

December 6, 2025

N° 59

Cultivar *Semanal*®



**Corn
transforms
Helicoverpa**

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Corn mixtures promote improved flight patterns in corn earworms.

Research in the US shows that a mixed diet accelerates morphological changes in *Helicoverpa zea*.

02.12.2025 | 07:47 (UTC -3)

Cultivar Magazine



Photo: Rebekah D Wallace, University of Georgia

Research has revealed that the diet of corn earworm (*Helicoverpa zea*), when composed of a corn mixture Bt (transgenic) and non-Bt, can cause drastic changes in the wing morphology of adult insects.

The results indicate that these changes give the insects greater aerodynamics, favoring long-distance flight and, consequently, the faster spread of resistance to Bt toxins.

The study shows that just one generation fed this mixed diet was enough for the insects to develop longer, thinner, and more tapered wings -- comparable to the wings of fighter jets.

How Bt corn works

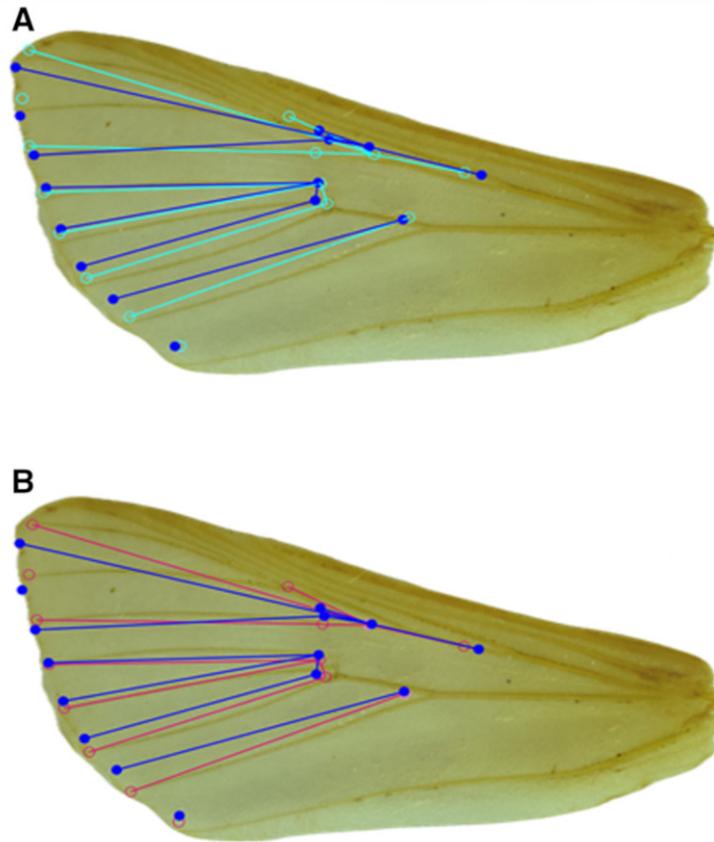
Bt corn was designed to produce proteins that kill pests. (Cry1Ab, Cry1F, Vip3A and others) Currently, about 80% of the corn grown in the United States contains these toxins. Agricultural practices include planting areas with mixed seeds: 80% Bt and 20% non-Bt. This mixture aims to delay pest resistance to the toxins, allowing susceptible insects to survive.

However, the study's data suggests the opposite effect. According to Dominic Reisig, co-author of the article and entomology expert, this combination of diets accelerates the selection of resistant insects and favors physical characteristics that increase their dispersal potential.

"These insects are able to withstand stronger winds and travel greater distances," he explains.

Altered morphology

Researchers compared the wings of four groups of caterpillars: those fed exclusively on non-Bt corn; those fed on Bt corn with two toxins; those fed on Bt corn with three toxins; and those fed on a seed mixture (80% Bt and 20% non-Bt). The group that consumed the mixed diet showed the most aerodynamic and wind-resistant wings, with changes observed as early as the first generation.



Average differences in wing shape visualized using a wireframe construction superimposed on the wing of *Helicoverpa zea* for females **(a)** Bt corn with 3 toxins in a pure crop (light blue) and a seed mixture with 80% Bt corn with 3 toxins and 20% non-Bt corn (dark blue); and **(B)** Non-Bt corn in a pure crop (red) and a seed mixture with 80% Bt corn containing 3 toxins and 20% non-Bt corn (dark blue) - doi.org/10.1093/ee/nvaf117

Morphometric analyses and computational modeling have shown that these wings, especially in females, deform less under the action of wind, which allows for longer and more efficient flights.

Need for review

The research reinforces previous observations that point to limitations in the current model of mixed refuges.

Furthermore, it broadens the understanding of the indirect effects of agricultural practices on pest behavior.

The evidence obtained suggests that the use of Bt and non-Bt mixtures not only fails to contain resistance, but may accelerate its spread.

The study's findings indicate that the resistance of *Helicoverpa zea* It goes beyond genetics: it incorporates morphological and biomechanical characteristics that favor the adaptive success of the pest. According to the

researchers, this finding requires a review of integrated pest management guidelines and policies for the use of agricultural biotechnology in the United States and other countries that adopt the Bt planting model.

Further information can be found at doi.org/10.1093/ee/nvaf117

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Late planting ensures soybean seed vigor in subtropical environments.

A study conducted in Paraguay shows that advancing the soybean growing cycle reduces seed quality.

05.12.2025 | 10:11 (UTC -3)

Cultivar Magazine



Photos: Syngenta

The choice of sowing date defines the success in soybean seed production in low-altitude subtropical regions. Research conducted over four growing seasons in Los Cedrales, in the Alto Paraná department, Paraguay, indicates that late sowing, carried out between January 15 and 31, is the only strategy capable of guaranteeing seeds with high vigor, viability, and longevity.

The study evaluated 15 soybean cultivars with varying growth cycles (RMG 5.5 to 6.9) over four years (2019 to 2023).

Researchers compared three sowing times: early (September), normal (November), and late (January).

Production occurred under a no-till system with standardized technical management.

Early sowing

The results indicate that early sowing synchronizes flowering and grain filling with the peak of solar radiation. This increases grain productivity by up to 62,8% compared to late sowing. However, this advantage poses a high risk to seed quality.

During maturation, crops sown early in the cycle face temperatures exceeding 35°C and water deficits. This thermal and water stress causes the formation of green seeds with an incidence up to 95% higher than in crops sown later. The damage directly impacts the vigor and longevity of the seeds.

Late sowing

Under the evaluated conditions, no crop sown in September or November maintained germination above the commercial limit (80%) after 150 days of storage. However, all seeds from late sowing exceeded 95% germination and vigor after this period.

In one of the years evaluated, under severe drought and extreme heat (2021/22), late sowing was the only one that maintained physiological quality and also recorded the highest grain productivity, surpassing the other treatments by up to 54,6%.



Performance and physiological quality

Researchers warn of the inevitable antagonism between yield and physiological quality in low-altitude regions. Seed production requires the maturation phase to occur under mild

temperatures, which is only possible with late sowing. Even with a lower production volume, the added value compensates: the revenue per hectare with late seeds exceeded the revenue from grains from more productive crops by 60%.

The study concludes that managing the sowing date is crucial. For grains, early sowing offers greater yield potential, but at a high climatic risk. For seed production, late sowing is essential. This practice avoids maturation stress and ensures the production of high-vigor seeds, fundamental for the success of the next harvest.

The work was carried out by Jose Ricardo Bagateli, Ricardo Mari Bagateli, Giovana Carla da Veiga, Ivan Ricardo Carvalho,

Willyan Junior Adorian Bandeira and Geri
Eduardo Meneghello.

Further information at
doi.org/10.3390/seeds4040064

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Agricultural Market - December 5, 2025

Soybean exports hit a record high, totaling R\$ 13,6 billion in November.

05.12.2025 | 09:54 (UTC -3)

Vlamir Brandalitze - @brandalitzeconsulting



Brazilian soybean exports continue at a rapid pace. In November, the country shipped 4,2 million tons, according to data

from the Secretariat of Foreign Trade (Secex). The value of the exports reached US\$2,542 billion, equivalent to R\$13,6 billion. From January to November, the total exported reached 104,8 million tons, a historical record for the period.

China remains the main destination for Brazilian soybeans. The Asian country has already received about 80% of the production exported by Brazil in 2025.

Chinese purchases of American soybeans are disappointing traders in Chicago, who expected larger volumes. So far, the number is far from the projections of 10 to 12 million tons.

Soybean meal also drives exports. The accumulated volume for the year reached 22,7 million tons, compared to 21,8 million

in the same period of 2024. The soybean complex has already reached 138 million tons exported in 2025, consolidating itself as the main generator of foreign exchange in Brazilian agribusiness.

In the domestic market, 93% of the soybean crop has already been planted. In 2024, this number was 98% at the same time. The estimate is for a harvest of 141 million tons, with 82,2% of the 2024/25 crop already traded. The historical average would be 86,5%. The new crop, however, is progressing slowly: only 28% has been sold so far, compared to 37% the previous year.

The concentration of the harvest in March could put pressure on prices, even with premiums for March and April rising.

Currently, 50 million tons of the new crop have already been traded, compared to 64 million in the same period last year.

Corn situation

In November, Brazil exported 5 million tons of corn, generating US\$1,105 billion (R\$5,9 billion). The year-to-date total is 34,9 million tons, slightly below the 35,5 million tons projected for 2024. To reach the projected 40 million tons, more than 5 million tons will need to be shipped in December.

In the fields, the first corn crop is suffering losses in Rio Grande do Sul, especially in the Missões region and the north of the state, due to heat and drought. In other

regions, such as Paraná, Santa Catarina, and parts of Minas Gerais, the situation is more stable. There are still 35,3 million tons available for sale, including both the second crop and the first crop.

Wheat situation

Wheat exports reached 121 tons in November. Year-to-date exports totaled 1,677 million tons, below the 2,488 million tons of 2024. The harvest is nearing completion, with projections of 7,5 million tons. Mills indicate they will only resume purchases in January. Sales remain slow, with prices between R\$ 1.100 and R\$ 1.500 per ton.

Rice situation

Rice production is lower this season, with approximately 1,5 million hectares planted. Sales are stalled. Prices in the Rio Grande do Sul market range from R\$ 46 to R\$ 58 per sack. Only 35% of the state's harvest remains to be sold. The industry is facing difficulties passing on the cost to retailers, who are selling packages below R\$ 10 in promotional offers.

Bean situation

Bean harvests in Paraná are still sporadic. The first crop suffered from reduced planted area and weather impact. Supply is limited, with nominal prices between R\$ 220 and R\$ 250 for carioca beans. Black

beans range between R\$ 125 and R\$ 133. Business is expected to intensify only from January 15th onwards, with the replenishment of retail stocks.

By Vlamir Brandalitze -
@brandalitzeconsulting

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Cargill CEO joins John Deere board.

Brian Sikes strengthens company's leadership with a focus on innovation and sustainability.

05.12.2025 | 07:58 (UTC -3)

Cultivar Magazine, based on information from Jen Hartmann



Brian Sikes, president and CEO of Cargill, has now joined the board of directors of Deere & Company. The announcement

was made by the agricultural machinery manufacturer. Sikes leads one of the world's largest privately held companies and has over three decades of experience in the industry.

John C. May, CEO of John Deere, highlighted the strategic vision and commitment to innovation and sustainability as strengths of the new board member. Sikes, who has been with Cargill since 1991, has held positions in the areas of protein, ingredients, and the agricultural supply chain. In 2023, he assumed the presidency of the company, and in 2024, he became chairman of the board.

With Sikes' arrival, the Deere board now has 11 members, 10 of whom are independent and external.

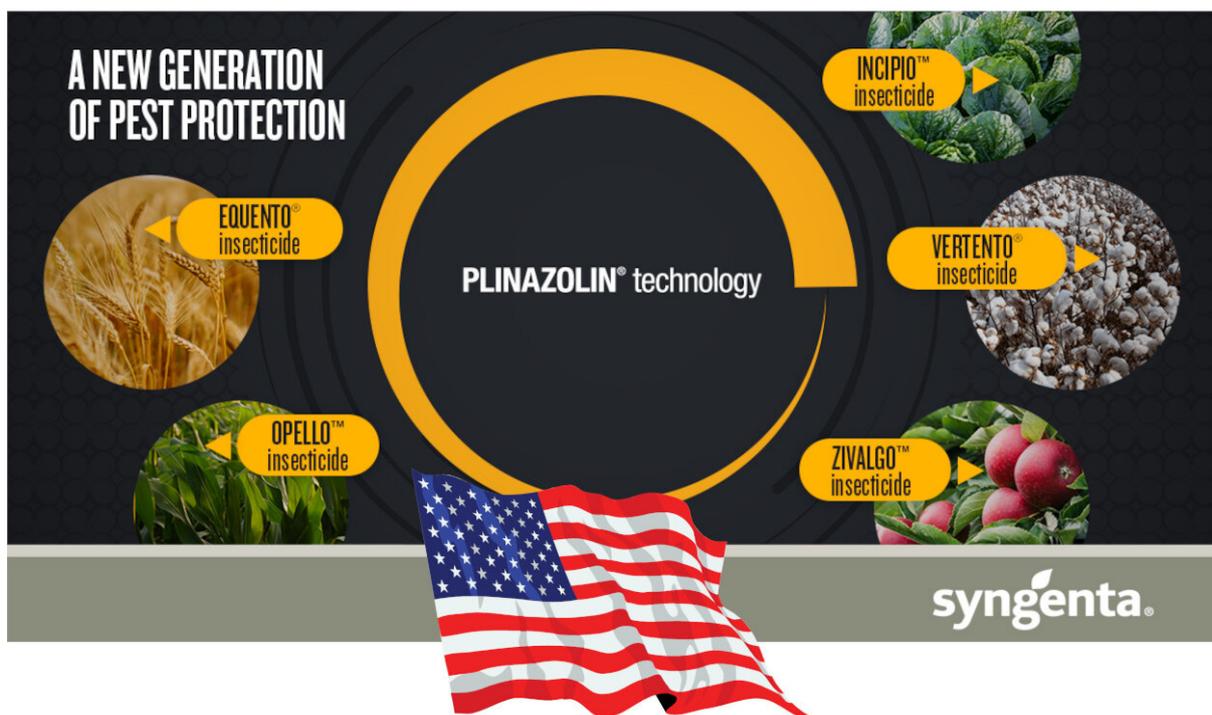
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Syngenta reports on Plinazolin registration in the US.

The molecule enters the market with a focus on pest control in various crops.

05.12.2025 | 07:44 (UTC -3)

Cultivar Magazine, based on information from Julie Richards



Syngenta has obtained registration from the U.S. Environmental Protection Agency (EPA) for the technology. [Plinazolin](#)

(isocycloseram), approved for use in accordance with state regulations. The new product will integrate five insecticides targeted at crops such as corn, cotton, vegetables, fruit trees, and cereals.

The result of 12 years of research and more than 3.000 tests in the USA, the new molecule acts in the management of pest resistance. The products will reach the North American market for the 2026 crop season in the forms of seed treatment, soil application and foliar application.

The brands include: Opello (corn), Equento (seed treatment), Vertento (cotton, peanuts and onions), Incipio (vegetables) and Zivalgo (potatoes and fruit trees). Classified in IRAC group 30, the insecticides promise broad and

residual control with formulations adapted to different field needs.

In Brazil, the molecule is sold in products Atexzo ANT-F; Frondeo; Joiner, Drexios, Laudento 200 SC; Joiner Pro; poppet; Sponta, Virantra; Verdavis, Viambi; is Vulter.

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Agricultural diversity supports pollinators in the tropics.

Study indicates that distance to natural habitats does not determine pollinator abundance or fruit set.

04.12.2025 | 15:55 (UTC -3)

Cultivar Magazine



Photo: John E Banks

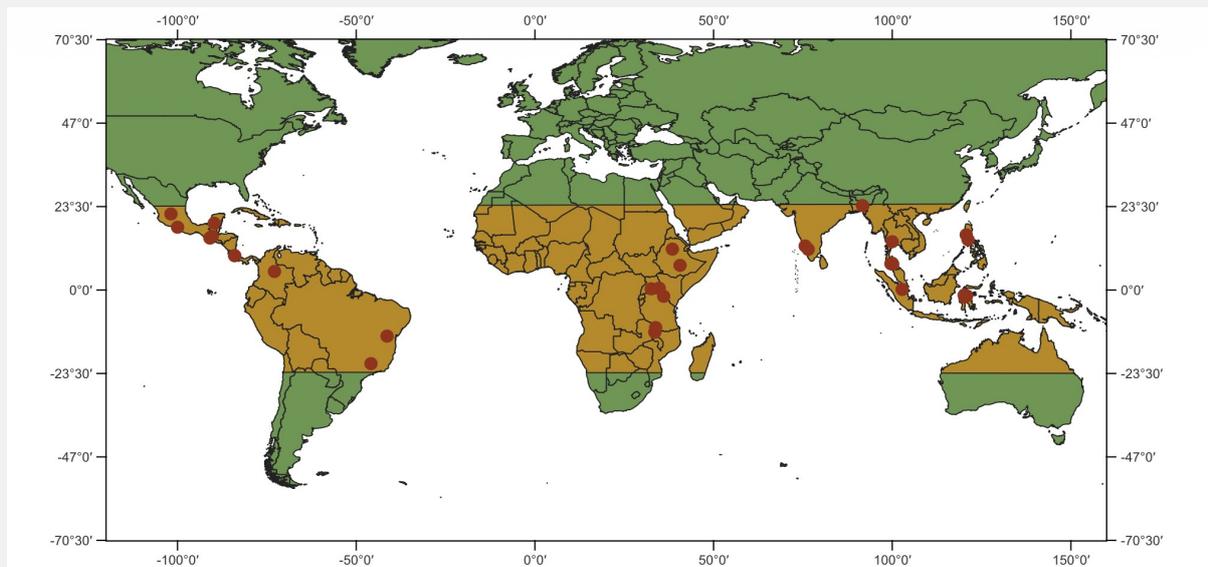
Proximity to forests and other natural areas does not guarantee more pollinators in the fields of small tropical farmers. A meta-analysis gathered data from more than 500 farms in 13 countries and concluded that distance to natural habitats does not determine the presence of bees and other insects, nor does it consistently influence the transformation of flowers into fruit.

The study evaluated 35 research projects conducted in Central America, South America, East Africa, and South and Southeast Asia. The authors analyzed the relationship between crop isolation and three indicators of pollination services: pollinator abundance, species richness, and fruit set. The results showed great

variation among the areas studied. The analysis did not register a clear pattern of insect decline or fruit set with increasing distance from the natural habitat.

Downward trend

The investigation identified a slight trend of reduced species richness in more distant areas. The predicted drop in diversity at 1 km from the natural habitat reached 31%. Even so, the authors highlighted strong heterogeneity between studies and the absence of a uniform response. Insect abundance and fruiting did not show a consistent relationship with distance.



Map showing the geographic distribution of the 35 studies included in the meta-analysis, represented by red dots. There is spatial overlap of studies conducted in the same regions or in nearby regions. The tropics are indicated in orange - doi.org/10.1111/ele.70229

The research attributed this stability of pollination services to the ecological complexity typical of small farms. These systems often bring together different crops, trees, flowers, and shaded areas in diverse arrangements. This diversity creates mosaics of habitats capable of supporting pollinators even far from forests or other natural formations.

Industrial agricultural systems

The meta-analysis highlighted that most previous evidence was based on industrial agricultural systems. In these areas, extensive monocultures and intensive use of inputs reduce the availability of resources for insects. In contrast, traditional smallholding practices can compensate for the distance to natural habitats and maintain ecological services.

According to the authors, conserving the complexity of the rural landscape helps sustain biodiversity and improves food security. The study advocated for the adoption of elements from these diverse systems in conventional agricultural

models as well, especially in tropical countries that depend on pollination to guarantee production and income.

Further information can be found at doi.org/10.1111/ele.70229

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Sumitomo Chemical and Valent BioSciences launch biostimulants for EMEA.

The portfolio brings together three technological platforms to increase nutritional efficiency, stress tolerance, and productivity in various crops.

04.12.2025 | 14:46 (UTC -3)

Cultivar Magazine, based on information from Sumitomo Chemical Europe



Sumitomo Chemical Agro Europe and Valent BioSciences announced in Barcelona the commercial launch of a portfolio of biostimulants for farmers in the EMEA region (Europe, Middle East and Africa). The announcement took place during the Biostimulant World Congress. The companies are expanding their offering of biological solutions focused on productivity, quality and efficient use of resources.

The package brings together three platforms: MCOM, S-ABA, and MycoApply. These technologies support vigor, nutritional efficiency, and stress tolerance.

MCOM technology improves nutrient availability and mobility, promotes photosynthetic efficiency, and enhances

performance under abiotic stress. Among the products, BoronBoost Prime strengthens boron nutrition and carbohydrate mobility in fruit trees, olive trees, citrus fruits, grapevines, and vegetables. Zicron stimulates initial growth, leaf development, and fruit set. The line also includes TransTec Duo and SuperSede, planned for release soon.

The S-ABA platform directs carbohydrates to storage organs, which promotes grain filling and post-harvest quality.

TopGrain/FullGrain products promote grain development. InGrain increases yield by intensifying carbohydrate allocation.

The MycoApply line features arbuscular mycorrhizal fungi that expand root acquisition networks and form aggregates in the soil. The products increase nutrient

and water efficiency and contribute to soil structuring. MycoApply DR is suitable for vegetables, fruit trees, and vines.

EndoPrime SC is directed to grains such as corn, wheat, and canola.

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Sipcam Nichino launches Click Pro herbicide.

This product combines two active ingredients and promises effective weed control.

04.12.2025 | 13:40 (UTC -3)

Cultivar Magazine, based on information from Fernanda Campos



Sipcam Nichino reports that it has launched the herbicide. [Click Pro](#), formulated with [terbuthylazine](#) e [mesotrione](#) The product acts in the pre-

and post-emergence phases of corn, focusing on the control of broadleaf and grass weeds.

According to agricultural engineer Eric Ono (pictured), the company's manager, the product exhibits high selectivity for the crop. Field tests in São Paulo, Paraná, Goiás, and Mato Grosso do Sul have proven its effectiveness and safety in more than 12 hybrids, both in the summer and off-season crops.

The synergistic action of the active ingredients ensures a long-lasting residual effect and reduces weed pressure for the following soybean crop. According to information provided by the company, on average, the product yielded up to seven more sacks of corn per hectare.

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Alcohol-based technique speeds up detection of *Amrasca biguttula*

The pest, which originated in Asia, is causing crop losses in the United States.

04.12.2025 | 10:45 (UTC -3)

Cultivar Magazine



Tray collection method, in which workers lightly tap the host plant over a dry tray and vacuum the leafhoppers from the surface, or tap the plant over a tray containing a solution - doi.org/10.3390/insects16121226

Researchers from the Florida Department of Agriculture and the University of Florida have identified the most effective technique for detecting the stink bug.

Amrasca biguttula The pest, which originated in Asia, causes losses in cotton, okra, and eggplant crops in the United States. An active sampling method using trays with 70% isopropyl alcohol outperformed seven other techniques tested in the field.

The challenge of detection

Passive methods, such as sticky traps, have shown low efficiency in detecting the pest. The captured insects degrade rapidly

or go unnoticed among other specimens. Furthermore, there are still no known pheromones to attract the species.

Therefore, the researchers chose to compare eight active field collection methods. The goal was to identify the most practical, quick, and effective technique, especially for capturing adult males, which are fundamental for the morphological identification of the species.

The experiment

The tests took place in two areas in Miami-Dade County, Florida: an okra plantation with a severe infestation and an eggplant field with a low presence of the insect.

The techniques evaluated were:

- Manual suction with suction device
- Bagging branches in plastic bags
- Beat sheet
- Entomological net sweep
- Dry tray
- Tray with water
- Tray with water and soap
- Tray with 70% isopropyl alcohol

Each method was applied by workers in different sections of the field. The collected insects were taken to the laboratory, where they were counted and separated by stage and sex.

Results

In the okra field with high infestation, the isopropyl alcohol tray method captured the largest number of males. It was also the fastest, with the shortest time per sampled plant. The technique showed superior efficiency even when compared to established methods such as aspiration and sweep netting.

In eggplant crops with low infestation, only three methods were successful in capturing insects: alcohol tray, bagging, and dry tray. Again, only the alcohol tray allowed for the collection of males.

Efficiency and Safety

In addition to its effectiveness in detection, the use of alcohol immediately immobilizes

bed bugs, facilitating the transport of specimens to the laboratory. Alcohol also preserves the insects, which is essential for both morphological identification and genetic testing, if necessary.

Another positive point is that the method proved consistent among workers with different levels of experience. All were able to successfully execute the technique without needing specific training.

comparisons

The manual suction technique also yielded good results, especially in collecting adult mosquitoes. However, the use of a manual suction device can expose the worker to pesticides, which discourages its

application in commercial areas without information on recent spraying.

Bagging has proven efficient, but it is more time-consuming and can damage plants. Its application in large areas is also limited by logistics.

The sweep net method, traditionally used in agricultural entomology, proved to be ineffective. The nets became entangled in the plants, especially in windy conditions, reducing collection efficiency.

Further information at
doi.org/10.3390/insects16121226

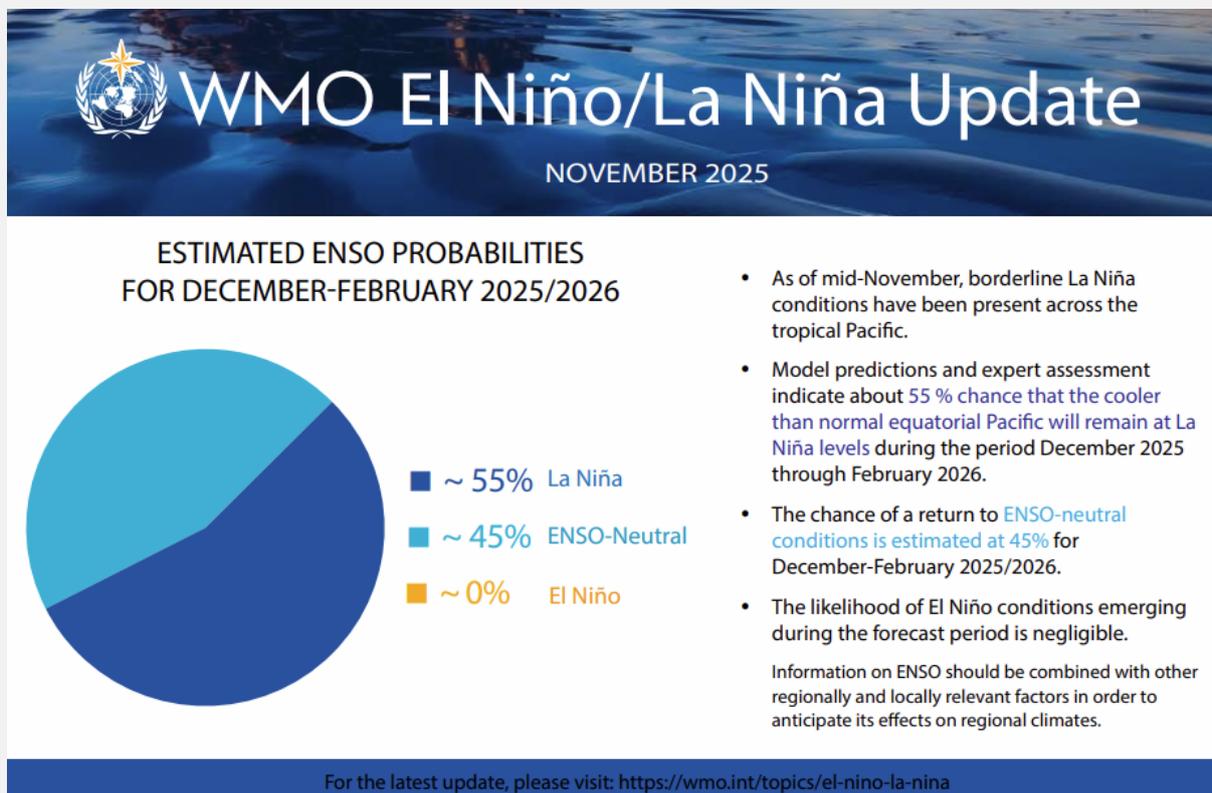
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WMO indicates a 55% chance of a weak La Niña between December and February.

The update indicates borderline conditions for the phenomenon and predicts above-average temperatures in several regions.

04.12.2025 | 10:13 (UTC -3)

Cultivar Magazine



The World Meteorological Organization (WMO) predicts a 55% chance of a weak La Niña phenomenon in the next three months. The bulletin released today reports that oceanic and atmospheric indicators have already shown a borderline situation for the phenomenon since mid-November.

La Niña involves cooling of large areas of the equatorial Pacific and alters winds, pressure, and rainfall patterns. Even with the temporary influence of global cooling, the WMO projects above-normal temperatures across much of the Northern Hemisphere and large areas of the Southern Hemisphere from December 2025 to February 2026.

Seasonal forecasts from the WMO's global network of producing centers show that the probability of a return to neutral ENSO conditions gradually increases to 65% to 75% between January and April 2026. The chance of El Niño remains low.

The Secretary-General of the WMO, Celeste Saulo, states that these projections support climate-sensitive sectors such as agriculture, energy, health, and transportation. According to her, the use of this information prevents economic losses and reduces humanitarian risks. National meteorological services will monitor the evolving scenario in the coming months.

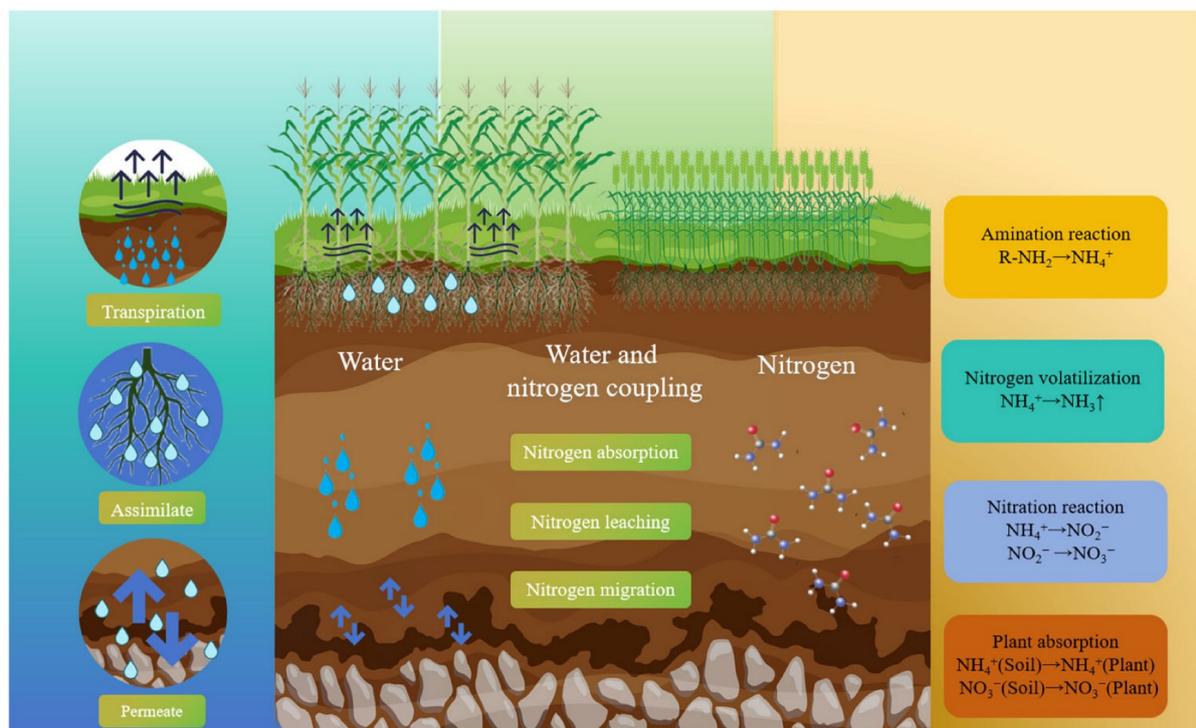
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Water and nitrogen management increases wheat and corn productivity.

Precise irrigation, planned fertilization, and conservation practices increase resource use efficiency and reduce environmental losses.

04.12.2025 | 10:00 (UTC -3)

Cultivar Magazine

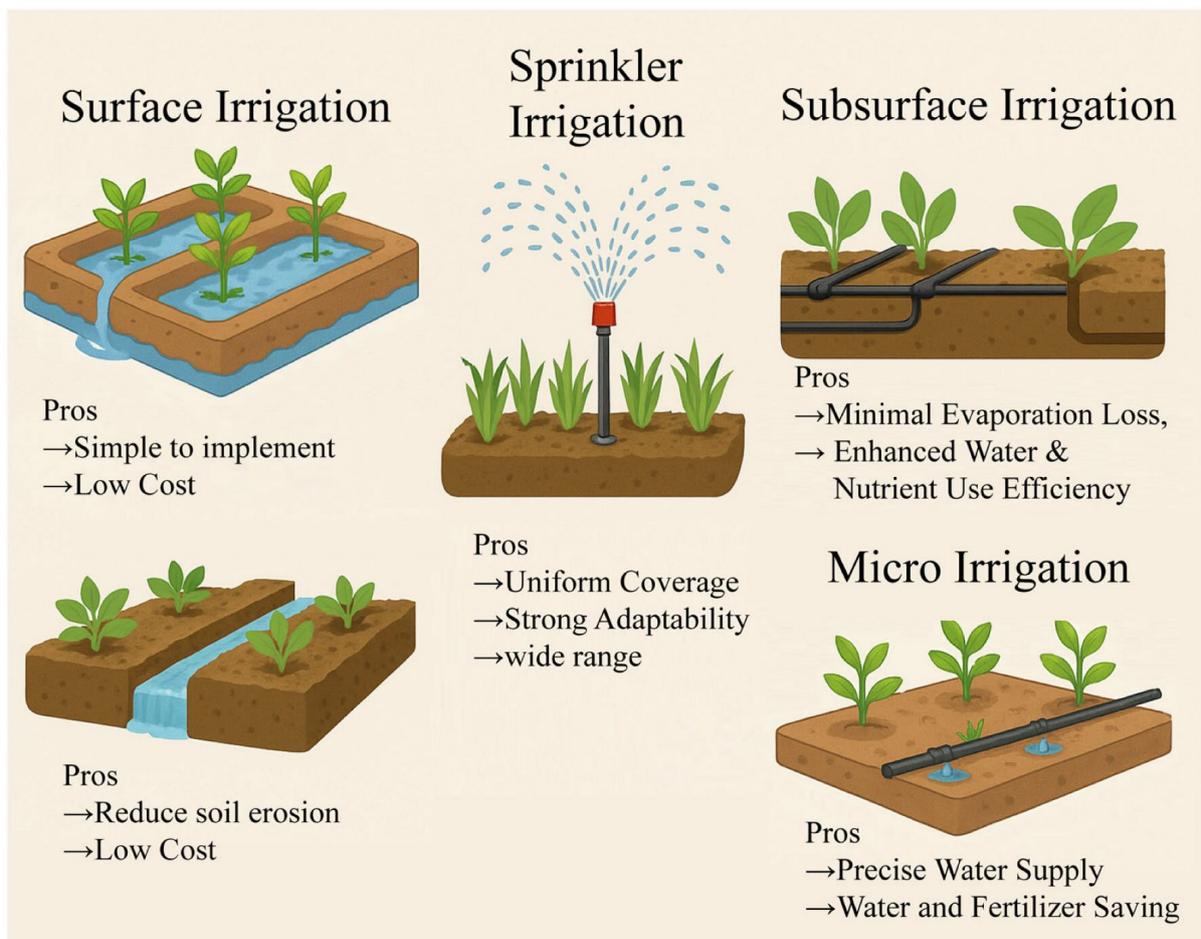


Chinese researchers compiled and analyzed 131 studies on water and nitrogen transport in wheat-maize rotation systems. The review demonstrated that the combination of irrigation, fertilization, and soil management practices promotes productivity gains, efficient resource use, and reduced environmental impact.

Irrigation directly influences moisture distribution and nitrogen mobility in the soil. Methods such as drip and subsurface irrigation offer the highest efficiencies in water and nitrogen use. These techniques reduce losses due to evaporation, leaching, and volatilization. Traditional methods, such as furrow and border irrigation, are less precise and pose a greater risk of nitrogen loss.

Nitrogen fertilizers

The use of controlled-release nitrogen fertilizers proved more effective than conventional sources. Fractionated applications throughout the crop cycle, with doses adjusted to plant demand, resulted in lower ammonia emissions and greater nutrient uptake. The addition of biochar and manure also contributed to nitrogen retention and improved soil conditions.



Soil management with straw, mulch, and biochar has demonstrated a central role in water retention and nitrogen stabilization. These practices increased organic matter, porosity, and microbial activity, reducing leaching and promoting efficient root absorption. Biodegradable films showed

similar performance to plastics, with an environmental advantage.

The integration of irrigation, fertilization, and soil management generated synergy in the production system. The wheat-corn rotation responded positively to the coordinated management, with better root development, greater biomass accumulation, and grain yield. Models such as HYDRUS and DSSAT were used to simulate these effects.

Local conditions

The study highlights the need to adapt practices to local soil, climate, and water availability conditions. The system's efficiency depends on the careful selection

of the irrigation method, the type of fertilizer, the applied dose, and the physical and biological management of the soil. The research recommends the combined use of precision technologies and conservation strategies.

Further information at
doi.org/10.3390/agriculture15232442

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Flowers planted earlier help prevent losses due to extreme heat.

Research indicates that flowering in the early hours of the day functions as a natural escape strategy.

03.12.2025 | 17:37 (UTC -3)

Cultivar Magazine



Photo: Sandra Brito

Flowering in the early hours of the day reduces heat damage to agricultural crops. Researchers from China Agricultural University analyzed global climate records since 1850 and gathered data on flower opening from 102 species. The group identified "early morning flowering" as an efficient strategy to protect the reproductive process from high temperatures.

Scientists assessed hourly temperatures during the hottest months in 50 agricultural areas across Asia, Africa, Europe, and the Americas. Between 2004 and 2023, the daily maximum temperature rose by 1,25°C. The daily period above 29°C increased by 1,08 hours during the same interval. Africa recorded an average maximum temperature of 34°C in 2023,

while North America showed the fastest rate of warming and the fastest increase in heat waves.

The team divided the species into groups with morning, afternoon, and night flowering. In cereals, the differences were striking. Optimal flower opening temperatures reached 26,1 °C in the morning flowering group, 22,3 °C in the midday group, and 29,3 °C in the night flowering group. Corn and indica rice opened flowers in the morning and tolerated higher thresholds for grain formation: 37,5 °C and 37,4 °C. Japonica rice, which flowers at midday, had a limit of 36,7 °C. Sorghum and millet, which are nocturnal, reached 38 °C and 42,4 °C, respectively.

Controlled experiments

Controlled experiments reinforced the protective effect. Wheat and rice varieties with early flowering maintained a higher proportion of grains under heat. In corn, pollination carried out in the early hours increased the fruit set rate when the maximum temperature reached 40 °C. These results indicate that shifting anthesis to cooler times is an effective mechanism for thermal escape.

The researchers also identified genes that regulate the timing of flower opening. In rice, genes such as OsMYB8 and EMF1 modulate the cell wall structure of the lodicules and adjust the timing of opening. Homologs of these genes appear in more

than 60 species, indicating potential for broad use in genetic improvement for heat.

Further information can be found at doi.org/10.48130/seedbio-0025-0013

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Ants sacrifice diseased larvae to protect the colony.

Pupae of infected worker ants release an odor that triggers lethal disinfection.

03.12.2025 | 14:59 (UTC -3)

Cultivar Magazine



When an ant pupa signals its imminent death from an incurable infection, the worker ants remove it from the cocoon and disinfect it - Photo: Christopher D. Pull / ISTA

Researchers at the Austrian Institute of Science and Technology (ISTA) have identified a novel defense mechanism in ants of the species **Anaphyla**. *Lasius neglectus* Terminally ill pupae, facing an incurable fungal infection, emit specific chemical compounds. The odor signals to worker ants that there is an invisible but lethal threat. They act quickly: they remove the pupa's cocoon, break the cuticle, and apply formic acid, a potent natural disinfectant. The procedure eliminates the pathogen and the host.

This behavior functions as an early warning system. Communication between pupa and worker occurs before the infectious phase of the disease. This prevents outbreaks and protects the

collective.

Chemical signal and immediate action

The response of worker bees depends on two cuticular hydrocarbons:

tritriacontadiene (C33:2) and tritriacontene (C33:1). Both increase significantly only in the pupae of diseased worker bees that are accompanied by healthy worker bees. Isolated, infected pupae do not produce the signal.

The researchers tested whether this odor would be enough to trigger disinfection behavior. To do this, they extracted the compounds from infected pupae and applied them to healthy pupae. The simple

transfer of the substance was sufficient to cause the worker ants to "unpack" and subsequently disinfect themselves.

The composition of the signal is complex. Beyond the total quantity of compounds, the worker ants seem to react to the presence of specific isomers. In diseased pupae, for example, the ratio of the 13-C33:1 isomer increases considerably. Others, such as the 12-C33:1 isomer, decrease. This detailed pattern, and not just the presence of an isolated compound, appears to be the trigger for the collective response.



Worker ants organize the colony's brood into separate nest chambers. The larvae, which have hatched from the eggs and require frequent care, are grouped together and fed regularly. The pupae, on the other hand, do not feed and are protected from desiccation by their cocoons, needing only occasional inspections by the workers.

Programmed altruism

The pupae do not emit the signal immediately after infection. Instead, they attempt to fight the pathogen with their individual immune systems. Only when the infection proves irreversible does the

signaling for elimination occur. This is a form of programmed altruism. The pupa loses its life, but protects relatives with whom it shares genes. In evolutionary terms, it indirectly increases its fitness.

Researcher Erika Dawson, first author of the study, states that this sacrifice is not irrational behavior. "Non-reproductive pupae have no chance of producing offspring. Their adaptive value depends on the survival of the colony," she says.

Queens do not signal

Interestingly, the mechanism does not occur in pupae destined for royalty. Even when infected with higher doses of the fungus *Metarhizium brunneum* They do not

alter the chemical profile and do not signal. However, they also do not put the ant colony at risk. This is because they have a more efficient immune response. Data from the study show that, after a peak of infection, queen pupae reduce the fungal load by up to three times -- the opposite of worker pupae, whose infection only progresses.

This difference indicates that the warning system depends on immune failure, and not just on the presence of the pathogen.

Superorganism with a collective immune system

The social structure of ants resembles the functioning of a multicellular organism. Queens produce offspring. Workers take care of maintenance. Each individual performs an interdependent function. In this model, "social immunity" emerges as a collective mechanism. Just as infected cells in a human body emit signals to attract phagocytes, irrecoverable pupae emit odors that summon workers for controlled elimination.

This system does not act indiscriminately. Pupae with the potential for recovery are not sacrificed. According to Sylvia Cremer, leader of the research group, this precision avoids unnecessary losses and reinforces the system's efficiency. "The colony acts based on reliable signals. It only eliminates what truly threatens the collective."

Further information can be found at
doi.org/10.1038/s41467-025-66175-z

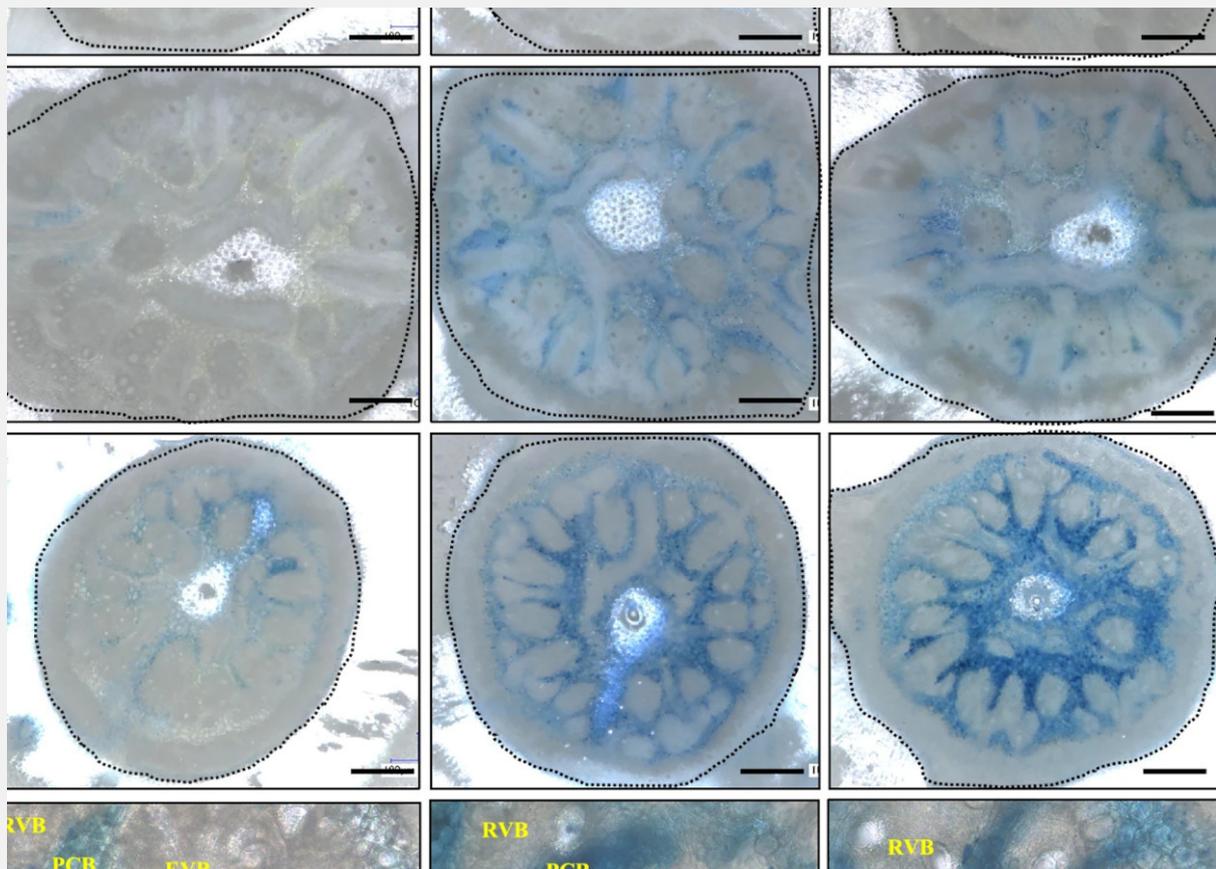
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Gene discovered that sends iron to young rice tissues.

Researchers identify OsIET1 gene, which impacts plant health and production.

03.12.2025 | 14:44 (UTC -3)

Cultivar Magazine



Researchers from China and Japan have identified a key gene for the efficient

distribution of iron in rice plants. The gene, named OsIET1, encodes a protein located in the plasma membrane, responsible for exporting Fe²⁺ iron to developing tissues.

OsIET1 acts in the xylem regions of the diffuse vascular bundles (DVB) at the plant nodes. These nodes function as logistics centers, redirecting nutrients between the main vascular bundles that connect roots and leaves. When OsIET1 is deactivated, the plant accumulates iron in the nodes and older leaves, but fails to deliver the nutrient to young leaves and grains.

This poor distribution generates symptoms of iron deficiency, such as chlorosis in new leaves, even when the total iron content in the plant remains high. Furthermore, mutant plants exhibit shorter height, fewer

tillers, and a reduction of up to 48% in grain productivity.

Experiments with mutants

Experiments with mutants created by CRISPR/Cas9 confirmed the gene's role. Even with roots absorbing iron normally, plants lacking OsIET1 showed less accumulation of the nutrient in young tissues. Tests with radioactive iron ^{57}Fe reinforced that the gene promotes preferential transfer to growing leaves.

Unlike other genes in the same family (VTL), OsIET1 is not located in the vacuole, but in the cell membrane, facilitating the release of iron into the

xylem of DVB cells. Its expression increases with iron supply, which helps maintain the internal balance of the nutrient under conditions of abundance.

Complementary function

The function of OsIET1 complements that of other known genes, such as OsOPT7, responsible for releasing iron from the xylem of enlarged vascular bundles (EVB). OsIET1 performs the final step: it recharges iron in the xylem of the DVB, ensuring that tissues with low transpiration rates, such as new leaves and panicles, receive the iron necessary for growth.

Further information at
doi.org/10.1038/s41467-025-64863-4

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Ascenza announces new sales coordinator for the Southeast and Northeast regions.

Márcio Lavoura takes on the role to expand distribution channels.

03.12.2025 | 13:48 (UTC -3)

Cultivar Magazine, based on information from Silvana Guaiume



Ascenza Brasil announced the arrival of Márcio Lavoura as the new commercial coordinator for the Southeast and Northeast regions. The objective is to expand distribution channels and consolidate the company's presence in the fruit and vegetable market.

Lavoura is an agricultural engineer graduated from the Federal University of Lavras and holds an MBA in marketing from FGV in Chapecó. He has accumulated experience in various biomes and production chains. He has worked in large companies, focusing on the fruit and vegetable segment, in roles such as technical consultant, market development analyst, sales manager, and marketing manager.

According to him, Ascenza differentiates itself by offering registered solutions for HF, a segment with a historical shortage of authorized products in the country. "The company's portfolio directly addresses this demand, guaranteeing productivity and sustainability," he states.

In his new role, Lavoura will coordinate the sales team and provide technical support to distribution channels and producers.

"We have a skilled team ready to share knowledge and meet the growing demand for effective and sustainable solutions," he emphasizes.

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Beetle expands transmission of ToBRFV among solanaceous plants.

Research indicates that *Henosepilachna vigintioctopunctata* acts as a mechanical vector for the virus.

03.12.2025 | 08:53 (UTC -3)

Cultivar Magazine



Photo: Merle Shepard, Gerald R Carner and PAC Ooi

The beetle *Henosepilachna vigintioctopunctata* expands transmission of *Tomato brown rugose fruit virus* (ToBRFV) between host plants. The study analyzed the insect's efficiency as a mechanical vector and quantified its ability to transfer the virus to tomato, pepper, eggplant, and weeds of the Solanaceae family.

Tests confirmed that the insect acquires the virus by feeding on diseased leaves and transmits the pathogen while chewing on healthy leaves. The virus appears on damaged leaves nine days after exposure. Systemic signs appear from the 12th day onwards. The experiment recorded a higher viral load on leaves damaged by abrasion with sand. Leaves chewed by the beetle showed about half the viral load

observed in the positive control.

The study showed that the beetle transmits the virus to other solanaceous plants. In *Solanaceae nigrum* The transmission efficiency was equal to the mechanical method. In peppers and eggplant, transmission occurred, but at lower levels than with abrasive inoculation.

Cage trials

Cage trials have shown that the beetle intensifies the spread of the virus in mixed host populations. The presence of the insect increased the viral load in tomato, pepper, eggplant, potato and *S. nigrum* The movement of the beetle reduced the effect of the infected plant's position within the

cage. This homogenized the risk of transmission.



Photo: Merle Shepard, Gerald R Carner and PAC Ooi

The research evaluated the virus retention period in the beetle. Transmission capacity reached high levels up to 36 hours after acquisition. Efficiency decreased in the following 48 and 72 hours. The viral load concentrated in the insect's digestive tract.

The head and legs showed weak and decreasing signs.

The study found that injuries caused by uninfected beetles increase the susceptibility of plants to the virus.

Applying infected sap to previously damaged leaves generated a viral load approximately five times higher than that observed when applied directly to intact leaves.

Research has indicated that a single bite from an infected beetle is enough to transmit the virus. The intensity of the bite did not alter the transmission capacity.

Further information at
doi.org/10.3390/insects16121225

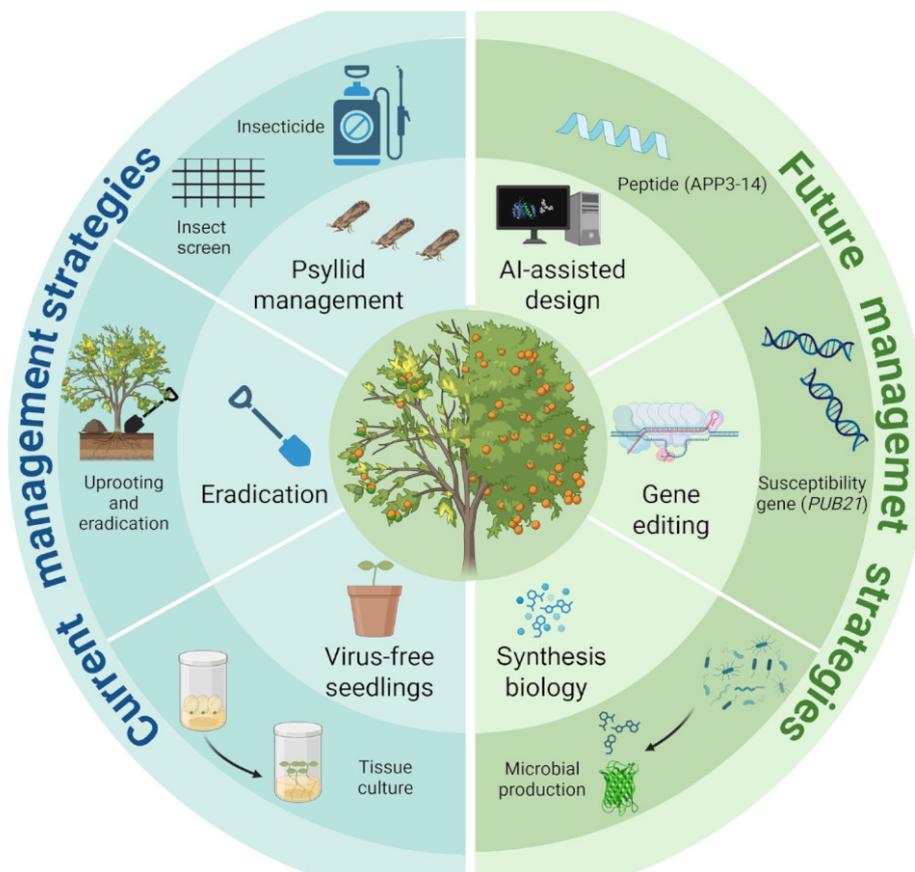
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Scientists propose evolutionary principles to combat citrus greening.

Study identifies key proteins and proposes precision biological control.

03.12.2025 | 08:36 (UTC -3)

Cultivar Magazine



Greening (HLB), caused by the bacteria *Candidatus Liberibacter asiaticus (CLas)*A disease threatens the global citrus industry. It spreads rapidly, reduces productivity, and has brought Florida's citrus industry to its worst level in 105 years. Faced with the ineffectiveness of conventional methods, researchers are proposing an innovative approach based on evolutionary principles, biotechnology, and artificial intelligence (AI).

The idea was expressed by scientists Qiong Li, Huan Yang, Pingzhi Zhao, Daniel J. Kliebenstein and Jian Ye.

Conventional pest and disease control strategies accelerate pathogen resistance. Evolution-informed pest management (EIPM), on the other hand, proposes

exploiting the genetic vulnerabilities of pests, anticipating their adaptations. Recent research has identified two genetic mechanisms associated with citrus susceptibility to HLB. The first involves the PUB21 protein, which degrades the defense regulator MYC2, inhibiting the plant's immune response. The second refers to a genetic element (helitron) that intensifies the expression of the PUB21 gene, increasing susceptibility.

Natural variants

Wild species of the Rutaceae family, such as *poncirus trifoliata* These strains exhibit natural variants of the PUB21 gene. One of these variants, PUB21DN, has a mutation that prevents the degradation of

MYC2, conferring resistance to HLB. These characteristics are not present in commercial varieties, suggesting evolutionary limitations imposed throughout the domestication process.

Based on these findings, researchers developed the antimicrobial peptide APP3-14, designed with the aid of AI. The compound stabilizes the MYC2 protein and acts directly in destroying the CLas bacteria, offering double protection. Tests indicate a significant reduction in bacterial load in treated plants.

Beneficial microorganisms

In addition to the peptide, beneficial microorganisms such as *Pseudomonas fluorescens* They can activate the defense via MYC2. Scientists suggest engineering these microorganisms to produce antimicrobial peptides, amplifying the effect of biological control.

The proposal also includes the use of gene editing, such as CRISPR-Cas9, to eliminate susceptibility genes like PUB21 or modify MYC2 to make it resistant to degradation. The strategy combines precision genetic improvement with biocontrol agents, forming a more robust and sustainable defense network.

Evolution-informed management

The EIPM concept considers evolutionary pressures as allies. Several pathogens, such as viruses and insects, use the same JA–MYC2 signaling pathway to weaken plant defenses. By identifying and blocking these critical points, scientists develop long-lasting control tools that are less susceptible to resistance.

Despite the advances, challenges remain. Large-scale production of the APP3-14 peptide faces barriers such as degradation time in the field and costs. Furthermore, pathogens can evolve to circumvent the new defense mechanisms. To overcome these obstacles, researchers propose the

creation of synthetic microorganisms,
guided editing based on natural variations,
and rigorous field evaluation.

Further information at

doi.org/10.1016/j.tplants.2025.11.004

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MicroXisto has a new national marketing manager.

Thiago Duarte has over 10 years of experience in agribusiness.

03.12.2025 | 07:40 (UTC -3)

Cultivar Magazine



Thiago Duarte has taken over as national marketing manager for MicroXisto. The company operates in the market for

producing fertilizers based on shale water.

The executive has over a decade of experience in the sector. He has worked for companies such as Alta, Ihara, BASF, and FMC. He coordinated marketing and portfolio strategies, focusing on crops such as sugarcane, citrus, and forests. He worked in product development, market planning, and commercial access in different regions of the country.

At Alta, she led strategic marketing for almost a year and a half, based in Curitiba. Before that, she spent seven years at Ihara, where she managed accounts for cooperatives, sugar mills, and distribution channels in Minas Gerais and São Paulo.

He also worked at BASF as an agronomist in technical marketing. He began his

career at FMC as a market development intern.

Duarte is an agricultural engineer from Eduvale de Avaré. He holds an MBA in Agribusiness from Esalq/USP.

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A fall armyworm (*Spodoptera frugiperda*)

suffered drastic effects after exposure to the insecticide. broflanilide (broflanilide)

Research has revealed that both lethal and sublethal doses of the substance reduced larval growth, impaired sex pheromone production, and compromised the attractiveness of females to males.

Tests showed that broflanilide caused a decrease in body size, larval and pupal weight, and pupation, emergence, and hatching rates. The substance also caused alterations in metabolic pathways essential to the production of sex pheromones, such as a drop in Ca^{2+} , cAMP, acetyl-CoA, and pyruvate levels. Enzymes fundamental to pheromone biosynthesis, such as calcineurin (CaN) and acetyl-CoA carboxylase (ACC), also lost activity.

The reduction in the production of the main pheromonal component (Z9–14:OAc) resulted in a lower capacity of females to attract males. The direct consequence was a decrease in the mating rate and fecundity. At high concentrations (LC30), broflanilide reduced key population parameters in the next generation (F1), such as intrinsic growth rate (r), finite rate of increase (?), and net reproductive rate ($R?$).

Even at low doses (LC5 and LC10), delayed development, lower pupal weight, and reduced emergence rate were observed. Although the number of eggs increased in some situations, the hatching rate decreased. This discrepancy suggests a compensatory physiological response to chemical exposure.

Broflanilide acts on GABA receptors, affecting nerve signaling in insects. This action may explain the drop in levels of secondary messengers and in the enzymatic activity involved in pheromone production. These effects indicate that the insecticide can significantly reduce the reproductive success of the pest.

Further information at
doi.org/10.1016/j.pestbp.2025.106861

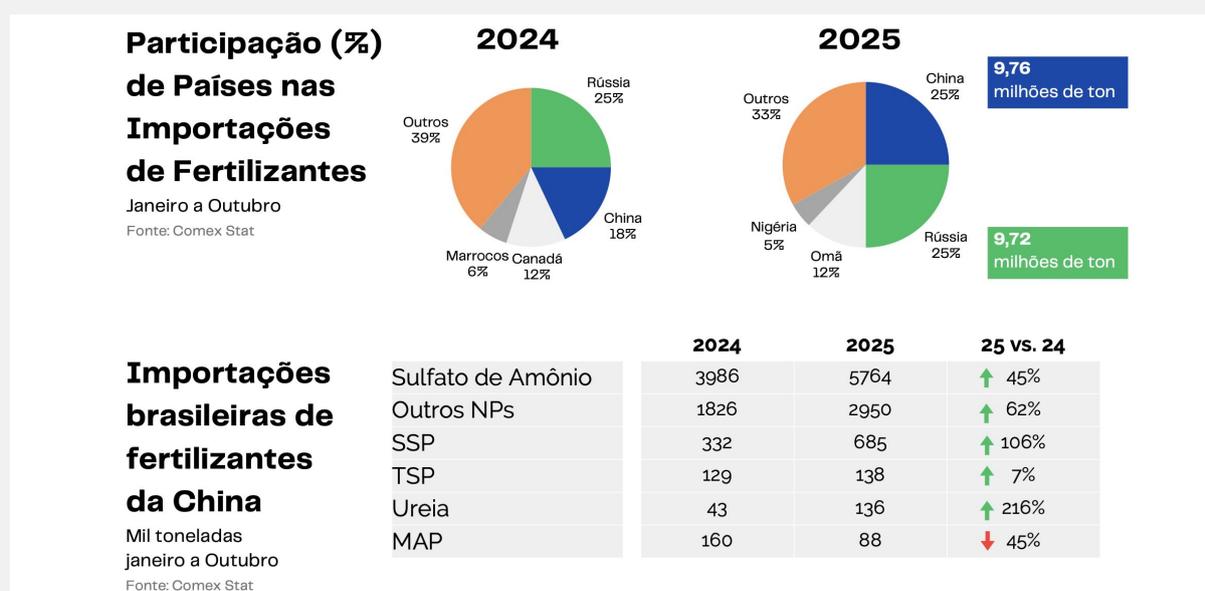
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China takes the lead in supplying fertilizers to Brazil.

A report from CNA indicates cautious domestic demand, prices still under pressure, and a structural change in the profile of suppliers.

02.12.2025 | 14:06 (UTC -3)

Cultivar Magazine, based on information from CNA



Brazil has increased its fertilizer imports and recorded a further increase in Chinese participation in sales to the country. From January to October, purchases totaled

38,3 million tons, a 4,6% increase compared to the same period in 2024. China surpassed Russia and became the leading supplier, driven by increased exports of Ammonium Sulfate (SAM) and NP formulations. This information is contained in a report by the CNA (National Confederation of Agriculture).

The domestic market is operating with weakened demand. India, the United States, and Brazil are reducing their impetus for new negotiations. This retraction sustains the trend of stable or falling prices. Urea costs R\$ 3.445 per ton, MAP R\$ 4.899, SSP R\$ 2.091, and KCI R\$ 2.880.

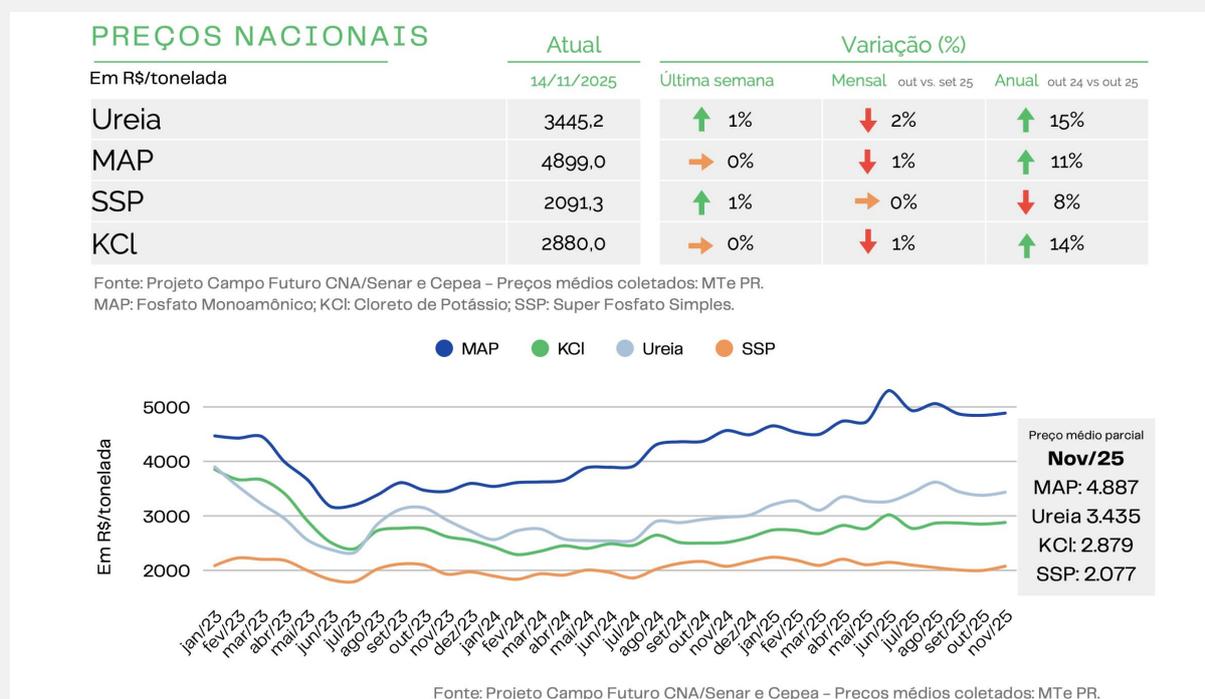
The pace of deliveries in the country is exceeding that observed in 2024. By

August, 30,5 million tons had arrived, a 9% increase. The CNA (National Confederation of Agriculture) projects a record volume in 2025. Delays in purchases in Rio Grande do Sul may influence the final result. In 2026, even with profitability and credit challenges, producers are expected to maintain investment in crops.

Growth in supply

Chinese supply is growing at a rapid pace. Imports jumped from 9,72 million tons in 2024 to 9,76 million in 2025. This movement generated queues at the Port of Paranaguá. Ships waited up to 60 days to unload. The backlog put pressure on operational capacity and increased costs

and demurrage.



In the domestic market, nitrogen fertilizers remain volatile. The purchase announced by India halted the decline in urea prices and brought upward pressure. Cautious demand is encouraging substitution with SAM (sugar-based phosphates). In phosphates, MAP (mineralized phosphate) is falling, but the terms of trade are still hindering new purchases. In potash,

limited supply in Brazil is supporting firm prices.

Exchange rates show a loss of purchasing power in several crops. Soybeans face less favorable conditions for KCI acquisition. Cotton maintains a negative scenario, affected by still expensive phosphates. Corn improves its exchange rate with SAM and registers an advance in urea. Coffee remains an exception and shows consistent gains for the producer.

Pesticide market

In the pesticide market, soybean crops are driving occasional increases in fungicide prices. The overall price index fell to 83,1 points in November, compared to peaks

above 140 recorded in recent years. The product with the largest monthly increase is the combination of prothioconazole and trifloxystrobin, while glyphosate WG and 2,4-D are declining.



CNA points out that, even with recent stability, the market remains attentive to the behavior of global inventories and upcoming Indian tenders. China's new

export quota also influences international supply and adds volatility in the short term.

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New Holland expands Smart Dealer network in Santa Fe.

The brand expands its presence in Argentina with new units in partnership with Agroterra and Grosso Tractores.

02.12.2025 | 13:25 (UTC -3)

Cultivar Magazine, based on information from Facundo Cabrera



New Holland, a CNH brand, has incorporated four units into the Smart Dealer concept in the province of Santa Fe, Argentina. This initiative is in partnership with the dealerships Agroterra and Grosso Tractores. The model, which combines technology and personalized service, now has 23 stores in the country. The total investment has already reached US\$25 million.

Agroterra's main building in Venado Tuerto underwent extensive renovations and occupies a 5-hectare plot, with 3.500 m² of built area. The space includes a showroom, coworking area, official brand store, and dynamic testing area. One of the highlights is the intelligence center, which allows for real-time machine monitoring, failure prevention, and remote

update application.

The site also features sustainable solutions, such as solar panels that supply 20% of the energy consumption, composting, a biodigester, permeable pavement, and a partnership with the municipality for recycling. Agroterra also participates in environmental initiatives at the Alma Guaraní Reserve through the Avanterra Group.

Grosso Tractores reopened three branches -- Franck, San Justo, and San Francisco -- under the new standard. The stores received improvements in the sales, parts, and workshop areas, with a total focus on customer experience and the efficiency of technical service. The units also improved the management of recyclable waste.

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FMC strengthens its team in sugarcane production.

Leonardo Brusantin adopts national strategy to bring the company closer to producers and partners.

02.12.2025 | 07:22 (UTC -3)

Cultivar Magazine, based on information from Ingrid Ribeiro



FMC announced the return of Leonardo Brusantin (pictured) as manager of sugarcane cultivation. The agronomist will lead the company's strategies for the sector, focusing on strengthening relationships with producers and partners throughout the country.

Brusantin has over 15 years of experience in agribusiness. He has worked in areas such as marketing, market development, and portfolio management. A graduate of UNESP, he holds an MBA in marketing and business management and a postgraduate degree in sugar and ethanol management and technology.

He began his career at FMC through the Sugarcane University, a project created in 2008 by the company in partnership with

the Dr. Francisco Maeda Faculty. The initiative trained professionals specialized in the sugarcane supply chain with a technical and managerial focus.

The executive highlighted the importance of returning to FMC and reinforced the company's commitment to innovation and sustainability in the field. "Our focus is to continue supporting producers with solutions that combine high performance and sustainability," he stated.

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US Attorney General supports Supreme Court review of glyphosate.

Company seeks favorable ruling to limit lawsuits involving the Roundup herbicide.

02.12.2025 | 07:17 (UTC -3)

Cultivar Magazine, based on information from Brian Leake



Bayer has received support from the U.S. Attorney General to take the Durnell case, related to the Roundup herbicide, to the Supreme Court. The company is trying to settle thousands of lawsuits alleging failures to warn about the product's risks. The government's backing strengthens Bayer's arguments regarding preemption, a legal principle that defends the prevalence of federal law over state regulations.

The divergence among federal courts regarding the application of this principle motivated Bayer's request to the Supreme Court. The company argues that the federal pesticide law (FIFRA) should prevent state sanctions when labels comply with national requirements. CEO Bill Anderson stated that government

support represents progress for US farmers, who need regulatory certainty.

Bayer argues that the case has implications beyond the agricultural sector. Medical devices, meat, poultry, and vehicles are also subject to similar federal regulations. The company believes that flawed court decisions jeopardize innovation and investment in the United States.

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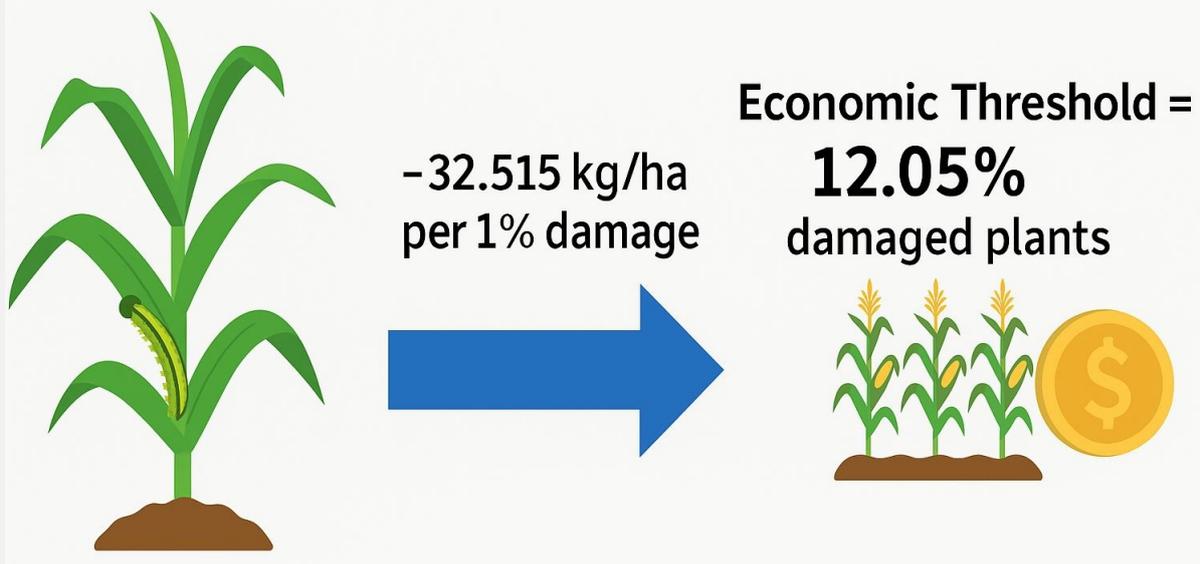
Short-stature corn requires new limit for fall armyworm control.

Study determines that control of the *Spodoptera frugiperda* pest should begin when 12% of plants are damaged.

01.12.2025 | 13:22 (UTC -3)

Cultivar Magazine

Economic Threshold for Fall Armyworm in Short-Stature Maize (Delfín variety)



Producers of short-stature corn of the Delfín variety should begin controlling the fall armyworm When damage reaches

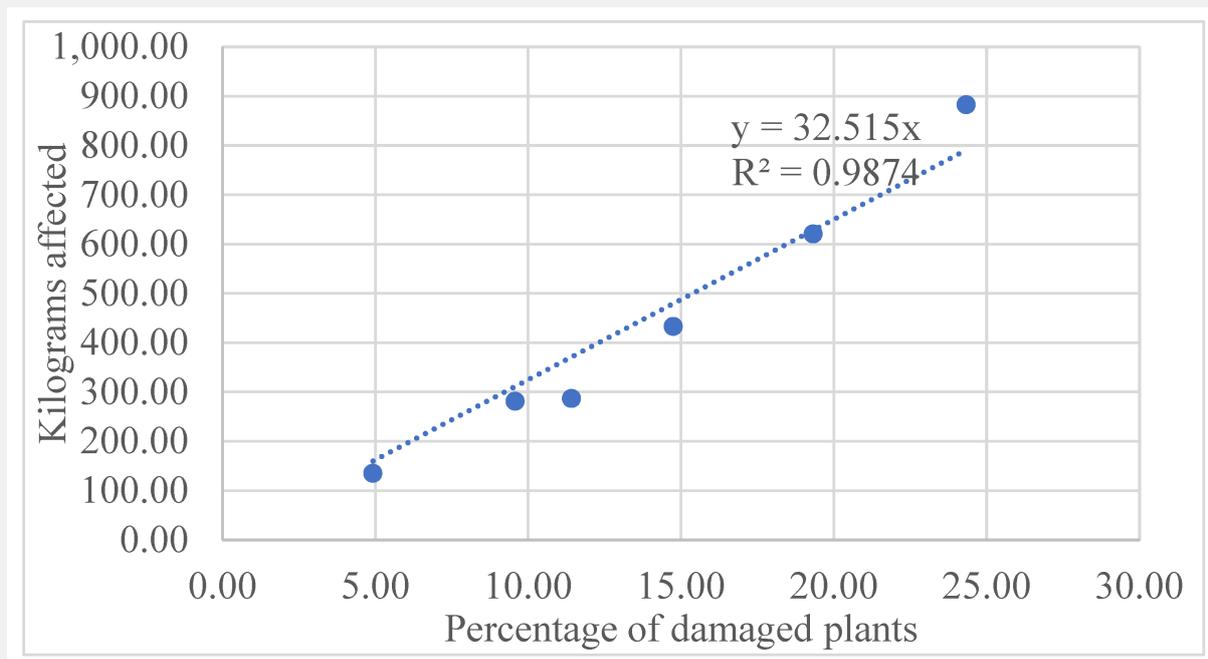
12,05% of the plants. A study conducted in the municipality of El Fuerte, Mexico, quantified linear losses of 32,515 kg/ha for each 1% of plants damaged by the pest.

The researchers evaluated seven treatments with different levels of artificial infestation of *Spodoptera frugiperda* between 0% and 25%. The DK-4050 hybrid was introduced as a regional control under natural infestation. The experiment used plots of 400 plants and manually infested each selected plant with two to three newly hatched caterpillars.

Assessments were conducted 20, 40, and 60 days after infestation. Damage levels increased with the percentage of infested plants. The severity of the attack also increased proportionally. Treatment T6,

with 25% of plants infested, maintained the highest damage levels in all readings. The treatment without induced infestation recorded minimum values.

Production progressively decreased as damage increased. The highest productivity occurred in the treatment with minimal natural infestation (12.199,18 kg/ha). The lowest occurred with 24,33% of plants damaged (11.316,78 kg/ha), a reduction of 882,40 kg. The DK-4050 variety, under natural pressure of 11,42%, yielded 11.912,40 kg/ha, a performance similar to the treatment with 10% artificial infestation.



Based on the regional price of corn, at US\$325/t, and the average cost of two insecticide applications, at US\$127/ha, the researchers defined an economic loss equivalent to 391,6 kg/ha. Applying this value to the linear equation generated by the study, the economic limit was calculated at 12,05% of damaged plants. Above this level, insecticide application compensates for the cost of management.

The study indicates that Delfín maintains susceptibility until the beginning of grain formation, a longer period than observed in other hybrids. The authors recommend validating the economic threshold in other environments, sowing times, and natural levels of pest pressure.

Further information at
doi.org/10.3390/insects16121219

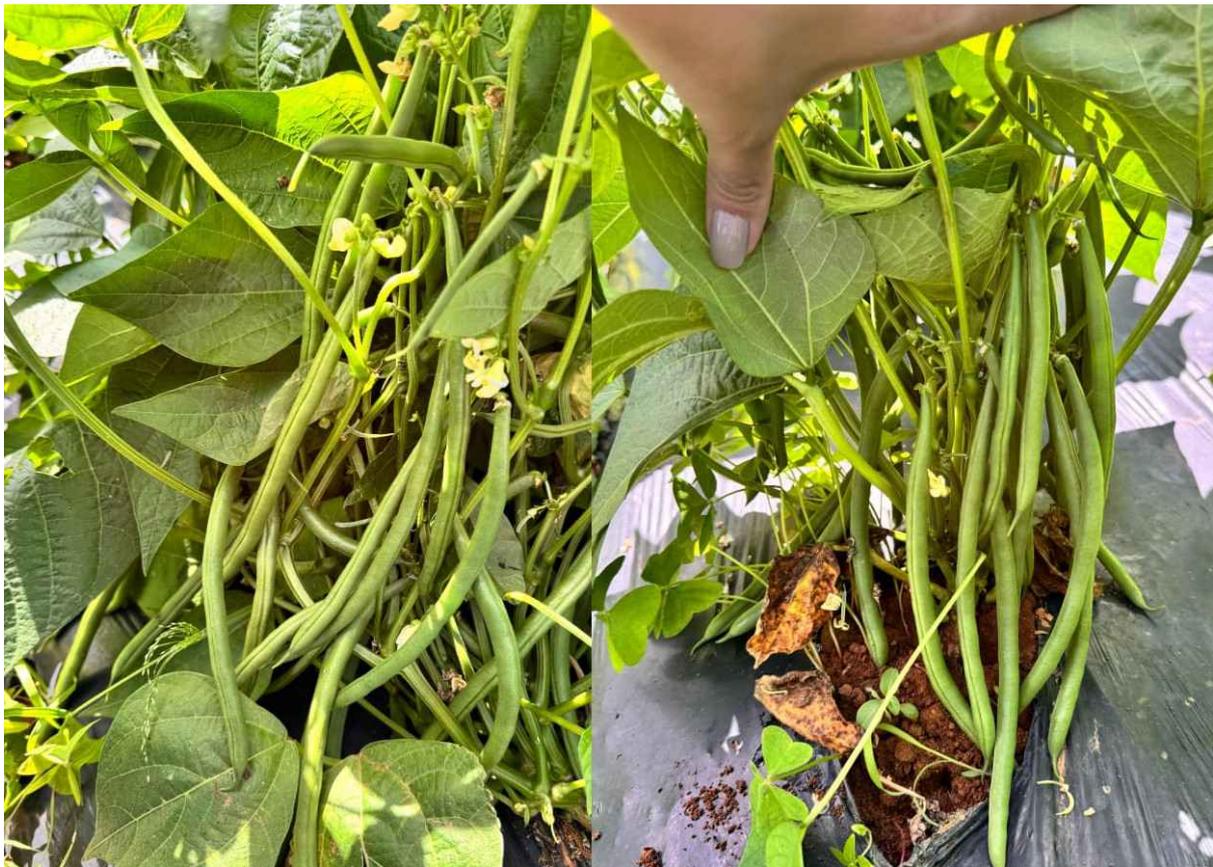
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Concentrated harvesting makes the green bean a more efficient choice.

Concentrating up to 90% of the pods in the same window improves management.

01.12.2025 | 10:12 (UTC -3)

Juliana Bonassa, edition of Cultivar Magazine



The pursuit of greater efficiency in management has led many producers to prioritize green bean varieties that concentrate harvesting and offer more uniform pods with better commercial quality. In regions such as São Paulo, southern Minas Gerais, Goiás, Paraná, and Santa Catarina, where cultivation is traditional, characteristics such as short cycle, plant vigor, and visual quality have gained prominence in crop planning.

According to Green Belt expert Roberto Araújo, concentrated harvesting is one of the main advantages observed in the field today. “While conventional, deterministic materials require two or three passes to take full advantage of their productive potential, there are varieties that can have about 90% of their pods ready at the same

time. The producer can harvest practically everything at once,” he explains.

This behavior reduces losses due to plant damage—common in repeated harvests—preserves final productivity, and facilitates the organization of labor. On farms that use mechanization, uniformity also contributes to more precise and faster operations.

In addition to the ease of harvesting, Araújo points out that these varieties stand out for the quality of their pods. The slightly darker green color ensures a better appearance and prolongs their shelf life after harvesting. “When the pod is very light, after two or three days it already looks like it's drying out. This darker color keeps it looking fresh for longer in the tray,” he says.

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Alexandre Mezzomo takes over as commercial director of Netafim.

The executive has over 15 years of leadership experience in agricultural sales and has worked at Bayer, FMC, and Monsanto.

01.12.2025 | 09:51 (UTC -3)

Cultivar Magazine



 **NETAFIM**[™]
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Netafim has hired Alexandre Mezzomo de Paula as its commercial director in Brazil. The executive has over 15 years of experience in sales, marketing, and leadership in agribusiness. He has worked at companies such as Bayer, FMC, and Monsanto, where he led large teams and operations in different producing regions of the country.

Mezzomo is an agricultural engineer with a postgraduate degree in Agribusiness and an MBA in commercial management. He has a solid track record in structuring sales forces, developing teams, and strategizing market access. He also has experience in launching technologies, strategic planning, and managing distribution channels.

Before Netafim, she led the commercial area of FMC in Western Brazil. At Bayer, she led the seeds and biotechnology division, operating in the states of MS, SP, MG, BA, SE and AL. She was also the national manager for the Dekalb brand.

Mezzomo began his career at Monsanto in 2008 as a licensing representative.

At Netafim, he will now lead the commercial strategy of the company specializing in localized irrigation solutions, headquartered in Ribeirão Preto.

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Field size determines rat population density.

Research conducted in the Czech Republic reveals that smaller cultivation areas limit the population density of *Microtus arvalis*.

01.12.2025 | 07:43 (UTC -3)

Cultivar Magazine



Photo: Dieter TD, CC BY-SA 3.0

Larger agricultural fields favor the increase in populations of field mice (*Microtus*

arvalis), a pest that causes significant damage to agriculture in Central Europe. This is the main conclusion of a seven-year study conducted in the Czech Republic.

The research observed a positive, non-linear relationship between field size and rodent population density. The effect was strongest in fields up to 20 hectares. In larger areas, the rodent population growth was less pronounced, but still present.

The study

Researchers monitored over 3 data pairs of rodent density and field size across 22 agricultural districts in the Czech Republic between 2015 and 2021. Population

density was estimated based on the count of active burrow entries per hectare. The burrow index is a standardized method used to estimate rodent populations.

Microtus arvalis.

Sampling was conducted twice a year—spring and autumn—in fields cultivated with alfalfa, clover, and mixtures of alfalfa with grasses. All fields analyzed showed connectivity through strips of vegetation or drainage ditches, which function as corridors for rodent dispersal.

The results

Three factors strongly influenced the density of the grassland mouse: field size, crop type, and altitude. Statistical models

confirmed that an increase in cultivated area raised rodent density, especially in fields up to 20 hectares. The relationship proved robust even after controlling for variables such as season, forage type, and altitude.

Alfalfa fields showed the highest rodent densities in the fall. On average, they had 1,5 times more rodents than clover fields and more than double the number compared to mixed grass areas. In the spring, mixed grass fields had the largest populations, followed by alfalfa.

Altitude only influenced clover fields, where density increased in higher areas. This association was not observed in other crop types.

Practical implications

According to scientists, the relationship between field size and density of the pampas mouse challenges the prevailing ecological theory, which predicted an absence of correlation or even a reduction in density with increasing area. Species that preferentially live in the interior of habitats, such as *Microtus arvalis*, tend to have fewer immigrants per unit area in large stretches, due to the geometric difficulty of locating the resource.

However, the authors suggest that, in these cases, the increased density is due to individuals remaining in their natal areas, reducing emigration. This behavior has already been observed in studies with

other microtinus species.

The field mouse experiences cyclical population explosions every two to five years. During these outbreaks, populations can exceed 6 individuals per hectare, causing significant losses in cereals, oilseeds, and forage crops. Only one other species, the Australian house mouse, exhibits similar densities.

Further information at
doi.org/10.1002/ps.70410

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Anvisa establishes rules for measuring the risk of exposure to pesticides.

RDC 998 expands safety analysis and mandates occupational risk assessment.

01.12.2025 | 07:19 (UTC -3)

Cultivar Magazine, based on information from Danilo Lysei



Photo: Lúcio Bernardo Jr / Agência Brasília

Anvisa (Brazilian Health Regulatory Agency) has regulated unprecedented criteria for assessing the risk of pesticide exposure in the country. Resolution of the Collegiate Board (RDC) 998/2025 defines guidelines for measuring the risk to operators, workers, residents, and passersby exposed to agrochemicals. The regulation fulfills the requirements of Law 14.785/2023 and creates technical parameters for analyzing real-world usage scenarios.

The resolution mandates that companies submit an Occupational and Resident/Transporter Risk Assessment Dossier (DAROC) for each formulated product. The document must detail all exposure scenarios and utilize the agency's official calculator. The text

requires specific studies when the tool does not cover certain situations. It also demands comparison of exposure estimates with reference values ??defined in monographs. Scenarios exceeding these limits will no longer be included in the indications for use.

The rules broaden the scope of Brazilian regulation. Previously, the system mainly detailed the risk to consumers from the diet. Now, the analysis expands to include operators who apply the products, workers who return to treated areas, nearby residents, and people who circulate through the production regions.

CropLife Brasil believes the measure corrects a historical gap. "We have always emphasized the need for a comprehensive

safety assessment," stated Arthur Gomes, the organization's director of chemical pesticides. He highlighted that the regulation brings transparency and predictability by defining criteria aligned with international standards.

The rules of this resolution will come into effect 180 days after the date of its publication.



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Algae as biological inputs in agriculture

By Thiago Assis Rodrigues Nogueira, Rodrigo Silva Alves, Paulo Paschoalotto Marques and others

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Agriculture has undergone significant transformations in recent decades. Demands for productivity in the agricultural

sector have increased in order to meet the needs of the growing world population, primarily ensuring food security.

On the other hand, the global perspective on agriculture has been changing, and the search for sustainable and ecological practices has intensified in the face of possible negative impacts on the environment, mainly due to anthropogenic activities and the inappropriate use of natural resources (Pereira et al., 2022).

The use of bio-inputs has stood out as an efficient alternative to conventional inputs, and can positively impact agricultural production (Souza; Castilho; Macedo, 2022; Silva et al., 2024). Therefore, public policies promote the encouragement of biological practices and technologies in

agriculture, such as the National Bio-inputs Program, one of the most significant, as it fosters the use of biological products that influence the development of animals, plants, and microorganisms (Brazil, 2020; Souza; Castilho; Macedo, 2022).

Perspectives on the supply of bio-inputs in agriculture.

The use of biological inputs is growing rapidly in modern agriculture. In 2023, more than 55% of Brazilian crops adopted some type of bioinput, covering 36% of the cultivated area (84 million hectares) (Camargo, 2024; Romanelli, 2024).

The demand for sustainable solutions should drive new research and expand the market, which could reach US\$4,76 billion and 43,23 million hectares by 2028 (Inkwood Research, 2023; Borges, 2025).

Algae as a bio-input

Among agricultural biological inputs, algae stand out as a promising alternative, but they still require further studies on their interactions in the soil-plant system (Khan et al., 2009). Their application faces challenges such as large-scale production, lack of industrial standardization, high costs, logistical obstacles, risk of contamination, and a scarcity of high-quality research (Abinandan; Shanthakumar, 2015).



Figure 1 - Flowchart of microalgae production processes

Algae, which are mostly photosynthetic, adapt to extreme conditions and have occurred in virtually all biomes since the dawn of life on Earth (Craigie, 2011). They are natural sources of bioactive compounds such as lipids, minerals, phytohormones, amino acids, carbohydrates, and antibacterial substances (Craigie, 2011).

Among the best-known genres are *Chlorella*, *spirulina (Arthrospira)*, *Kappaphycus*, *Lithothamnion*, *dunaliella*,

scenedesmus, boat, Nostoch, anabaena e Ascophyllum (Parmar et al., 2023), including cyanobacteria, photosynthetic prokaryotes (Ortiz-Moreno; Sandoval-Parra; Solarte-Murillo, 2019).

Algae extracts act as biostimulants, providing phytohormones such as auxins, cytokinins, and gibberellins, increasing nutrient use efficiency, stimulating roots, promoting vegetative growth, and inducing stress resistance through pathways such as signaling pathways (salicylic acid, jasmonate, and ethylene) (Chemik, 2013; Jardin, 2015; Shukla et al., 2019; Ali; Ramsubhag; Jayaraman, 2021; Deolu-Ajayi et al., 2022).

They also enhance the efficiency of mineral fertilizers and can participate in

biological nitrogen fixation (BNF).

Chlorella, for example, recycles nutrients, mobilizes phosphorus (P) and potassium (K), increases organic matter (OM), and stimulates soil microbiota (Ortiz-Moreno; Sandoval-Parra; Solarte-Murillo, 2019; Singh et al., 2025).

During mucilage, algae release polysaccharides that act as bioconditioners, improving moisture retention, porosity, and reducing erosion (Ortiz-Moreno; Sandoval-Parra; Solarte-Murillo, 2019; Mahgoub Shaalan, 2025). In sugarcane, *Ascophyllum nodosum* It promotes soil microbial growth and activity (Mahgoub Shaalan, 2025).

Additionally, studies indicate that the application of microalgae extracts can significantly increase germination rate,

height growth, shoot dry biomass, chlorophyll content, and grain productivity in crops such as corn, wheat, and rice (Ortiz-Moreno; Sandoval-Parra; Solarte-Murillo, 2019; Alvarez et al., 2021). Among the compounds present in algae, betaine stands out, a solute that confers greater tolerance to abiotic stresses such as salinity, water deficit, and thermal variations (Singh et al., 2025).

Some species also demonstrate antifungal and antibacterial activity in the rhizosphere, contributing to protection against phytopathogens. Certain cyanobacteria form heterocysts, differentiated cells with thickened walls, partial suppression of Photosystem II, and high hydrogenase activity, which convert

atmospheric N₂ into assimilable forms, contributing to the supply of N to plants and to the efficiency of N use (ENU) in agricultural systems, representing a significant agronomic and environmental advantage (Wolk, 1996; Bothe 2010; Alvarez et al., 2021; Singh et al., 2025).

Nitrogen use efficiency in agriculture

Nitrogen (N) is the macronutrient most required by plants, but about 50% of the N applied via fertilizers is lost, generating economic losses and environmental impacts, such as GHG emissions and water contamination (Cassim et al., 2021).

However, the current scenario is worrying, where approximately 60% of the recent increase in N contamination comes from agriculture, reinforcing the need for technologies that improve nitrogen fixation and reduce dependence on mineral fertilizers (Robertson; Groffman, 2007; Cassim et al., 2021; Jiménez-Ríos, 2024). In this context, cyanobacteria stand out for promoting plant growth, acting as bioconditioners, tolerating abiotic stresses, and contributing to biological nitrogen fixation.

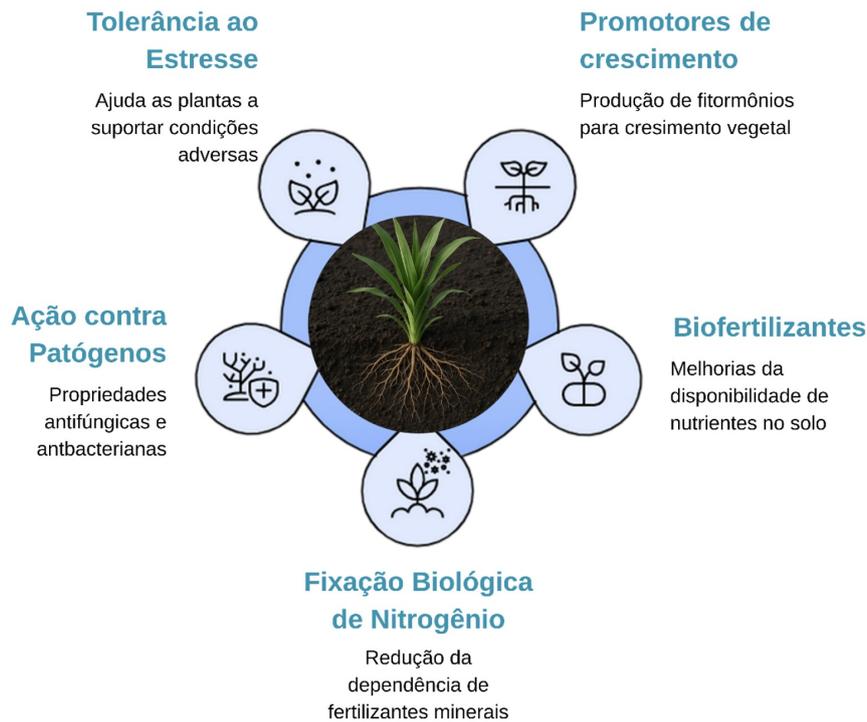


Figure 2 - some beneficial characteristics of using microalgae in agriculture

These properties increase productivity and align with agroecology, reconciling sustainability, high yields, and maintenance of soil fertility (Cassim et al., 2021; Álvarez et al., 2023; Jiménez-Ríos, 2024). Bio-inputs such as algae and cyanobacteria nourish plants, strengthen soil health, and reduce the impacts of mineral fertilizer use, integrating with

regenerative agriculture (Cassim et al., 2021; Álvarez et al., 2023; Jiménez-Ríos, 2024; Cherubin, 2024), despite the potential, high costs, variation in quality, and low uniformity of strains. However, advances in biotechnology and stable formulations represent a strategic opportunity to consolidate their use in a viable and sustainable way in agriculture (Khan, 2018; Chisti, 2013).

Final considerations

Bio-inputs are promising alternatives for sustainable agriculture, and algae stand out as biofertilizers, promoting plant growth, nutrient solubilization, biological nitrogen fixation (BNF), and greater tolerance to abiotic stresses. Their benefits

include plant development, soil health and quality, combining sustainability, biological balance, environmental conservation, and productivity.

Despite its potential, the diversity of species and strains still challenges its widespread adoption, requiring public policies, research, and partnerships to develop technologies and formulations that make its use more efficient, accessible, and environmentally responsible.

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