

# Researchers' Notebook

Crop Protection Cluster  
RDE DIARY

Volume 1, Issue 1



For the  $n^{\text{th}}$  time...

## CUMAGUN TAKES CENTER STAGE



Dr. Christian Joseph Cumagun's good looks and patented smile will not deceive you. In spite of his many accomplishments, he remains a low profiled person, achiever and a good family man.

Among friends and colleagues, he is a "prolific researcher," "mentor," "teacher," and "a multi-awarded scientist". Of great significance for those in

the practice of plant pathology, Dr. Cumagun is synonymous with fungal population genetics and molecular plant pathology, his contributions in this field can only be described as beneficial and lasting.

Dr. Cumagun received his B.S. degree from the University of the Philippines Los Baños with honors in Agriculture in 1993, and at the same institution he completed his M.S. degree in Plant Pathology in 1998. He then went to Copenhagen, Denmark as UNESCO/ICSU/TWAS fellow in the basic sciences at the Royal Veterinary and Agricultural University from 1999-2000.

He was awarded a fellowship by the German Academic Exchange Service (DAAD) from 2000-2004 and completed his degree as Doktor der Agrarwissenschaft from the University of Hohenheim, Stuttgart, Germany as *magna cum laude* in 2004. Five years later, he went to Kobe University, Japan as a Postdoctoral Research Fellow by the Japan Society for the Promotion of Science (JSPS).

He assumed his first position as an instructor at the College of Agriculture at the University of the Philippines Los Baños, where he launched his highly productive and distinguished academic career.

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### From the Editor

*We take pride of our researchers at the Crop Protection Cluster-National Crop Protection Center (CPC-NCPC); that's why we have conceived this sort of a diary that will showcase not only their outstanding researches but also who they are beyond research works and other duties that they do for the cluster, the university and the country..*

*We thought it is our obligation to share with our readers the kind of researchers that we have and the quality of research that our scientists have been doing for years.*

*Just read on..*

*Then, you can judge the cluster for what it has become.*

*Thank you for my resourceful production team, Erich, April, Joedel and Sarah and for the concept, Ms. Cely Navasero.*

## CUMAGUN..FROM P1..

He became assistant professor from 1999-2006 then associate professor from 2007-2008 and subsequently became the Head of the Crop Protection Biotechnology Division of the Crop Protection Cluster and at the same time as Secretary of the College of Agriculture. He became associate dean of the College of Agriculture from 2008-2009 and 2011-2015.

In 2014, he assumed his current position as Professor 12. He was also visiting scientist at the Swiss Federal Institute of Technology (ETH), Zurich in 2013, a visiting professor at UNESP, Campus de Ilha Solteira, Sao Paulo, Brazil in 2014 and at the same time a part-time lecturer at the Graduate School of Agri-

cultural Sciences, Kobe University, Japan.

Dr. Cumagun is a student-centered educator to his fellows and young faculty. He considers teaching as the noblest profession. "Your influence as a teacher will continue, the knowledge that you impart will influence their (students) lives", he says. He also adds that, "a teacher can even influence by giving a simple recommendation during their application for work or further studies". Beginning with his first post as an instructor and his current position as Professor 12, he has taught undergraduate courses in crop protection, pest management, plant disease control, postharvest pathology, and research methods in plant pathology and agriculture, to name a few. To date, he has supervised/graduated 17 undergraduate students, 5 MS students and 2 PhD students. In addition, he has served as chair of the College Curriculum Committee and facilitated the offering of Bachelor of Science in Agricultural Biotechnology to address the decline of agriculture students in the university.

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This issue's features:



CUMAGUN



JAVIER



DALISAY

## FACTS ABOUT BOTANICAL PESTICIDES FROM DR. PIO JAVIER, IPM EXPERT



To name a few, researches on *Trichogramma* parasitoids, biological control against Asian corn borer, was one of his pioneering tasks at the center. He also initiated researches on earwigs, effective predators of corn borer as well as pests of coconut and banana. He received numerous awards from local and national agricultural entities due to his hard works as researcher, extension worker and for the last years as cluster, a faculty.

With the advent of organic agriculture, he has been doing serious studies on botanical pesticides. The following are highlights of his studies on BPs in an informal interview done by Eric Jhon dG. Cruz and Sarah Jane B. Manaday.

**Dr. Pio A. Javier**, multi awarded researcher and faculty of CPC has recently retired from a 40 year dedicated and meritorious service at the Crop Protection Cluster-National Crop Protection Center. He was one of the pioneers of integrated pest management and biological control projects and studies that the center continues to be proud of.

### WHAT ARE Botanical Pesticides (BPs)?

Botanical pesticides or plant extracts are naturally occurring toxins obtained from plants that is intended to reduce pest populations. Specifically, botanical insecticides are plant extracts intended for the control of insect pests. There are plants that have evolved for several million years and to defend themselves from frequent insect infestation they were able to biosynthesize any of the compounds like

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## CUMAGUN..FROM P2..

## MULTI-AWARDED

Dr. Cumagun has received numerous international and national awards and honors during his career. He is one of the five awardees of The Outstanding Young Men (TOYM) in agriculture presented by the Junior Chamber International in 2008. He was conferred as UP Scientist III in 2014-2016 prior to his conferment as UP Scientist I and II in 2008-2010 and in 2011-2013, respectively. His recent awards include, the British Mycological Society International Mycological Congress Bursary Award in 2014, International Society for Plant Pathology Travel Award in 2013, Eusebio Y. Garcia Award in Molecular Biology and Pathology presented by the National Research Council of the Philippines (NRCP) in 2013, DOST Outstanding Research and Development Award-Eduardo Quisumbing Medal in 2012, Outstanding Young Scientist (OYS) in Agricultural Science presented by the National Academy of Science and Technology (NAST) in 2007. In addition, he was granted Professorial Chair awards by: the Bangko Sentral ng Pilipinas (2014), SEARCA Professorial Chair Lecture (2008), Metro Manila Commission Professorial Chair Lecture (2007) and Vicente Sinco Professorial Chair Lecture (2006).

Cumagun has likewise made significant contributions through service on a number of editorial boards of international and national journals.

In 2015, he served as reviewer of several journals including the *Journal of Applied Microbiology* (John Wiley and Sons), *Food Biotechnology* (Taylor and Francis), *Phytopathology and Plant Disease* (American Phytopathological Society), and *Brazilian Journal of Microbiology*.



Cumagun receiving **TOYM** award from then Pres. Gloria Arroyo with other prominent personalities of the country



Cumagun receiving **Quisumbing Medal** from Sen Loren Legarda and DOST Sec. Montejo.



Outstanding Young Scientist (OYS) Award in 2007

He previously served as the editor-in-chief of the *Journal of Tropical Plant Pathology* in 2007-2009 and now he is the current editor-in-chief of the *Philippine Agricultural Scientist* (PAS). Furthermore, he has served or serves on numerous honor societies, scientific organizations and committees including The World Academy of Sciences, Gamma Sigma Delta Honor Society of Agriculture, Mycological Society of the Philippines and Philippine Phytopathological Society, to name a few.

## PERSONALLY...

Born into a family with Ilocano and Batangueno roots, Dr. Cumagun grew in Lipa, Batangas. His father is a visual artist and his mother is a businesswoman who's into baking sweet goodies. At age 5, his artistic talent in painting showed up winning for him several awards during his childhood.

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JAVIER..FROM P. 2

alkaloids, steroids, phenols, flavonoids, glycosides, glucosinolates, quinones, tanins and terpenoids that are toxic against insects. If you see plants that are quite healthy and free from insect damage, suspect that these plants might contain compounds that may exhibit toxicity against insect pests. The use of plant extracts as insecticides dates back as the Roman Empire wherein dry flowers of pyrethrum was used in delousing children.

Not all plants can be a safe source of botanical pesticides because some plants may exhibit high toxicity to mammals and maybe carcinogenic like the yellow bell. The tubli (*Derris elliptica*), a botanical insecticide that exhibits toxicity against wide range of insect pests could not be recommended since it is quite toxic to fish.

Therefore, not all plants that are reported to be toxic against insect pests could be used as a safe source of botanical insecticides. Examples of plant extracts that can be sources of BPs are makabuhay, oregano, luyang dilaw, langkauas, marigold, lantana, name, black pepper, langundi, lemon grass and many others. Fortunately, most of these plants also have

medicinal values, hence, they can be considered as safe source of botanical insecticide.

### How are BPs prepared and applied?

The common practice of obtaining plant extracts from plants is by using expensive solvent systems like hexane, methanol and others; but the use of solvent systems are not allowed in organic agriculture, instead vinegar, wine and water are being recommended.

However, since vinegar is acidic, the presence of vinegar in the spray solution may cause phytotoxicity. While the use of wine like lambanog is quite expensive. results of our preparation of crude plant extracts using water provided satisfactory results.

### MODE OF ACTION OF BPs

Although plant extracts kill insects through contact toxicity (applied directly to insects), do not expect that the application of BP will cause an immediate and abrupt reduction in insect pest populations. It should be remembered that many of the plant extracts are less toxic to insects than synthetic insecticides. The residual action of plant extracts is short since they are rapidly

degraded by UV light, therefore, BP should be applied more frequently. BPs do not leave residues on treated plant parts, hence they are safe to non-target organisms and insect resistance development to BP is not common. Botanical pesticides exhibit antioxidant activity which suggests that insects could feed on the treated plants but there is significant reduction in food intake until the insects die of starvation. Botanical pesticides also exhibit repellent action wherein the insect are driven away after exposure to treated plant parts without necessarily initiating the feeding activity. Another mode of action of BP is that they possess growth inhibitory effects. Insects that feed on plants treated with BP results to the emergence of abnormal pupae and adults and produce eggs that are partially sterile. With the above properties of BP, the use of plant extracts could be an important component of integrated pest management since they are safe to the population of biological control agents which played a significant role in regulating pest population. This will be better than the synthetic insecticides which will kill majority of the insect pests but at the same time will decimate the biological control agents in the field.

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JAVIER..FROM P. 4

### Preparation of crude extracts of oregano (leaves and stems), luyang dilaw



oregano



Luyang dilaw



langkauas

- Separately chop/macerate 2 kg of plant parts
- Soak in 4 liters of water for 24 h (except 72 h for oregano) + ½ perla soap (crushed)
- After 24 or 72 hrs, filter the mixture and place the filtrate (solution) in 16-liter knapsack sprayer.

So to what crops can BP be used and what pests does it control?

In our previous PCAARRD-funded project entitled “Development of Pest Management Products and Systems for Organic Vegetable Production in Southern Luzon” which was completed in August 2014, we evaluated BP against insect pests of eggplant, pechay, stringbeans and ampalaya. Our plant materials are effective against black bean aphids, flea beetles, cabbageworm and cutworm. Best results on the use of plant extracts (langkauas + oregano and luyang dilaw) was achieved when plant extracts was integrated with the release of predatory earwigs, especially in the control of eggplant fruit and shoot borer. Fortunately, after our PCAARDD project, I had another DABAR funded project entitled “Enhancing the Effectiveness of Crude Preparations of Botanical Pesticides Against Selected Insect Pests and Plant Pathogens of Selected High Value Crops” (pests of okra , pipino, tomato, and mungo).

Do you prepare crude extracts only or are the bioactive components being identified? What can you say about the stability of the final product?

Initially, we prepared crude water extracts only but the extracts should be immediately applied within 48 h because they are unstable. After 48 hours, some materials, especially langkauas and oregano will have a foul smell, an indication that the crude plant extracts are unstable which will reduce their insecticidal activity. We observed that farmers are adding molasses in their extracts and lately, we also add molasses in our plant extracts and fortunately we noticed that development of foul odor was prevented and the activity of the extracts is maintained. Consequently, we always add molasses to our crude plant extracts to extend the shelf-life. With regards to the identification of the active components of the plant extracts is not a part of our project and we don't have the capacity to do the identification. However, the active components of the different botanical insecticides had already been identified and this could be searched in the internet.

**How effective are BPs? What is the mortality rate of the pests?**

There are so many plant extracts that were reported to be toxic against many insect pest species. When we conducted the contact toxicity tests, majority of the reported plants

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showing toxicity to insect pests are not that toxic. Remember that insect mortality using plant extracts can not be compared with the synthetic pesticides since the concentration of the active component is quite low. The effectiveness of the plant extract will vary depending on the target pest to be controlled. For example, mortality can be as high as 100% for black bean aphids using oregano, 90% against flea beetle of eggplant using langkawas, 70% for cutworms, and 30-70% for others. However, mortality should not always be the yardstick in determining the effectiveness of the plant extract.

BPs also exhibit other mode of action like anti-oxidant activity wherein the insect will also feed but their food intake in treated plant parts will be significantly reduced until the insect die from starvation. Some BPs possess repellent effect wherein the insects will be driven away after exposure to treated plants parts even if there is no feeding. BPs could also cause insect growth regulatory effects. Feeding on plants treated with plant extracts may results to the emergence if abnormal pupae and adults.

#### **PROS and CONS about BPs**

For disadvantages, since BPs are not as toxic as the conventional insecticides, more frequent application and higher amount of

plant extracts are needed for efficient control of pests. It also leads to low mortality of pests because when applied in the environment, they are affected by UV light and thus, degrades faster. Therefore, they should be applied late in the afternoon to prevent faster degradation. For the advantages, firstly, it is very safe to the consumers, non-target organisms, and natural enemies. If the natural enemies are spared from the application of plant extracts, they will always be in the field to contribute in the pest population reduction. The BPs are not persistent in the environment hence, development of pesticide resistance by the pests is not that common. In addition, BPs are locally available; majority of them also possess medicinal values.

#### **Is there a necessity for personal protective equipment (PPE)?**

It is not that strict as compared with the application of synthetic insecticides but it is still recommended due to some ingredients in the BPs that may act as irritant (example is *sili*).

#### **In terms of commercialization are there companies marketing BPs already? How much will it cost to purchase these botanical pesticides?**

Foreign companies have started to market these BPs but for local companies, some are importing these BPs. Local producers are encouraged to register their material but the registration procedure is not yet intact. It's ongoing and around 90% finished by BAFPS. There is a cooperative in Tayabas, Quezon that sells plant extracts at less than 100 pesos for 1 Liter. I believe botanical insecticides are cheaper than synthetic insecticides.

#### **In terms of usage, can you say that farmers have been using BPs significantly?**

BPs are primarily used by

Therefore, almost all of them are now using botanical pesticides in their crops except for ordinary farmers, because of the low mortality rate against pests. They have to protect their crops against pests because consumers demand crops that are free from pest damage (but they don't know that crops that are totally free from pest damage are generally loaded with pesticides residues).

#### **Are there botanical fungicides or herbicides for fruits also?**

We do not have projects on fruit trees but there should be an evaluation of botanicals against major pests of fruit trees especially in mangoes. However, Dr. Candida B. Adalla had already registered luyang dilaw extracts against scale insects in lanzones. For the botanical fungicides, I had a project with Mr. Carlos L. Padilla, study leader in my previous PCAARRD-funded project and existing DA-BAR project but based on our results, there are very few botanical pesticides with fungicidal activity. Generally, it can be used for preventive application when the infestation is still low.

Interview by:  
Eric Jhon dG. Cruz &  
Sarah Jane B. Manaday  
Photos: PA Javier

His artworks have shown how inclined he is into science as depicted by the sugarcane planters in Lipa, Batangas in particular wherein his painting was displayed at Yokohama Museum in Japan. As a young boy, too, Dr. Cumagun considered Dr. Jose Rizal as a role model and an inspiration and still believe in his saying that "The youth is the hope of our future". According to him, the youth should not limit themselves in acquiring knowledge and education and to use their capabilities, talents and skills to stand out not only for themselves but also for the country. He also visited the place in Germany where Rizal stayed and wrote his book, Noli Me Tangere. Cumagun is an active member of the Jesus Christ of Latter-day Saints. He acts as a bishop of the said congregation who conducted missionary works to bring His teachings to life at home, work, and in communities and help the needy especially during calamities.

Not everyone knows that Dr. Cumagun also does household chores like washing and ironing clothes, going to market and buying groceries for the family. Not used to having helpers, they work as a family. His wife supervises their children in their school assignments and activities. According to him, he is not a strict dad and has never beaten his children to discipline them. He can be quiet and loud at the same time to show his anger but he always considers the feelings of others. "Be kind to others because you never know what others are going through", he added.

Being in the academe for more than two decades, Dr. Cumagun still considers staying in the university to teach and do research and collaborate with international agencies and organization but he is not also closing his doors for other opportunities that will come along. He added that even if he retires from the academe, he will continue with science works by writing books, manuals, and other related things.

Interview by: April N. Alviar and Joedel dG. Padilla  
Photos: CJR Cumagun

**"Be contented with what you have BUT don't be contented with what you can become"..**

**CJR CUMAGUN**

# Dalisay Faces New Challenges