ISAAA Inc.

DEPARTMENT OF AGRICULTURE 1898

PINOY BIOTEK MAGAZINE

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Welcome Message

Welcome to the fourth issue of *Pinoy Biotek Magazine*!

In collaboration with the Philippine Agriculture and Fisheries Biotechnology Program of the Department of Agriculture (DA Biotech), we are pleased to share with you the different technologies that aim to help the agricultural and fisheries industries in the Philippines.

On this issue, we highlight disease-resistant crops that would help farmers and food producers in producing higher yields. One of these is Golden Rice which will help address Vitamin A deficiency in the Philippines and also protect rice crops from diseases, particularly tungro and bacterial blight. The article on the development of banana varieties resistant to banana bunchy top virus (BBTV) highlighted its potential to help reduce yield losses.

Two loop-mediated isothermal amplification (LAMP) technologies are presented on this issue. The LAMParA kit for abaca virus detection aids farmers to monitor the condition of their abaca crops, while the Juan Amplification (JAmp) WSSV Detection Kit helps reduce shrimp mortality and minimizes economic loss among farmers and pond owners.

This issue features the story of two biotech scholars. Kier Domingo persevered in his education and now serves as an inspiration to future leaders in biotechnology. Robert Christian Patani originally had a different career plan and was redirected into the field of fisheries biotechnology, which he grew to love.

A feature on the Golden Rice and Bt eggplant helps enlighten readers about the situation of these biotech crops with biotech critics in the Philippines.

We hope that this magazine will boost your appreciation and support of our homegrown biotechnologies designed to contribute toward the upliftment of Filipino lives.

Congratulations to the researchers, contributors, and ISAAA Inc. team for curating another excellent issue!

Dr. Rhodora Romero-Aldemita
Executive Director, ISAAA Inc.
Director, Global Knowledge Center on Biotechnology

Director's Message

As we delve into another issue of *Pinoy Biotek Magazine*, it is essential to contemplate the profound changes the biotechnology sector has brought into our lives — from developing crops that are more resilient to pests, diseases, and climate change, to ultimately increasing agricultural productivity and food availability.

In this fourth issue of the magazine, the DA Biotech Program and ISAAA Inc. explore technology-focused topics and discuss relevant issues related to biotech crops. This issue also features inspiring stories of scholarship recipients from the DA Biotech Program.

Misinformation about biotechnology still persists. Our goal with this magazine is to provide science-based and evidence-based information about biotechnology. We aim to create a platform for everyone to engage in discussions on technology and innovation in the agriculture sector, which are vital to our country's future.

We hope the knowledge shared here sparks curiosity, inspires innovation, and promotes informed decisions for the benefit of future generations. Our dedication remains steadfast as we continue to deliver valuable insights in future editions, always with an eye on sustainable agriculture and cultivating a community committed to making a positive difference.

Dr. Paul C. Limson, DVM
Director, DA Biotech Program

PINOY BIOTEK MAGAZINE

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Disease Resistant Golden Rice: Improving Nutrition and Yields for Filipinos

BY DR. REYNANTE ORDONIO

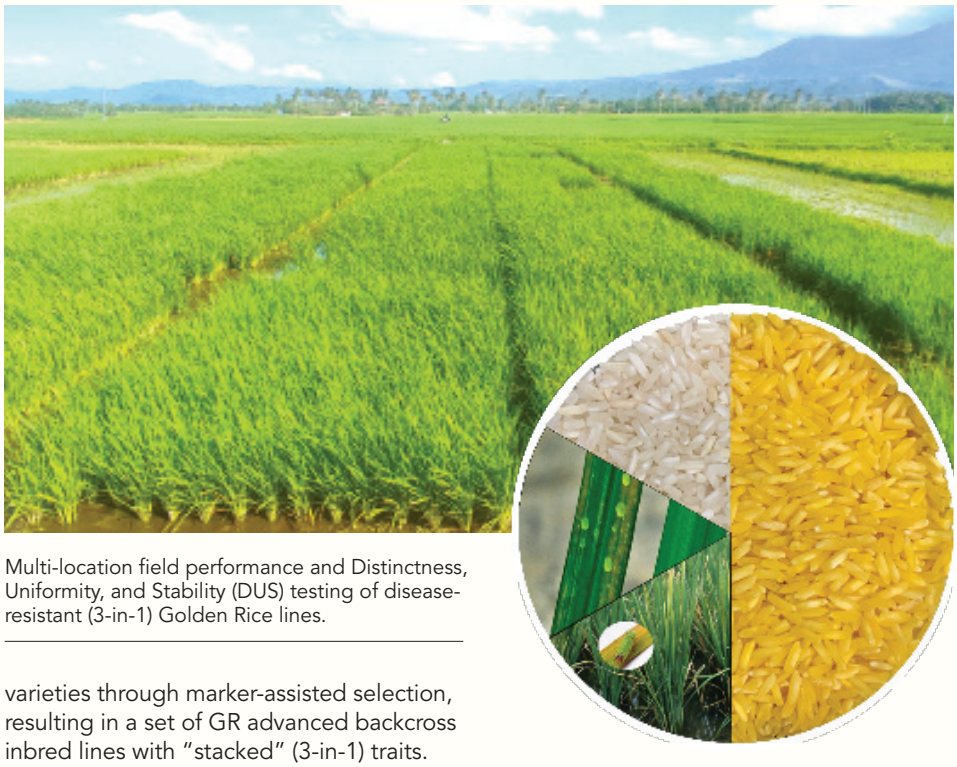
Malusog 1 is the first-ever genetically modified (GM) rice with beta-carotene (pro-Vitamin A) in the grain to be commercially approved and registered as a variety (in 2021 and 2022, respectively) in the Philippines. Developed through the Golden Rice (GR) Project, a collaboration between the International Rice Research Institute (IRRI) and the Philippine Rice Research Institute (PhilRice), with assistance from international scientific organizations, it is intended as a complementary tool to address vitamin A deficiency among children and pregnant/lactating women. Except for the genetically modified rice event (GR2E) transgene, it largely retains the genetic makeup of and characteristics of a popular local variety, known for its high yield and excellent grain quality. However, just like any other crop, GR is exposed to biotic stresses, making pest and disease resistance a necessary trait to sustain its maximum yield.

Among the major rice diseases in the Philippines are tungro and bacterial leaf blight (BLB). Tungro is a disease caused by the co-infection of plants by the rice tungro spherical virus (RTSV) and rice tungro bacilliform virus (RTBV), transmitted by green leafhoppers (GLH). It is characterized by severe stunting and yellowing of the rice plant, resulting in 20% to 100% crop yield loss. BLB, on the other hand, is caused by the pathogen *Xanthomonas oryzae* pv. *oryzae* (Xoo), which infects the xylem, causing lesions that may lead to plant death. BLB can cause about 74% to 81% yield loss, or may even result in total crop failure in more severe cases. Adding tungro and BLB resistance to upcoming GR varieties would therefore help stabilize their yields, especially in disease hotspots, and increase their adoption rate across different regions of the country.

Production of disease resistant Golden Rice

PhilRice introduced the Golden Rice and disease resistance traits into other local varieties through marker-assisted selection, resulting in a set of GR advanced backcross inbred lines with "stacked" (3-in-1) traits. These lines have the genetic makeup of four popular National Seed Industry Council (NSIC) varieties. The lines had yellow grains with good grain quality and significant levels of total carotenoids. The lines also had at least one resistance gene each for RTSV or GLH and BLB and showed the expected resistant phenotypes (intermediate to resistant) under screenhouse conditions.

The 3-in-1 GR candidate lines had been seed-increased for one season in preparation for large-scale field testing. The first lines to be tested were those in the background of NSIC Rc 160, which have now undergone Multi-Location field performance and Distinctness, Uniformity, and Stability (DUS) testing for two seasons across four sites (Agusan, Bicol, Isabela, and Nueva Ecija). They were characterized in terms of agro-morphological and other traits at the vegetative, reproductive, maturity, and post-harvest stages.



Multi-location field performance and Distinctness, Uniformity, and Stability (DUS) testing of disease-resistant (3-in-1) Golden Rice lines.

Data collected during the first season (2023 Wet Season) indicated that the NSIC Rc 160 GR lines had a 5.35% average yield advantage over Malusog 1. The second season of DUS testing is ongoing and is expected to be completed by the first half of 2024. Together, these two seasons of DUS testing will essentially determine the best-performing line and provide the required passport data for the varietal registration of such line. This data will also serve as the basis for seed certification by the Bureau of Plant Industry-National Seed Quality Control Services (BPI-NSQCS).

Future of disease resistant Golden Rice

The release of this 3-in-1 variety is expected to provide farmers with improved Golden Rice varieties that not only have the potential to improve vitamin A nutrition but also help ensure better yields via the introduced resistance genes for tungro and BLB. This project on disease resistance in Golden Rice at PhilRice was funded by the Philippine Agriculture and Fisheries Biotechnology Program of the Department of Agriculture (DA Biotech Program) from 2016 to 2022.

Dr. Reynante Ordonio is a Senior Science Research Specialist and Scientist I at PhilRice.

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LAMParA Kit For Abaca Virus Detection: An Important Tool for Disease Prevention

BY DR. LENY C. GALVEZ, CRIS FRANCIS BARBOSA, AND RHOSENER BHEA L. KOH

Abaca, an endemic crop to the Philippines closely related to banana (Lasalita-Zapico and Aguilar, 2014), is primarily harvested for its prized fiber, considered the longest and strongest natural fiber in the world. The abaca industry not only engages 130,000 farmers (PhilFIDA, 2023) but also provides employment in the manufacturing and processing industry for fiber products.

However, abaca production is hampered by the occurrence of dreaded viral diseases, namely abaca and banana bunchy top, bract mosaic, and sugarcane mosaic viruses. These four viruses may occur singly or in mixed infections, which primarily account for the low average fiber yield and are capable of wiping out the indigenous plants in the country. These viruses are primarily transmitted through insect vectors, such as aphids, or through contaminated planting materials.

The Philippine Fiber Industry Development Authority (PhilFIDA) collaborates with local government units and abaca farmers to control virus diseases by continuously surveilling and eradicating them. Hotspots, or severely infected areas, are treated with insecticides to kill aphid vectors, and infected plants are either removed or treated with glyphosate. PhilFIDA promotes the use of high-yielding, disease-free planting materials and operates tissue culture and diagnostic labs to produce disease-free plantlets. These labs use serology-based detection (enzyme-linked immunosorbent assay or ELISA) and nucleic acid-based detection (polymerase chain reaction or PCR) methods.

Many rural areas, however, do not have extensive resources to conduct ELISA or PCR for routine detection of viral diseases. Therefore, a simple, rapid, and reliable detection method is needed to identify virus-free planting materials and monitor disease incidence in the field. Thus, another technique, called loop-mediated isothermal amplification (LAMP) (Notomi et al., 2000), which possesses these characteristics, was also developed for the detection of the four abaca viruses.

Development of LAMParA Kit

PhilFIDA and the University of the Philippines Diliman National Institute of Molecular Biology and Biotechnology (UPD-NIMBB) developed LAMP-based virus detection as part of the "Enhancing Virus Detection Technology for Effective Disease Management in Abaca" project, funded by the Philippine Biotechnology for Agriculture and Fisheries of the Department of Agriculture (DA Biotech Program). To ensure field applicability of the developed LAMP assay, a subsequent project was initiated to package and refine the LAMP technology into a portable kit suitable for on-site use.

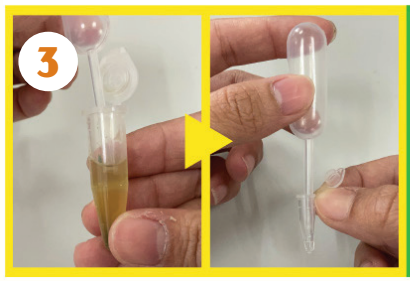
HOW TO USE THE KIT?

SAMPLE COLLECTION

Clip the cover of the collection tube with 1 ml of water into the leaf samples to collect leaf disc.

SAMPLE GRINDING

Grind the leaf disc in tube using micropestle until the sample solution turns green.

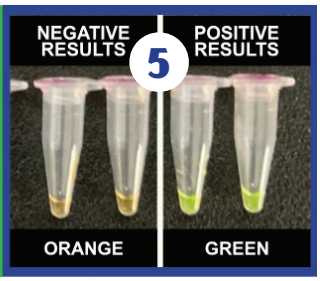


ADDING OF SAMPLE TO LAMP MIX

Transfer a drop of sample solution (~10 µl) using dropper from the collection tube to the LAMP mix.

INCUBATION

Incubate the LAMP mix with the sample and 350ml water at 65°C for 45 minutes.



STAINING

Gently flick the cover of the reaction tube to mix the staining dye. Observe for the color-change.

Evaluation of the field performance of the kit includes assessing its diagnostic accuracy, replicability, and ease of use by farmers and other beneficiaries without requiring a high level of technical knowledge. Through this project, PhilFIDA developed the *LAMP para sa Abaca*, or LAMParA Kit, for the detection of abaca viruses. The kit includes all the necessary supplies to conduct a diagnostic assay directly in the field. The kit is portable allowing for on-site testing. The procedure is simple and does not require sophisticated equipment. The process is rapid, with results available within 30 minutes, and the results analysis is simply based on color change.

Features of LAMParA Kit

Implementing LAMP kits for abaca virus detection is an important tool for early detection allowing timely intervention to prevent the spread of the disease. The LAMParA Kit empowers farmers by providing them with the tools to monitor their abaca plants effectively. With proper training, farmers can utilize LAMP kits to manage viral infections more efficiently, enhancing the overall yield and quality of abaca fibers and supporting the economic stability of abaca farmers. For maximum impact, LAMP technology should be integrated into comprehensive disease management programs.

Currently, developing multiplex LAMP assays that can detect multiple viruses simultaneously is underway. As technology advances, the integration of LAMP with other diagnostic and management strategies will likely enhance its impact, contributing to healthier crops and more resilient farming communities.

Dr. Leny C. Galvez is the Head at PhilFIDA - Immunology and Molecular Biology Laboratory (IMBL). Cris Francis Barbosa is a Science Research Specialist II at PhilFIDA. Rhosener Bhea L. Koh is an Instructor 7 at UP-NIMBB.

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Understanding Resistance Mechanisms: Developing BBTV-Resistant Banana Varieties Through Innovative Omics Approaches

BY ELAINE P. LAURIO, SHERRY ANNE G. RODRIGUEZ, AND DARLON V. LANTICAN

Banana bunchy top disease (BBTD) is the most significant viral threat to global banana production. Caused by the banana bunchy top virus (BBTV), it is transmitted by banana aphids (*Pentalonia nigronervosa*). Symptoms include yellowing and rosetting of the leaves, stunted growth, and the appearance of morse code patterns or dark green streaks in the leaves, pseudostem, and petioles. Once established, BBTD is notoriously difficult to control. The virus can also spread through infected banana planting materials, such as suckers and corms, which can further accelerate its dissemination.

BBTD has a widespread presence worldwide and can cause 100% yield losses in severe cases. Popular cultivars like Lakatan and Cavendish are especially susceptible, posing a significant risk to countries like the Philippines, a leading contributor to the global banana export market. However, research offers a promising solution. The wild banana species, *Musa balbisiana*, shows complete resistance to BBTV. This locally available resource presents valuable potential for conventional and marker-assisted breeding programs.

The Banana-BBTV Omics Project, spearheaded by Mr. Darlon V. Lantican at the Institute of Plant Breeding, University of the Philippines Los Baños (IPB-UPLB), and supported by the Philippine Biotechnology for Agriculture and Fisheries Program of the Department of Agriculture (DA Biotech), has yielded research contributions that utilized innovative omics techniques and plant breeding tools to elucidate the resistance mechanisms of bananas against BBTV.

A key finding of the project involves the identification of differentially expressed genes (DEGs) in response to BBTV infection through comparative RNA-sequencing (RNA-seq) analysis. This study revealed a distinct set of 151 DEGs in the resistant wild *Musa balbisiana*, providing insights into the potential mechanisms underlying its resistance. Conversely, 99 DEGs were identified in the susceptible *Musa acuminata*, offering clues into the host-factor mechanisms that may facilitate successful viral infection in these cultivars.

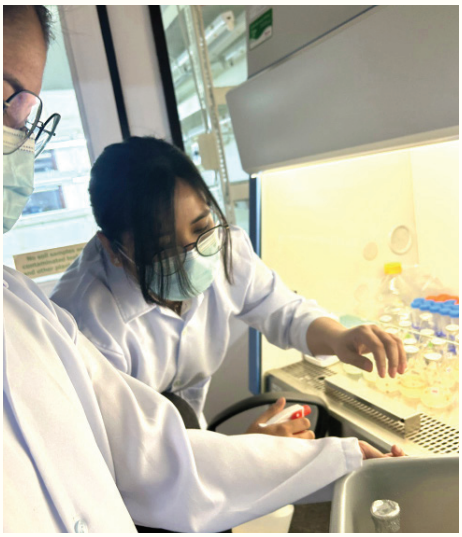
The expression of these candidate genes has been validated, utilizing a stable internal control gene that was also established by the research group. With the team's contributions to Philippine banana genomics research, they were recently awarded the 2024 UPLB AGORA Outstanding Researcher Project award.

The team has also undertaken a comprehensive analysis of the banana germplasm collection housed within the National Plant Germplasm Resources Laboratory (NPGRL), aiming to characterize the genetic diversity of the collection and identify potential resources for banana breeding programs. Additionally, they have developed a cost-effective 1 K SNP panel for targeted genotyping-by-sequencing in bananas, which serves as the basis for establishing the first banana breeding block in the country. This breeding block consists of potential parents that can be strategically crossed to generate offspring with BBTV resistance. While initial crosses are underway, the team has already developed molecular markers associated with Receptor-Like Kinases (RLKs) for marker-assisted breeding, accelerating the development of improved banana varieties.

In addition, the team also developed a high-throughput and sensitive detection method for BBTV. This technique, using quantitative polymerase chain reaction (qPCR) equipment, quantifies viral load and facilitates large-scale sample testing, streamlining both research and industry practices.

The application of these research outputs is not only limited to facilitating marker-assisted selection programs. The project's transcriptomic analysis and DNA marker development lay the groundwork for the creation of gene-edited, BBTV-resistant banana cultivars. As proven by the international banana breeding groups, traditional banana breeding can be slow and complex due to hybridization challenges. Hence, clustered regularly interspaced short palindromic repeats (CRISPR) technology offers a promising alternative for introducing resistance genes to potentially speed up the development of superior banana cultivars.

The project is currently in its second phase. Looking ahead, the team is focused on whole genome sequencing for association studies and *de novo* assembly of Philippine wild banana species reference genomes, functional validation of host-factor genes in susceptible bananas, and metabolomic validation of candidate pathways linked to BBTV resistance. These comprehensive investigations aim to unlock the genetic mechanisms underlying resistance and pave the way for the development of robust, BBTV-resistant bananas.



Genetic transformation experiments in bananas, using CRISPR-Cas for functional genomics applications, are conducted within UPLB-IPB's Biosafety Level 2 facility (DOST-BC permit Ref No. 2023-0347).

Core to the project is the utilization of advanced molecular biology techniques, including RNA-seq, genotyping-by-sequencing, and RT-qPCR.

Elaine P. Laurio is a University Research Associate at Genetics Lab - IPB. Sherry Anne G. Rodriguez is a University Researcher I in Plant Cell and Tissue Culture Lab - IPB. Darlon V. Lantican is a University Researcher II at Genetics Lab IPB.

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Juan Amplification (JAmp) WSSV Detection Kit: A Simple and Convenient Tool for Shrimp

BY LUCILLE GRACE V. PUNZALAN

Filipinos love eating seafood, such as shrimp, crab, and various types of fish. About 96% of the shrimp produced in the Philippines is consumed locally, with only 4% exported to other countries. However, the domestic shrimp production is threatened by diseases which must be detected immediately. One deadly pathogen for shrimp is the White Spot Syndrome Virus (WSSV), which has no commercially available control method. The virus can cause white spot syndrome, which is highly contagious and lethal to shrimp. To address this issue, a research team from the University of Santo Tomas, led by Dr. Mary Beth Maningas, produced the Juan Amplification (JAmp) WSSV Detection Kit. This technology is based on the molecular diagnostic assay known as loop-mediated isothermal amplification (LAMP). The kit includes instructions for extracting DNA and a master mix for the LAMP assay with primers specifically designed for WSSV detection.

In field testing, farm staff readily learned how to use the WSSV detection kits.
Photo Source: Global Seafood Alliance.

Features of JAmp Detection Kit

JAmp WSSV Detection Kit is a simple and convenient tool for onsite detection of WSSV in shrimp. It can be used for shrimps at different life stages and any type of tissue can be used.

The kit uses four to six specially developed primers, which makes it ten times more sensitive compared to the polymerase chain reaction (PCR), which uses only two primers. The multiple primers of JAmp also speed up the reaction time, reducing the detection time and providing results within an hour. The results can be easily determined by visual examination. A fluorescent sample indicates a positive result.

The cost-effective technology is paired with a heat block apparatus, which is cheaper than a thermal cycler and does not require other sophisticated instrumentation. As a result, testing is low-cost compared to other conventional methods.

Impact of the technology

Since the JAmp WSSV Detection Kit efficiently detects WSSV in shrimp, it enables immediate control and preventive measures to curb the spread of the disease. This will help avoid shrimp mortality and reduce economic losses for farmers and pond owners in the Philippines. The technology can also be used by other countries.

The kit may enhance farm management practices in the Philippines and lessen dependence on costly and imported diagnostic kits. Using locally-built equipment will also decrease the cost of pathogen detection.

LAMP detection kit for WSSV in shrimps.
Photo Source: DOST PCAARRD.

Pilot tests of the kit have been conducted in General Santos, Iloilo, Bohol, Cebu, and Davao. Eighteen kits were distributed to shrimp operators and beneficiaries nationwide.

Related research

The JAmp WSSV Detection Kit can be adapted to detect other diseases when the platform is modified or customized. Dr. Maningas developed the JAmp-AHPND Diagnostic Kit to detect acute hepatopancreatic necrosis disease (AHPND) or early mortality syndrome (EMS) in shrimp. AHPND is a bacterial disease that causes high mortality rates in farmed populations of giant tiger prawn and whiteleg shrimp.

The process and features of using JAmp-AHPND Diagnostic Kit are similar to those of JAmp WSSV Detection Kit. For more information about these technologies, you may contact Dr. Mary Beth B. Maningas at (02) 732-7486.

Lucille Grace V. Punzalan is a Project Assistant at ISAAA Inc.

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Writ of Kalikasan: Golden Rice and Bt Eggplant Face Legal Battle Against Biotech Critics in the Philippines

BY CLEMENT DIONGLAY

In the past three decades, scientists have significantly contributed to finding solutions to ensure the global food supply. Scientists are one of the driving forces behind the development of genetically modified (GM) crops to improve food production. They have developed crops with beneficial traits like resistance to pests and diseases, crops that adapts to harsh environmental conditions such as drought and heat, and used genetic modification to enrich crops with vitamins and minerals.

In the Philippines, two GM crops that have been recently approved for commercial propagation are Golden Rice and Bt eggplant. Golden Rice, or *Malusog Rice*, is a variety of rice genetically engineered to produce beta-carotene, a precursor of vitamin A, in the grain, making it a potentially powerful tool to combat vitamin A deficiency, a major public health problem in many parts of the world, especially Southeast Asia where rice is a dietary staple.

Bt (*Bacillus thuringiensis*) eggplant, developed by the University of the Philippines Los Baños (UPLB), is a variety of eggplant that has been modified to resist the eggplant fruit and shoot borer (EFSB), a major insect pest of eggplant in the Philippines, causing significant yield losses for farmers of up to 50-70%. Bt eggplant is projected to help reduce these losses and increase farmers' income with a 192% yield advantage.

Bt eggplant fruit. Photo Source: UP Los Baños Bt Eggplant Project

Golden Rice and Bt eggplant face legal battle against biotech critics

On April 18, 2023, the Philippine Supreme Court (SC) issued a Resolution that granted a *Writ of Kalikasan* to stop the commercial release of Golden Rice and Bt eggplant. The Writ was petitioned by a group led by *Magsasaka at Siyentipiko Para sa Pag-Unlad ng Agrikultura.*

The SC Resolution also required the respondents to file a verified return of the *Writ of Kalikasan*, to which the Secretaries of Agriculture (DA), Environment and Natural Resources (DENR), and Health (DOH), the Bureau of Plant Industry (BPI), UPLB, and the Philippine Rice Research Institute (PhilRice) complied with.

In a separate Resolution issued on June 13, 2023, the SC referred the case to the Court of Appeals (CA) to hear, receive, and render judgment. On April 17, 2024, the CA rendered its judgment on the petition, which grants the privilege of *Writ of Kalikasan*; issues a Writ of Continuing Mandamus against respondent government agencies; directs UPLB to cease and desist from commercially propagating and conducting Bt eggplant activities; revokes the Biosafety Permit for Commercial Propagation of Golden Rice; and orders PhilRice to cease and desist from commercially propagating and conducting Golden Rice research activities.

GM products receive support from various groups

Since the Writ was issued, members of the academe, scientists, and media practitioners released their statements of support, including the National Academy of Science and Technology, Science Communicators Philippines Inc., the Coalition for Agriculture Modernization in the Philippines, Inc., and the Biotechnology Coalition of the Philippines.

GM crops to help feed the world's future population

GM crops have been commercially propagated since 1996. In 2019, 29 countries, including the Philippines, planted 190.4 million hectares of 15 biotech crops contributing significantly to food security, sustainability, climate change mitigation, and upliftment of the lives of up to 17 million biotech farmers and their families worldwide.

Scientific research and development for agriculture play a critical role in ensuring a stable and nutritious global food supply for the Philippines and the world as more people demand more food. The debate on GM crops is complex, but carefully weighing their potential benefits and drawbacks, and implementing these technologies responsibly, will help contribute to a future where everyone has access to adequate and nutritious food.

This article was first published in ISAAA Science Speaks Blog (https://tinyurl.com/mrnyycpx).

Clement Dionglay is a Project Associate at ISAAA Inc.

What is *Writ of Kalikasan*?

A *Writ of Kalikasan* is a special civic action and legal remedy under Philippine law that protects one's constitutional right to a healthful environment, as outlined in Section 16, Article II (Declaration of Principles and State Policies) of the 1987 Philippine Constitution.

To date, the *Writ of Kalikasan* has been issued against environmental protection and mining operations in the Philippines. It was issued against a crop for the first time in 2013, when the Court of Appeals upheld a court ruling banning the field trials of Bt eggplant.

PINOY BIOTEK ON SPOTLIGHT

Kier A. Domingo, RCh

From Wonder to Wisdom: How I Began My Science Journey

Kier A. Domingo is an Instructor at Philippine Science High School Southern Mindanao Campus.

"Itablog ra! Hindi pag kan-a hay mahilu ka kara."

My mother's warning echoed as she hurried toward six-year-old me, holding a mysterious purple fruit I found in a bush by our rice field. Unsure of its name or safety, her caution sparked my curiosity. Growing up, I discovered that even small-scale farmers in Mindanao are unfamiliar with many local plants, fueling my fascination with the rich biodiversity of the Philippines.

I'm Kier A. Domingo, honored to be a Philippine Agriculture and Fisheries Biotechnology of the Department of Agriculture (DA Biotech) Scholarship Alumnus. I started my education at Ranzo Elementary School in Carmen, Cotabato, where I graduated at the top of my class. After that, I embarked on a journey as a working student until completing my secondary education at Antipas National High School, Antipas, North Cotabato, specializing in the Science, Technology, Engineering, and Mathematics (STEM) Strand–again graduating at the top of the class.

The opportunity for higher education became a reality through the DA Biotech Scholarship Program, leading me to pursue a Bachelor of Science in Chemistry at the University of Southern Mindanao's Main Campus. My college experience was marked by financial struggles, prompting me to seek alternative accommodations near the university. It was during this time that I discovered the DA Biotech Scholarship Program, a beacon of hope that propelled me forward. Through divine grace, I was selected as a scholar, reigniting my aspirations to contribute to the nation's scientific community.

In 2022, I proudly graduated cum laude. Currently, I am a registered chemist and am privileged to mentor aspiring scientists at the Department of Science and Technology (DOST) Philippine Science High School-Southern Mindanao Campus, where I teach chemistry and research subjects. This role allows me to inspire and guide the next generation of scientific leaders, a testament to the transformative power of programs like DA Biotech in shaping the future of our country.

Focus and fascination

Growing up in a farming community amidst the rich biodiversity of the Philippines, I developed a keen interest in utilizing our abundant, yet often overlooked, plant resources. Fueled by the pressing global challenge of bacterial resistance and the need for novel antibiotics, my undergraduate research focused on the synthesis of silver nanoparticles using an extract from *Macaranga tanarius*, locally known as Binunga.

This eco-friendly approach not only offers a cost-effective alternative but also harnesses the inherent properties of a widely available plant species. The synthesized silver nanoparticles exhibited promising antibacterial activity against both gram-positive and gram-negative strains, signaling their potential as effective antimicrobial agents.

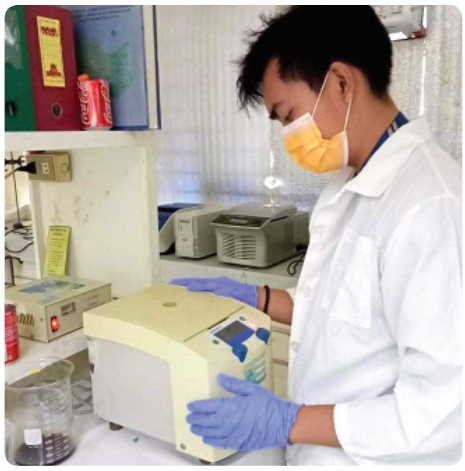
Harnessing agricultural wastes and less utilized plants for the synthesis of silver nanoparticles is a sustainable and innovative approach that addresses both environmental and economic challenges. By repurposing these often-overlooked resources, we can reduce waste and create value-added products. This not only promotes a circular economy but also opens new avenues for cost-effective and eco-friendly nanotechnology applications.

My vision for agribiotech: Educating tomorrow's innovators

During my student days, the DA Biotech Program was more than just financial support. It provided invaluable experiences, particularly through the guidance of the dedicated individuals at the university's biotechnology laboratory. Their mentorship played a pivotal role in shaping who I am today. Despite my humble beginnings, their support instilled in me the understanding that I was not alone in my journey.

My journey in science, particularly in agribiotech, has been driven not solely by the pursuit of recognition, but by a genuine passion. Working in the research field has always been more than a task; it has been a source of inspiration. It showed me that by nurturing the curiosity of the next generation, we can foster innovation and drive progress in agribiotech.

I learned that success is not just about personal achievement; it is about using our knowledge and skills to make a meaningful impact in our communities. As a teacher, I hope to instill the same passion for agribiotech in the younger generation through STEM education promotion. The future starts with inspired youth, and by nurturing their curiosity and providing them with the tools they need to succeed, we can ensure a brighter tomorrow for biotechnology.



Centrifugation process for purifying biosynthesized silver nanoparticles.

Pipetting supernatant after centrifugation for nanoparticle purification.

(Photos courtesy of Kier A. Domingo)

Robert Christian F. Patani, Rfp

How I got into the DA Biotech Scholarship

In times when we think all things are well planned out, life often leads us to unexpected paths. My journey as a fisheries student, becoming a Philippine Agriculture and Fisheries Biotechnology Program of the Department of Agriculture (DA Biotech) scholar, and charting a course in the field of biotechnology exemplify this notion. Indeed, in the vast ocean where currents sometimes steer us toward unexpected destinations, things still work together for good.

My journey was far from conventional. Unlike most of my classmates, I never envisioned myself pursuing a degree in Fisheries, let alone becoming a DA Biotech Scholar. I had already set my focus on a business-related degree. However, an unanticipated detour happened when I qualified for a Bachelor of Science in Fisheries through the University of the Philippines College Admission Test (UPCAT) in UP Visayas. Despite many reservations, I still seized the opportunity, hoping to eventually switch to my desired program. However, I struggled to find my footing during my first year, so the shift never happened.

The trajectory of my college life changed when I stumbled upon the DA Biotech Scholarship Program. Unfamiliar with the program, I applied out of curiosity rather than conviction. Despite my less-than-ideal grades and my then-wavering commitment to Fisheries, the panel saw potential in me, encouraged me to stay in the program, and offered me the scholarship. Accepting their offer was a huge turning point in my life, and I am grateful it happened.

Life as a DA Biotech Scholar

As a Fisheries student and a DA Biotech scholar, I embarked on a transformative journey filled with experiences, learning, and growth opportunities. Through various academic pursuits, including lectures, apprenticeships, and workshops, I honed new skills and gained a profound understanding of the importance of fisheries science and biotechnology in addressing the pressing needs of the fisheries industry. This led me to focus my thesis, funded by DA Biotech, on discovering practical biotechnological applications and solutions to meet the growing demand for healthy seaweed propagules among seaweed farmers in the country.

My journey as a DA Biotech scholar became the foundation of my future in fisheries science. It led me to embrace roles I never thought suited me and opened doors I never thought possible. Despite the challenges and uncertainties along the way, I persevered and, by the grace of God, graduated with the distinction, cum laude. I was also conferred as an Academic Awardee of DA Biotech and placed 7th in the 2022 Licensure Examination for Fisheries Professionals. On top of that, I found fulfillment in my thesis endeavor when I had the opportunity to share my findings with the international scientific community – truly a testament to things still working out for good.

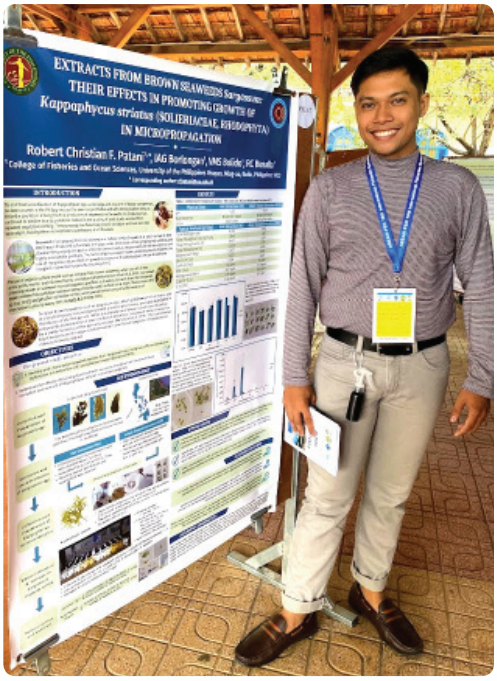
Commitment to the future of fisheries and biotechnology

As I embark on my professional journey, though not entirely in the field of biotechnology, I am grateful to have contributed to the upliftment of the fisheries sector when I worked as a Science Research Specialist in a technology-transfer project that aimed to provide reliable Alimango seed stocks for growers in my municipality in Panay, Capiz.

Currently, I am a faculty member in our province, guiding students in the intricacies of fisheries science and biotechnology. As I continue to navigate the waters of academia and research, I embrace the challenge of being a catalyst for mainstreaming fisheries and biotechnology. I seek to open doors and opportunities for others, just as mine were opened. I am also committed to being at the forefront of meaningful initiatives promoting sustainable aquaculture and ensuring food security for future generations.

Ultimately, what began as a series of unexpected twists and turns has blossomed into a journey of passion, service, and dedication to make this world a little better than it used to be– one breakthrough at a time.

Robert Christian F. Patani is a Faculty Member at Capiz State University-Pontevedra Campus.

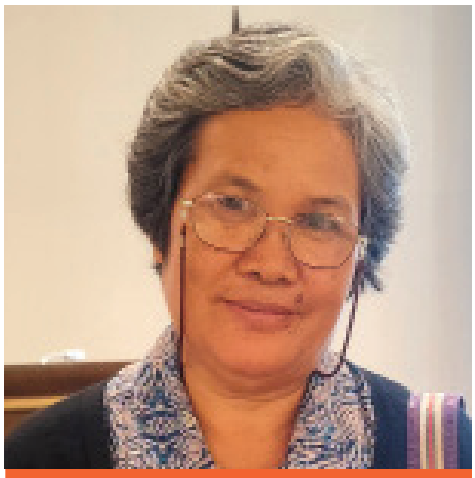


Robert at ASEAN-FEN 10th International Fisheries Symposium.

(Photos courtesy of Robert Christian F. Patani)

What Farmers Say About Bt Corn in the Philippines

It has been more than 20 years since Bt corn was commercially approved in the Philippines, and farmers are still reaping the benefits of planting its seeds. Know more about what Filipino farmers say about planting Bt corn.



Mercedes Fabilla Engallado
Antique

"Bt corn gave us a high profit, and we don't need to use many pesticides."

Jose Noel Jardeleza
Iloilo

"Some biotech crops have resistance to pests, which will be a great help to farmers."

Ricky Sazon
Iloilo

"Bt corn is easier to harvest and it has a better yield."

Indalencio Supan
Pampanga

"Bt corn yields more than the conventional variety as the latter is usually eaten by the corn borer."

Aquino Gozun
Pampanga

"Bt corn brought good results to farmers. It gave an income twice more than what we get from conventional corn."

Faustino Astrero Jr.
South Cotabato

"When I started to plant Bt corn, I felt more relaxed because there was less labor in planting it."

PROJECTS

This infographic highlights various biotech products made by Filipino researchers to help the agricultural and fisheries industries in the Philippines

CROP PROPAGATION & PROTECTION

BioMeg
microbial inoculant that boosts the yield and nutritional quality of crops, such as sweet potato and purple yam

Coconut Somatic Embryogenesis Technology (CSEt)
production of Makapuno plantlets using plumule taken from the nut and cultured in nutrients in an artificial environment

Bt Eggplant
genetically engineered eggplant that is resistant to eggplant fruit and shoot borer, the most destructive eggplant pest

Bt Cotton
insect resistant cotton can control cotton bollworm, which reduces the amount of pesticide necessary for its growth

CROP TEST KIT & GENOMICS

LAMParA Kit for Abaca
detects abaca bunchy top and mosaic viruses and can be used on the field for early detection of abaca viruses

LAMP Kit for Rice Tungro Bacilliform Virus (RTBV)
detects RTBV before the symptoms become noticeable, helps protect standing crops and minimize crop loss

Genome-Wide Association Mapping of Selected Philippine Rice Germplasm for Root Plasticity Alleles
uses genome wide association mapping to identify traditional rice varieties with root plasticity associated with drought tolerance

FOOD AND BEVERAGE

Golden Rice/Malusog Rice
new type of rice with significant amount of beta-carotene in its grains, which can provide at least 30% of average daily requirement for vitamin A

Disease Resistant Golden Rice
rice with significant amount of beta-carotene and resistance to tungro and bacterial leaf blight

Red Mold Rice
produced by fermenting non-glutinous rice with *Monascus purpureus*, a species of red mold with known health-promoting properties against lifestyle-related diseases

Guava Probiotic Drink
produced from fermented guava leaf extract using selected lactic acid bacteria; this drink has health benefits from the guava leaves and probiotics

FISHERIES/AQUACULTURE

Induced Spawning of Mudfish
triggers the reproduction of mudfish to provide pure spawn of fish under cultivation

Improved Hatchery Protocol for Stock Enhancement of Blue Swimming Crab
increases the number of good-quality crablets that can be released into the wild and generate income for crab fishers

LAMP Detection of *Vibrio* in Fish
detects *Vibrio* or gram-negative bacteria in fish to ensure timely interventions and revolutionize the management of diseases

DNA Barcoding of Scallops

DNA-based protocol for scallop species identification

LIVESTOCK TEST KIT

Portable Molecular Diagnostic Platform for Rapid Detection of Poultry Pathogens
quickly detects diseases in chickens and prevents the spread of pathogens

QuickCArE Dry LAMP CAEv Test Kit
screening kit that detects Caprine arthritis and encephalitis virus in goats which is easier to use, cheaper, and has a shorter test time compared to other test kits

PCR-based Detection Kit for Salmonella in Meat

uses polymerase chain reaction to detect Salmonella in various types of meat; this kit has higher sensitivity and specificity compared to traditional methods

ISAAA GM Approval Database

The ISAAA GM Approval Database (GMAD) is an easy-to-use database of biotech/GM crop approvals for public use. It features the biotech/GM crop events that have been approved worldwide for commercialization/planting and importation (food and feed). Entries in the database are from publicly available English (and translatable) decision documents of each approving country, Biosafety Clearing House of the Convention on Biological Diversity, and peer-reviewed scholarly articles.

SCAN THIS TO VISIT GMAD!

CONTENTS OF ISAAA GM APPROVAL DATABASE:

- GM/BIOTECH CROPS
- TRAITS
- EVENTS
- DEVELOPERS
- GENES
- COUNTRIES

PINOY BIOTEK MAGAZINE

Pinoy Biotek Magazine aims to raise the Filipinos' awareness, understanding, and acceptance of Pinoy biotech products derived from conventional and modern biotechnology. It is published in print and distributed for free to selected schools and institutions. This magazine is also available for free download in the ISAAA Inc. website.

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