New Holland introduces T7 XD tractors in North America.

The most powerful series in the line arrives on the North American market after its global launch at Agritechnica 2025.

23.02.2026 | 12:49 (UTC -3)

Cultivar Magazine, based on information from Leah Welk

New Holland is showcasing the T7 XD tractor in North America. The exhibition will take place during the Commodity Classic, from February 25th to 27th, 2026, in San Antonio. The brand positions the model as the most powerful in the T7 family.

The T7 XD delivers 360 to 435 hp. The line includes the T7.360 XD, T7.390 XD, and T7.440 XD models. The design caters to large-scale transport, silage, haymaking, and planting operations. The tractor combines high power with versatility for both field and road use.

The series premiered globally during Agritechnica 2025 in Germany (see here Now, the manufacturer is expanding the model's presence in the North American market.

The powertrain utilizes an FPT Cursor 9 engine, an 8,7-liter, six-cylinder unit. Maximum torque occurs at 1.400 rpm. The Auto Command 4x2 CVT transmission works in conjunction with the engine. The system manages the engine speed to reduce fuel consumption. At idle, the engine operates at 650 rpm.

Rear lift

The three-point rear hitch has been redesigned, increasing lifting capacity. The tractor features an integrated front hitch and a two-speed front PTO. This configuration enhances flexibility in the use of implements.

The extended wheelbase enhances stability. The front axle support improves maneuverability, even with dual wheels. The turning radius allows for headland turns with a 16-row planter. The hydraulic capacity supports larger implements for high-productivity operations.

Road travel

The T7 XD reaches 37 mph on the highway. This speed reduces cycle time in operations such as silage harvesting and manure hauling. The independent Terraglide front suspension with anti-roll control enhances stability and directional precision. The inboard, oil-cooled front brakes work in conjunction with the engine brake and the Intelligent Trailer Braking

System to reinforce control when transporting heavy loads.

Tire calibration

The model incorporates a central tire calibration system. The operator adjusts the pressure from the cab. This technology increases traction in the field and reduces soil compaction. Rapid reinflation is advantageous for road transport.

The Horizon cab features Comfort Ride suspension. The interior offers improved climate control and visibility. The IntelliView 12 monitor centralizes tractor settings, implement control, and precision agriculture features.

The T7 XD models come standard with FieldOps connectivity for farm management, monitoring, and data sharing. The engine service interval reaches 750 hours. The Top Protect package includes a three-year warranty, a three-year Top Maintain maintenance plan, and Top Service support to extend operational availability.

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Mechanization contributes to the efficiency of irrigated rice production.

The Massey Ferguson line includes tractors up to 250 hp, planters with high flotation, and hybrid harvesters to reduce losses.

23.02.2026 | 12:32 (UTC -3)

Flavia Amarante, Cultivar Magazine edition

Wet soils, short planting and harvesting windows, and precise operations put pressure on irrigated rice producers. Specific mechanization is gaining importance in strategic decisions. To meet this demand, Massey Ferguson offers a complete portfolio focused on cultivation, from planting to harvesting.

“With production concentrated in areas with high operational demands and facing a scenario of climatic variations, mechanization adapted to irrigated rice has become part of the producer's strategic decisions,” says Lucas Zanetti, product marketing manager for the brand.

In its tractor line, the manufacturer offers different power ranges. For areas requiring greater traction and operational efficiency,

the MF 7700 Dyna-6 series includes the MF 7718, with 180 hp and a six-cylinder engine. Power reaches 250 hp in the MF 7725, suitable for intensive operations.

The use of R2 tires influences performance in flooded fields. The deeper treads increase traction. According to the company, the technology reduces slippage and promotes the regularity of operations throughout the growing season.

During planting, the MF 300 planter promotes adequate compaction and favors uniform plant emergence, even under high humidity. High-flotation tires better distribute the machine's weight over the soil and reduce surface pressure. High-capacity seed and fertilizer hoppers minimize downtime for refilling. The

movable divider allows for adjustment of input ratios and increases management flexibility.

During harvesting, hybrid combine harvesters combine conventional and axial systems. The combination aims for efficiency in threshing, separation, and cleaning. The proposition includes low rates of grain loss and breakage. The portfolio includes the MF 4690 HD, MF 5690 HD, and MF 6690 HD models, geared towards different production scales.

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Case IH launches Patriot 4050 at Expoagro 2026

The new generation of the 50 Series enhances drip control, reduces drift, and integrates remote monitoring via FieldOps.

23.02.2026 | 12:19 (UTC -3)

Cultivar Magazine, based on information from María Micaela Albónico

Case IH is launching its new generation of Patriot Series 50 sprayers at Expoagro 2026 in Argentina. The highlight is the 4050 model. The manufacturer promises more control, less drift, and greater utilization of the applied product.

The Patriot 4050 combines increased power, a new electronic architecture, and an optimized engine and transmission package. The machine incorporates the AIM Command FLEX II system. This technology allows for peak-to-peak control and product recirculation. The system reduces waste and increases application precision.

ECO mode adjusts engine speed according to demand. This feature optimizes fuel consumption. The solution

reduces operating costs without compromising performance.

Internal space

The cabin has been redesigned. The project expands the interior space and improves ergonomics. The PRO 1200 monitor centralizes the machine's functions. The system delivers greater precision and facilitates operation. All units leave the factory connected to the Case IH FieldOps platform. This tool centralizes data, allows remote monitoring, and generates real-time diagnostics.

Air suspension enhances stability. The new ladder and access design increases safety. The 100% LED work lights operate

with an intelligent lighting controller. The system maintains visibility in nighttime applications. The 4WD transmission ensures traction and precision on challenging terrain.

According to Rodrigo Lanciotti, marketing manager at Case IH, the company listened to the demands of producers and developed more powerful, precise, connected, and ergonomic machines. The executive stated that the 50 Series optimizes the use of inputs and fuel and improves application quality.

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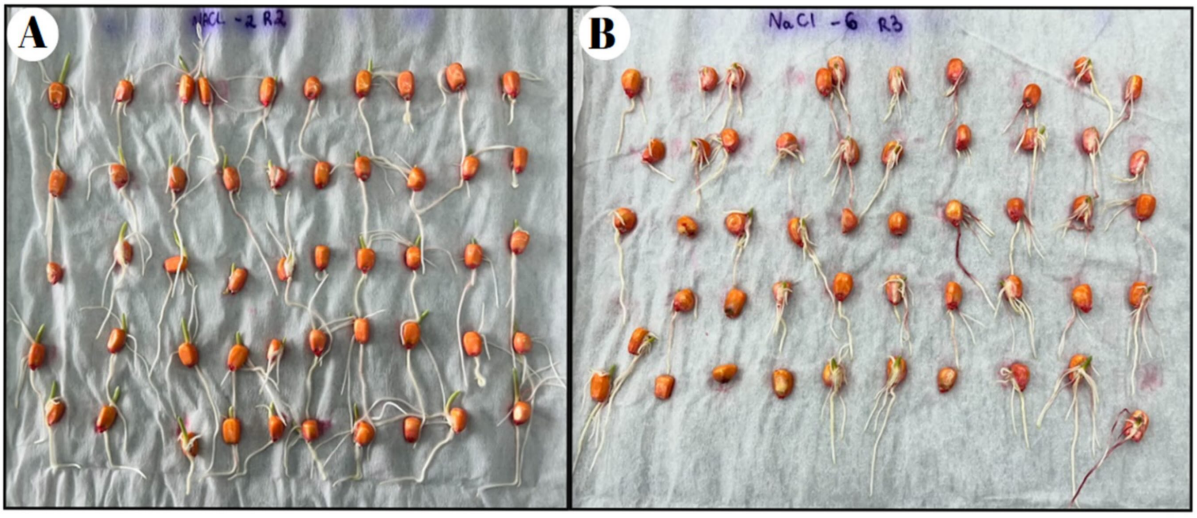
Algae extract mitigates the effects of salinity on corn germination.

Doses between 1,0 and 2,0 mL/L increase vigor and initial growth under stress of up to -0,8 MPa.

23.02.2026 | 12:11 (UTC -3)

Cultivar Magazine



Germination of corn seeds subjected to different osmotic potentials induced by NaCl.

The extract of *Ascophyllum nodosum* The study increased germination and vigor of corn seeds under saline stress. Doses between 1,0 and 2,0 mL/L promoted

greater root and shoot growth. The effect surpassed the performance of the isolated mineral fraction. The study evaluated the AL Bandeirante cultivar under controlled laboratory conditions.

The research tested five doses of the extract. The researchers applied 0, 0,5, 1,0, 1,5, and 2,0 mL/L. The intermediate doses resulted in greater epicotyl length and a higher vigor index four days after sowing. At seven days, the doses of 1,0 and 2,0 mL/L increased the percentage of normal seedlings, radicle length, and epicotyl length. The treatment reduced the incidence of abnormal seedlings.

The authors also subjected the seeds to five osmotic potentials induced by NaCl: 0; -0,2; -0,4; -0,6 and -0,8 MPa. Reducing the

osmotic potential decreased germination, root growth, and epicotyl growth. Potentials from -0,4 MPa onwards compromised initial development. Levels of -0,6 and -0,8 MPa imposed the most intense restriction on growth.

In the third bioassay, the team combined stress levels of -0,6 and -0,8 MPa with the extract and the mineral fraction of the product. At -0,6 MPa, the extract increased germination, vigor index, and radicle and epicotyl length compared to the mineral fraction. At -0,8 MPa, the extract also maintained superior performance, although with lower absolute values ??than at moderate stress.

The biofertilizer contained 2,19% total nitrogen, 5,71% total potassium, and

1,925% sulfur, among other nutrients. The mineral fraction was tested in isolation to differentiate the nutritional effects of the bioactive compounds.

The experiments followed a completely randomized design, with four replicates of 50 seeds per treatment. The team evaluated germination, normal and abnormal seedlings, radicle length, epicotyl length, and vigor index. Statistical analysis used Tukey's test at a 5% probability level.

The results indicate that Ascophyllum nodosum extract mitigates salinity damage in the early stages of maize growth. The effect is most pronounced under moderate stress of -0,6 MPa. The response depends on the applied dose and the stress level.

This work was developed by Janyne Soares Braga Pires, Francine Bonomo Crispim Silva, Maria Eduarda da Silva Barbosa, Geovana Ribeiro Cavilha, Mateus Moura Coelho, Samile Mardegan Otilia, Josué Wan Der Maas Moreira, Guilherme Roas Martins Marquito, Fernando Gomes Hoste, Ana Júlia Câmara Jeveaux-Machado, Vinicius de Souza Oliveira, Adriano Alves Fernandes, and Sara Dousseau-Arantes.

More information at doi.org/10.3390/seeds5010014

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Kubota has an agricultural robot among the top 100 designs in the world.

Agri Concept receives recognition from WIPO on the centenary of the Hague System.

23.02.2026 | 07:19 (UTC -3)

Cultivar Magazine, based on information from Kubota

Kubota announced that the Agri Concept has been included in the list of the 100 best designs in the 100-year history of the Hague System for International Registration of Industrial Designs. The World Intellectual Property Organization (WIPO) granted the recognition. The model appeared at CES 2024. It is the only agricultural machine selected from over two million designs registered in 99 countries and regions.

The Hague System was established in 1925. It allows companies and designers to register industrial designs in multiple countries with a single application. WIPO, a specialized agency of the United Nations based in Geneva, administers the system and promotes the protection of intellectual property.

The Agri Concept functions as an electric and autonomous agricultural robot. The project combines automation, artificial intelligence, and environmentally focused technologies. The proposal aims to reduce the workload in the field.

The equipment performs operations autonomously using advanced cameras and sensors. It carries out tasks such as plowing and hauling. The fast-charging system raises the battery from 10% to 80% in about six minutes. External lighting communicates the machine's actions and status to nearby workers, which promotes integration into agricultural operations.

Kubota has already registered more than 80 designs through the Hague System, including products and concepts.

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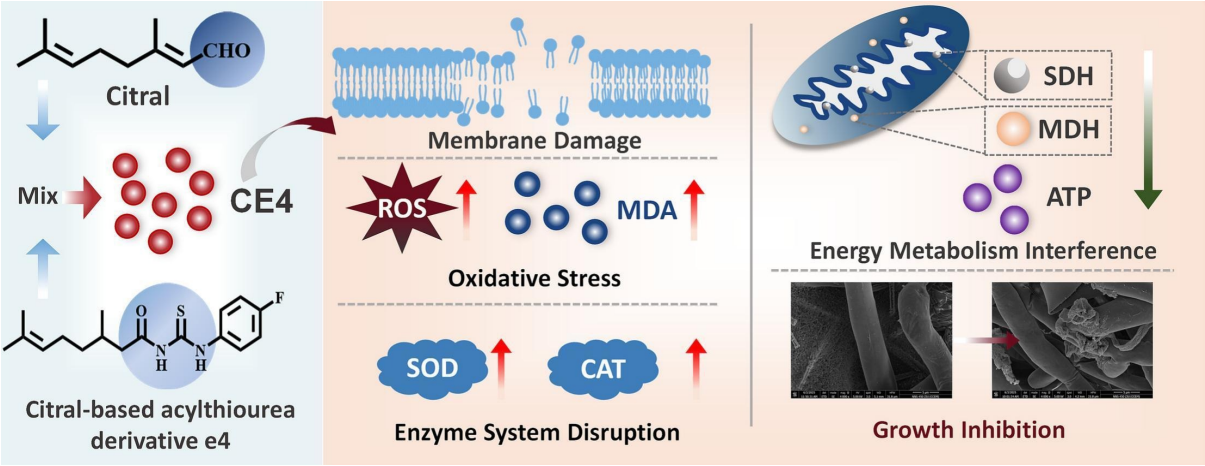
Formulation with citral and derivative reduces Rhizoctonia solani

Study points to synergistic action with greater antifungal efficiency and low cytotoxicity.

22.02.2026 | 16:03 (UTC -3)

Cultivar Magazine



A combination of citral with an acylthioureic derivative reduced mycelial growth and sclerotia formation. Rhizoctonia solaniCitral, a soil fungus that causes losses in crops such as rice, corn, and soybeans, was the most efficient

formulation among 22 derivatives tested in a study by Chinese researchers. This formulation had an effective concentration (EC50) of 10,97 mg/L, lower than that of citral alone, which reached 34,75 mg/L.

Researchers combined citral, a natural organic compound belonging to the terpene family, with the e4 derivative in a molar ratio of 25%. The mixture showed a synergism ratio (SR) of 2,23. The result indicated a superior effect to that expected from the sum of the isolated substances.

In culture plates, CE4 reduced colony diameter by 61,5%. Citral alone reduced it by 48,8%. e4 alone reduced it by 32,9%. In liquid medium, CE4 decreased mycelial dry mass by 79,9%. Citral reduced it by 43,7%. e4 reduced it by 56,6%.

The mixture also limited the formation of sclerotia, structures that ensure the pathogen's survival and persistence in the soil. CE4 reduced the dry mass of sclerotia by 77,3%. Citral reduced it by 52,8%. e4 reduced it by 54,4%.

Electron microscopy

Electron microscopy analyses showed more intense structural damage in hyphae treated with CE4. The treatment increased the relative electrical conductivity of the cells, a sign of increased membrane permeability.

CE4 also reduced the ergosterol content in the mycelium, an essential component of the fungal membrane. Citral and e4 alone

did not cause a significant change in this parameter.

The study recorded an increase in reactive oxygen species and alterations in antioxidant enzymes. The mixture decreased the activities of SDH and MDH enzymes and reduced ATP levels. The result indicates impairment of the fungus's energy metabolism.

Cytotoxicity tests in three mammalian cell lines showed survival rates exceeding 90% for the treatments. The CE4 combination did not increase toxicity compared to citral alone at the concentration effective against the fungus.

The authors indicate that the strategy may increase the efficiency of plant-derived compounds in managing diseases caused

by *Rhizoctonia solani*This work suggests an experimental basis for the development of lower-dose, more stable antifungal formulations.

More information at doi.org/10.1016/j.pestbp.2026.107027

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Study proposes new model for the origin of complex life.

Research indicates that ancestors of eukaryotes tolerated oxygen and reinforces the role of coastal environments in eukaryogenesis.

21.02.2026 | 10:16 (UTC -3)

Cultivar Magazine, based on information from Marc Airhart

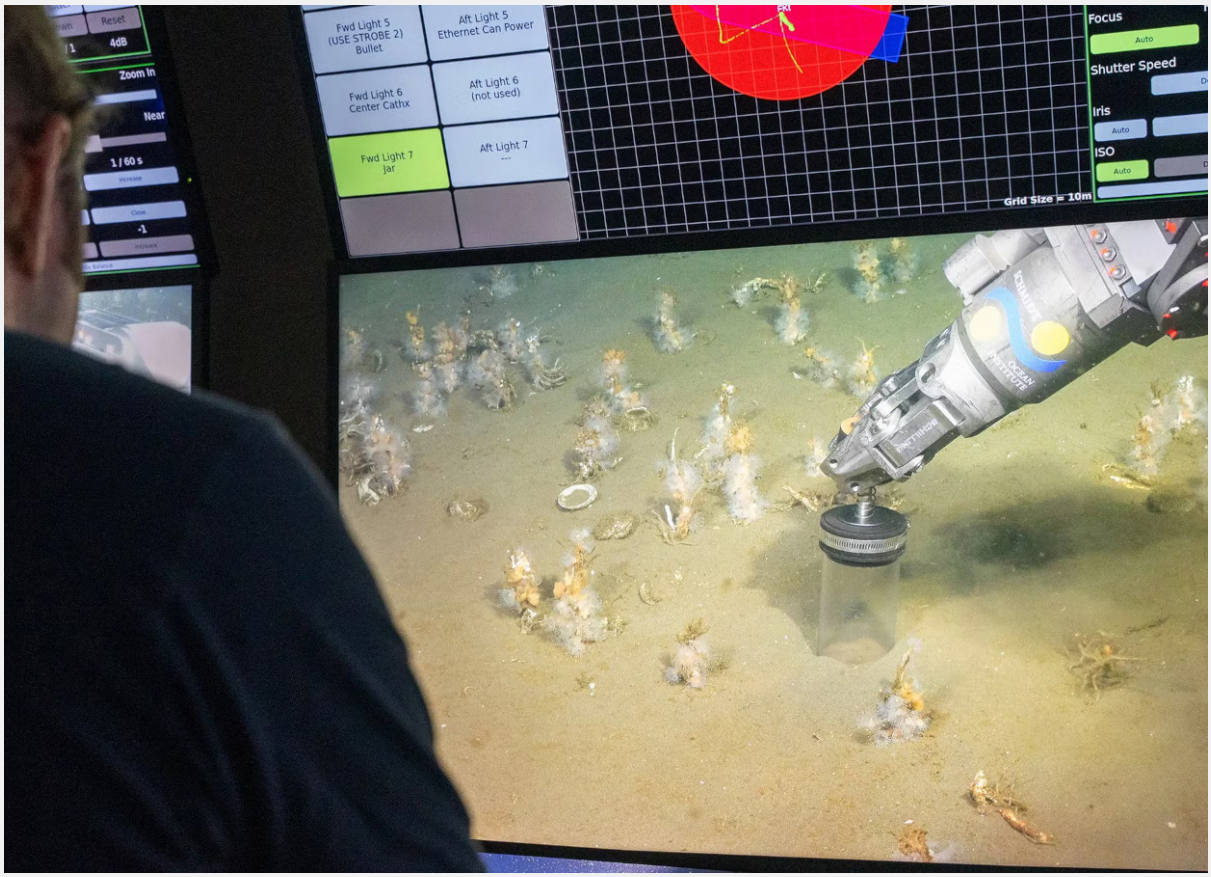

Photo: Monika Naranjo-Shepard, Schmidt Ocean Institute

Scientists at the University of Texas at Austin have identified that archaea from the Asgard group, considered ancestors of eukaryotes, used or tolerated oxygen. The finding helps to clarify how complex life arose on Earth.

The most widely accepted theory suggests that plants, animals, and fungi arose from the association between two distinct microorganisms. One depended on oxygen. The other lived in oxygen-free environments. What remained to be explained was how these organisms came to share the same space.

The team analyzed genomes of Asgard archaea. This group currently lives in deep, oxygen-free marine environments. However, lineages closely related to

eukaryotes appear in shallow coastal sediments and in the water column, where oxygen is present. These lineages exhibit metabolic pathways that utilize oxygen.

Researchers sequenced DNA from marine sediments. The work yielded more than 13 new microbial genomes. The collection included 404 genomes of Asgardarchaeota. Among them, 136 new genomes of Heimdallarchaeia. The number nearly doubled the known genomic diversity of the group.

Metabolic reconstructions

Analyses indicated that many of these archaea occupy coastal sediments with

varying oxygen levels. Metabolic reconstructions pointed to proteins linked to an aerobic lifestyle. The group encodes components of the electron transport chain, heme biosynthesis, and mechanisms for detoxifying reactive oxygen species.

Scientists also compared Heimdallarchaeia proteins with eukaryotic proteins linked to energy metabolism. Structural models predicted similar three-dimensional shapes. The results suggest functional proximity between the groups.

The study proposes a Heimdallarchaeia-centered model for eukaryogenesis. The hypothesis includes hydrogen production and aerobic respiration in the common ancestor of Asgard and eukaryotes.

Geological records indicate a sharp increase in atmospheric oxygen about 1,7 billion years ago. Shortly thereafter, the first microfossils of eukaryotes appeared. Genomic data reinforce the link between oxygen and the origin of complex life.

More information at doi.org/10.1038/s41586-026-10128-z

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