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PAKISTAN BIOTECHNOLOGY INFORMATION CENTER (PABIC)

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Highlights of Current Issue

- Activities at the ICCBS
- Agri-Biotech News
- Other than Crop Biotech News
- National News



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Pakistan Biotechnology Information Center (PABIC)

I S A A A

International Service for the Acquisition of Agri-biotech Applications

MESSAGE OF THE DIRECTOR

Biotechnology remains one of the most dynamic and influential areas of science, continuously offering innovative approaches to face complex challenges across healthcare, agriculture, industry, and environmental sustainability. By integrating biology with modern technology, biotechnology not only enhances disease prevention and treatment but also promotes sustainable farming practices, efficient industrial production, and eco-friendly approaches to conserving natural resources.

The **Pakistan Biotechnology Information Center (PABIC)** is a premier national organization dedicated to the advancement of biotechnology in Pakistan. Established with the vision of promoting scientific research in the field of biotechnology, PABIC plays a key role in facilitating the exchange of knowledge and resources related to biotechnological advancements. It gives me great pleasure to welcome you to the latest edition of PABIC Newsletter. I hope this newsletter will enhance the knowledge and awareness of contemporary techniques across various branches of biological sciences, especially among emerging researchers.

Prof. Dr. Muhammad Raza Shah, *T.I*
Director
International Center for Chemical and Biological Sciences,
University of Karachi,
Karachi-75270,
Pakistan.

MESSAGE OF THE PATRON

The application of modern agriculture biotechnology requires the availability of efficient and compatible communications networks for key players. At any rate, no matter how advancements are planned, Information Networks existing among stake holders can play a key role to shift organizational culture towards collaborative activities within and among institutions in a multidisciplinary, multi-sector and multinational participation.

The Pakistan Biotechnology Information Center (PABIC) is an NGO (Non-Government Organization), generously supported by ISAAA and the Husein Ebrahim Jamal Institute of Chemistry (University of Karachi) is one of the most active organizations working to promote biotechnology and its applications in Pakistan since 2007. Under the patronage of the OIC COMSTECH the main emphasis of PABIC is on the training of media personnel and journalists on objective reporting of the biotechnology and related issues. The PABIC also work to design educational approaches to train interdisciplinary scientists in emerging area of health, agriculture, bioinformatics and environmental biotechnology.

I hope the newsletter in hand will contribute to disseminate information about new developments and novel applications of biotechnological approaches in various exciting fields of sciences and technology.

Prof. Dr. M. Iqbal Choudhary, Mustafa (PBUH) Prize Laureate, H.I., S.I., T.I.
Patron PABIC
Coordinator General OIC-COMSTECH
Advisor and Distinguished National Professor
International Center for Chemical and Biological Sciences,
University of Karachi, Karachi-75270, Pakistan.

ACTIVITES AT THE ICCBS

PABIC–ICCBS Winter Internship Program for Youth 2025

KARACHI: The one-month PABIC–ICCBS Winter Internship Program for Youth 2025 commenced on December 15, 2025, at various laboratories of the International Center for Chemical and Biological Sciences (ICCBS), University of Karachi. The internship program, designed for final-year M.Sc. and MS students from public and private sector universities across Pakistan, is being offered in various disciplines, including Plant Biotechnology, Molecular Biology, Drug Discovery, Genomics, and Computational Chemistry and Bioinformatics. The internship program is an initiative of PABIC under the project titled "Dissemination of Information, Raising Awareness and Capacity Building about the Application of Modern Biotechnology in OIC Member States." The project is funded by OIC-COMSTECH and aims to promote multidisciplinary research while enhancing awareness and appreciation of modern sciences at both the local and OIC levels.




It is worth mentioning that over 250 applications were received for the internship program, out of which more than 35 candidates were selected and placed in various laboratories at ICCBS. At the conclusion of the program, successful candidates will be awarded certificates.

COMSTECH-PCMD International Training Course in Virology and Pandemic Preparedness (15th October to 30th November, 2025)

The recent viral pandemics and outbreaks including, worldwide COVID-19, Ebola, Mpox, influenza, dengue, and lumpy skin disease have made it imperative to ascertain surveillance and control strategies for pandemic preparedness. Pandemic preparedness is not merely a scientific pursuit; it is a strategic responsibility of every nation. For preparing developing countries against infectious outbreaks, COMSTECH in collaboration with Dr. Panjwani Center for Molecular Medicine and Drug Research (PCMD), ICCBS organized an intensive International Training Course on Virology and Pandemic Preparedness. The course was successfully conducted at the National Institute of Virology, PCMD, ICCBS. Researchers from 10 OIC member states, including Afghanistan, Bénin, Cameroon, Nigeria, Sudan, Senegal, Uganda, Ethiopia, Iran, Mauritania and Pakistan were benefited from this 6-week rigorous hands-on course. The participants from diverse institutions and regions in the OIC countries gained strength, expertise, and knowledge regarding pandemic preparedness that will contribute towards a safer and healthier future for the nations in the OIC region.

Bangladeshi Farmers Gain Higher Yields and Profits from Bt Brinjal

Researchers from Hiroshima University and partners analyzed data from 489 brinjal farmers, A new study has confirmed that cultivating Bt brinjal significantly increases yield, farm profits, and reduces pesticide costs for farmers in Pabna District, Bangladesh. The findings of the study highlight both economic and environmental benefits and emphasize Bt brinjal's potential to support sustainable agriculture in the country comprising 197 adopters of Bt brinjal and 292 non-adopters. The results showed that Bt brinjal adoption increased yields by 5,845.33 kg per hectare and boosted profits by 226,577 BD taka (1,884.95 USD) per hectare. The researchers also found that their pesticide expenses dropped by 41,269.499 BD taka (343.38 USD) per hectare, reflecting the reduced dependence on chemical sprays and improved environmental outcome.

The study concludes that Bt brinjal offers transformative potential for smallholder farmers by enhancing productivity, profitability, and sustainability. However, broader adoption will require overcoming barriers such as market access challenges and resistance from some traditional growers. The researchers urged the policymakers to expand farmer access to Bt brinjal, provide assistance from cooperatives and incentives, and implement targeted education programs to accelerate the adoption of Bt brinjal in the country.

Original Link: https://www.tandfonline.com/doi/full/10.1080/21645698.2025.2560698
ISAAA Link: https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=21535

Researchers Identify Soybean Gene that Could Help Crops Thrive in Acidic and Low-Phosphorus Soils

A study published in *Plant Cell Reports* found that the *GmAP2* gene enhances soybean tolerance to aluminum toxicity and low-phosphorus stress, which are among the major challenges for crop productivity worldwide. By overexpressing this gene, the researchers observed an improvement in physiological indicators, such as fresh weight, root length, and number of lateral roots.


GmAP2 is primarily expressed in roots, and its activity increases under acidic and low-phosphorus conditions. In this study, the researchers found that overexpression of *GmAP2* in soybean root hairs led to significant increases in above-ground dry weight, phosphorus content, and total phosphorus concentration. They also found that the proline contents in the *GmAP2* lines significantly increased and the accumulation of malondialdehyde significantly decreased, which suggests increased tolerance to aluminum toxicity.
Further analysis revealed that *GmAP2* activates genes, such as *AtALMT1*, *AtMATE*, *AtSTOP1*, and *AtPHT1;1*, which contribute to enhanced aluminum tolerance and phosphorus uptake. The team also found that *GmAP2* promotes lateral root development, which allows plants to absorb nutrients more efficiently. The findings of the study provide insights into how *GmAP2* helps plants improve stress tolerance and offer a theoretical foundation for developing soybean varieties that can thrive in acidic and low-phosphorus soils.

Original Link: https://link.springer.com/article/10.1007/s00299-025-03622-7
ISAAA Link: https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=21548

Cornell Students Develop Color-changing Tomato

Doctoral students Jacob Belding and Ava Forystek of Cornell University successfully developed genetically engineered tomato plants that turn vivid red when the soil nitrogen levels are low. Known as RedAlert Living Sensors, the modified plants are expected to help gardeners, farmers, and hydroponic growers become informed if their tomato plants need more nitrogen to grow.
Growers find out about their plant's nitrogen deficiency when the leaves wilt and turn yellow. However, this is considered late detection as the plants are already low in nutrients.

“We like to use the analogy of a dog that whines when it's hungry,” said Forystek. “It would be kind of ridiculous to wait until you feel its ribs to feed it.”
The engineered tomato plants use a native pathway in the plants responsible for nitrogen detection around the roots. Then, when the plant receives the signal, it transmits the signal to the rest of the plant. Thus, the tomato plants express a red pigment when the root zone nitrogen is low. Furthermore, varied shades of red also indicate the level of soil nitrogen.
RedAlert Living Sensors is one of the finalists in the Collegiate Inventors Competition organized by the National Inventors Hall of Fame.

Original Link: https://news.cornell.edu/stories/2025/09/students-color-changing-tomato-reaches-national-contest-finals

ISAAA Link: https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=21543

New Gene Editing Technique Boosts Precision and Efficiency

A research team has developed a new gene editing approach, called prime editing with prolonged editing window (proPE), designed to enhance the accuracy and efficiency of current prime editing (PE) methods. The technique addresses the inconsistencies in PE's efficiency and specificity for more reliable genetic modifications and potential therapeutic applications.
ProPE introduces a second non-cleaving guide RNA to improve the reach of DNA modification. This modification allows scientists to overcome several technical barriers that limit traditional PE systems. The researchers reported that proPE increased overall editing efficiency by up to 6.2-fold, achieving as much as 29.3% success in previously low-performing edits (<5% with PE).
The study also demonstrated that proPE could extend the editing range for allele-specific modifications from 15 to over 50 nucleotides. The researchers noted that this breakthrough could advance precision medicine by enabling more effective disease modeling and potential therapeutic interventions. Overall, proPE's high efficiency and adaptability may mark a significant step forward in biomedical genome engineering.

Original Link: https://www.nature.com/articles/s41929-025-01406-6

ISAAA Link: https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=21554

Drought-Resilient Alfalfa Offers Lifeline to Kazakh Farmers

A new, climate-resilient variety of alfalfa has been released in Kazakhstan, offering hope to farmers fighting severe drought and water scarcity. The variety, named *Tozimdi* (meaning "stable" or "sustainable" in Kazakh), was developed through an international collaboration between the Kazakhstan

Scientific Research Institute for Agriculture and Plant Growing (KSRIAPG) and the Australian Pastures Genebank at the South Australian Research and Development Institute (SARDI).

The Tozimdi variety of alfalfa, developed by cross-breeding local alfalfa with wild relatives sourced from global genebanks, boasts exceptional drought and heat tolerance. Funded by the BOLD project, it promises stable forage in drylands, aids in combating desertification, and enhances soil health through nitrogen fixation. For Kazakh farmers, Tozimdi is a game-changer, offering high yields of three to four harvests annually and thriving in diverse climatic conditions, thus contributing to food security and profitability in livestock farming.

Original Link: https://www.croptrust.org/news-events/news/new-climate-resilient-alfalfa-gives-hope-to-drought-stricken-farmers-in-kazakhstan/

ISAAA Link: https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=21551

Australia Approves Commercial Planting of GM Cotton

Australia's Office of the Gene Technology Regulator (OGTR) has issued license DIR 216 to Bayer CropScience Pty. Ltd., authorizing the commercial release of cotton genetically modified (GM) for insect resistance and herbicide tolerance.

The GM cotton contains four introduced genes from a common soil bacterium that confer insect resistance to common pests of cotton. Three of these genes provide protection against bollworms, and one protects against specific pests, including aphids and thrips. The GM cotton also contains three introduced genes for tolerance to herbicides, including glyphosate, glufosinate, and dicamba. The genes enable the GM cotton plants to grow in the presence of these herbicides, which can be used to control weeds in the GM cotton crop.

The GM cotton will be released throughout Australia. The GM cotton and products derived from it may enter general commerce, including use in human food and animal feed. The Risk Assessment and Risk Management Plan (RARMP) and the license were finalized, taking into account input received during consultation with State and Territory governments, Australian Government agencies, the Minister for the Environment, the Gene Technology Technical Advisory Committee, local councils, and the public.
The finalized RARMP, a summary of the RARMP, the license, and Questions and Answers about this decision can be obtained online from the DIR 216 page of the OGTR website.

Original Link: https://www.ogtr.gov.au/gmo-dealings/dealings-involving-intentional-release/dir-216
ISAAA Link: https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=21549

Scientists Discover Tomato Gene that Boosts Resistance against Bacterial Wilt

Experts from Yichun University in China discovered that *SlWRKY75* plays a crucial role in helping tomatoes fight bacterial wilt, a devastating disease caused by *Ralstonia solanacearum*. The study, published in *Frontiers of Plant Science*, provides new insights into how this gene enhances disease resistance, offering potential pathways for developing stronger, more resilient tomato varieties.
In this study, the researchers observed that the *SlWRKY75*-overexpressing tomato lines show enhanced resistance to bacterial wilt. The generated lines show improved growth, elevated activity of key antioxidant enzymes, increased jasmonic acid (JA) accumulation, and upregulation of genes

involved in JA biosynthesis and signaling. Additionally, the edited lines also showed decreased levels of hydrogen peroxide (H2O2), superoxide anion (O2–), and salicylic acid (SA) and decreased expression of SA synthesis-related and signal response-related genes.
Further analysis confirmed that *SlWRKY75* interacts with *SlMYC2* to activate defense pathways that improve hormone signaling and antioxidant defense in tomato immunity. The study concludes that *SlWRKY75* could serve as a promising target for breeding bacterial wilt-resistant tomato cultivars for future disease management strategies.

Original Link: https://www.frontiersin.org/journals/plant-science/articles/10.3389/fpls.2025.1704937/full
ISAAA Link: https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=21564

CRISPR Rice Exhibits Broad-Spectrum Herbicide Resistance

Researchers from Hainan Bolian Biotechnology Co. in China successfully generated broad-spectrum resistance to herbicides in rice using CRISPR-Cas9. Their findings are published in the journal Rice. Weed resistance and crop rotation issues are some of the challenges in modern agriculture; thus, there is a need for herbicide-resistant genetic resources.
This led the researchers to use CRISPR-Cas9-mediated non-homologous end joining (NHEJ) together with whole-stage selection to develop herbicide-resistant indica rice by mutating the acetolactate synthase (ALS) gene. Through this technique, they detected mutations, including the triple mutation that conferred broad-spectrum resistance to multiple classes of herbicides, showing an impressive 1153-fold increase in resistance to imazethapyr (IMT) compared to wild-type rice. Furthermore, field trials showed that the resistant mutant exhibited normal agronomic characteristics without affecting the yield after IMT application.
The study demonstrated that the ALS mutations could serve as an effective and reliable transgenic selection marker for laboratory research, showcasing a powerful method for generating valuable herbicide-resistant germplasm and novel resistant mutations via CRISPR-mediated NHEJ.

Original Link: https://link.springer.com/article/10.1186/s12284-025-00845-w
ISAAA Link: https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=21541

High-Biomass Sorghum Hybrids Show Yield Gains with Nitrogen Management

A recent study highlights the potential of high-biomass sorghum hybrids as a superior feedstock for biofuels and bioproducts, showing that their performance can be precisely optimized through tailored nitrogen fertility management.

Researchers evaluated the biomass yield potential and feedstock quality of several hybrids across various environments and nitrogen application rates. They successfully identified specific hybrids that not only delivered high yields but also maintained excellent quality—a critical balance for efficient conversion into renewable energy. This finding confirms that sorghum, which is already naturally drought-tolerant, is an increasingly viable and attractive crop for sustainable fuel production.

The research provides valuable tools for precision agriculture, enabling farmers and breeders to select the most suitable sorghum hybrid and apply the optimal nitrogen management strategy for their specific location. The ability to fine-tune growing conditions to maximize both yield and the chemical composition (like cellulose and lignin content) of the biomass means a more predictable and high-quality supply chain for the bioenergy sector. By connecting hybrid selection with fertility management, this work accelerates the development of efficient and economically viable bioenergy crops.

Original Link: https://phys.org/news/2025-10-high-biomass-sorghum-hybrids-yield.html#goog_rewarded

ISAAA Link: https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=21569

International Research Teams Decode Oats' Pangenome and Origin

In a breakthrough for agricultural science, an international team of researchers, led by the IPK Leibniz Institute in Germany, has successfully decoded the pangenome and pantranscriptome of the common oat (*Avena sativa*). Oats, prized globally for their health benefits, including high fiber and gluten-free properties, have a genome that is notoriously large and complex.

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This work provides a complete genetic map essential for accelerating the development of new, improved oat varieties.

The researchers established a detailed pangenome, sequenced and analysed the genomes of 33 different cultivated and wild oat lines, including genes present only in certain varieties. To create the transcriptome, they examined the gene expression patterns in six tissues and developmental stages of 23 of these oat lines. According to Dr. Martin Mascher, coordinator of the PanOat consortium, this genetic blueprint will help breeders better understand which genes are key for improving traits such as yield, adaptation, and health content in a climate-challenged world.

The deep genomic analysis also yielded surprising insights, such as finding a significant number of gene losses in one of the oat's three subgenomes, with the plant compensating by using other gene copies. Importantly, the researchers identified that structural variations within the genome affect the genes responsible for controlling flowering time, a critical trait for adapting crops to local growing conditions. The team's findings, which also included a second related study on the evolutionary origin of the oat, were published in *Nature* and *Nature Communications*.

ISAAA Link: https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=21583

Original Link: https://www.ipk-gatersleben.de/fileadmin/content-presse/Pressemitteilungen/2025_PM_10_Hafer_engl._final.pdf

Researchers Develop Cold-Resistant Tomato Without Compromising Growth

The tomato plant is highly susceptible to cold stress, with temperatures below 12°C severely impairing its growth and development. This sensitivity leads to crop failure and food waste, particularly in regions with unpredictable weather. To solve this challenge, researchers at the University of Barcelona and the Centre for Research in Agricultural Genomics (CRAG) developed a new cold-resistant tomato variety that maintains robust growth without compromise.

Researchers found that increasing glycosylated sterol (GS) levels in tomatoes enhances cold tolerance by stabilizing cell membranes and activating hormonal signaling pathways. GS, prevalent in the Solanaceae family, serve as vital cold sensors. By overexpressing the SlSGT2 enzyme, they trigger a protective response that includes hormonal signaling, particularly involving jasmonates, and the activation of antioxidant enzymes and defense genes. This preconditioning helps plants withstand cold stress, leading to potential agricultural benefits like increased yields, reduced food waste, and more sustainable cultivation by minimizing greenhouse heating needs.

Original Link: https://www.cragenomica.es/crag-news/251022_SC_Altabella-Ferrer_cold_tolerance
ISAAA Link: https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=21589

Study Finds Narrower Rice Leaves Boost Photosynthesis Efficiency

A new study has found that reducing the width of rice leaves can significantly enhance photosynthesis, potentially leading to higher yields. Published in The Plant Journal, the researchers aimed to uncover key leaf traits that contribute to crop productivity and investigated how leaf width affects photosynthetic performance and water-use efficiency.

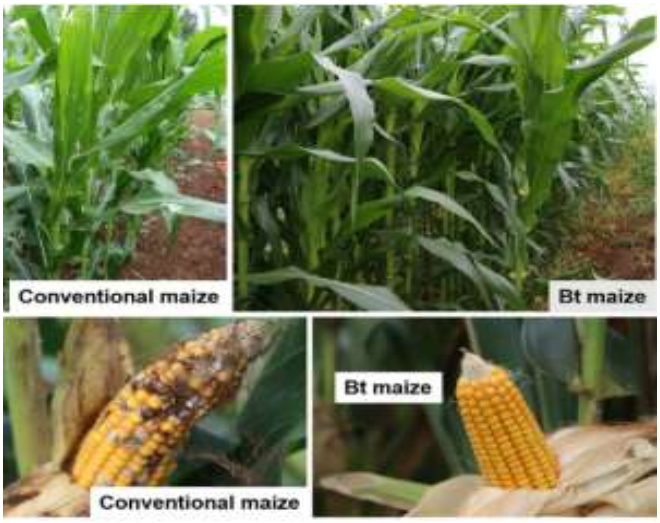
The study examined 14 rice genotypes with varying leaf widths and genetically modified rice lines carrying the NARROW LEAF 1 (NAL1) gene. Results showed that plants with narrower leaves exhibited higher photosynthetic efficiency. A 48.2% reduction in leaf width in the

modified NAL1-K line resulted in nearly a 50% increase in photosynthetic rate. The narrower leaves led to increased stomatal density and leaf hydraulic conductance.

The findings provided valuable insights into how leaf morphology influences photosynthetic mechanisms. While the narrower leaves improved photosynthesis, the researchers noted that the water-use efficiency did not increase. The study suggests that optimizing leaf width could be a promising strategy for improving photosynthetic capacity in rice.

Original Link: https://onlinelibrary.wiley.com/doi/full/10.1111/tpj.70540
ISAAA Link: https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=21596

Bt Maize Shows Strong Protection Against Major Pests in Tropical Asia



https://scijournals.onlinelibrary.wiley.com/doi/10.1002/ps.8520

The researchers evaluated the Bt maize event LP026-2 by measuring toxin levels in different plant A new study has confirmed that Bt maize containing three insect-resistant proteins (Cry1Ab, Cry2Ab, and Cry1Fa) is highly effective against fall armyworm and other major lepidopteran pests in tropical Asia. These pests pose a significant threat to maize production in a region that serves as a year-round breeding zone and a source of seasonal pest migration across Asia.
parts and conducting bioassays on six key pests. Laboratory tests showed more than 90% mortality against all targeted pests in leaf and kernel assays within five days. The results revealed that Helicoverpa armigera showed the highest susceptibility, followed by Spodoptera frugiperda, Ostrinia furnacalis, Mythimna separata, Spodoptera exigua, and Spodoptera litura.

The field trials confirmed that Bt maize showed fewer larvae, reduced plant damage, and better crop performance compared to non-Bt maize. The study concludes that Bt maize expressing Cry1Ab, Cry2Ab, and Cry1Fa provides strong, broad-spectrum protection against multiple migratory pests. The Bt maize also delivered yield increases of 4.52% to 25.41% compared with

non-Bt maize, highlighting its potential as a valuable tool for managing insect pressures and strengthening maize production systems across tropical Asia.

Original Link: https://scijournals.onlinelibrary.wiley.com/doi/full/10.1002/ps.70365
ISAAA Link: https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=21604

Precision Breeding Act Now Live in the UK

The United Kingdom has officially launched a new era for crop science as the Genetic Technology (Precision Breeding) Act 2023 took effect on November 13, 2025. This landmark legislation introduces a new regulatory framework for precision-bred plants in England, distinguishing them from traditional genetically modified (GM) crops.

These regulations concern plants developed using techniques such as CRISPR-Cas9 gene editing to make small genetic changes that could have occurred naturally or through conventional breeding, but which can now be achieved faster and with greater accuracy.

Scientists and breeders in the UK can now apply to register new crop varieties, marking a significant advancement in agricultural legislation aimed at promoting the use of advanced genetic technologies. Professor Mario Caccamo from the National Institute of Agricultural Botany (NIAB) notes that this legislation enables rather than restricts innovation, facilitating the development of improved crop varieties that benefit farmers, consumers, and the environment. The policy is expected to enhance food security and sustainability by accelerating the creation of crops like higher-yielding strawberries and disease-resistant potatoes, thus promoting healthier food production and reducing waste. Political backing for the Act reflects a growing public and political shift toward science-based solutions to food challenges.

Original Link: https://www.tsl.ac.uk/news/precision-breeding-regulations-come-into-effect
ISAAA Link: https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=21609

OTHER THAN CROP BIOTECH NEWS

Plant-Based Biosensor Could be Key to Timing Fruit Ripening

Researchers have developed a novel plant-based biosensor to detect the presence of the fruit ripening hormone ethylene. This sensor uses a specially engineered plant line where areas with ethylene will glow (using a fluorescent protein gene) or turn blue (using an enzyme gene).

This visual change allows scientists to see exactly which cells and tissues respond to ethylene under various conditions.

The biosensor will help researchers better study ethylene's role beyond fruit ripening, including its impact on pathogen response, nodulation, and parasitic plant relationships. It could also be adapted to control the speed of fruit ripening. By fusing the biosensor to a gene that inhibits ripening, the presence of ethylene could be used to slow down the process, potentially leading to reduced loss of fruits and vegetables due to overripening and deterioration.

Anna Stepanova, a professor in the Department of Plant and Microbial Biology at North Carolina State University and corresponding author of a paper describing the research, said that they are collaborating with international researchers to leverage the biosensor's DNA to create new sensors that can simultaneously monitor multiple plant hormones to understand their complex interactions during processes like growth, heat stress, and infections

Original Link: https://cals.ncsu.edu/news/new-biosensor-could-be-key-to-timing-fruit-ripening/
ISAAA Link: https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=21533

MIT Genetically Engineers Mice to Stop Lyme Disease Transmission

Led by Associate Professor Kevin Esvelt, researchers from the Massachusetts Institute of Technology (MIT) Media Lab's Sculpting Evolution group are pioneering groundbreaking research to combat Lyme disease. The initiative, called *Mice Against Ticks*, aims to reduce Lyme cases on Nantucket by genetically engineering wild white-footed mice to be immune to the infection.

In collaboration with Tufts epidemiologist Sam Telford, the team uses CRISPR gene editing technology to insert antibodies directly into mouse DNA. This approach creates what the researchers call a “heritable immunization,” which allows immunity to pass from one generation to the next.

Unlike traditional vaccines, this method targets the disease cycle itself. If ticks feed on these immune mice, they can no longer carry Lyme bacteria.

Before lab work began, the researchers consulted Nantucket residents through multiple public meetings to ensure transparency and trust. “We need to do the science differently because we need to ensure that people have a voice, early enough, to actually influence the direction that the technology is developed,” Esvelt said. A controlled field trial on a private island will be the next step in this research.

Original Link: https://www.media.mit.edu/articles/scientists-focus-on-genetically-engineering-mice-to-cut-lyme-disease-transmission/
ISAAA Link: https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=21547

Scientists Show How to Grow More Nutritious Rice That Uses Less Fertilizer

https://www.the-microbiologist.com/news/scientists-show-how-to-grow-more-nutritious-rice-that-uses-less-fertilizer/6832.article

A new study co-led by the University of Massachusetts Amherst has introduced a groundbreaking method for cultivating rice. Researchers found that applying nanoscale selenium to rice plants can

dramatically cut the need for synthetic nitrogen fertilizer while maintaining or even increasing crop yields.

This innovation addresses the "triple threat" of a growing population, climate change, and the high environmental cost of conventional farming, which typically sees up to 70% of fertilizer wasted and washed away.

The researchers found that the key to this success lies in how the rice plant interacts with the nano-selenium. Applied directly to the leaves and stems via aerial drone, the selenium suspension stimulates the plant's photosynthesis by over 40%. This surge in energy production drives carbohydrates down to the roots, leading to bigger, healthier root systems. These robust roots then release organic compounds that cultivate a community of beneficial microbes in the soil, which in turn work symbiotically to pull more nitrogen from the soil into the plant.

This increased efficiency, known as Nitrogen Use Efficiency (NUE), jumped from as low as 30% to over 48%. The result is a substantial reduction in environmental pollution, including a 41% decrease in negative environmental impacts and an 18.8–45.6% cut in the release of powerful greenhouse gases like nitrous oxide and ammonia. Furthermore, the final rice grain is more nutritious, with elevated levels of protein, essential amino acids, and selenium, offering a significant pathway toward more sustainable and healthier global food production.

Original Link: https://www.umass.edu/news/article/scientists-show-how-grow-more-nutritious-rice-uses-less-fertilizer

ISAAA Link: https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=21567

Australian Researchers Engineer Encapsulins to Supercharge Photosynthesis in Crops

https://www.technology.org/2025/11/15/synthetic-biology-to-supercharge-photosynthesis-in-crops/

Australian researchers have achieved a breakthrough in synthetic biology by engineering nanoscale compartments called encapsulins to significantly enhance photosynthesis in major food crops such as wheat and rice. Led by teams from the University of Sydney and the Australian National University, the five-year project tackled the Rubisco enzyme.

By creating nanoscale "offices" for Rubisco, the scientists aim to enable future crops to produce higher yields while drastically reducing water use and the need for costly nitrogen fertilizers.

The innovation focuses on encapsulins, simple bacterial protein cages that self-assemble like "Lego blocks." The method involves attaching a 14-amino acid "address tag" to the Rubisco enzyme, guiding it into the encapsulin shell, a significant advantage over natural systems in algae and cyanobacteria. Research shows that the encapsulin shell's pores allow necessary molecules to pass through. Although currently a proof of concept published in Nature Communications, early plant experiments are in progress at ANU. The next step is integrating the encapsulin system into plants to enhance Rubisco's performance, potentially revolutionizing agriculture by improving crop yields while minimizing resource use.

Original Link: https://www.sydney.edu.au/news-opinion/news/2025/11/04/synthetic-biology-encapsulins-photosynthesis-szyszka.html
ISAAA Link: https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=21584

Experts Convert Food Waste into Biofuel for Aircraft

https://shapiroe.com/blog/what-to-do-with-food-scraps/

Scientists at the University of Illinois Urbana-Champaign developed a strategy to convert food waste into sustainable aviation fuel that can be used for commercial aircraft. Their findings are published in *Nature Communications*. Reducing carbon emissions in the aviation industry is a challenge compared to efforts for the automotive sector.

To address this concern, the researchers used hydrothermal liquefaction, which transforms wet food waste into biocrude oil, simulating nature's oil production but in a rapid manner. Refining the biocrude oil is achieved through catalytic hydrotreating to remove impurities and reach strict industry benchmarks for jet fuel without the need for special additives to the fuel or changing the aircraft structure.

Innovations that convert waste into reusable energy contribute to a “circular economy” and are a significant step toward the aviation industry's goal to meet net-zero carbon emissions. The biomass-derived fuel works as a direct, drop-in replacement for conventional fossil fuels. The findings provide a proof of concept and will be used to scale up to mass commercial production, requiring industry investment and resources.

Original Link: https://www.popsci.com/technology/food-scraps-airplane-fuel/
ISAAA Link: https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=21586

University of Waterloo Researchers Turn to Biotechnology to Combat Plastic Pollution

https://www.isaaa.org/kc/cropbiotechupdate/newsletter/default.asp?Date=1/13/2021

Research teams at the University of Waterloo collaborate to tackle the growing plastic pollution crisis using synthetic biology, microbial engineering, and engineering. The researchers aim to identify and develop new strategies to break down and upcycle plastic waste and promote a more sustainable and circular plastics economy.

Waterloo's research group explores microbial pathways that turn plastic into energy sources and enzyme-based methods that degrade PET plastics in wastewater. Their studies show that certain microbes can simultaneously metabolize carbon dioxide and plastic waste. The research team also looks into evolving microbes that "eat" plastics and engineering synthetic symbiotic bacterial consortia for the bioconversion of plastic waste.

Early findings show that engineered microbes and redesigned materials could enable more sustainable plastic degradation and upcycling systems. This method offers a great advantage for reducing plastic pollution. The researchers conclude that combining expertise across disciplines strengthens the potential for long-term solutions toward building a circular plastics economy.

Original Link: https://uwaterloo.ca/news/engineering-research/were-stepping-out-our-silos
ISAAA Link: https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=21611

NATIONAL NEWS

Pakistan Approves GM Sugarcane and GM Cotton for Commercialization and GM Canola for Food, Feed, and Processing

The National Biosafety Committee (NBC) of Pakistan has approved the country's first genetically modified (GM) sugarcane and advanced cotton varieties for commercialization during its 35th meeting. The approved sugarcane lines, CABB-IRS and CABB-HTS, are safe for humans, animals, and the environment, having passed safety trials and DUS testing, and will now undergo National Uniform Yield Trials (NUYT). The NBC also approved two GM cotton varieties, CEMB-AAS3 and NIBGE-1601, which resist pests and tolerate herbicides and diseases. Additionally, the Committee allowed the import of 43 GM canola events, which have beneficial traits for health and agriculture.

Original Link: https://pid.gov.pk/site/press_detail/30733
ISAAA Link: https://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=21573

Bridging gender gaps in agriculture

Rising food prices and insecurity in South Asia, particularly in Pakistan, highlight significant gender inequalities in agriculture. Rural women, who make up a large part of the agricultural workforce, face challenges such as limited mobility, low literacy, and cultural barriers that restrict access to resources and decision-making. Although they perform hard farm tasks, they are largely unrecognized in labor statistics. Initiatives like vocational programs and microfinance support aim to help, but long-term solutions require structural reforms, better education for girls, and increased participation of women in agricultural processes to enhance productivity. With coordinated policy action, improved education, and women's own participation in agricultural institutions, Pakistan can empower rural women and boost national agricultural productivity.

Original Link: https://www.pakistangulfeconomist.com/2025/10/20/bridging-gender-gaps-in-agriculture/

Pakistan launches push for local vaccine production to strengthen health security, reduce imports

Pakistan relies heavily on imported vaccines, primarily managing small-scale operations at the National Institute of Health in Islamabad. Public-health experts emphasize that this dependence results in a significant annual import bill exceeding $250 million, leaving the country vulnerable to global supply disruptions. A high-level meeting chaired by Special Assistant to the Prime Minister Haroon Akhtar Khan has initiated a draft National Vaccine Policy aimed at boosting local vaccine manufacturing to enhance health security and economic independence. The policy seeks to build biotechnology and pharmaceutical capabilities, reduce import reliance, and improve rapid response to future pandemics. Additionally, a proposed Pakistan Vaccine Manufacturers Alliance

aims to streamline efforts between public and private sectors, with the goal of meeting WHO standards and potentially positioning Pakistan as a regional vaccine supplier in South Asia.

Original Link: https://www.arabnews.com/node/2619970/amp

Pakistan Launches Historic Public-Private Genomics Venture to Revolutionize Food Security and Biotechnology.

Pakistan's Federal Minister for National Food Security & Research, Rana Tanveer Hussain, has announced the launch of the country's first public-private genomics venture. This initiative aims to enhance research institutions, foster agricultural innovation, and improve healthcare through local genomic research and diagnostics. It involves collaboration between the National Institute for Genomics and Advanced Biotechnology, PARC–Agro Tech Company, and Blazon Diagnostics. The ceremony in Islamabad was attended by notable experts and aimed to reduce reliance on foreign genomic services. Minister Hussain stated that the project would boost food security and support local researchers, farmers, and healthcare professionals. The venture is expected to drive economic growth and establish Pakistan as a leader in genomic research and biotechnology.

Original Link:
https://mnfsr.gov.pk/NewsDetail/Njk0OTY1MmMtMzM0Mi00MzMzLWEwZTktOTU5NzFhMDUxNzVi

New Saudi-Pakistan biotech pact seeks to harness AI to repurpose drugs, fight cancer.

Saudi Arabia's Novo Genomics and the Precision Medicine Lab at Rehman Medical Institute (RMI) in Peshawar, Pakistan, have started the Saudi-Pakistan Biotech Bridge Initiative to enhance genomics and AI research focused on cancer and other diseases. The agreement was signed in Riyadh by Novo Genomics CEO Dr. Abdulelah Al-Hawsawi and Dr. Faisal Khan of RMI. Both organizations are supported by their governments.

The partnership aims to create cross-border biobanks, conduct joint clinical studies, and use AI to predict and prevent diseases. It will also include academic exchanges and conferences to train young scientists and improve biotechnology skills in the region. Dr. Khan emphasized that after extensive discussions, this collaboration opens a path for exchanging research, ideas, and talent.

Original Link: https://www.arabnews.com/node/2620822/pakistan.

Pakistan launches First Genomics venture with Chinese support

Pakistan has launched its first public-private genomics joint venture with support from Chinese scientific institutions. This initiative is a collaboration between the National Institute for Genomics and Advanced Biotechnology (NIGAB), PARC-Agro Tech Company (PATCO), and Blazon Diagnostics, showcased at an event attended by a Chinese delegation. The project aims to advance

biotechnology in agriculture and diagnostics, marking a significant step in China-Pakistan cooperation. Dr. Syed Murtaza Hassan Andrabi highlighted its importance for scientific development and self-reliance in research. The venture seeks to reduce reliance on foreign DNA sequencing, save costs, and enhance agricultural technology in Pakistan.

Original Link: https://cpecinfo.com/pakistan-launches-first-genomics-venture-with-chinese-support/

UPCOMING INTERNATIONAL BIOTECH EVENTS

- **29th European Biotechnology Congress**
  March 23-24, 2026 Rome, Italy
  (https://www.biotechnologycongress.com/europe/)
- **International Conference on Bioinformatics and Biotechnology ICBB.**
  January 05-06, 2026 in Tokyo, Japan
  (https://conferenceindex.org/event/international-conference-on-bioinformatics-and-biotechnology-icbb-2026-january-tokyo-jp)
- **International Conference on Bioscience, Biotechnology, and Biochemistry ICBBB.**
  January 12-13, 2026 in Phuket, Thailand
  (https://conferenceindex.org/event/international-conference-on-bioscience-biotechnology-and-biochemistry-icbbb-2026-january-phuket-th)
- **International Conference on Molecular Biology, Biochemistry and Biotechnology ICMBBB.**
  January 26-27, 2026 in Sydney, Australia
  (https://conferenceindex.org/event/international-conference-on-molecular-biology-biochemistry-and-biotechnology-icmbbb-2026-january-sydney-au)
- **International Conference on Medical, Biological and Pharmaceutical Sciences ICMBPS.**
  February 02-03, 2026 in Singapore, Singapore
  (https://conferenceindex.org/event/international-conference-on-medical-biological-and-pharmaceutical-sciences-icmbps-2026-february-singapore-sg)
- **12th International Conference on Bioengineering and Biotechnology (ICBB 2026)**
  August 20 – 22, 2026 – London, United Kingdom
  (https://bbseries.org/index.html).
- **LSX World Congress Europe 2026**
  March 24-26, 2026-Lisbon, Portugal.
  (https://informaconnect.com/lsx-world-congress/)
- **Biotech Showcase™**
  January 12-14, 2026-San Francisco

(https://informaconnect.com/biotech-showcase/?utm_source=VentureValuation&utm_medium=web&utm_campaign=EBTS2026WEBVVEP&utm_term=VentureValuation_website_eventprofile&utm_content=EBTS2026WEBVVEP&tracker_id=EBTS2026WEBVVEP)

UPCOMING NATIONAL BIOTECH EVENTS

- **International Conference on Science, Engineering and Management Technology**
  January 15, 2026, Islamabad, Pakistan.
  (https://conferencealerts.co.in/event/3376293)
- **ICEBB 2026 - International Conference on Environmental Biotechnology and Bioprocess.**
  January 30, 2026, Quetta, Pakistan.
  (https://www.conferencealert.com/eventdetail/1626038)
- **International Conference on Microbial Biotechnology and Environmental Engineering (ICMBEE) - SNRI**
  February 5th, 2026, Lahore, Pakistan.
  (https://allconferencealert.net/eventdetails.php?id=100027208)
- **Improve Effectiveness of Cardiac Assessments in Early Phase Trials with Early Precision QT and AI-powered Data Quality Checks**
  Webinar, Starts: Wednesday, 14 January 2026 - 11:00 (in 3 weeks, 4 days)
  Location: Xtalks, Toronto, Canada
  (https://www.lifescience.net/events/77784/improve-effectiveness-of-cardiac-assessments-in-ea/)
- **International Conference on Community-Based Lifelong Learning Practices**
  February 11th, 2026, Multan, Pakistan.
  (https://conferencealerts.co.in/event/100039912)
- **International Conference on Biomedical Technologies and Bioinformatics (ICBTBI)**
  August 20th, 2026, Karachi, Pakistan.
  (https://internationalconferencealerts.com/eventdetails.php?id=100763003)
- **International Conference on Coronavirus Disease ICCD on December 30-31, 2026 in Karachi, Pakistan**
  December 30-31, 2026, Karachi, Pakistan.
  (https://waset.org/coronavirus-disease-conference-in-december-2026-in-karachi?utm_source=conferenceindex&utm_medium=referral&utm_campaign=listing)