NATIONAL ACADEMY OF SCIENCE AND TECHNOLOGY
20th ANNUAL SCIENTIFIC MEETING
and the
4th NATIONAL SOCIAL SCIENCE CONGRESS

The Philippine Social Sciences in the Life of the Nation

July 8-9, 1998
The Westin Philippine Plaza Hotel
CCP Complex, Roxas Boulevard, Pasay City

in celebration of the philippine centennial
NATIONAL ACADEMY OF SCIENCE AND TECHNOLOGY
20th ANNUAL SCIENTIFIC MEETING
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4th NATIONAL SOCIAL SCIENCE CONGRESS

Theme: "THE PHILIPPINE SOCIAL SCIENCES IN THE LIFE OF THE NATION"

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I would like to extend my congratulations to the National Academy of Science and Technology on the occasion of its 20th Anniversary.

This year, the 20th Annual Scientific Meeting focuses on "The Philippine Social Sciences in the Life of the Nation" as its overall theme. During this meeting there will be discussions on aspects of social interaction and behavior, and on studying patterns of individual and group actions. It is my hope that such understanding will enlighten scientists and researchers regarding the impact of their findings on the individual and society at large. Indeed, the decision to highlight the contributions of the social sciences is a welcome development in the agenda of NAST's annual meetings.

Once again, congratulations to the National Academy of Science and Technology. May the country's best scientific minds continue to serve the greater good of the Filipino people.

WILLIAM G. PADOLINA, Ph.D.
Secretary
Social Science, as the theme of the National Academy of Science and Technology's 20th Annual Meeting, which coincides with the 100th Anniversary of the Declaration of our Independence, is indeed a most appropriate and timely subject. For, of all the sciences, Social Science is the one that deals with how human feelings and emotions directly affect human motivations, behavior, and of course, relations.

The relevance of this discipline was brought with great force to the Academy's concern when NAST's resolutions and recommendations for environmental conservation and calamity mitigation from the so-called "hard sciences" were found to be undoable because of unacceptably unresolved other effects on our people.

I therefore anticipate a fruitful Congress as we tackle the most challenging of our challenges — human behavior and society.

CONRADO S. DAYRIT, M.D.
President
The holding of the 4th National Social Science Congress coinciding with the 1998 Annual Scientific Meeting of the National Academy of Science and Technology on the theme, "The Philippine Social Sciences in the Life of the Nation" is a fitting celebration of the centennial of Philippine independence. Indeed, it is a rare illustration of how the different disciplines and branches of knowledge can come together to assess their unique and combined contributions to nation building.

We thank the organizers (The National Academy of Science and Technology, the National Research Council of the Philippines, the Phi Gamma Mu International Honor Society in Social Science, the U.P. Center for Integrative Development Studies, and the U.P. College of Social Science and Philosophy) for collaborating with the Philippine Social Science Council in the successful mounting of the Congress.

NESTOR N. PILAR, Ph.D.
Chairman, PSSC Board of Trustees
As Chairperson of the 20th Annual Scientific Meeting Program Committee, I am pleased to present to you the program with the theme "The Philippine Social Sciences in the Life of the Nation." The theme is very appropriate as we celebrate 100 years of freedom and Philippine progress.

Lest we forget the importance of social sciences in nation building, we have devoted and dedicated the 20th Annual Scientific Meeting to Social Scientists in recognition of their contribution to the life of the nation. May this serve as an inspiration to aspiring social scientists.

JOSE O. JULIANO, Ph.D.
Secretary and Chairperson
1998 ASM Program Committee
July 8, 1998

7:00 REGISTRATION

8:30 OPENING CEREMONIES

Entry of Colors UP Manila Rayadillo
National Anthem UPLB Choral Ensemble
Invocation Academician Bienvenido F. Nebres, S.J.
President, Ateneo de Manila University
Welcome Academician Conrado S. Dayrit, M.D.
President, National Academy of Science and Technology
Philippine Folk Songs UPLB Choral Ensemble
Introduction of the Keynote Speaker Elizabeth R. Ventura, Ph.D.
President, Pi Gamma Mu International Honor Society for the Social Sciences, UP Alpha Chapter
Keynote Address Academician Gelia T. Castillo, Ph.D.
National Academy of Science and Technology

Master of Ceremonies
Academician Jose O. Juliano, Ph.D.

9:30 - 10:30 OPENING OF EXHIBITS, POSTER SESSION, AND PRESENTATION OF PUBLICATIONS

Coordinated by Elizabeth R. Ventura, Ph.D.
Virginia A. Miralao, Ph.D.
Ma. Cynthia Rose B. Bautista, Ph.D.

Ribbon Cutting Amelia C. Ancog, D.P.A.
Undersecretary, Department of Science and Technology
Mrs. Milagros M. Dayrit, B.S.Phar.
and
Ma. Cristina D. Padolina, Ph.D.
Chancellor, UP Open University
PLENARY SESSIONS

10:30 - 11:30 SESSION I  "100 Years of Philippine Social Sciences"

Speaker: Virginia A. Miralao, Ph.D.
Executive Director, Philippine Social Science Council

Discussants: Luis C. Dery, Ph.D.
Professor, Department of History, De La Salle University

Erlinda M. Burton, Ph.D.
Director, Research Institute for Mindanao Culture, Xavier University

Moderator: Wilfrido V. Villacorta, Ph.D.
President, Yuchengco Center for East Asia

Rapporteur: Raymund Jose G. Quilop
Teaching Assistant
Department of Political Science, UP Diliman

11:30 - 12:30 SESSION II  "The Social Sciences and Other Branches of Knowledge"

Speaker: Academician Ledivina V. Cariño, Ph.D.
Director, Ugnayan ng Pahinungód, UP Diliman

Discussants: Academician Ernesto O. Domingo, M.D.
University Professor, College of Medicine, UP Manila

Leonardo Q. Liongson, Ph.D.
Professor, College of Engineering, UP Diliman

Moderator: Academician Perla D. Santos Ocampo, M.D.
Chancellor, UP Manila

Rapporteur: Joseph Anthony Y. Lim, Ph.D.
Professor, School of Economics, UP Diliman

12:30 - 1:00 LUNCH
July 8, 1998

1:00 - 2:00  **SESSION III**

"Population, Resources, and Environmental Policy in the Social Sciences"

*Speaker:*  Academician Mercedes B. Concepcion, Ph.D.
National Academy of Science and Technology

*Discussants:*  Florian A. Alburro, Ph.D.
Professor, School of Economics, UP Diliman

Angelina P. Galang, Ph.D.
Vice President for Academic Affairs, Miriam College

Tomas P. Africa
Administrator, National Statistics Office

*Moderator:*  Academician Edgardo D. Gomez, Ph.D.
Director, Marine Science Institute, UP Diliman

*Rapporteur:*  Corazon M. Raymundo, Ph.D.
Vice Chancellor for Academic Affairs, UP Diliman

2:00 - 3:00  **SESSION IV**

"Economic Policy and the Social Sciences"

*Speaker:*  Felipe M. Medalla, Ph.D.
Dean, School of Economics, UP Diliman

*Discussants:*  Federico M. Macaranas, Ph.D.
President, Clemente Asia (Phils.), Inc.

Gonzalo M. Jurado, Ph.D.
Visiting Research Fellow, Philippine Institute for Development Studies

*Moderator:*  Academician Raul V. Fabella, Ph.D.
Professor, School of Economics, UP Diliman

*Rapporteur:*  Ma. Socorro H. Gochoco-Bautista, Ph.D.
Professor, School of Economics, UP Diliman
Program of Activities

3:00 - 3:15  BREAK

3:15 - 4:15  SESSION V  “Governance, Civil Society, and Social Justice”
Speaker: Felipe B. Miranda, M.A.
Professor, Department of Political Science, UP Diliman
Discussants: Edicio G. dela Torre
President, Education for Life Foundation
Teresita Ang See
Executive Director, KAISA para sa Kaunlaran
Moderator: Olivia C. Caoili, Ph.D.
Vice President for Academic Affairs, UP Diliman
Rapporteur: Alex B. Brilliantes, Jr., Ph.D.
Associate Professor
College of Public Administration, UP Diliman

Speaker: Academician Andrew A. Gonzalez, F.S.C.
President, De La Salle University
Discussants: Ester A. Garcia, Ph.D.
Commissioner, Commission on Higher Education
Dionisia A. Rola, Ph.D.
Consultant, Congressional Committee on Education
UP Diliman
Moderator: Milagros D. Ibe, Ph.D.
Professorial Lecturer, College of Education
UP Diliman
Rapporteur: Ma. Cecilia G. Gonaco, Ph.D.
Professor, Department of Psychology, UP Diliman
Program of Activities

July 9, 1998

7:00 REGISTRATION

8:00 - 9:00 SESSION VII

“The Social Sciences, Human Development, and Public Welfare”

Speaker: Leonor M. Briones
Vice President for Finance and Administration
UP Diliman

Discussants: Allen L. Tan, Ph.D.
Department of Psychology, Ateneo de Manila University

Celia M. Reyes, Ph.D.
Research Fellow, Philippine Institute for Development Studies

Moderator: Corazon Alma G. de Leon
Chairman, Civil Service Commission

Rapporteur: Ann Inez N. Gironella, Ph.D.
Dean, Graduate School, UP Los Baños

9:00 - 10:00 SESSION VIII

“The Social Sciences and Science and Technology Policies”

Speakers: Academician Bienvenido F. Nebres, S.J.
President, Ateneo de Manila University

Academician Emil Q. Javier, Ph.D.
President, University of the Philippines

Moderator: Academician Ruben L. Villareal
Chancellor, UP Los Baños

Rapporteur: Allan Benedict I. Bernardo, Ph.D.
Dean, College of Education
De La Salle University

10:00 - 10:15 BREAK
Program of Activities

10:15 - 12:15 SCIENTIFIC PAPERS (Simultaneous Sessions)

Mathematical, Physical, and Engineering Sciences  Chair: Academician Lourdes J. Cruz, Ph.D. (Leyte Room)
10:15-10:35 Effects of Subdivision and Contraction of Edges on the Dimension of a Graph by Dr. Severino V. Gervacio
10:35-10:55 On the Automorphism Groups of Paley 2-Designs by Dr. Blessilda P. Raposa
11:55-11:35 Synthesis of Low Molar Mass and Side-Chain Polymeric Liquid Crystals by Dr. Leonorina G. Cada
11:55-12:15 Minimizing PAH (Polycyclic Aromatic Hydrocarbons) in Coconut Products by Dr. Ernesto P. Lozada

Biological Sciences  Chair: Academician Salcedo L. Eduardo, Ph.D. (Samar Room)
10:15-10:45 Biodegradation of Crude Oil Using Microorganisms from Pasig River and Manila Bay by Dr. Ponciano M. Halos
10:45-11:15 Volant and Non-Volant Mammals of Central Sierra Madre, Aurora, and Northern Quezon: A Preliminary Report by Dr. Perry S. Ong
11:15-11:45 Patterns and Processes in Population Divergence of Microaena stipopoides (Labill.) R. Br. by Dr. Damasa B. Magcale-Macandog
11:45-12:15 Mass Culture of the Sea Urchin Tripneutes gratilla by Dr. Marie Antonette Juinio-Meñez

Social Sciences  Chair: Academician Raul V. Fabella, Ph.D. (Luzon Ballroom)
10:15-10:45 The Problem of Food and Inflation: A Case Study from the Japanese Occupation by Dr. Ricardo T. Jose
10:45-11:15 Growth and Equity in the Philippines: A Reexamination by Dr. Arsenio M. Balisacan
11:15-11:45 Capital Flows and the Integration of International Financial Markets by Dr. Ma. Socorro Gochoco-Bautista
11:45-12:15 The Adoption of Improved Mungbean Varieties in Two Rice-Based Villages in the Philippines: A Network Analysis by Dr. Serlie Barroga-Jamias

Agricultural Sciences  Chair: National Scientist Dolores A. Ramirez, Ph.D. (Mindoro Room)
10:15-10:30 The Role of Veterinary Medicine in Public Health by Acd. Teodulo M. Topacio, Jr.
10:30-10:45 Proposal for a New Scientific Name of the Swamp Buffalo - The Carabao by Acd. Leopoldo S. Castillo
10:45-11:00 Applications of Non-Conventional Acupuncture In Sheep, Cattle, and Water Buffaloes by Dr. Jezie A. Acorda
11:00-11:15 The Search for Rice Varieties Adapted to Rainfed Growing Conditions by National Scientist Pedro B. Escuro
11:15-11:30 Alternative Management Strategies Against the Rice Root-Knot Nematode, Meloidogyne graminicola in Rice-Onion Systems by Dr. Ruben M. Gacasin
11:30-11:45 Gene Delivery Systems in Rice by Dr. Rhodora R. Aldemita
11:45-12:00 Cloning and Characterization of Five β-Glucanase Genes in Rice by Dr. Gabriel O. Romero
12:00-12:15 Philippine Forest Lands: Opportunities for Mitigating Climate Change by Dr. Rodel D. Lasco

Health Sciences  Chair: Academician Ernesto O. Domingo, Ph.D. (Romblon Room)
10:15-10:45 Hepatitis E Virus Infection Diagnosed by Serology: A Report of Cases at the San Lazaro Hospital, Manila by Dr. Nina Gloriana-Barzaga
11:15-11:45 Bone Transplantation in Limb Saving Surgeries: Philippine Experience by Dr. Edward H. Wang

12:30 - 1:30 LUNCH
OYS, Inc. Business Meeting
2:00 - 4:00  CLOSING CEREMONIES

PROCEDURAL

PRESENTATION OF RESOLUTIONS
TO THE HONORABLE SECRETARY
OF SCIENCE Undersecretary Amelia C. Ancog, D.P.A.
Chair, Resolutions Committee

PRESENTATION OF AWARDS
Best Posters
Outstanding Scientific Papers
Outstanding Books and/or Monographs
Outstanding Journals
Philippine Talent Search for Young Scientists
NAST-TWAS Science Prize
Outstanding Young Scientists

Academician Conrado S. Dayrit, M.D.
President

assisted by:

Academician Dolores A. Ramirez, Ph.D.
Vice President and National Scientist
and
Academician Quintin L. Kintanar, M.D., Ph.D.
Chairman, Board of Judges

CLOSING REMARKS Academician William G. Padolina, Ph.D.
Secretary, Department of Science and Technology

EXIT OF COLORS UP Manila Rayadillo

Master of Ceremonies
Academician Jose O. Juliano, Ph.D.

ABSTRACT: The sudden depreciation of the peso beginning July 1997 was ultimately traceable to the Philippines’ declining competitiveness. Hence the crisis had real domestic roots, which speculation and the regional currency crisis merely exposed. The authors discuss the crucial role played by the exchange rate in determining competitiveness and show how the Bangko Sentral’s flawed policy of exchange rate pegging made the country vulnerable to speculative attack. They argue that tight money policies and high interest rates seeking to reverse it are a cure that may be worse than the disease. The authors call for a revamp of the goals and methods of exchange rate policy and suggest ways to accomplish this.


ABSTRACT: The study was conducted to determine the effects of lactic acid bacteria on the sensory, physical, and microbiological characteristics of carabeef chunks stored at 26 to 27°C and 7 to 10°C.

Carabeef chunks were individually inoculated with Lactobacillus plantarum, Lactobacillus citrovorum, Streptococcus cremoris, Streptococcus lactis, Pediococcus, and Streptococcus. The samples were stored at 26 to 27°C (room temperature) and at 7 to 10°C (refrigerated temperature). The total plate count, pH, and sensory traits of the samples were determined after 24 to 48 h of storage at room temperature and 2 to 9 days under refrigerated conditions. Lactic acid-forming bacteria were also determined in samples stored at 7 to 10°C while S. aureus load was monitored in samples at 26 to 27°C.

Staphylococcus aureus load of the carabeef chunks inoculated with L. plantarum, S. cremoris, S. lactis, and Pediococcus was below log 6 per gram sample after 24 h of storage at room temperature. The S. aureus load was similar in all treatment after 48 h.

The inoculated samples stored at 7 to 10°C had lower total plate counts than the control. The lactic acid-forming bacteria were significantly (P<0.05) lower in the uninoculated samples than those inoculated with test organisms.

Shear value was lowest in samples inoculated with L. citrovorum after 8 days of storage. Scores for color, meat odor, and off-odor were similar among treatments. The uninoculated samples had the lowest consistency score after 6 days; however, all samples regardless of treatment were considered only slightly desirable after 8 days of storage.

ABSTRACT: The genetic diversity of 67 rice varieties developed in the Philippines from 1960 to 1994 by various research institutions was analyzed using a pedigree-based measure of relationship between individuals/groups, namely coancestry ($\theta$). Results of the analysis showed a mean coancestry value of $\theta = 0.143$ for all possible pairings of the 67 varieties, suggesting that these varieties were generally related through some common donor parent(s) of important genes. To ensure that these varieties accumulated the basic genes for desirable traits and general adaptation, rice breeders resorted to a genetic core of 19 ancestral parents from 57 initial landraces. Among the varieties evaluated, IR36 showed the highest mean coancestry with the other varieties of $\theta = 0.254$, suggesting a great similarity of its lineage with those of the other cultivars. Other materials with relatively high coancestries with the other varieties are IR8, IR24, IR50, IR42, IR72, BPI Ri-12, IR66, IR74, and PSB Rc10 ($\theta = 0.244, 0.233, 0.230, 0.222, 0.222, 0.217, 0.207, 0.206, \text{and} 0.203$, respectively). On the other hand, PSBRc16, BPI Ri-10, BPI 3-2, BPI Ri-1, BPI Ri-3, PSBRc1, C22, UPL Ri-2, UPL Ri-5, UPL Ri-7, and BPI Ri-6 are least related to the other varieties by pedigree ($\theta = 0.00, 0.030, 0.030, 0.038, 0.038, 0.044, 0.06, 0.061, 0.073, 0.078, \text{and} 0.084$, respectively). The analysis also indicated that IR20 and IR30 are very much related by genetic descent ($\theta = 0.627$) and so are IR56 and IR60; IR32; IR38 and IR40; and IR36 and IR42 with coancestries of $\theta = 0.618, 0.610, \text{and} 0.594$, respectively.


SIGNIFICANCE: This is the most comprehensive presentation of a fatal medical condition with varied manifestation and organ system involvement. The series of reports highlight the epidemiologic and clinical presentation of the disease that is influenced by geographic and racial factors. Although the diagnosis of Systemic Lupus Erythematosus (SLE) is based on the American Rheumatology Association, so far no extensive reporting of epidemiologic data among Filipinos in particular and among developing countries in general has been reported.

O.D. Corpuz's *An Economic History of the Philippines* magisterially fills a long-felt need for a history of the archipelago with a sympathetic economic perspective. Many of the economic problems extant today, such as rice sufficiency, land tenure, squatting, and revenue raising, have roots in our history. We learn how the failure of the insular government during the American occupation to properly and expeditiously transfer purchased friar lands to occupants and tenants and the eventual employment of "tax declaration" were the seeds of the agrarian unrest that persisted well into the future. The book's handling of the land question is excellent. Its treatment of what was then the "foreign grown rice" problem shows how deep-rooted is the rice problem today. The book also relates that between 1898 and 1902, the Philippine currency (then Mexican silver peso) dropped in value from 1.98 to 2.47 to a U.S. dollar. Currency fluctuations are not new.


The book contains an updated technical information and technology guide on crops and livestock production and farm resources management. Thirty two technoguides are presented and generated out of painstaking work by CLSU scientists and researchers, hand in hand with students and farmers as cooperators.


The author gives insights on the relevance and responsibilities of a physical therapist/occupational therapist as well as insights to the profession through a series of case presentations.
**The Philippine Journal of Biotechnology, ISSN 0117-0903, 1992-1996 Issues.** Published biannually by the National Institute of Molecular Biology and Biotechnology (BIOTECH), University of the Philippines Los Baños. Executive Editor: Reynaldo E. dela Cruz; Editor: Reynaldo V. Ebora; Associate Editors: Mariechel J. Navarro and Imelda V. Garcia.

Significant contribution to science:

The journal serves as a forum by which scientists can share original research information. Aside from enhancing transmission of knowledge generated through research, it also strengthens scientific literacy by upgrading technical writing skills among researchers through a high level of substantive and grammatic editing. Its distinguished list of multi-disciplinary reviewers and editors makes this possible.

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**The Philippine Agriculturist, ISSN 0031-7454, 1992 to 1996 Issues.** Published quarterly by the College of Agriculture, University of the Philippines Los Baños. Editor: Teresita L. Rosario; Associate Editor: Hosanna H. Espanto.

Significant contribution to science:

*The Philippine Agriculturist* has served as the main repository of researches by students, faculty, and research and extension personnel at the College of Agriculture through the publication of original research papers and reviews on plant, animal, soil and food sciences, agricultural processing and technology, agricultural biotechnology, agricultural education and rural sociology, development communication, agribusiness, agricultural economics, and management.

As one of the earliest and continuing sources of knowledge and information about the science and practice of agriculture in the Philippines and Southeast Asia, *The Philippine Agriculturist* marks its 81st volume of publication this year.
GIRLIE NAOMI N. SISON, Ph.D.
FIRST PRIZE

In recognition of her pioneering scientific and technological research in the electrocatalytic reduction of carbon dioxide by mixed-metal trimetallic complexes of the form \(\left\{ [(bpy)_2Ru(BL)]_2IrCl_2 \right\}^{5+}\) where bpy = 2,2'-bipyridine and BL = 2,3-bis(2-pyridyl)quinoxaline (dpq) or 2,3-bis (2-pyridyl) benzoquinoxaline (dpb).

RINA B. OPULENCIA, M.S.
SECOND PRIZE

In recognition of her significant scientific and technological research in the design of polymerase chain reaction (PCR) primers based on 16S rDNA and on internal transcribed spacer (ITS) region for rapid, sensitive, and specific detection of Burkholderia (Pseudomonas) andropogonis.

JEAN O. LOYOLA, Ph.D.
THIRD PRIZE

In recognition of her outstanding scientific research in the products of sequences from finite semigroups.
ALEXES C. DAQUINAG, M.S.
SPECIAL CITATION

In recognition of his pioneering research in the primary structure of a potent dopa-containing inhibitor of phenol oxidase from *Musca domestica*.

LOURDES D. TAYLO, M.S.
SPECIAL CITATION

In recognition of her significant research in the morphological and biochemical aspects of okra (*Abelmoschus esculentus* (L.) Moench.) resistance to the cotton leathopper (*Amrasca biguttula* (Ishida)).

MICHAEL P. ATRIGENIO, M.S.
SPECIAL CITATION

In recognition of his significant research in the effects of the soft coral *Xenia puertogalerae* on the recruitment of scleractinian corals.
RHODORA R. ALDEMITA, Ph.D.
(Botany)

In recognition of her significant contributions to rice science and biotechnology. Her work on rice genetic engineering using *Agrobacterium tumefaciens* as a vector for transformation is recognized as a significant breakthrough. She has always endeavored to contribute in the country's quest for rice self-sufficiency through her works in the development of biotechnological approaches and its applications in the improvement of rice varieties in the Philippines.
MARK J. ENCARNACIÓN, Dr.techn.  
(Technical Mathematics)

In recognition of his significant achievements in the field of computer algebra, in particular his improvement of the modular algorithm for computing gcd's of polynomials over algebraic number fields. His algorithm is currently being used in various software systems and is considered to be the best practical algorithm available.

FELIX P. MUGA II, Ph.D.  
(Mathematics)

In recognition of his significant research works in the combinatorial aspect of network theory. Specifically, he designed a class of networks with minimal diameter which are recursively expandable, and computed the wide-diameter of networks with properties similar to that of the hypercubes. These networks serve as alternatives to the hypercubes in building a parallel computer systems and large interconnection networks.

MA. JAMELA R. REVILLEZA, Ph.D.  
(Biochemistry)

In recognition of her significant achievements in the field of biochemistry of various Philippine food crops—especially on biochemical factors affecting their nutritional and food quality. Moreover, her research has successfully resulted in the identification, purification and gene cloning of methionine-rich proteins in soybean as part of molecular strategies to increase the methionine content, and thus, the nutritional quality of legumes.
PHILBERT S. BONILLA, Ph.D.  
(Plant Physiology)  

In recognition of his significant contribution to plant physiology. His researches on the mechanism of stress tolerance in rice, particularly salt tolerance, has led to the development of simple techniques which can easily be adopted by farmers. He has also made remarkable accomplishments and leadership in reinvigorating and spearheading the national program on developing rice varieties for adverse agro-ecosystems in the country.

RONALD R. MATIAS, Ph.D.  
(Zoology)  

In recognition of his researches on free-living pathogenic amoebae that led to a better understanding of their biology and public health importance in the country, and for his pioneering studies on the molecular epidemiology of the dengue virus which has contributed significantly to the development of basic biomedical research in the Philippines.

MA. EMMA CONCEPCION O. LIWAG, Ph.D.  
(Psychology)  

In recognition of her significant research works on the emotional and cognitive development of children as well as in developing family-based therapies of autistic children and their families. Her work which provides scientific knowledge that can be used to guide therapy for children who experience traumatic or highly emotional events, and to design educational programs to prepare Filipino children for the cognitive challenges of the 21st century, is unmatched by any other psychologist in the country.

VERMANDO M. AQUINO, Ph.D.  
(Plant Pathology)  

In recognition of his significant contributions in phytopathological researches related to the improvement of the major crops: peanut, passion fruit, potato, abaca and banana through the use of molecular and conventional technologies. He also developed immunoassay technique used for early detection of peanut stripe virus (PStV).
EDILBERTO D. REDOÑA, Ph.D.
(Genetics)

In recognition of his pioneering and vital scientific and technical contributions to the development of hybrid rice in the Philippines, the development of conventional rice genotypes for direct-seeded culture, and the application of the molecular markers in rice varietal improvement. His research activities have very high social significant, and are contributing greatly to our quest for food security through rice self-sufficiency.

MARIO R. FESTIN, M.D.
(Obstetrics and Gynecology)

In recognition of his significant research works in the measurement of reproductive health morbidity, reproductive health statistics, perinatal infections, medical complications in pregnancy, nutrition in pregnancy and research methodology in reproductive health which made him a recognized resource person in research in obstetrics and gynecology. Through his efforts, the research output of the department has improved greatly in terms of quality and in quantity.

JAIME C. MONTOYA, M.D.
(Microbiology)

In recognition of his significant researches in the field of microbiology through the advancement of our understanding of the immune host defense against tuberculosis through the concept of protective antibody clones directed against specific *M. tuberculosis* epitopes that will prevent the development of neurologic sequelae in *Tuberculous meningitis*; the development of new and rapid diagnostic tests for pulmonary and extrapulmonary tuberculosis; and the discovery of newer and more effective modalities of treatment particularly for multi-drug resistant tuberculosis in the form of new combination chemotherapy and immunotherapy.
EFFECTS OF SUBDIVISION AND CONTRACTION OF EDGES ON THE DIMENSION OF A GRAPH

SEVERINO V. GERVACIO

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If the vertices of a graph can be associated bijectively with points in the \( n \)-dimensional Euclidean space \( E_n \), such that the distance between points associated with adjacent vertices is unity, then the graph is called a unit graph in \( E_n \). The smallest \( n \) for which a graph \( G \) is a unit graph in \( E_n \) is called the dimension of \( G \). Harary, et al., sometime in the 60s determined the dimension of some graphs and gave upper bounds for the dimension of a graph in terms of the number of vertices and in terms of the chromatic number. There are very few existing articles on this subject and it is to be noted that effects of some graph operations on dimension have not been investigated. The effects of two graph operations on the dimension of a graph are considered here. An edge subdivision means inserting one new vertex in an edge of a graph. An edge contraction means reducing an edge to a single vertex by identifying its end vertices. Here, we show that edge subdivision or edge contraction may either increase, decrease, or leave the dimension of a graph unchanged. Proof is presented here that every graph with \( n \) vertices and \( m \) edges can be subjected to a finite number of edge subdivisions to obtain a unit graph in \( E_2 \) with \( n + m \) vertices and \( 2m \) edges. Likewise, a Hamiltonian graph with \( n \) vertices and \( m \) edges can be subjected to a finite number of edge subdivisions to yield a unit graph in \( E_2 \) with \( m \) vertices and \( 2m - \) \( n \) edges. Most results are proven by actual construction. So far, no analogous results for edge contractions have been found.

Key words: Euclidean space, distance, dimension, graph, edge subdivision, edge contraction

ON THE AUTOMORPHISM GROUPS OF PALEY 2-DESIGNS

BLESSILDA P. RAPOSA

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Paley 2-designs are Hadamard 2-designs which are derived from Hadamard 1-designs of Paley type as constructed by N. Ito. We determine here the automorphism groups of these Paley 2-\((2q + 1, q, (q-1)/2)\) designs where \( q \) is a prime power and \( q = 1 \) (mod 4).

Key words: Automorphism group, Paley 2-designs, Hadamard design
ON ROOTS OF LIKELIHOOD FUNCTIONAL EQUATIONS IN CLASSICAL
UNIVARIATE AND MULTIVARIATE STATISTICAL THEORY

TITO A. MIJARES

National Academy of Science and Technology
Bicutan, 1631 Taguig

Many inferential problems in univariate analysis can be reduced often to requiring the sampling distribution of the root of an equation of the form

\[ h - \lambda g = 0, \]

where \( h \) and \( g \) are mutually independent random variates with known distributions and parameters. If \( g \) is a non-zero constant then the root has a distribution which is proportional to the distribution of \( h \). In normal theory, the root \( \lambda \) generally turns out to have a distribution that enables one to perform directly significance testing. If the distribution is unknown, a monotonic transformation to a variate function in \( \lambda \) with known distribution may be undertaken to enable one to perform significance testing on the function in \( \lambda \) and equivalently, on the root itself.

Consider the \( p \)-component row vector \( h' \). Define its respective mean and measure of variance by the expected value \( E(h') = (0, 0, \ldots, 0) \) and the \( E(hh') = \Sigma = (\sigma_{ij}), i, j = 1, 2, \ldots, p \). The symmetric matrix \( \Sigma \) is called the covariance matrix of vector \( h \). There are two possible multivariate analogues of the univariate variance \( \sigma^2 \):

\[ \Sigma = (\sigma_{ij}), i, j = 1, 2, \ldots, p \]

\[ \text{det} \Sigma = |\Sigma| = |\sigma_{ij}|. \]

While the first expression has \( p(p+1)/2 \) distinct variates that of the second is equivalent to a single variate since it represents the determinant of covariance matrix \( \Sigma \). Thus three possible types of equations representing the multivariate analogues of the univariate equation are possible. These are:

\[ |H - \lambda G| = 0, \]
\[ |HI - \lambda G| = 0, \text{ and} \]
\[ a'(H - \lambda G)a = 0. \]

Some statistical implications - distributional and inferential problems - of these multivariate analogues are examined.

Key words: Sum of the roots test, Barlett-Nanda-Pillai trace criterion, first elementary symmetric function of the roots, \( V_1^{(P)} \) test, Lawley-Hotelling trace \( U^{(P)} \) test, multivariate roots tests, largest root, Wilks \( \Lambda \), likelihood ratio criterion, Hotelling \( T^2 \), distribution of the roots of determinantal equations)
SYNTHESIS OF LOW MOLAR MASS AND SIDE-CHAIN POLYMERIC LIQUID CRYSTALS

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Liquid crystals (LCs) are predominantly organic molecules which can assume structured phases in between the solid and the isotropic liquid states. These materials may be low in molecular mass or may be polymeric. These materials find applications in both electro-optic and thermochromic devices. In an effort to lower the cost of liquid crystals research in the country, inexpensive formulations based on coco-cholesteryl esters were prepared. Fatty acids obtained from coconut oil were esterified with cholesterol, and the resulting esters were added to commercial nematic E7 to yield cholesteric low molar mass LCs. These are presently being utilized in researches involving liquid crystal dispersions and thermochromic mixtures. Epoxy-based side-chain polymeric LCs were also synthesized for possible use as matrices in LC/polymer composites. Ring opening reaction of a commercially available epon resin, ethyleneglycol diglycidyl ether (EGDE) with the nematic 4-(ω-aminoxyloxy)-4'-cyanobiphenyl and the twisted nematic cholesteryl 4-aminobutyrate was carried out in bulk at 100°C for 10 hours. The side-chain copolymers obtained were found to be mesomorphic as observed under the polarizing microscope. No trend was observed in the transition temperatures of these polymeric systems based on the differential scanning calorimetric (DSC) study. A liquid-crystalline epoxy prepolymer exhibiting monotropic mesomorphism was also prepared by functionalization of the dihydroxy terminated groups of 4,4'-dihydroxybiphenol with glycidyl groups of epichlorohydrin. The effects on mesomorphic properties with the addition of the side-chain mesogenic pendant group, 4-(ω aminoxyloxy)-4'-cyanobiphenyl and varying concentrations of a diamine crosslinker were compared. FTIR and DSC were used to monitor the isothermal cure of the thermosets at different temperatures. Liquid crystallinity of the thermosets was sustained for a 3 wt % crosslinker whereas a highly crosslinked network resulted in loss in mesomorphic properties.

Key words: Liquid crystals, cholesteric, thermochromic, side-chain liquid crystalline polymers, nematic, epoxy thermosets, curing

GROWTH, EMISSION AND EXCITATION SPECTRA, AND THE TRANSITION PRESSURES OF ZnSe_{x}S_{1-x} SINGLE CRYSTALS

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ZnSe_{x}S_{1-x} single crystals which can be used in blue luminescent devices are prepared by sublimation method and their crystal structure is confirmed to be zincblende from x-ray diffraction analysis and the crystal composition x is determined from the lattice constant assuming Vegard's law holds for the ZnSe_{x}S_{1-x} crystal system.

The characteristics of the observed photoluminescence spectra, static phase transition points, and the shock compression curves of the single crystals are described.
MINIMIZING POLYCYCLIC AROMATIC HYDROCARBONS (PAH) IN COCONUT PRODUCTS

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Polycyclic aromatic hydrocarbons (PAHs) are carcinogenic compounds which are formed by incomplete combustion of biomass and petroleum fuels. They are easily absorbed by oily materials such as fish, meats, and vegetable oils. In the case of coconut oil, the PAH levels are reduced tremendously in the decolorization process using activated carbon. However, data gathered by Head (1992) showed means of total PAH of 670 ppb and 17 ppb which is high for edible purposes.

Most of the PAH contaminations take place in the copra making process. Tests showed that very high levels are obtained in copra made in smoke kilns using coconut husk as fuel. Copras produced in the Los Baños Dryer have lower PAH levels than copra produced in smoke kilns. Laboratory tests also showed that the minimum levels set by Unilever of 1 ppB for B (A)P, 5 ppb for heavy PAH, and 25 ppb for total PAH can be satisfied with the use of sufficient dosage of activated carbon. The quick method of PAH measurement using HPLC developed at NRI was used in this study.

Key words: Polycyclic aromatic hydrocarbons, coconut oil, copra making

BIOLICAL SCIENCES

BIODEGRADATION OF CRUDE OIL USING MICROORGANISMS FROM PASIG RIVER AND MANILA BAY

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The consortium of microorganisms used consisted of *Alcaligenes* sp., *Flavobacterium indologenes*, and *Bacillus* spp. These were isolated from Pasig River and Manila Bay through streak plating technique. These isolates were identified based on biochemical tests and morphological observation. They were introduced to Natural Seawater (NSW) and Mineral Medium C (MMC) with oil. The crude oil layer in the inoculated treatments gradually diminished after eight weeks of continuous shaking compared to the uninoculated control treatment. Qualitative analyses of extracts from the control and inoculated liquid media with crude oil were performed using gas chromatography. The consortium was effective in degrading crude oil.

Key words: *Alcaligenes* sp., *Bacillus* spp., biodegradation, bioremediation, consortium, crude oil, *Flavobacterium indologenes*, Manila Bay, microorganisms and Pasig River

**VOLANT AND NON-VOLANT MAMMALS OF CENTRAL SIERRA MADRE, AURORA, AND NORTHERN QUEZON: A PRELIMINARY REPORT**

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The Sierra Madre mountain range contains one of the largest contiguous, intact lowland rainforests in the country and its survival is threatened by habitat destruction, particularly through logging and mining. This study was conducted from May 1996 to June 1997 to document the biodiversity of the least known areas in the Central Sierra Madre in Aurora and Northern Quezon.

The Philippine mammalian fauna consists of 201 species, with 172 native terrestrial species, 7 introduced species, and 22 marine species. One hundred ten (64%) of the 172 terrestrial mammals are found only in the Philippines and nowhere else in the world. The Philippines appears to have the highest level of endemic mammalian species richness of any country on per unit basis.

Three areas along the Umiray River in General Nakar, Quezon namely: (a) Bo. Magsikap; (b) Sitio Mapijas and; (c) Sitio Tambo; and three areas in Aurora: (d) San Luis; (e) Amro, Dilasag; (f) Sitio Dugyan, Bgy. Umiray, Dingalan were surveyed and their biodiversity assessed. A combination of wildlife techniques was used in studying the mammalian fauna of the Central Sierra Madre in Aurora and Northern Quezon such as mist netting, snap and live trapping, and ethnobiological interviews with local people. Sixteen volant and 11 non-volant mammals were identified, eight of which (*Ptenochirus jagori*, *Haplonycteris fischeri*, *Otopteropus cartilogonodus*, *Crocidura grayi*, *Apomys cf. abrae*, *Apomys cf. sacobianu*, *Bullimus luzonicus*, and *Rattus everetti*) are endemic. Of these, only *Otopteropus cartilogonodus* of the volant mammals and *B. luzonicus* of the non-volant mammals are restricted to Luzon, while the rest are widespread. A total of 27 mammals are now recorded, with *H. fischeri* considered vulnerable.

The results of the mammalian survey indicate that the Central Sierra Madre is home to an important group of wildlife. This is an indication of the high conservation value of the area and should thus be included as one of the priority sites for biodiversity conservation.

Key words: Volant mammals, non-volant mammals, Central Sierra Madre, Northern Quezon, Aurora, rodents, bats, Philippine endemics, Luzon endemics, biodiversity, mammalian fauna
PATTERNS AND PROCESSES IN POPULATION DIVERGENCE OF *Microlaena stipoides* (LABILL.) R. BR.

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Morphological, behavioral and genotypic patterns of variation among the four populations of *M. stipoides* found growing in association with *L. perenne* (M (Lpe)), *P. pratensis* (M(Ppr)), *D. glamerata* (M (Dgl)), and *P. aquatica* (M(Paq)) were examined. *Microlaena stipoides* (Ppr) had narrower leaves than the other populations. Seeds of M (Ppr) weighed significantly less and had a faster rate of germination than the other three populations. *Microlaena stipoides* (Ppr) exhibited greater shade tolerance, while M (Dgl) showed greater tolerance to full light. *Microlaena stipoides* (Dgl) and M(Paq) exhibited a greater tolerance to water stress than M(Ppr) and M(Lpe). Random amplified polymorphic DNA banding patterns of the four populations showed greater base sequence divergence in M (Ppr) compared with the other three populations. It is suggested that the greater divergence of M (Ppr) from the three other populations resulted from interspecific competition with the associated naturalised perennial species, *P. pratensis*. Coexistence between *M. stipoides* populations and introduced and naturalised perennial grass species in permanent pastures could be due to the balancing of competitive abilities between natural neighbouring pairs.

Key words: Plant competition, population divergence, microevolution, genotypic variation, light intensity, water stress tolerance, DNA fingerprinting, natural selection, plant association, coexistence, competitive abilities

MASS CULTURE OF THE SEA URCHIN *Tripnuestes gratilla*

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The sea urchin, *Tripnuestes gratilla*, is an important fishery resource. Its roe and gonads are high value local and export products. Overexploitation has led to the decimation of viable spawning populations. This species has been cultured locally for the first time, through its entire life cycle, at the U.P. Marine Science Institute Bolinao Marine Laboratory. Laboratory experiments to determine optimal rearing and feeding regimes were conducted to improve the production of presettlement larvae and juveniles for grow-out culture and reseeding. Preliminary studies on the gonad yield of sea urchins in grow-out culture indicate considerable intra-annual and inter-annual variation in gonad weight to test diameter ratio. Likewise, young adults (6.0-6.4 cm) in high stocking density cages had significant lower gonad yield than those in low stocking density cages. Development and further optimization of mass culture techniques provide an opportunity to utilize mariculture as a resource management tool in the form of sea pen/cage grow-out culture which can enhance the recovery of depleted natural populations and at the same time provide a supplemental source of livelihood for fisherfolk.

Key words: Sea urchin, *Tripnuestes gratilla*, mariculture, grow-out culture
SOCIAL SCIENCES

THE PROBLEM OF FOOD AND INFLATION: A CASE STUDY FROM THE JAPANESE OCCUPATION

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Insufficiency of food production, particularly rice, has long been a problem in the Philippines. During the American regime, periodic shortages occurred, necessitating importation from neighboring countries. Attempts were made to make the Philippines self-sufficient and to rationalize the distribution of food in the 1930s, but World War II erupted and the Philippines came under Japanese rule. The war and the Japanese occupation disrupted supply lines and agricultural cycles, resulting in a potential shortage of rice and other food commodities. Foreseeing this, the Japanese Military Administration and later, the Laurel administration, adopted various plans to increase production, systematize distribution, and control prices. Almost all the plans failed due to a variety of reasons - lack of peace and order; lack of fuel and transportation; resistance by the people; the necessity of feeding Japanese soldiers, and so on. Many of the plans are worth studying to see how the country tried to face up to the problem of a food shortage during very abnormal times.

Key words: Agriculture, food, Japanese occupation, Laurel administration, rationing, rice, World War II

GROWTH AND EQUITY IN THE PHILIPPINES: A REEXAMINATION

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In this paper a newly constructed data set on poverty and inequality to reexamine the usual story on economic growth, poverty, and income inequality in the Philippines is used. Contrary to popular perceptions, growth in recent years and across sectors or areas of the country has not had an adverse impact on the position of the poor. Poverty responds quite well to growth, although the ability of the economy to translate growth to poverty reduction appears weaker than for the "average" developing country. Similarly, the absence of growth hurts the poor, both absolutely and relatively.
CAPITAL FLOWS AND THE INTEGRATION OF INTERNATIONAL FINANCIAL MARKETS

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As financial markets become more integrated, factors other than purely domestic policies will affect macroeconomic performance. In this study an attempt is made to empirically assess how capital flows have affected domestic interest rates, real money demand, real consumption demand, and real investment demand in the Philippines using quarterly data from 1982 to 1995. Dynamic simulations are used to obtain the time paths of interest rates and money demand assuming no inflows, which are then compared to the actual. Incorrect attributions of changes in these variables to capital flows could lead to incorrect policies. The possible effects of capital flows on real consumption demand and real investment demand are examined, distinguishing between real FDI flows and real portfolio flows.

Key words: Capital flows, financial integration, macroeconomic performance, dynamic simulations

THE ADOPTION OF IMPROVED MUNGBEAN VARIETIES IN TWO RICE-BASED VILLAGES IN THE PHILIPPINES: A NETWORK ANALYSIS

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The communication networks among 173 rice-mungbean farmers in two rural villages (rainfed and irrigated) in Pangasinan were analyzed and related to their adoption of improved rice-mungbean technology. The incorporation of network variables with non-network variables (e.g., socio-economic, agricultural, etc.) greatly contributed to understanding the significantly high adoption in Nancayasan compared to Carosucan. The Nancayasan farmers had significantly higher spatial distance scores or they interacted with more dispersed farmers within the village; and had higher betweenness centrality scores or there were more information 'brokers' or liaisons that mediated agricultural information flow in the village. Nancayasan is also near the Urdaneta market where farmers actively sought vital market information and supply of new varieties from market traders.

The blockmodelling analysis vividly highlighted shortcomings of the diffusionist paradigm's concept of information flow, from innovators/leaders to others throughout the community. Results revealed the potential disadvantage of groups of farmer-cooperators turning into a "select group", isolated from other groups in the community and having little or no reciprocated ties with them, hence limiting the spread of adoption. In the stepwise regression analysis, five social network variables influenced adoption: connectedness, reciprocity, and heterogeneity in television ownership; radio use; and credit availment.

Key word: Rice-mungbean technology, rainfed rice-based farms, technology adoption, communication or social network analysis, blockmodelling analysis
AGRICULTURAL SCIENCES

THE ROLE OF VETERINARY MEDICINE IN PUBLIC HEALTH

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The veterinarian has been more closely identified with agriculture, specifically food animal production. Under the present state of economic development of the Philippines, this identity is appropriate and relevant. The country is still unable to meet the protein needs of the people through the adequate supply of food of animal origin (terrestrial and aquatic). To achieve self-sufficiency in food of animal origin, the production and health of animals used as food by humans need to be maintained and promoted. This is the important role of the veterinarian.

As a consequence of the rapid developments in agriculture, a new field in veterinary medicine was born: veterinary public health. It is defined as "a component of public health activities devoted to the application of professional veterinary skills, knowledge, and resources towards the protection and improvement of human health."

The areas of concern in this field are: (1) Food animal production (quantity and quality); (2) Ante-mortem and post-mortem inspection of terrestrial and aquatic animals for human consumption; (3) Supervision of food animal exports and imports including their by-products; (4) Zoonoses (diseases of animals naturally transmissible and common to humans); (5) Disaster veterinary medicine (disastrology); (6) Environmental protection and health; (7) Comparative medicine and biomedical research; and (8) Ethology and animal welfare.

Keywords: Production, health, inspection, residues, zoonoses, disastrology, medicine, ethology, environment

PROPOSAL FOR A NEW SCIENTIFIC NAME OF SWAMP BUFFALO - THE CARABAO

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There are two groups of the water buffalo, (Bubalus bubalis, Linn.), namely the swamp buffalo, typified by the carabao, and the riverine buffalo, typified by the murrah. The proposal for a new scientific name of the swamp buffalo (Bubalus carabanensis) is suggested because of important differences between the two groups.

Differences were noted in (1) the number and size of chromosomes, (2) the location of centromers on the chromosomes, (3) the body color, (4) various external body structures, and (5) attachment of male genitalia to the body.

Key words: Carabao - (Bubalus carabanensis) with 48 chromosomes; murrah - (Bubalus bubalis Linn.) with 50 chromosomes; whitish hair in muzzle of carabao but black in murrah; whitish stockings in carabao but black in murra
APPLICATION OF NON-CONVENTIONAL ACUPUNCTURE IN SHEEP, CATTLE, AND WATER BUFFALOES

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Acupuncture is an alternative approach for the treatment of various diseases and disorders in animals. Although it is less expensive and has less side effects compared to conventional drugs and other chemicals, its potential for use in animals in the Philippines has not been thoroughly investigated. In this series of studies, different methods of acupuncture were used in cattle, water buffaloes, and sheep, namely: pneumoacupuncture (injection of air), hypodermic needle acupuncture (stimulation using disposable hypodermic needles), and aquapuncture (injection of distilled water, 5% lactated Ringer's solution, vitamin ADE solution, 2% lidocaine solution, and capsicum decoction). Results show that non-conventional acupuncture methods can: (1) produce analgesia sufficient for performance of surgical procedures; (2) increase reproductive performance; (3) be used for the treatment of reproductive disorders; and (4) increase white blood cell counts in ruminants.

Key words: Acupuncture, analgesia, aquapuncture, blood cells counts, cattle, pneumoacupuncture, reproduction, sheep, water buffaloes

THE SEARCH FOR RICE VARIETIES ADAPTED TO RAINFED GROWING CONDITIONS

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Traditional rainfed rices are generally low yielders, tall, weak-strawed, and late maturing. To facilitate their improvement, the Cooperative National Rice Varietal Improvement Program was organized and launched in 1953 and it has continued up to the present with some revisions. The U.P. College of Agriculture and Bureau of Plant Industry undertook the breeding work while the Bureau of Agricultural Extension and agricultural schools and colleges conducted the multilocation tests of new selections. Outstanding selections were recommended to the SeedBoard for approval and release. Since then until 1996, 18 upland, 14 rainfed lowland, and 72 irrigated lowland varieties were released. Comparison of the performance data on the released rainfed varieties revealed that there was hardly any perceptible increase in the yield of newer varieties. Hence, breeders are advised to utilize relevant findings from related disciplines in modifying the procedures and criteria for selection of the plant type appropriate to rainfed environments so as to achieve further yield improvement.

Key words: Rainfed rice breeding, rainfed-lowland rice breeding, upland rice breeding
ALTERNATIVE MANAGEMENT STRATEGIES AGAINST THE RICE ROOT-KNOT NEMATODE, *Meloidogyne graminicola* IN RICE-ONION SYSTEMS

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Studies were conducted to determine alternative management strategies against the rice root-knot nematode, *Meloidogyne graminicola* in rice-onion systems. The cannister experiment performed to determine the effective soil depth level reached by rice hull burning (RHB) on nematode mortality showed that nematodes were killed by heat even at 15 cm depth. Several galls in the roots were counted in rice seedlings in the unburned treatment as compared to zero galls in all the burned treatments (0, 5, 10, 15 cm depth). The field experiment using RHB significantly affected the number of galls and in most cases the nematode densities in the soil and roots. Yield of onion increased almost three-fold in the burned treatment. The pot experiment showed that *Tagetes* sp. and two *Crotalaria* species reduced the number of galls and nematode densities in the soil by 73-96% and increased fresh root weight when incorporated in the soil. Rice hull burning and the use of *Tagetes* and *Crotalaria* could be effective alternative management strategies for *M. graminicola* in rice onion systems.

Key words: Root-knot, nematode, *Meloidogyne graminicola*, rice hull burning, *Tagetes* sp., *Crotalaria* sp., onion, rice

GENE DELIVERY SYSTEMS IN RICE

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The increasing population rate (2.5% per year growth rate) and the shrinking area devoted to rice production (-1.8% per year decline) in the Philippines pose a big challenge to plant breeders to expedite genetic improvement in rice. Genetic engineering is a powerful and novel means complementing the traditional methods in improving plant characters by introducing foreign genetic material or by enhancing the expression of endogenous genes. Improved varieties are developed in a shorter time, repeatable results are obtained, and there is an immense source of genetic variability. Monocots were not transformable using *Agrobacterium tumefaciens*, a natural transformation vector for dicots. Hence, other methods were developed such as polyethylene glycol-mediated DNA and electroporation-mediated transformation of protoplasts, and the particle bombardment of tissues. The recent utilization of the *Agrobacterium* system in transforming rice paved the way to a more efficient, less costly, and more reliable method. In rice the development of these transformation systems was reflective of the scientific knowledge of the
The development of each gene delivery technology conducted in rice, the advantages and disadvantages, and the important contributions in rice improvement based on experimental results and published data will be discussed.

Key words: Genetic engineering, transformation, rice, protoplasts, polyethylene glycol, electroporation, particle bombardment, Agrobacterium tumefaciens, monocots, crop improvement

CLONING AND CHARACTERIZATION OF FIVE B-GLUCANASE GENES IN RICE

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B-glucanases play key roles in the defense response of plants and in important physiological process such as seed germination. As a step toward engineering better resistance and germination, five B-glucanase genes in rice were cloned and their structure and expression characterized. Gns5 and Gns6 are tandemly arranged within a 6-kb region in the rice genome while Gns7, Gns8, and Gns9 are at least 8 kb apart from each other and from Gns5 and Gns6. Gns5 encodes a mature peptide of 304 aa, with an estimated pK of 4.2. Gns6 specifies a mature peptide of 307 aa, with an estimated pK of 4.6. Gns7 encodes a mature peptide of 311 aa, with an estimated pK of 5.4. Gns8 specifies a mature peptide of at least 313 aa, with an estimated pK of 4.6. Gns9 encodes a mature peptide of 322 aa, with an estimated pK of 9.9. The Gns5 and Gns6 isoforms likely have a B1,3-glucanase activity, while Gns7, Gns8, and Gns9 isoforms may have either a B1,3-glucanase or a B1,3;1,4-glucanase activity or a novel substrate-specificity. Gns5 showed maximal expression in root and mature leaf, Gns6 in root and germinated seed, Gns7 in germinated seed, Gns8 in root, and Gns9 in calli and root. In young leaf, exogenous salicylic acid strongly induced Gns5, Gns6, and Gns7; and exogenous GA, auxin, ethylene, and ABA strongly induced Gns7 and Gns9.

Key words: ABA, auxin, B-glucanase, calli, coleoptile, ethylene, GA, PR protein, seed germination

PHILIPPINE FOREST LANDS: OPPORTUNITIES FOR MITIGATING CLIMATE CHANGE

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Drastic climate change is one of the most critical environmental threats mankind has ever faced. Because of their rapid biomass accumulation, tropical forests are viewed as one of the promising approaches to mitigate C in the atmosphere. In the first part of the paper the ways by which tropical forests could serve as C sink by conservation, expansion and substitution are discussed. In the second part a national estimate of the potential of Philippine forest lands to store and sequester C is provided. All forest land uses are estimated to store about 1005 M tons C and sequester 34 M tons C per year. The latter is equivalent to almost 80% of total Philippine C emissions. In the third part of the paper practical strategies for mitigating C through forestry interventions are explored. These include: C-offset projects, reforestation by private groups, and urban forestry. Costs of C sequestration are also estimated. Finally, recommended research topics are identified.

Key words: C storage, C sequestration, climate change, tropical forest

HEALTH SCIENCES

HEPATITIS E VIRUS INFECTION DIAGNOSED BY SEROLOGY: A REPORT OF CASES AT THE SAN LAZARO HOSPITAL, MANILA

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Sixty-five patients who presented with jaundice at the San Lazaro Hospital between July to September, 1992 were tested for the viral hepatitis markers by serology. Qualitative enzyme-linked immunosorbent assays (ELISA) were performed using commercial kits from Abbot or Genelabs Technologies, U.S.A. This particular study had as its primary objective, the determination of the proportion of jaundiced patients with hepatitis E virus (HEV) infection, but other serological markers were also used. The tests for hepatitis A virus (HAV) and hepatitis C virus (HCV) consisted of detecting total immunoglobulins (mainly IgG) in patients' sera, whereas both IgM and IgG tests were available to detect specific antibodies to HEV. Hepatitis B virus (HBV) infection was tested using the HB s antigen detection kit. Past exposure/immunity to the hepatitis A virus as measured by total antibody against HAV was 98.46%. This confirms
the high endemicity of HAV infection in our setting. As these patients are jaundiced, the ongoing inflammation of the liver may be caused by the HBV where HBs antigen positivity was 46.15% among the patients. The symptoms may be due to hepatitis C virus infection in 3% of the patients who were positive for HCV antibodies. Acute or relatively recent HEV infection was diagnosed in 6.15% of the patients who tested positive for IgM anti-HEV. Some 10.76% of the patients were positive only for IgG anti-HEV. This study therefore reports for the first time, the hepatitis E virus as a cause of viral hepatitis among our patients at the San Lazaro Hospital. This is just one of the many viral hepatitis agents that have to be considered among our patients, especially those in the lower socioeconomic group. While management is still basically supportive and the same for all viral agents, prognosis as in hepatitis A infection is much better, compared to HBV or HCV infections.

Key words: Hepatitis agents, enteric hepatitis, viral hepatitis, hepatitis markers

MOLECULAR DETECTION AND SEROTYPING OF DENGUE VIRUS IN A RECENT (1995-1997) OUTBREAK IN METRO MANILA, PHILIPPINES

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Dengue virus infection is one of the persistent health problems in the Philippines. Despite reports of Dengue virus outbreaks annually, surveillance and diagnosis have been limited to detecting clinical symptoms. In this duty, a reverse transcription-polymerase chain reaction (RT-PCR) assay, complemented with virus isolation, was used to detect and isolate dengue virus from serum of patients. RT-PCR using flavivirus specific primers was done directly on serum samples. Subsequently, serum samples were inoculated into Aedes albopictus C6/36 cell line and the virus was detected by RT-PCR using either the infected culture fluid or RNA extracts. Out of 697 serum samples tested, Dengue virus was detected and isolated in 59/469 samples in 1995, 16/164 samples in 1996, and 17/64 samples in 1997. Comparison of the three protocols for virus detection showed that the use of total RNA from infected cells followed by RT-PCR using Dengue Consensus primers was more sensitive (30%) than using infected culture fluid as template (21%). On the other hand, only 14% tested positive when RT-PCR was done directly on the serum samples. RT-PCR using serotype-specific primers showed that Dengue serotypes 2 and 3 are prevalent in Metro Manila.

Key words: Molecular detection, dengue virus, serotyping, reverse transcription-polymerase chain reaction, virus isolation, flavivirus specific primers, Aedes albopictus C6/36 cell line, infected culture fluid, RNA extracts, Dengue Consensus primers
BONE TRANSPLANTATION IN LIMB SAVING SURGERIES: PHILIPPINE EXPERIENCE

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Until the turn of the decade, Filipino patients afflicted with malignant and aggressive extremity tumors were almost uniformly treated with mutilating amputations. Limb saving surgery only recently became an option locally — this resulting not only from a better comprehension of surgical oncologic principles but also from the development and refinement of reconstructive procedures following such surgeries. Foremost among the latter is the use of long bone transplants, otherwise known as large segment bone allografts.

Large-segment allografts are available from the Tissue and Bone Bank of the University of the Philippines — the only bank of its kind in the country. All allografts are harvested from appropriate donors (both cadaveric and live), processed at the Bank, radiation-sterilized at the Philippine Nuclear Research Institute (PNRI), and finally brought back to and stored in a -80°C deep freezer at the Bank.

This paper presents our 4-year experience with large-segment allografts for extensive defects of limb salvage surgery in musculoskeletal tumors. All patients included in this presentation had: (1) malignant or aggressive extremity tumors; (2) surgery performed by the University of the Philippines-Musculoskeletal Tumor Unit (UP-MuST Unit); (3) follow-up of at least one year or until death; and (4) available pre-and post-operative radiographs for review.

Over a period of 4 years (January 1993-January 1997), 63 patients with malignant or aggressive extremity tumors (who formerly would have been amputated) underwent limb salvage surgery by the UP-MuST Unit. Twenty (20) of these patients had reconstructions utilizing irradiated large-segment allografts and fulfilled the above criteria for inclusion in this review.

Limb saving surgery for Filipino patients with musculoskeletal tumors continues to be a challenge because of both tumor size and the size of the defect requiring reconstruction. Large-segment allografts from the UP-Tissue and Bone Bank, however, make this difficult surgery realizable in our setting and offers to our patients a chance to save not only life but also limb.
MATHEMATICAL, PHYSICAL, AND ENGINEERING SCIENCES

1. CONSTRUCTION OF r-REGULAR SINGULAR GRAPHS

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A graph G is said to be singular if the adjacency matrix G is a singular matrix. For each integer \( r \geq 2 \), we determine here all values on \( n \) for which there exist connected \( r \)-regular singular graphs of order \( n \). The constructions used in this paper make use of 1-factors of the even complete graphs. It is known that when \( r = 2 \), the only connected 2-regular singular graphs are the cycles whose number of vertices are divisible by 4. We prove here that if \( r \geq 4 \) is even, there exist connected \( r \)-regular singular graphs of order \( n \) only for \( n \geq r + 2 \). When \( r \geq 3 \) is odd, we show that connected \( r \)-regular singular graphs exist only when \( n \) is even and \( n \geq r + 3 \).

Key words: Graph, adjacency matrix, singular matrix, 1-factor, connected graph, regular graph

2. ON THE DIMENSION AND SPAN OF GRAPHS

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The dimension of a graph \( G \), denoted by \( \text{dim} (G) \), is the smallest nonnegative integer \( n \) for which the vertices of the graph can be represented bijectively by points in the Euclidean \( n \)-space \( \mathbb{R}^n \) such that the distance between points corresponding to adjacent vertices is equal to 1. This paper gives bounds for \( \text{dim} (G) \) as well as the sum \( \text{dim} (G) + \text{dim} (\overline{G}) \), where \( \overline{G} \) is the complement of \( G \). The problem of inscribing a graph in a sphere in \( \mathbb{R}^n \) with as small a radius as possible is also studied here. In particular, we show that every tree can be inscribed in a circle in \( \mathbb{R}^2 \) with radius \( 1/2 + \epsilon \), for any \( \epsilon > 0 \). We show here how to construct a unit graph in \( \mathbb{R}^n \) out of a block design where \( V \) is the total number of points. The construction gives the well known result that in a 1-design, the number of blocks does not exceed the total number of points.

Key words: Euclidean space, distance, dimension, graph, complete graph, block design
3. THE CHARACTERIZATION OF FINITE PSEUDOGROUPS OF SMALL ORDER
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A pseudogroup is a finite algebraic system compactly defined as: "a not associative invertible loop". The study of pseudogroup theory is relatively new, having been introduced only in 1981. Thus, in order to fully understand them, there is a need to determine the existence of considerable number of non-isomorphic pseudogroups. This will enable the researchers in the field to have enough materials to use in order to study their properties and how they differ from other algebraic systems. In 1997, the author characterized all abelian pseudogroups of order 6. The results were presented in the 19th ASM of the NAST. The generation and analysis of all non-isomorphic pseudogroups of orders 5, 6, and 7 (abelian) have now been completed. In this paper these pseudogroups are presented and characterized according to the structural properties they possess, such as the number of subsystems, weak association properties satisfied and the structural form. A total of 50 isomorphism classes were found and identified. Comparisons will be made regarding the properties of groups and pseudogroups, their similarities as well as their basic differences. All data were generated using computer software designed for the purpose.

Key words: Pseudogroups, isomorphism, structural properties, loops

4. VARIABLE SELECTION IN FACTOR ANALYSIS REGRESSION AND ITS NUMERICAL APPLICATION
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Factor analysis (FA) regression is a statistical tool which can deal with the problem of linear prediction where the independent variables are subject to errors. It has been studied by several authors including Lawley and Maxwell (1973) and Browne (1988). Their works have made clear its basic properties. But, there still remain important problems such as sensitivity analysis and variable selection which have not been studied well. Therefore, our main target is to concentrate on these two problems. However, the part of variable selection procedure will be given more emphasis since the sensitivity analysis part had already been discussed in the paper of Mateo, Odaka, and Tanaka (1993).

In this paper, a backward elimination procedure is proposed for the selection of variables in FA regression. The squared correlation coefficient \( r^2(B) \) was used as a criterion to measure the adequacy of a regression model and for evaluating and comparing subset regression models. Some numerical investigations are presented to analyze the performance of the proposed variable selection procedure.

Key words: Backward procedure, factor analysis regression, ordinary analysis regression, ordinary least squares regression, variable selection
5. DIBENZO-18-CROWN-6 ETHER IN SOL-GEL SILICON DIOXIDE MATRIX FOR METAL PRECONCENTRATION.
I. SYNTHESIS AND CHARACTERIZATION

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Preconcentration is a common sample preparation technique in the analysis of trace metals. This study aims to develop a material composed of silicon dioxide (SiO2) powder incorporated with dibenzo-18-crown-6 (DB18C6) which will be used to trap and preconcentrate trace metals in aqueous solutions. The SiO2-DB18C6 was synthesized using the sol-gel method with tetraethylorthosilicate (TEOS) as silicon precursor. The effects of catalyst used, pH, and solvent on the resulting products were determined. The stability of the silicon dioxide-dibenzo-18-crown-6 ether (SiO2-DB18C6) in acidic conditions was also investigated. SiO2 and SiO2-DB18C6 products were characterized using Fourier Transform Infrared (FTIR) spectroscopy, thermal gravimetric analysis/differential thermal analysis (TGA/DTA), scanning electron microscopy (SEM) and energy dispersive x-ray spectroscopy (EDX). Solid powder products were formed using ammonia as catalyst, while gelatinous films were formed using nitric acid as catalyst. The use of ethanol as solvent resulted in fastest drying compared to butanol and methanol, while it also showed the best ability to dissolve DB18C6. Infrared spectroscopy showed the characteristic peaks for SiO2 and DB18C6. Similar spectra for both the SiO2-DB18C6 and acid treated SiO2-DB18C6, indicated that no changes in bonding had occurred during acid treatment. SEM analysis of SiO2, SiO2-DB18C6, and acid treated SiO2-DB18C6 showed that all products had uniform spherical particles with diameters ~0.4 µm. Thermal analysis indicated no major difference between the acid treated sample and the untreated sample that suggests no major change in composition occurred during acid treatment. However, DB18C6 degrades at ~350°C and therefore, the SiO2-DB18C6 material can only be heat treated to remove trapped water at temperatures less than 350°C. The thermal profiles also showed that the SiO2 matrix is also stable up to ~950°C. EDX results confirmed that silicon is the major component (~95% atomic composition).

Key words: Silicon dioxide, sol-gel, crown ether, trace metals, preconcentration, infrared spectroscopy, FTIR, TGA, DTA, SEM, EDX

6. SYNTHESIS OF LIQUID CRYSTALLINE SILICONES WITH CYANOBIPHENYL AND CHOLESTERYL PENDANT GROUPS

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Cholesteric polymers are of special interest to materials scientists and technologists because of their unique property of combined thermo-electro-optical sensitivity and mechanical property. In the synthesis of liquid crystalline silicones, the cyanobiphenyl is introduced as a side group to enhance the electro-optical property. The cholesteryl moiety as another side group is expected to enhance the cholesteric nature, hence the possible thermo-optical property of the resulting polymers. To prepare the polymers, vinylic monomers containing the cyanobiphenyl group
(4-(m-hexenoxy-4'-cyanobiphenyl) and the cholesteryl moiety (cholesteryl 4-propenoxy-4'-benzoate) were synthesized, and were reacted with cyclic polysiloxanes using the Speier's catalyst. The cyanobiphenyl-containing monomer was found to be nematic at a temperature range of 35.37°C to 52.68°C, whereas the cholesteryl-containing vinyl was found to be cholesteric from 106.97°C to 118.42°C. The synthesis and properties of the monomers and the resulting side-chain polymers will be presented.

Key words: Cholesteric, cyclosiloxane, cyanobiphenyl, liquid crystalline, nematic, polymers, silicone, Speier's catalyst, vinylic monomers, thermo-electro-optical.

7. ARSENIC SPECIATION BY HYDRIDE GENERATION-ATOMIC ABSORPTION SPECTROMETRY COUPLED WITH A CRYOGENIC TRAP

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Hydride generation-atomic absorption spectrometry (HG-AAS) combined with a cryogenic trap was utilized in arsenic speciation. The set-up of the HG-AAS system consists of a peristaltic pump, PE 3100 atomic absorption spectrometer, 7 Variac transformers, and a strip chart recorder. Mixed solutions of inorganic arsenic (As III), monomethyl arsenic acid (MMAA), and dimethyl arsenic acid (DMAA) were converted to their corresponding volatile hydrides and the generated arsines trapped and separated according to their volatility: inorganic arsine first, then methyl arsine, followed by dimethylarsine. HG-AAS system parameters, like flow rates, were optimized for quantitative analysis of the different arsenic species. Linear responses were obtained in the nanogram levels. The technique was applied to arsenic speciation in some seawater and seaweed samples. The seawater samples contained an average of 1.5 ng/mL inorganic As. The seaweed sample analyzed contained inorganic arsenic species and DMAA totaling 0.5 µg total As/g of seaweed.

Key words: Arsenic, atomic absorption, spectrometry, speciation, hydride generation, sea water

8. CALORIMETRY: ENTHALPIES AND ENTROPIES OF SOME METAL-CYANIDE COMPLEXES BY THERMOMETRIC TITRATION

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Thermodynamic modelling provides a method for predicting the chemical behavior of the complicated processes in the hydrometallurgical extraction of gold but is critically dependent on the availability of reliable data. Such thermodynamic data are limited or not available. Enthalpy changes associated with the complexation of some metals with cyanide were determined by titration calorimetry using an isoperibol (constant temperature environment)
calorimeter. These calorimetric measurements were done in both aqueous NaCl and NaClO₄ media at an ionic strength of 1M.

The ΔH values show slight to no dependency on the medium. Other thermodynamic properties are calculated from these ΔH values with available stability constant or ΔS values. These data are very important in the cyanide processes involving high ionic strength solutions.

Key words: Calorimetry, titration calorimetry, isoperibol, enthalpies, entropies, cyanides, cyanide complexes, metal cyanides, thermodynamic data, hydrometallurgical solutions, gold extraction

9. POTENTIOMETRIC pH-SENSOR BASED ON ELECTROPOLYMERIZED POLY (O-PHENYLENEDIAMINE)

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A novel potentiometric pH-sensor device was fabricated using galvanostatic electrochemical polymerization of poly (o-phenylenediamine) (PoPD) onto a Pt wire from a suitable buffer solution containing the doubly crystallized o-phenylenediamine and the dopant bovine serum albumin (BSA). Electrochemical polymerization parameters of the sensor were optimized against Ag/AgCl electrode using buffer solutions of pH 3 to 10. The polymer-coated pH-sensor exhibited a high sensitivity with nearly Nernstian response and a slope of -47.5 mV/pH, a good linearity (r = -0.991), a reasonable response time (8 min. at pH 3-10), a favorable repeatability at three (3) replicate measurements (RSD = 6% at pH 3-8), and a very high reproducibility (RSD < 3%) at 11 replicate and alternate measurements of pH3 and 10 for a period of < 2 h. This yellow-brown PoPD polymer coated Pt wire is a promising pH transducer for the analysis of pH changes in biological reactions acting as biosensor.

Key words: pH, sensor, poly(o-phenylenediamine), potentiometric, transducer, bovine serum albumin, polymer, electropolymerization, biosensor, Nernstian response

10. DESIGN OF A MICROCOLORIMETRIC ENZYME ASSAY FOR SCREENING OF RADIOPROTectors USING THE ORIENTAL FRUIT FLY

Bactrocera philippinensis MODEL

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Loss of function and expression of a 109 kDa protein is observed in the Oriental fruit fly, Bactrocera philippinensis, upon exposure to a γ-radiation dose of 100 Gy. Found to possess tyrosinase activity, this marker enzyme is particularly important during quarantine treatment of export fruits. A semi-automated radioprotector screening assay for anti-
cancer drug development at PNRI has been developed and optimized. Larvae of *B. philippinensis* are subjected to relatively high and low doses of standard radioprotectors (L-glutathione (GSH), tert-butylated hydroxyanisole (BHA), garlic bulb extracts), temperature treatments (37°C and 42°C), and relatively high and low radiation doses (10 and 40 Gy) following a 2-factorial design. Using mushroom tyrosinase as standard and 605 nm as reference wavelength, optimum precision, sensitivity and curve linearity are achieved at the 405 nm window within a 60-minute reaction time with 2-methyl DOPA yielding dopachrome. Significant radioprotection and tyrosinase activity are observed. Results showed that GSH exhibited the best radioprotection with an emergence rate of 100% (GSH, 42·10). Consequently, GSH, exhibited a high dopachrome level next to garlic. Garlic approximates the performance of GSH and BHA, but the fact that dopachrome levels of garlic are exceeding high could be correlated with the relatively lower emergence rates observed. Dopachrome level of 0.45-0.05 µg/ml exhibits the optimal radioprotection. Other radioprotectors will be screened in the future using this assay in search of potent and less toxic radioprotectors that could decrease radiation-induced morbidities and improve therapeutic gains in patients undergoing therapy.

Key words: Radioprotector, radiotherapy, *Bactrocera philippinensis*, anti-cancer drugs, radiation biology, natural products, cancer management, dopachrome, fruit fly, tyrosinase

11. CHARACTERIZATION OF FIBER, PULP, AND PAPER FROM TOBACCO STALK AND THEIR UTILIZATION FOR HANDMADE PAPER PRODUCTION

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Fiber, pulp, and paper derived from tobacco stalks were characterized in terms of their chemical and physical properties, such as total pulp yield, fiber dimensions, holocellulose and lignin contents, and paper strength properties. Conventional handmade paper making and paper products conversion was then done to establish the technical and economic feasibility of paper production from tobacco stalks.

Results showed that the pulp yield obtained from soda-pulped tobacco stalk was 64.89%. This is higher than those of rice straw, cogon grass, banana and pineapple fibers, and comparable to abaca fiber, the most commonly used fiber for handmade paper. The average fiber length was 0.72mm, which is within the moderately short fiber category.

The holocellulose content of tobacco pulp is comparable to jute. Tobacco paper sheets made of pulp beaten for 15 minutes in a Valley beater are comparable to paper mulberry, maguey, and salago sheets in terms of tensile index, tear index, and burst index, respectively.

Practical handmade paper production also showed that even at higher charge of NaOH (15%) and at longer cooking time, the cooked fiber still retained its relative hardness and did not defibrillate readily like mulberry, cogon and other fibers.

It was shown that with slight modification of some processes, e.g., pulping and beating, it is technically feasible to produce handmade paper from tobacco stalks. At current prices of handmade paper products, the profitability is assured and even surpasses the net income derived from the main crop.

Key words: Tobacco stalk, pulp, fiber, handmade paper, pulp yield, fiber length, holocellulose, tensile index, tear index, burst index
12. ANTIGENOTOXICITY STUDIES ON SPINASTEROL, AN ISOLATE FROM Cucurbita maxima FLOWERS

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Spinasterol was isolated from squash flowers by solvent partitioning and repeated vacuum liquid chromatography using a Micronucleus Test-directed scheme. At a dosage of 100 mg/kg mouse, spinasterol is antigenotoxic as it decreased the mutagenicity of tetracycline, a known mutagen, by 64.7% (a = 0.001) using the micronucleus test, an in vivo method.

Spinasterol was then tested for its antitumorigenic and antiteratogenic potentials. The antitumorigenic activity was monitored using the mouse skin tumor assay. There was a 90% tumor incidence for the positive control group (DMBA + croton oil + acetone). At a concentration of 15.0 µg / 0.2 ml acetone, spinasterol decreased the incidence of skin tumors by 55.6% when applied immediately after croton oil. It is not a co-carcinogen nor a co-tumor promoter as there was no increase in the incidence of skin tumors after spinasterol application. Hence, spinasterol showed antitumorigenic potential. Moreover, spinasterol was able to counteract the teratogenic effect of tetracycline as there was a significant decrease in the number of females with resorptions and a decrease in the number of dead implantations.

Key words: Squash flower, spinasterol, antimutagen, antiteratogen, antitumorigenic, micronucleus test, dominant lethal skin, mouse skin tumor assay

13. MINIMIZING EMISSION OF CARBON DIOXIDE IN THE COCONUT PROCESSING

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About 90% of the world’s coconut production is made into copra. There are 2-3 million smoke kilns which are used by the coconut farmers for making copra. It is estimated that these kilns emit carbon dioxide from 247 to 366 gram of carbon per kg of copra produced. From the world copra production of 10 M tons, the total carbon released in copra making range is 2-3 Tg (telegam = 10¹² grams) or 2-3M tons of carbon per year. To minimize carbon dioxide emission in copra making, kilns with better combustion characteristics and heat utilization efficiencies must be used.

One of the more promising alternative dryer is a direct-fired, natural draft dryer known as the Los Baños (Lozada) Dryer. Developed at the University of the Philippines Los Baños, the dryer consist of a simple burner, a heat distributor and a drying bin. The burner combust coconut shell, corn cob, and wood pieces with extremely high efficiency thus, minimizing fuel consumption and dramatically reducing the release of airborne pollutants. The resulting copra is practically smoke-free. Tests have shown that carbon dioxide emissions from the Los Baños (Lozada) Dryer are about half of that released by the traditional smoke kilns. Furthermore, the dryer emits lower concentrations of CO (50 ppm vs 2000-3000 ppm), of NOx (5 ppm vs 400 ppm), and SOx (5 ppm vs 400 ppm). When used widely, significant reductions in the emissions of greenhouse and acid rain gases from biomass combustion will be attained. (About 500 units of the Los Baños (Lozada) Dryer are now in use in the Philippines and Papua New Guinea).

Key words: Greenhouse gases, drying technology, copra making
14. RECYCLING OF DISTILLERY SLOPS FOR ETHANOL AND ACETIC ACID FERMENTATION

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Laboratory scale experiments of slops recycling on ethyl alcohol fermentation and acetic acid production were studied. Back slopping was carried out using a 25% slops solution for each cycle. The effect of the number of recycles on the fermentation efficiency was investigated.

Statistical analysis of data indicated that there was no significant difference in the fermentation efficiencies obtained for the five recycles, which means that the number of recycles did not adversely affect the fermentation efficiency.

The use of back-slopping was able to cut the wastewater generation by 18.42%. It therefore reduced the water consumption in the distillery by approximately the same quantity. The unrecycled slops were then used in the production of acetic acid.

The production of acetic acid was done using the standard method for acetic acid fermentation. An efficiency of 13.04% was obtained for the second set-up, 10.47 for trial A, 9.97% for trial B, and 3.03 for trial I. At the end of the fermentation, a total acetic acid content of 9.55 g, 9.37 g, 10.50 g and 1.25 g for trials A, B, control, and I, respectively. These values are lower compared to the commercial vinegar which has 40 g acetic acid for every liter. The low efficiencies and acid content were attributed to the absence of aeration during fermentation.

The use of back-slopping already resulted in a commendable reduction in wastewater generation, but the conversion of the excess slops to acetic acid, with the necessary refinements applied, will guarantee an almost zero wastewater generation. The recycling of slops using the said methods is therefore an effective and productive way of treating distillery wastewater.

Key words: Distillery slops, recycling, ethyl alcohol, acetic acid, fermentation

15. PRODUCTION OF ACONITIC ACID FROM MUSCUVADO MASSECUITE

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Aconitic acid is a useful compound in the preparation of plasticizers, in organic synthesis, and as a flavoring agent. Effective detergents can be prepared by the reaction of esters of aconitic acid with sodium bisulfite. Aconitic acid commanded a price of $21.86 per 250 mg as of 1997.

Aconitic acid is the most abundant constituent acid of cane. Massecuite, an intermediate product of cane sugar manufacture, and final molasses, a by-product after centrifugation, contain aconitic acid in varying amounts depending on the location of sugarcane production. Some reports showed that aconitic acid is about 1-6% by weight of molasses. It is assumed that “muscuvado massecuite” contains more aconitic acid, since in this process the sugar crystals are still intact in the mother liquor, and do not undergo centrifugation.

Aconitic acid crystals of purity 99.57% by mass, 3.2 g/100 ml solubility at 15°C, and melting at 194°C, were recovered from “muscuvado massecuite” which contained about 1.049% aconitic acid, giving an average of about 92% recovery by the ion exchange method using a weak base exchanger (polyamine), Amberlite IRA-95. Further purification treatments involved the use of 10% sulfuric acid, bentonite and Dowex 50 W cation. It was observed that temperature had no significant effect on the yield of dried and pure aconitic acid. Based on the results, adsorption was optimum at 27°C and pH 5.58.

Key words: Aconitic acid, muscuvado massecuite, ion-exchange
16. DESIGN, FABRICATION, AND PRELIMINARY TESTING of A BENCH-SCALE SPINNING BAND COLUMN FOR THE DEODORIZATION OF COCONUT OIL

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A spinning-band column was designed, fabricated, and tested for the deodorization of coconut oil. The helical spinning band was made of stainless steel perforated mesh that was spot-welded around a stainless steel shaft. A variable electric motor was connected to the shaft. The whole process is steam distillation. The coconut oil was scraped to the wall as the steam was introduced into the system.

The equipment was tested at 70 and 100°C and with flowrates at 1000, 750, and 500 ml/h. These conditions were evaluated by determining the %FFA, by spectrophotometric analysis and olfactory evaluation. The best operating condition was at 100°C and a flowrate of 500 ml/h. The %FFA was decreased from 0.2943 to 0.2400, and the highest % transmittance and the lowest color units were obtained.

It was found out that the higher the temperature, the shorter is the deodorization time and the longer the time of contact between steam and fat, the more efficient is the deodorization.

Key words: Spinning band, deodorization, coconut oil, decolorization

17. ELEVATED PERFORATED SOLAR DRIER

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Drying is one of the problems associated with crop production. Substantial portions of agricultural products are lost due to improper drying.

An inexpensive elevated “tray type” perforated platform solar dryer was designed and developed using a wooden frame with a screen mesh bottom. The wire mesh is used to hold the grain. The system of operation is simple. The tray containing the grain is placed in the platform at a depth of 5 cm. The elevation from the ground can be at 30, 45, 60, or 75 cm. It can be placed even in uneven surfaces and above grasses when conventional floor drying is not possible.

The dryer is effective even when solar radiation is low because the dry air is allowed to pass above, below, and through the grain bed. This is in contrast to open sun drying over the pavement wherein the air is passed only on the surface of the grain bed. The dryer is better than open sun drying over pavement or with the use of net or canvas. It can reduce the drying time by 10% and the milling recovery by 5%. Cracked and fermented grains can also be reduced with the use of the dryer.

The cost of the elevated platform dryer is comparable to that of the canvas or the plastic mesh. It can be constructed by the farmer using basic tools like the triangle, cross-cut saw, and hammer.

The dryer is portable and can be easily dismantled for safe keeping when not in use. It can also be used to dry other agricultural and fishery commodities.

Key words: Dryer, drying, palay, solar, milling, fermented grains, cracked grains
18. DEVELOPMENT OF THE FEMALE GAMETOPHYTE 
OF Pittosporum resiniferum HEMSL. (PITTOSPORACEAE) 

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The anatomy of the megaspore and the process of megasporogenesis and megagametogenesis in Pittosporum resiniferum Hemsl. is described from sections processed using modified paraffin and clearing techniques. The ovary is superior and bicarpellate. The ovule is unitegmic, tenuinucellate, and ana-campylotropous. The archesporial cell functions directly as the megaspore mother cell. The first meiotic division of the megaspore mother cell gives rise to the dyads and meiosis II to linear megaspore tetrads. The megaspore towards the chalazal end remains functional while the three megaspores at the micropylar end degenerate. The functional megaspore divides mitotically three times and gives rise to the eight nucleated female gametophytes. Development of the female gametophyte conforms to the Polygonum type and is monosporic.

Key words: Archesporial, gametophyte, megasporogenesis, megagametogenesis, bicarpellate, unitegmic, tenuinucellate, ana-campylotropous, Polygonum, monosporic 

19. ISOLATION AND CHARACTERIZATION OF 
Anabaena SPP. FROM PHILIPPINE MARINE WATERS 

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The cyanobacteria have made a significant impact in the search of new sources of novel bioactive compounds for the treatment of both old and newly emerging human and animal diseases. The vast marine waters surrounding the Philippines remain unexplored for the discovery of unique microorganisms which may produce useful molecules. Three filamentous cyanobacterial isolates from the coastal waters of Palawan and Batangas, Philippines, were obtained following the methods of Rippka (1988) and Castenholz (1988). Based on morphological features, the isolates designated as Btg-01, Pal-04, and Pal-05 were identified as belonging to one Anabaena species. However, using 5 isoenzymes, namely, aldehyde oxidase (AO), alkaline phosphatase (AKP), esterase (EST), malate dehydrogenase (MDH), and superoxide dismutase, each isolate showed different banding patterns. Based on
isoenzyme analysis, it is possible that each isolate is a distinct taxon but maybe closely related to each other. There is a high degree of resemblance both in morphological features and banding patterns to the freshwater reference strain *Anabaena* CB007A.

Crude extracts of the three *Anabaena* species were observed to possess antimicrobial activity against gram-negative and gram-positive bacteria and to the infectious fungi *Candida albicans* and *Tricophyton* sp. Components and mechanisms of action of the bioactive extracts were not elucidated. Further bioassay and fractionation procedures will be performed and will be tested against a wider spectrum of microorganisms like *Mycobacterium tuberculosis*, pathogenic amoebae, and to other microalgae.

**Key words**: Cyanobacteria, *Anabaena*, isoenzymes, aldehyde oxidase, alkaline phosphatase, esterase, malate dehydrogenase, superoxide dismutase, antimicrobial, *Candida albicans*, *Tricophyton* sp.

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**20. METAZOAN PARASITES FROM THE GILLS AND DIGESTIVE TRACT OF THREE SPECIES OF PHILIPPINE CARANGID FISHES**

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A total of seventy-five specimens, each of three carangid fishes (*Decapterus macrosoma*, *Selaroides leptolepis*, and *Alepes djedaba*), were obtained monthly from August to December 1996 from the fish landing in Navotas, Metro Manila. Examination of the fishes for gill and intestinal metazoan parasites resulted in the recovery of four species of adult parasites and larval anisakid nematodes. The monogenean *Gastrocotyle* sp. was recovered from the gills of *D. macrosoma* and *A. djedaba*. The copepod, *Caligus diaphanus* Nordmann was also recovered from the gills of *A. djedaba*. The digenean *Lecithocladium angustiovum* Yamaguti was recovered from the stomach of *S. leptolepis* and the nematode *Contracaecum* sp. from the intestine of *D. macrosoma*. Anisakid larval nematodes were found in the stomach and intestines of all three fish species. In the three fish species, anisakid larvae showed the greatest prevalence as well as intensity of infection.

**Key words**: Parasites, gills, intestines, carangid fish, *Caligus diaphanus*, *Gastrocotyle*, *Lecithocladium*, *Decapterus macrosoma*, *Contracaecum*, anisakid larva, nematodes

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**21. STUDIES ON Alitropus typus EDWARDS, AN ISOPOD PARASITE OF FISHES IN LAKE TAAL**

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Four edible fish species collected from Lake Taal, Batangas Province, Philippines from June 1993 to June 1994 were found to harbor the isopod parasite, *Alitropus typus* Edwards. The hosts were *Ophiocara aporos*, *Apogon thermalis*, *Therapon plumbeus*, and *Oreochromis niloticus*. Laboratory tests on the toxicity of formalin to the isopod
indicated 8-h LC50 and 8-h LC100 of 88 ppm, and 500 ppm, respectively. Exposure of experimentally-infested Oreochromis niloticus fingerlings to 0 ppm, 88 ppm, 500 ppm, and 1000 ppm formalin concentrations resulted in similar 8-h LC50 and 8-h LC100 to the parasite. However, all fingerlings died within 1 1/2 h at 550 ppm and within 30 min at 1000 ppm. Histological sections of the gills of fingerlings exposed to formalin exhibited morphological aberrations such as epithelial lifting and calavate lamellae.

Key words: Alitropus typus, isopod, parasite, Oreochromis niloticus, Lake Taal, formalin, fish gills, Ophocara aperoros, Apogon thermalis, Therapon plumbeus

22. ENZYME VARIABILITY IN DOMESTICATED AND FERAL POPULATIONS OF THE ASIAN HONEYBEE Apis cerana F. (HYMENOPTERA: APIDAE) FROM LAGUNA AND BENGUET

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Apis cerana, locally known as "laywan", is gaining popularity in honeybee culture in the Philippines for various reasons. It is locally available, cheaper to acquire, more adapted to the native climate, and less prone to parasitic mites compared with the imported species Apis mellifera L., also known as Italian or European bee. However, one major problem encountered with A. cerana was their tendency to abscond or vacate a nest due to disturbances and this is especially true for feral populations or those found in the wild compared with cultured or domesticated populations. This study was conducted to characterize biochemically the domesticated and feral populations of A. cerana based on enzyme polymorphism and determine the genetic variability among the populations through estimates of genetic variation, genetic identity, and genotypic similarity. A total of 720 honeybees from 24 colonies were collected from Laguna and Benguet: 360 domesticated and 360 feral. For each province, two localities were selected as sampling sites. Enzyme polymorphism was analyzed using starch gel electrophoresis. Polymorphism was observed in five enzymes encoded by 17 presumptive loci: three isozoci for alkaline phosphatase, four for acid phosphatase, three for glucose-6-phosphate dehydrogenase, three for α-glycerophosphate dehydrogenase, and four for esterase. Only malic enzyme with a single locus was found to be monomorphic. In terms of presumptive allelozymes in each locus, three alleles denoted as S (slow), M (moderate), and F (fast) were observed for ALPH-2, ACPH-1, and ACPH-3, while the other 14 isozoci showed only two alleles denoted as S and F. Colonies within each locality showed a very high degree of genetic identity and did not vary much in terms of the types of alleles. Greater genetic polymorphism was noted for Benguet populations compared with the Laguna populations as indicated by estimates of proportion of polymorphic loci (P) and average heterozygosity (H). No significant difference in enzyme variability was observed between the domesticated and feral populations within each province base on P, H, average number of alleles per locus (A), genetic identity (I(A)), genetic distance (D), and genotypic similarity (I(J)) indices. Pooled domesticated and feral populations showed higher degree of genetic identity compared with the pooled Laguna and Benguet populations. The data obtained indicate that the isozymes of honeybees in a given area, whether domesticated or feral, did not vary significantly.

Key words: Apis cerana F., starch gel electrophoresis, isozyme analysis, estimates of genetic variation, genetic identity, genetic distance, genotypic similarity
23. REARING TECHNIQUES FOR CALANOID COPEPOD 

_Pseudodiaptomus_ sp. UNDER LABORATORY CONDITIONS

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In this study the abundance and developmental stage frequency distribution of _Pseudodiaptomus_ sp. grown under three treatments: pond water fertilized with chicken manure (basal application) and 16-20-0, _Chlorella_-fed, and pond water fertilized with chicken manure (applied daily only) were evaluated. _Pseudodiaptomus_ sp. collected from brackish water ponds were reared under laboratory conditions, using either twelve white plastic basins or ice cream gallon containers with 5-3 liters of brackish water or pond water. Four experiments were conducted and took about forty culture days. The number of any developmental stage of _Pseudodiaptomus_ sp. did not vary according to treatment (P>0.05) indicating that this copepod is not selective regarding the quality of food - it can subsist on any microscopic food within its digestive capacity. However, at 2.0 cm depth of water, _Pseudodiaptomus_ sp. was most abundant in the chicken manure treatment while in the 8.5 cm depth of water, density of _Pseudodiaptomus_ sp. was highest when fed with _Chlorella_. However, comparing both densities, the growth of chicken manure-fed copepods was denser. Population densities were related to food abundance. Nauplii, copepodites, and adult males reached highest densities in the chicken manure treatment of 23, 10, and 17 ind. liter⁻¹, respectively. Egg-bearing and non-egg-bearing adult females were most abundant in the chicken manure + 16-20-0 treatment of 5, and 18 ind. liter⁻¹, respectively. Temperature and food abundance played a critical role (P<0.01) on the growth and development of _Pseudodiaptomus_ sp. Salinity and water pH had significant effects (P<0.05) also. Dissolved oxygen was not significantly correlated (P>0.05) to the densities of _Pseudodiaptomus_ sp.

Key words: Calanoid, copepod, _Pseudodiaptomus_ sp. abundance, developmental stage frequency distribution, nauplii, copepodite

24. POLY-β-HYDROXYBUTYRATE-PRODUCING BACTERIUM AS DEGRADER OF NITRATES IN CONTAMINATED WATERS

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A study was conducted to determine the ability of poly-β-hydroxybutyrate-producing Bacillus sp. to degrade nitrates in contaminated waters. Twenty-nine isolates were tested using nutrient broth with 0.1% potassium nitrate. Following incubation, nitrate content was determined spectrophotometrically using the brucine colorimetric method. The highest nitrate reduction obtained after 24 h of incubation was found to be 84.7% by isolate GR7. The rest of the isolate ranged in nitrate reduction from 0.6% by GR131 to 84.1% by GR114. A preliminary testing of isolate GR42 in degrading nitrates in distilled water (DW), Laguna Lake water (LLW), and nitrate-supplemented coconut water
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(NSCW) was done. Results showed LLW and NSCW elaborated 41.1% and 96.5% decrease in nitrate content, respectively after 4 days of incubation. A higher ability to degrade nitrates by the bacterium was found to be possible with the presence of nutrients needed for bacterial growth. When the conditions of degrading nitrates are optimized, the biological process can be exploited in bioremediating waste or contaminated waters and in water purification systems for drinking purposes.

Key words: Poly-β-hydroxybutyrate (PHB), Bacillus sp., nitrates, brucine colorimetric method, Laguna Lake water (LLW), bioremediating, water purification system

25. BIOLOGICAL CONTROL OF ENTERICS AND SOME GRAM-NEGATIVE BACTERIA USING Bdellovibrio sp.

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A Bdellovibrio species was isolated using the double-layer technique from a water sample from Pansipit River in San Nicolas, Batangas, and purified through various methods including membrane filtration and Penicillin G series plating. It produces a catalase and an oxidase, reduces nitrates, and lacks fermentative ability of several sugars. Test of bacteriocoric activity using the disk diffusion method shows significant activity against several gram-negative isolates and Escherichia coli. A reduction in turbidity increase was noted in host-Bdellovibrio mixtures. Monitoring of exocellular protease levels using azocasein digestion shows significant proteolytic activity, which may be associated with the process of host lysis. These suggest that the isolate offers a viable alternative in controlling or inhibiting gram-negative bacteria, especially pathogenic species.

Key words: Biological control, enterics, Bdellovibrio, gram-negative bacteria

26. INHIBITORY EFFECT OF SOME PLANT EXTRACTS ON EPSTEIN-BARR VIRUS ACTIVATION: A SCREENING STUDY FOR ANTITUMOR PROMOTERS

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As part of our on-going research program on Philippine medicinal plants, the potential antitumor promoting activity of the ethanol extracts of 12 plants was studied using a short term in vitro assay, the Epstein-Barr Virus - Early Antigen (EBV-EA) activation test. The antitumor promoting activities were evaluated based on their inhibitory effect on the induction of EBV-EA activation promoted by 12-O-tetradecanoylphorbol-13-acetate (TPA) on Raji cells, the EBV genome-carrying human lymphoblastoid cells. The activities of the test extracts were compared with the negative control at 4 different concentrations: 100, 10, 1, and 0.1 µg/ml. Based on the observed inhibitory effects, Coriandrum sativum (kulantro, seeds), Samanea saman (acacia, leaves) and Basella rubra (alugbati, leaves) were found to exhibit strong antitumor activity while Pedilanthus tithymaloides (luha/bird cactus, leaves and stems), and Antidesma bunius (bignay, leaves) showed moderate activity.

Key words: Antitumor promoter, Coriandrum sativum, Samanea saman, Basella rubra, Pedilanthus tithymaloides, Antidesma bunius, Musa sapientum, Ipomoea batatas, Mimosa pudica, Corchorus olitorius

27. THE DETECTION OF CIGUATERIC TYPE OF POISON FROM VISCERA OF SIGANID FISH FROM SAN FERNANDO, LA UNION

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Reports of recent incidences of intoxication due to the ingestion of siganid fish by some fishermen in Lingsat, San Fernando, La Union prompted this investigation to determine the toxin responsible. Prior to these incidents, there had been no report of poisoning when the siganid fish including their viscera were eaten. Since the symptoms of poisoning had indicated a possible ciguateric type, a bioassay procedure for the detection of the ciguatoxin was done. Batches of Siganus sp. were collected between July and October 1997. Polar lipids from homogenized visceral organs of Siganus sp. (common name in Ilocano: “barangan”) were extracted following stepwise partitioning in acetone and diethyl ether, aqueous methanol, and hexane according to recommended procedure by Yasumoto et al. (1983). The extract dissolved in 1% Tween 60 solution and injected intraperitoneally to albino mice caused deaths. Lethality of sample based on the dose-lethality relation of ciguatoxin was 5.0 MU/100g. Because of this result which confirms toxicity of the fish, the public is hereby advised to remove as much as possible the internal organs of the particular fish during food preparation.

Keywords: Siganus, siganid fish, ciguatera, ciguatoxin, ciguateric poisoning, marine toxin, seafood poisoning, ichthyosarcotoxism, mouse bioassay, lipid toxin
28. THE USE OF MULTIPLEX POLYMERASE CHAIN REACTION FOR RAPID DETECTION OF WATER-BORNE DIARRHEAEGENIC BACTERIA

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A multiplex Polymerase Chain Reaction (PCR) assay was developed for rapid detection of diarrhea-causing bacteria. This fast, reliable, and accurate procedure successfully identified Escherichia coli, Salmonella typhi, Shigella dysenteriae, and Vibrio cholerae in a single PCR run using primers highly specific for each pathogen. Additional experiments likewise revealed that these primers could not amplify non-target DNAs. Thirty-five (35) cycles of optimized PCR conditions produced the expected sizes of amplified DNA products visualized under UV in ethidium bromide stained agarose gels (1.5%). This assay may serve not only as a final confirmatory test for presence of bacterial pathogens in water samples but may also be a more rapid detection procedure than conventional microbiological techniques.

Key words: Multiplex PCR, diarrhea, Escherichia coli, Salmonella typhi, Shigella dysenteriae, Vibrio cholerae, primers, detection, DNA profile

29. RANDOM AMPLIFIED POLYMORPHIC DNA MARKERS USED TO CHARACTERIZE THE GIANT CLAM ALGAL SYMBIONT (ZOOXANTHELLAE)

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Many marine organisms, such as giant clams, rely on their photosynthetic symbionts for their nutrition. Studies have shown that these symbionts, commonly called zooxanthellae, are not of one species which may indicate possible differences in efficiency in terms of photosynthesis and ability to transfer photosynthates to their host. Thus, the choice of specific strains of zooxanthellae may greatly affect host performance. Identification and characterization of these zooxanthellae will allow the determination of the promising host-symbiont combination for improved growth and survival of giant clams. Single short oligonucleotide primers of arbitrary sequence are used to PCR-amplify the genomic DNA of zooxanthellae isolated from the different species of giant clams. Possible various strains of zooxanthellae will be classified based on the differences in the band patterns obtained. Mariculture of these slow-growing giant clams could then be improved by applying the derived host-symbiont combination.

Key words: Zooxanthellae, RAPD, giant clam, symbiont PCR, random primers, mariculture
30. SCREENING OF POTENTIAL RAPD MARKERS FOR THE PRAWN, 
Penaeus monodon

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The most economically important cultured shrimp, the black tiger prawn, Penaeus monodon, is successfully cultured for food in many Asian countries. Characterization of genetic variability in prawns is a prerequisite to genetic improvement, i.e. the selection of desired traits or characters such as for mariculture and understanding the dynamics of population structure. Identification of genetic markers which can be used for the evaluation of genetic variation will greatly help this endeavor. One way of determining genetic variation in prawns is through studying its polymorphisms at the DNA-level via Random Amplified Polymorphic DNA (RAPD) analysis. In this study, a total of 50 ten-mer primers were screened, of which 26 yielded amplification products. The potential of these RAPD primers as markers for the characterization of genetic variability in prawns is currently being assessed.

Key words: Penaeus monodon, giant tiger prawn, PCR-RAPD, genetic markers

31. FREQUENCY DISTRIBUTION OF THE 9bp-DELETION IN THE mtDNA CONTROL REGION AND A MALARIA RESISTANCE GENE AMONG FILIPINO POPULATIONS

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The distribution frequencies of certain DNA markers have been associated with human migration patterns and genetic relationships. Two markers associated with Asian populations are the 9bp-deletion of the mtDNA control region and the 27-bp deletion in the erythrocyte band 3 gene associated with resistance to malaria. This study has been undertaken to find out if Filipino ethnolinguistic groups vary in the distribution frequency of these DNA markers. DNA samples taken from unrelated individuals in seven Filipino populations were amplified by PCR using specific primers spanning these regions and the presence of these markers detected by gel electrophoresis. The malaria resistance marker was observed only in 1/46 Surigaonon and 2/50 Cebuanos. The 9-bp deletion was found in all populations in varying frequencies that represent a cline decreasing from North (48%) to South (21.8%) except for one Northern population, the Ibalois (22.85%). Several explanations were forwarded to explain this observation.

Key words: Filipino population, mtDNA deletion, malaria gene
32. GENETIC MAPPING USING RANDOM AMPLIFIED POLYMORPHIC DNA (RAPD) MARKERS IN A Vigna radiata X V. mungo INTERSPECIFIC CROSS

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To further saturate the genetic linkage map of mungbean, random amplified polymorphic DNA (RAPD) analysis in an F2 population of a Vigna radiata var. NCM X V. mungo var. Acc. 25 cross was conducted. DNA isolation and RAPD conditions were standardized for optimum resolution and to ensure reproducibility. The optimized procedure was used to survey for polymorphism between the two parents. Out of the 164 Operon primers tested during screening, 131 well-resolved and strongly amplified putative polymorphic markers were produced. The inheritance and linkage relationships of 19 RAPD markers in the F2 (NCM X Acc. 25) population were determined. Fifty-eight percent of the markers followed the expected dominance ratio of 3:1 and two RAPD linkage groups were formed. These markers will be subsequently anchored in the existing RFLP map of mungbean.

Key words: Mungbean, blackgram, RAPDs, genetic mapping

33. GENETIC LINKAGE AND QUANTITATIVE TRAIT LOCI ANALYSIS IN POTATO II. MOLECULAR MAPPING OF GENES FOR RESISTANCE TO THRIPS

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Among the staple food crops, potato ranks highest in nutritive value and productivity. Its major production constraint in the Philippines lowlands, however, is the severe occurrence of pests including thrips. Breeding for resistant varieties still provides the long term most effective strategy of control. Two Solanum tuberosum X S. berthaultii backcross populations (BCB and BCT) were developed and evaluated for resistance to thrips under greenhouse conditions. Appropriate statistical analysis was carried out and putative quantitative trait loci (QTLs) were located using the RFLP/RAPD map of potato. Interval mapping by MAPMAKER/QTL software was employed and further verified by one-way ANOVA (P≤0.05). One QTL on chromosome 8 in BCB, and one QTL on chromosome 1 in BCT were found to influence resistance. The QTLs accounted for 9-27% of the phenotypic variation observed, with the locus in BCB consistently identified for the resistance traits evaluated. Further multiple regression analysis of the identified QTLs is underway and field screening will be set up to verify the resistance reaction under natural growing conditions.

Key words: Potato, Solanum tuberosum, S. berthaultii, interval mapping, one-way ANOVA, QTLs
34. MOLECULAR MAPPING OF FIBER QUALITY IN COTTON (Gossypium sp.)

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Nine cotton accessions were identified as parents for the improvement of fiber quality traits (length, strength, and fineness). These include three of the currently recommended varieties, UPLC-2, CRDl-1, and CRDl-2 as the recurrent parents, and five outstanding accessions in terms of fiber quality traits, CRDN 174, PR-1, SI-A, SI-SAID, SI-Neris, and SI-J, as donor parents. Random amplified polymorphic DNA (RAPD) analysis was used to identify markers that are polymorphic between the recurrent and donor parents. The DNA extraction and RAPD procedures were initially optimized based on the protocols by Iqbal et al. (1997). Using the optimized conditions, survey for polymorphism was done. The polymorphic markers identified will be subsequently mapped in an F2 population.

Key words: Random amplified polymorphic DNA (RAPD), cotton mapping

35. CLONING AND CHARACTERIZATION OF A MELANIN BIOSYNTHETIC THR1 REDUCTASE GENE ESSENTIAL FOR APPRESSORIAL PENETRATION OF Colletotrichum lagenarium

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Melanin biosynthesis of Colletotrichum lagenarium is essential for appressorial penetration of the host plant. A melanin-deficient mutant 9141 (Thr) has a defect in the conversion of 1,3,8-trihydroxynaphthalene to vermelone in the melanin biosynthetic pathway. The mutant formed nonmelanized appressoria and had little infectivity on cucumber leaves. A cosmid clone pCR1 was selected from a heterologous probe BRM2, one of the clustered genes involved in melanin biosynthesis of Alternaria alternata, pCR1 transformed the Thr mutant 9141 to wild type phenotype. A DNA fragment (THR1) homologous to BRM2 was subcloned from pCR1 and the nucleotide sequence determined. THR1 contains one open reading frame that encodes a protein of 282 amino acids. A transformant resulting from gene disruption showed a light brown phenotype different from the dark brown phenotype of the wild type 104-T. The transformant formed nonmelanized appressoria and had little infectivity. The THR1 amino acid sequence contains a region highly similar to the Ver1 gene involved in the conversion of versicolorin A to sterigmatocystin in aflatoxin biosynthesis by Aspergillus parasiticus and to the T₄HN reductase gene involved in the conversion of 1,3,6,8-

tetrahydroxynapthalene to scytalone and 1,3,8-trihydroxynapthalene to vermelone in melanin biosynthesis by *Magnaporthe grisea*. Expression of the *THR1* gene during spore germination of *C. lagenarium* was detected by RNA blotting. We propose that the *C. lagenarium* *THR1* gene encodes a reductase involved in the conversion of 1,3,8-trihydroxynapthalene to vermelone.

Key words: Reductase gene, cloning, *Colletotrichum lagenarium*, fungal transformation, gene disruption, melanin biosynthesis, appressorial penetration, cucumber, sequencing, melanin-deficient mutant

36. GENETIC LINKAGE AND QUANTITATIVE TRAIT LOCI ANALYSIS IN POTATO

III. EVALUATION AND MAPPING OF GLANDULAR TRICHOMES UNDER THE PHILIPPINE LOWLAND and HIGHLAND CONDITIONS

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The resistance reaction conferred by *Solanum berthaultii* to a wide range of insects was associated with the presence of glandular trichomes (GT). Quantitative trait loci (QTLs) have already been analyzed for this valuable character under temperate conditions using the *S. tuberosum* × *S. berthaultii* backcross populations (BCB and BCT). In the Philippines, these populations have been further verified for resistance against thrips. To determine if this new-found resistance is also GT-based, trichome expression and QTLs were evaluated under the Philippine lowland (IPB-UPLB, Laguna) and highland (NPRCRTC-BSU, La Trinidad, Benguet) conditions. In both elevations, trichome types A and B expression in BCB and trichome A in BCT were confirmed. Proper statistical analysis was carried out and the RAPD/RFLP map of potato was used to validate the QTLs. MAPMAKER/QTL and one-way ANOVA were employed. The same interval on chromosomes 5 and 2 was verified for trichome B density in BCB, while on the same chromosome different intervals were identified for trichome A. A putative QTL, which was not previously mapped, was further located in chromosome 2 in BCB along the interval of TG 276 and TG 306 markers. Further multiple regression analysis and correlation with QTLs for thrips resistance is underway.

Key words: Potato, *Solanum tuberosum*, *S. berthaultii*, glandular trichomes, interval mapping, one-way ANOVA, QTLs

37. MORPHOLOGICAL AND MOLECULAR CHARACTERIZATION OF TALL AND DWARF POPULATIONS OF COCONUT, *Cocos nucifera*

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Selected tall and dwarf varieties of coconut collected from the Institute of Plant Breeding - Fiber and Industrial Crops Division, Philippine Coconut Authority (PCA) - Zamboanga Research Center, and PCA - Davao Research Center were characterized for horticultural and morphological traits. genomic DNA extraction, random amplified polymorphic DNA (RAPD), and microsatellite (SSRs) conditions were optimized. Preliminary putative molecular markers were generated and are currently being correlated with the agro-morphological characterizations. Informative markers will be used to construct a molecular linkage map of coconut and to tag morpho-agronomic traits of interest. Ultimately, tightly linked markers will be identified and designed/converted into easily scorable PCR-based markers for use in marker-assisted (MAS) breeding in coconut.

Key words: Coconut, Cocos nucifera, RAPD, DNA marker, genome map, MAS

38. GENETIC ENGINEERING FOR RICE IMPROVEMENT AT PHILRICE

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The increasing population rate and shrinking area devoted to rice production in the Philippines pose a big challenge to plant breeders. Genetic engineering at PhilRice is being conducted to support the existing strategies to increase the yield potential of rice such as the improvement of pest resistance in the high-yielding varieties, in the new plant type elite lines, and in the cytoplasmic male sterile lines used in hybrid rice breeding. A P3 laboratory and CL2 screenhouse established at PhilRice following the National Committee on Biosafety of the Philippines was constructed. Gene introgression into selected varieties and lines is being conducted through the use of the natural vector Agrobacterium tumefaciens. Preliminary results of the tissue culture experiments on the determination of the most suitable explant, selection procedure, tissue culture media for transformation; evaluation of the use of different binary vectors in transforming rice; and transformation strategies will be presented.

Key words: Genetic engineering, rice, crop improvement, binary vectors, Agrobacterium tumefaciens, plasmids, selection, transformation, natural vector

39. MOLECULAR MARKER-AIDED DEVELOPMENT OF RICE VARIETIES FOR DIRECT-SEEDING

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Seedling vigor (SV) is important under direct-seeded rice culture. Quantitative trait loci (QTLs) for SV-related traits have been mapped to different rice chromosomes in both indica and japonica rice. Molecular markers flanking these QTLs could be useful as diagnostic probes for introgressing and/or pyramiding favorable SV alleles. Forty-nine promising cultivars for breeding direct-seeded varieties at 37 RAPD loci flanking 11 SV QTLs were assayed and their respective genotypes compared with: (a) that of Italica Livorno (IL), a cultivar used to map SV QTLs in japonica rice, (b) among themselves, and (c) actual SV performance based on slantboard tests. Relatively little genetic similarity
was observed between IL and the cultivars assayed suggesting the presence of other SV QTLs in the rice genome. This was supported by results from cluster analysis using 67 randomly selected RAPD markers that revealed a different pattern compared with groupings based on RAPDs flanking SV QTLs. Slantboard tests identified consistently superior varieties for the four SV traits measured - length of shoots, roots, mesocotyl, and coleoptile - and other high-SV donors, in addition to those already known (IL and Black Gora) were identified. Crosses between alternative genetic donors for SV to develop new populations that would segregate for the maximum number of high-SV alleles could facilitate the development of superior direct-seeded rice varieties.

Key words: Seedling vigor, QTL, molecular maker, RAPDs, rice

40. CHROMOSOMAL SEGMENT WITH MAJOR AND MINOR GENES FOR BLAST RESISTANCE IDENTIFIED USING DNA MARKERS

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The combination of major and minor genes has been associated to durability of resistance. Two durably resistant varieties of rice Oryza sativa L., ‘Lemont’ and ‘Teqing’ have four major genes tagged using DNA markers. The recombinant inbred population of these varieties was evaluated at the blast nursery to identify minor genes and their association with major genes mapped in this population. Data on area under disease progress curve (AUDPC), percent diseased leaf area (%DLA), and Standard Evaluation System for blast (SES rating), analyzed both at interval mapping and single marker analysis of 167 molecular markers revealed 13 putative quantitative trait loci (QTLs) for blast resistance distributed in nine chromosomes. Three of the QTLs were associated with major genes tagged in this population, five were near the reported QTLs and/or major genes, and five were apparently new QTLs for blast resistance. QTLs mapped at or near the major genes were identified consistently at the seedling stage and had good resistance compared with those mapped to the regions not associated with major genes. These suggest the importance of both major and minor genes in breeding for durable resistance to blast. Molecular markers will be useful in identifying these lines that are generally difficult to identify during classical selection for disease resistance.

Key words: Resistance gene, rice blast, molecular markers, mapping, disease resistance, major gene, minor gene, Oryza sativa

41. INHERITANCE OF TUNGRO RESISTANCE GENES FROM TWO TUNGRO-RESISTANT DONOR RICE VARIETIES

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The inheritance of RTSV resistance from two donor varieties - Utri Merah and Utri Rajapan - was studied using 111 and 131 F3 families derived from the crosses TN1 x Utri Merah and TN1 x Utri Rajapan, respectively. One-week old seedlings were inoculated using 5 RTBV+RTSV-viruliferous *Nephotettix virescens* (GLH) per seedling. Visual tungro incidence scores and ELISA were made 30 days after inoculation. Three inoculation trials were conducted for each family to determine the infection to RTBV and RTSV. Visual tungro incidence scores and the ELISA results for RTSV and RTBV were not correlated. Some lines of both crosses were observed to have high infection of RTBV but low disease incidence indicating tolerance to RTBV. Frequency distribution of percentage infection to RTBV among F3 families for both crosses indicates that recessive genes control RTBV resistance from both donor varieties. Frequency histograms of percentage infection to RTBV among F3 families from both crosses also indicate bi-modal distribution of resistant and susceptible lines and support the hypothesis that one recessive gene and two recessive genes control RTBV resistance in Utri Rajapan and Utri Merah, respectively. The information gained in this study will be very useful in the systematic transfer of these resistance genes into elite rice cultivars and in molecular mapping.

Key words: Rice, tungro, Utri Merah, Utri Rajapan, genetics, resistance, ELISA, GLH, RTBV, Oryza

42. NUCLEAR AND ORGANELLAR DNA APPLICATION IN Oryza TAXONOMY AND PHYLOGENY

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Conventional taxonomy and phylogeny of germplasm are based on the tedious characterization of morphological variation. The ability to assay DNA variation that underlies morphological variation offers great promise as a convenient alternative for the genetic characterization of germplasm. Restriction fragment length polymorphism (RFLP) was used to survey DNA variation in 22 species of the genus *Oryza*. At the ribosomal DNA (rDNA) multigene family, 15 rDNA spacer length (s/) variants were identified using restriction enzyme Sst1 and wheat rDNA unit as probe. Particular s/ variants predominated in certain isozyme groups of *O. saliva*, indicating a potential of s/ polymorphism in varietal classification. The distribution of s/ variants supports the origin of *O. sativa* and *O. nivara* from *O. rufipogon*, and that *O. spontanea* arose from introgressions among *O. sativa*, *O. nivara*, and *O. rufipogon*. The distribution also suggests that the CC genome, of all the genomes in the *Officinalis* complex, may be the closest to the *Sativa* complex genomes, and it affirms the genetic position of the *Officinalis* complex intermediate between the *Sativa* and *Ridleyi* complexes. Variation at the *Oryza* organelle genomes was probed with a maize mitochondrial gene, atpA, a wheat chloroplast inverted repeat segment, p6. Results indicated that the complexes can be differentiated by their mitochondrial genome, but not their chloroplast genome when digested by Sst1 or BamH1. Therefore, the natural DNA variation in the nuclear and mitochondrial genomes has demonstrated great potential in complementing the conventional basis of taxa classification and phylogeny in the genus *Oryza*.

Key words: *Oryza sativa*, *O. nivara*, *O. rufipogon*, *O. spontanea*, *O.officinalis*, RFLP, ribosomal DNA, *Ridleyi*, maize atpA
43. INDUCTION OF SALT TOLERANCE IN RICE BY SILICA TREATMENT

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The objective of the study was to investigate the possibility of inducing salt tolerance in rice by silica treatment. A total of ten varieties namely, salt-tolerant Kala Rata 1-24, Hsieh-Tso 12, Bhura Rata, SEW 273-5-13, IR4595-4-1-13, Joalbanga, and salt-susceptible Karti Gotak, Mangasa, Jyothi, and IR28 were used. The 50 ppm Na₂SiO₃ treatment started at transplanting time and lasted until the 14th d of salt treatment. The 50 mM NaCl treatment started 40 days after sowing (DAS). The dry weight increase, amount of Na⁺ and Cl⁻ in the different plant parts, transpiration stream concentration factor (TSCF) of Na⁺, and changes in the cell wall constituents were observed.

Si treatment changed the plant dry weight at 40 DAS of K. Gotak and Mangasa. Based on the dry weight increase, Si treated plants performed better than with no Si treatment after 14 d in 50mM NaCl. Si treated plants have lower amount of Na⁺ and Cl⁻ in the different plant parts, especially the leaf blades, except for the Na content of SEW and Joalbanga. Si treatment also improved the TSCFNa⁺ which implies improvement of the membrane selectivity for Na⁺. The modification in the cell wall constituents by Si treatment before the imposition of salt stress may have contributed to lower TSCFNa⁺ which reduced Na⁺ accumulation and consequently improved the dry weight increase of plants.

Key words: Adaptation, cell wall constituents, rice, salt tolerance, varietal differences

44. POTENTIAL METHODS FOR RAPID ASSAY OF LIPoxyGENASE

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Potential methods for the rapid assay of sweet corn lipoxygenase (LPO) were evaluated and compared. Both model system and homogenate system studies were carried out. Partially purified LPO had maximum activity at pH 6.0 and 2.0 mM linoleic acid. Methylene blue bleaching (MBB), carotene bleaching (CB), and potassium iodide-starch (KI-S) methods were evaluated both spectrophotometrically and visually. Both the MBB and KI-S methods worked well for the model system. The three methods were then evaluated for vegetable homogenate systems. The vegetables studied were sweet corn and green beans. The MBB method indicated positive results for both sweet corn and green beans whereas the CB method did not work for either vegetable. On the other hand, the KI-S method worked very well for green beans but not for sweet corn, due to the presence of carotenoid compounds which are oxidized preferentially. MBB method is suitable for both carotenoid-containing and non-carotenoid-containing vegetables. It is also more sensitive than the KI-S method. The use of this rapid assay is recommended for determination of LPO activity in sweet corn.

Key words: Lipoxygenase, rapid assay, methylene blue bleaching, carotene bleaching, potassium iodide-starch, corn, green beans, spectrophotometry, model system, homogenate system
45. GENERATION OF PHOTOPERIOD-INSENSITIVE VARIANTS FROM PHOTOPERIOD-SENSITIVE RICE VARIETY WAGWAG THROUGH ANther CULTURE

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Anther culture is basically utilized in crop breeding as a tool for rapid generation of breeding lines. However, as with other in vitro culture technologies, anther culture may result in the generation of variants that may have useful agronomic traits, or that may serve as source of genetic variation. In this study, plants were generated and cultured from anthers of rice, cv. Wagwag. The Wagwag variety, which was used as anther source, flowers and produces grains only during the wet season, but not in the dry season planting. From a total of 96 Wagwag lines generated via anther culture, 16 individual plants were identified, which flower and produce grains during both dry and wet season planting. These putative variants were screened for salt tolerance, and evaluated for their morpho-agronomical traits.

Key words: Photoperiod sensitive, putative variants, anther culture, Wagwag variety, salt tolerance, morpho-agronomical trait

46. DISCRIMINATING THE QUALITY OF PHILIPPINE RICE VARIETIES WITH THE NEW TENSIPRESSER

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The objective to breed intermediate-amylose (AC) rices in the Philippines has resulted in the commercial release of rice varieties with narrow range of starch properties. Conventional physicochemical tests can hardly differentiate among these rices and yet their eating qualities still differ based on sensory evaluation. Alternative objective techniques for grain quality evaluation are necessary. The applicability of the New-Tensipresser in evaluating the quality of Philippines rice varieties was looked into. Three modes of measurements were tried, namely: low compression (LC), high compression (HC), and continuous compression (CC) tests. In the LC test, a wider range of difference was evident for the cooked rice texture data of low-AC and intermediate-AC rices compared to the glutinous and high-AC samples. This suggests that low-AC and intermediate-AC rices can be discriminated well using the LC mode. The data for HC tests varied appreciably for all amylose classes. For the CC test, a wider range of difference was noted on the toughness data among and within amylose classes. Likewise, glutinous and low-AC samples varied noticeably in tenderness value; high-AC and intermediate-AC samples did not. The texture data obtained with the apparatus highly correlated with apparent amylose content, iodine blue value, and sensory evaluation scores. The results indicate the good potential of the New-Tensipresser as a tool for routine assessment of rice grain quality in the Philippines. It can differentiate cooked rice texture of cultivars with wide to narrow range of starch properties, gives quick results, and requires a small sample size.

Key words: Rice, tensipresser, cooked rice texture, grain quality, amylose, starch, sensory evaluation, compression test, tenderness, toughness
47. EFFECT OF GAMMA IRRADIATION ON MILLED RICE QUALITY

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Gamma irradiation as a technique for preserving cereal grains and other foodstuff is now gaining prominence. It has been proven to reduce post-harvest losses from insect infestation and microbial action. To validate its effects on storage, physicochemical, cooking, and sensory qualities of milled rice, this study was then conducted. Batches of milled rice stored in three different packaging materials (polypropylene sack, polyethylene bag, and polypropylene sack lined with polyethylene bag) were irradiated with 0, 0.5, and 1.0 kilogram of Co60. Treated samples were stored at room temperature and their grain qualities were evaluated monthly for a period of nine months. Irradiation decreased grain whiteness, gel consistency, water uptake ratio during cooking, and sensory ratings. It increased iodine blue value and percent soluble solids. The magnitude of change was influenced by the dose of irradiation. The effect was more apparent with 1.0 kGy dose. Differences in sensory quality between irradiated and non-irradiated samples became less evident with time. Irradiated rice stored in a polypropylene sack lined with a polyethylene bag was more organoleptically acceptable than those packed in polypropylene sacks and polyethylene bags.

Key words: Irradiation, preservation, grain quality, cereals, storage, water uptake ratio, gel consistency, soluble solids, iodine blue value, sensory quality

48. IN VITRO RESPONSE OF IMMATURE RICE INFLORESCENCE TO PHENYLACETIC ACID

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Genotype, plant growth regulator, explant type, and culture conditions are some parameters that can be exploited to optimize in vitro of crops, such as rice. In this study, the response of two varieties of indica rice, IR64 and PSBRc 46, cultured in vitro, to phenylacetic acid (PAA) at 10 and 40 mg/L, as compared with 2,4-dichlorophenoxyacetic acid (2,4-D) at 2 mg/L culture medium was evaluated. Spikelets from two sizes, 1 and 2 cm long, of immature inflorescence were used as explants. Separate sets of cultures were maintained in the dark and under light conditions. Morphological and developmental responses, such as explant growth, callus formation, callus differentiation, and plant regeneration, as affected by different culture parameters will be presented.

Key words: Rice, immature inflorescence, in vitro, phenylacetic acid, 2,4-dichlorophenoxyacetic acid
49. ENHANCING PLANT REGENERATION FROM ANther CULTURE-Derived CALLUS OF INDICA RICE BY DESICCATION

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Green plant regeneration is a limiting factor for efficient utilization of anther culture in rice breeding, especially for indica rice. In this study, the effect of simple desiccation on the enhancement of plant regeneration from anther culture-derived calli of three (one inbred and two F1 crosses) indica rice genotypes was investigated. Cali were air-dried for 24 h and 48 h resulting in approximately 11% and 16% water loss from the tissues, respectively. Desiccation for 24 h enhanced callus differentiation, as manifested by callus greening or presence of green specks on the tissue, in all genotypes, while with 48 h desiccation treatment, only two genotypes exhibited improved differentiation. Desiccation for 24 h enhanced more shoot elongation from differentiated calli in the inbred PSBRc 1 compared with 48 h desiccation. While with F1 cross, PRI A x IR 64, higher frequency of shoot elongation from differentiated calli was obtained with 48 h desiccation. Desiccation decreased frequency of rhizogenesis (unipolar germination). No reduction in the frequency of albinism was obtained with desiccation. However, desiccation markedly reduced the incidence of callus necrosis.

Key words: Anther culture, rice breeding, indica rice, desiccation, water loss, plant regeneration, callus differentiation, rhizogenesis, albinism, necrosis

50. MULTIPLE SHOOT DIFFERENTIATION FROM EXCISED SHOOT TIPS AND NODAL SECTIONS OF CORN (Zea mays L.)

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In vitro techniques have been developed to regenerate clumps of multiple shoots at high frequency from excised shoot tips and nodal sections of in vitro germinated seedlings of corn (Zea mays L). Each shoot tip produced about 7 shoots after 4 weeks of culture on MS medium supplemented with 2 mg/L BAP, 500 mg/L casein hydrolysate, and 20 g/L sucrose. Clumps of very small shoots were also produced from the nodal sections. Shoots developed into plantlets and formed roots when transferred onto MS medium supplemented with 1 mg/L IBA. Shoot tip cultures of 9 inbred lines (8 yellow com and 1 white corn) formed multiple shoots, with frequency ranging from 5 to 100%. Inbred line P22 gave the best multiple shoot response. This technique of axillary/adventitious shoot differentiation offers an efficient and high frequency regeneration system suitable for corn genetic transformation work.

Key words: Zea mays, multiple shoot clumps, axillary/adventitious shoot, organogenesis, regeneration
51. CALLUS INDUCTION IN *Ipomoea muricata* JACQ. 
(CONVOLVULACEAE) HYPOCOTYL AND LEAF EXPLANTS

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Recent studies employed the technique of tissue culture to produce secondary metabolites from plant sources. Initially, calli are formed from plant parts, grown in artificial medium and later, tested for the presence of bioactive compounds. Callus was induced from *Ipomoea muricata* Jacq. (Convolvulaceae), a medicinal plant active against various types of skin ailments. Hypocotyl and leaf explants were cultured on agar-solidified Murashige and Skoog (MS) medium supplemented with 3% (w/v) sucrose and various combination of auxins [α-naphthalene acetic acid (NAA), indole-3-acetic acid (IAA), 2,4-dichlorophenoxyacetic acid (2,4-D)], and cytokinins [benzylaminopurine (BAP), kinetin (K), adenine hemisulfate (AH)]. Cultures were incubated in the dark for 2-4 weeks at 28-30°C. Whitish to pale yellow calli were observed on both explants with 0.1, 0.5, 1.0 mg/LNAA with BAP and in 2,4-D with AH in factorial combinations. When grown on MS medium with 0.1, 0.5, 1.0 mg/LIAA and 0.1, 0.5, 1.0 mg/LK in factorial combinations, callus was induced on the explants in all treatments. When tested for the presence of secondary metabolites, particularly alkaloids, the callus derived from hypocotyl and the hypocotyl explant gave a negative result on the Culvenor-Fitzgerald test. The leaf explant gave a positive result on the test.

Key words: Callus, callus induction, tissue culture, *Ipomoea muricata*, Convolvulaceae, secondary metabolites, alkaloids

52. VEGETATIVE PROPAGATION OF *Paraserianthes falcataria* 
THROUGH TISSUE CULTURE

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The vegetative propagation of *Paraserianthes falcataria* through tissue culture was developed. Tissue culture protocol was developed from trials conducted to determine the appropriate sterilization technique of the tissues and the medium and incubation conditions appropriate for multiple shoot induction and for regeneration of plantlets by rooting these shoots. The best source of tissues for culture was also determined from the comparative response of tissues collected from trees (mature tissues) and developing seedlings (juvenile tissues) to the culture media tested. Results of experiments of *P. falcataria* showed that plantlets can be produced from both juvenile and mature tissues cultured aseptically under laboratory conditions of 18 h light and temperature range of 24-29°C. More plantlets can be produced from juvenile nodal sections. These juvenile sections are best collected from aseptically germinated seeds of this species sterilized by 3-minute dipping in 2% sodium hypochlorite. Multiple shoot induction of cultured
tissues was best in modified MS medium with 5 ppm BAP and 0.5 ppm IAA (M8). Rooting of excised shoots was observed in same MS medium but with 2 ppm IBA (M20).

Initial results of experiments using mature tissues, on the other hand, showed that nodal sections collected from genetically superior mature trees can regenerate into individual plantlets if cultured in modified MS with 5 ppm kinetin and 0.5 ppm IBA (M28). The best sterilization procedure for these tissues was treatment with 1% Benlate followed by immersion in 2% calcium hypochlorite for 15 minutes.

Key words: Species, *Paraserianthes falcataria*, tissue culture protocol, 5 ppm BAP, MS, 0.5 ppm IAA

53. IDENTIFICATION OF RAMBUTAN *Nephelium lappaceum* Linn. VARIETY MAHARLIKA USING PEROXIDASE ISOZYME

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Isozyme analysis of rambutan was conducted in view of the use of isozymes to identify rambutan (*Nephelium lappaceum* Linn.) varieties. Starch gel electrophoresis was done using young leaf samples of eight different varieties, three extraction buffers, two gel buffer systems, and ten enzyme systems. From the ten enzyme systems tested, only peroxidase showed polymorphism. Using the banding pattern of this enzyme, Maharlika may be differentiated from other rambutan varieties.

Key words: Rambutan, isozymes, peroxidase

54. PHENOLIC COMPOUNDS IN MATURING COCONUT, *Cocos nucifera* L., ENDSPERM

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Polyphenols in the liquid and solid endosperms of coconut at three stages of maturity were determined quantitatively by three methods: total phenols, acidified vanillin, and protein precipitable, and qualitatively by thin layer chromatography (TLC). Total phenols (4.01-1.00 mg catechin/g dry sample or catechin equivalents, CE), flavan-type phenolics (0.40-0.06 CE), and protein precipitable polyphenols (2.64-0.64 mg tannic acid/g dry sample or tannic acid equivalents, TAE) decreased during maturation. The values obtained at three stages of coconut liquid endosperm were similar with one another and lower than those of the solid endosperm. TLC showed that the bands observed in the solid coconut endosperm decreased in number as the fruit matures. The phenolic compound which was consistently present in all the stages is probably gentisic acid. For the liquid endosperm, the number of bands was relatively similar in all the three stages. The bands present at all stages of maturation were probably umbelliferone, syringic acid, and p-coumaric acid. Further analysis will be done to confirm the identities of these bands.

Key words: Phenolics, coconut, total phenols, flavan-type phenolics, protein precipitable polyphenols
55. UTILIZATION OF FERMENTED CACAO DRIPPINGS AS COAGULANT OF RUBBER LATEX

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Cacao drippings is a first-class organic acid which is usually turned to waste by cacao farmers. It can be utilized as coagulant of rubber latex, a substitute for glacial acetic acid - a commercial coagulant widely used by rubber farmers.

Cacao drippings, when collected and fermented for 15-60 days and applied as coagulant at 10 ml per liter of rubber latex, could coagulate the latex from 2.43 to 2.80 hours and produce quality Air-Dried Sheets (ADS).

Moreover, the longer the fermentation period, the shorter time of coagulation, clearer serum, whiter coagulum, and better quality of Air-Dried Sheets produced.

In utilizing cacao drippings as rubber latex coagulant, farm costs decrease in terms of cost of coagulant, the income of cacao and rubber farmers increases, and the farmers' resourcefulness in utilizing other farm resources/ by-products is developed.

56. UTILIZATION OF RICE (Oryza sativa L.) BRAN AS SUBSTRATE FOR VINEGAR PRODUCTION

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The possibility of rice bran as substrate for vinegar production was studied. Microorganisms were screened for high saccharification and ethanol fermentation efficiencies. Optimum conditions for substrate pre-treatment, and ethanol and acetic acid fermentations were established. Screening studies showed that Aspergillus niger produced the highest amount of glucose. For Saccharomyces species, no significant differences in yields were obtained. The optimum amounts of water and crude amylase needed to saccharify the substrate were 60% and 30%, respectively. The highest acetic acid production (2.17%) was obtained with 20% vinegar starter. Changes in chemical and microbial load were monitored for 15 days in a fermentation mixture supplied with the optimum parameters established in the previous experiments. The sugar and acetic acid production increased up to 11.4° Brix and 3.20%, respectively, on the 15th day of fermentation, while ethanol content was 1.5% on the ninth day. The microbial load decreased with length of the fermentation period. The vinegar was evaluated as moderately dark, moderately cloudy, and with slightly typical vinegar odor. From the results obtained, it can be concluded that production of vinegar from rice bran is feasible.

Key words: Rice bran, vinegar, substrate, saccharification, fermentation, Aspergillus, Saccharomyces, ethanol, acetic acid, amylase
57. IMPACT OF CONTINUED PROFENOFOS USE ON SOIL AS A CONSEQUENCE OF COTTON CROP PROTECTION

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The effects of profenofos in a cotton field were determined. The microbial biomass was not affected two days after application of profenofos. It was stimulating on the dehydrogenase activity at the upper layer of the soil between 0-15 cm. There was no inhibitory effect on nitrification of soil indigenous nitrogen. This result was directly correlated to the rapid degradation of profenofos two days after spraying of the cotton fields with half life of 2.28 days. Profenofos moves downward the soil column at the rate of 60 cm layer in 60 days.

2,4-D herbicide used in cotton field was quite persistent. A great portion of the applied 14C-2, 4D (40-50%) was bound on sterile soil while only 13-17% was bound on unsterile soil. Only 0.22-0.26% of the applied 14C-2,4-D volatilized while 0.59, 0.74, and 1.3% underwent mineralization in acidic, neutral, and basic soil, respectively.

58. PREDICTING PEAK RATES OF RUNOFF AND SOIL LOSS FROM A WATERSHED

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Concern for maintaining the long-term productivity of agricultural land focuses attention on erosion and soil degradation in the upper watershed areas. Soil loss from an area is loss of productivity and water-borne sediments tend to accumulate downstream causing siltation. Simple alternative methods of estimating flow and soil loss are essential to fully capture the value of control measures and evaluate the on-site and off-site impact of soil erosion.

This study attempted to determine the dominant factors affecting runoff and soil loss from an 86-hectare watershed in Bukidnon, Philippines. With an entire watershed as the unit of field observations, individual storm was taken as the unit of analysis as few intense rainfall events could have the greatest contribution in the annual soil loss in the humid tropics. A stepwise multiple regression analysis was used to find the predictive models for peak rates of runoff and soil loss considering the characteristics of individual rainfall events, runoff characteristics, farming activities, crop and soil cover conditions during the runoff events.

At the watershed level, the peak runoff rate at the range greater than 100 liters per second was found to be dependent on the amount of the runoff-producing rainfall. The peak sediment load was highly influenced by the average intensity of the runoff-producing rainfall and to a lesser degree by peak runoff. Peak runoff adequately predicted the peak rate of watershed soil loss and the total soil loss caused by a particular rainfall event. Analysis also showed a low correlation coefficient of about 0.4 between rainfall intensity and duration, intensity and rainfall amount, and duration and rainfall amount.

The methodology and the results offer a possible alternative to the rational formula in predicting peak runoff. A simple empirical equation estimating soil loss from a watershed was derived to address the limitations of the plot-level approach. There is a need to try the approach and check the trend of results in other watersheds to determine the possible effects and interactions of other factors like slope, soil type, crop cover, cultural practices, rainfall characteristics on soil loss at the watershed level.

Key words: Runoff, soil loss, watershed, individual storm
59. WEED MANAGEMENT IN COTTON UNDER MINIMUM TILLAGE

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Conservation of soil moisture and timeliness of planting are some of the constraints in cotton production. These problems usually arise when cotton is planted after rice. In such cases, the minimum tillage of establishing cotton is recommended. However, weed infestation becomes a problem. At present, initial weed control is practiced by handweeding. Despite this, weed infestation still occurs. Identification of the most compatible combination of two economical and effective weed control strategies is needed. Hence, an evaluation of different weed control measures was done at the Central Experiment Station of the Cotton Research and Development Institute in Batac, Ilocos Norte. The following approaches were evaluated: (a) handweeding before planting and at 25 days after planting (DAP); (b) glyphosate application (2 kg a.i./ha) before planting followed by handweeding at 25 DAP; (c) glyphosate application before planting followed by fluazifop butyl application (0.25 kg a.i./ha) at 25 DAP; and (d) handweeding before planting followed by fluazifop butyl application at 25 DAP. The application of glyphosate before planting cotton followed by either fluazifop butyl application or handweeding at 25 DAP resulted in excellent weed control. The former is recommended in areas where grasses are predominant whereas the latter is applicable when broadleaved plants are the problem weeds. Significant increases in seedcotton yield, gross income, net cash return, and return on investment were realized.

Key words: Weed management, minimum tillage, glyphosate, fluazifop butyl, seedcotton yield

60. ECONOMIC EFFICIENCY ANALYSIS OF THE BARANGAY INTEGRATED PEST MANAGEMENT ON RICE IN NUEVA ECIJA, PHILIPPINES

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Most researches on the economic superiority of the Integrated Pest Management (IPM) technology over that of the farmers' traditional practice of extensive pesticide use have concentrated on analyses of productivity and profitability advantages. Very few, if any, have evaluated the economic efficiency impact of IPM on rice production. A farm-level data set was used to compare the economic benefits and efficiency of IPM and the farmers' conventional practice. The study showed that IPM, as practiced on the farm level, was "an insecticide-reducing technology". Mean yields in all seasons of the two pest management strategies were significantly different but were not significant during the dry season. This was due to the significant impact of IPM on minimizing yield loss from pest damage during the wet season. The IPM strategy consistently generated higher net incomes across seasons than the farmers' traditional practice strategy. Using both Ordinary Least Squares (OLS) and Maximum Likelihood Estimation (MLE) methods, unit profit was found to be significantly affected by the price of rice, fertilizer, pre-harvest labor, type of pest control strategy adopted, and cropping seasons. Variations in actual profit from attainable frontier (maximum) profit mainly arose from differences in farmers' practices rather than on random variability. Regardless of cropping season, the IPM-trained farmers were more economically efficient than the conventional farmers in rice production. Across seasons,
conventional farmers consistently incurred larger profit loss, both in per kilogram and per hectare bases, than the IPM-trained farmers. It was observed that tenure status, participation in IPM training, and cropping season had significant impact on farmers' profit efficiency. Government efforts aimed at improving farmers' profit efficiency (as implied by the results of the study) should, therefore, be focused on encouraging massive IPM adoption on the community level, successful agrarian reform program, maintaining a relatively higher output price (in harmony with the objective function of the society, such as economic efficiency and competitiveness), and sustained public investment on agricultural extension services, particularly on IPM-related training programs. The study suggests that IPM is a promising substitute for the farmers' common pest control strategy, promotes sound agricultural pest management, increases farm profitability and efficiency, and definitely brings favorable impacts on the environment and health of both the farmers and consumers.

Key words: Economic efficiency, profit efficiency, frontier function, profit loss, IPM, pesticide, pest control, training, environment, health

61. CABBAGE INSECT FAUNA IN THE MOUNTAIN PROVINCE AND ILOCOS SUR

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Mountain Province and Sta. Catalina, Ilocos Sur are two of the major cabbage growing areas in Central Luzon. The former has started using natural enemies against the diamondback moth. The latter, on the other hand, is still dependent on pesticides.

To understand better the interaction of cabbage pest and associated arthropods a survey of cabbage insect fauna was conducted in the above sites using sweep net. Field surveys were conducted from July 1996 to June 1997. A total of 261 arthropods were collected from the Mountain Province while 515 arthropods were collected from Ilocos Sur. The analysis of distribution of the arthropods were done according to orders and families. Cabbage leafminer, Liriomyza spp. and cabbage root maggot, Delia radica L. were found in Mountain Province only. It is likewise significant to note that the cabbage root maggot is a new exotic pest recorded for the first time in the Philippines. This pest is usually found in America, Africa, and Europe. The other insect fauna are discussed in relation to cabbage pest in the abovementioned sites.

Key words: Mountain Province, Ilocos Sur, survey, cabbage, arthropods, cabbage root maggot, cabbage leafminer, exotic pest, insect fauna
62. CABBAGE ROOT MAGGOT, *Delia radica* Linnaeus (Anthomyiidae): A NEW PEST OF CABBAGE IN THE PHILIPPINES

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An anthomyiid root maggot, *Delia radica* Linnaeus (=*Hylemya brassicae* Bouche) was observed attacking cabbage in the highlands of Benguet. Its feeding behavior, degree of damage to the crop and host range as well as its distinguishing characters are discussed.

This anthomyiid root maggot is a new exotic pest of cabbage in the Philippines. It is usually found in Africa, Europe, and the Americas. The pest may have gained entry through the ingress of imported cabbage consumed by the Americans.

Key words: Cabbage root maggot, exotic pest, new pest, *Delia radica*, Anthomyiidae, Benguet

63. LIFE HISTORY AND DAMAGE ASSESSMENT OF BEAN LEAF FOLDER *Lamprosema indicata* Fab (PYRALIDAE, LEIPODPTERA) ON MUNGBEAN

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The life history, consumption rate of *Lamprosema indicata* and its effect on yield at different larval densities, growth stage of mungo, and planting method were studied. Eggs hatched in four days. The larvae passed through five instars in 11-15 days. The pupal period is 7.58 days while adult longevity is 5.28 days. Total consumption from first to fifth was 0.77, 2.44, 4.61, 17.44, and 74.74% of the total consumption. In furrow-planted mungbean, different growth stages show differing reactions to leaf folder damage with the maximum vegetative stage (30 DAS) being the most sensitive. A similar reaction was not observed in broadcast mungbean.

Key words: Life history, damage assessment, bean leaf folder, *Lamprosema indicata*, mungbean, consumption rate, larval unit, larval unit equivalent
64. COMPARATIVE TOXICITY OF INSECTICIDAL CRYSTAL PROTEIN PRODUCTS OF CRY GENES CLONED FROM LOCAL BACILLUS THURINGIENSIS BERL. ISOLATES AGAINST LEPIDOTEROUS AND COLEOPTEROUS PESTS

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The expression of cloned Cry IA (a), Cry IA(b), Cry IA(c) and Cry IB proteins fused with maltose-binding protein (MBP) in Escherichia coli DH5-a was verified. Purification of the fusion proteins was carried out in amylose resin affinity chromatography columns. Cleavage with 0.1% factor Xa and 0.1% trypsin yielded a 70 and a 65 kDa protein, respectively. Toxicity assays of recombinant E. coli cells and MBP-Cry proteins against neonate larvae of Asiatic cornborer, Ostrinia fumacalis (Guenee) and diamondback moth, Plutella xylostella (L.) showed significant effects of all Cry types and combinations (1:1 and 1:1:1 w/w) on the mortality after 72 h of exposure. Concentrations used for recombinant cells and MBP-Cry were 200 µg/ml and 50 µg/ml, respectively. Synergistic interactions among Cry 1 proteins were not observed. Bioassay studies of the recombinant cells against one-week old adults of Sitophilus zeamays (Motschulsky) did not show any significant toxicity. However, a significant effect on hatchability of 4-day old mango pup weevil, Stemochetus frigidus (Fabr.) eggs was observed only in recombinant cell treatments with Cry IA(a)+ Cry IA(c)+ Cry IB genes and Cry IA(b) gene while Cry IA(b) + Cry IA(c) and Cry IA(a)+ Cry IA(b) in MBP-Cry treatments.

Key words: Bacillus thuringiensis, Cry I genes, comparative toxicity

65. OCCURRENCE OF PRIMARY BIOLOGICAL CONTROL AGENTS OF RICE BLACK BUG, Scotinophara coarctata Fabr., in North Cotabato

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Periodic monitoring of rice black bug (RBB), Scotinophara coarctata Fabr. in North Cotabato was done to determine the occurrence of the major biological control agents associated with RBB in the field. A scelionid wasp, Telenomus sp., and a green muscardine fungus, Metarhizium anisopliae, were commonly observed in RBB infested areas. These organisms varied in temporal and spatial occurrence in North Cotabato. Based on percentage
parasitized egg masses, *Telenomus* sp. was higher (58.5%) during the early stages of crop growth than during the reproductive stage (36.7%), while percentage infection of RBB nymphs and adults by *Metarhizium* was generally observed to be very low during the vegetative stage. However, at the reproductive stage, incidence of infection gradually increased beginning one week after flowering (2%) until four weeks after flowering (as high as 18% per 25 hills).

Percentage parasitism of RBB egg masses on direct-seeded and transplanted fields did not vary significantly, with 92.26% and 95.83% parasitism for transplanted and direct-seeded rice, respectively. However, percentage parasitized eggs between crop establishments significantly differed. Percentage egg parasitism was higher on direct-seeded (47.67%) than on transplanted (29.47%). Percentage infection of RBB nymphs and adults was likewise higher on direct-seeded (17%) than on transplanted (14%) fields.

Key words: Biological control agents, rice black bug, *Scotinophara coarctata*, *Metarhizium anisopliae*, *Telenomus* sp.

66. INSECTICIDAL ACTION OF SELECTED INDIGENOUS PLANTS AGAINST PINK BOLLWORM, *Pectinophora gossypiella* SAUNDS.

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Chemical insecticides constitute the highest among the production inputs in cotton. Pest control starts a few days after planting and may continue through the growing season and even after harvest. Pink bollworm, *Pectinophora gossypiella* is one notorious insect pest that attacks cotton flowers, bolls, and cotton seeds, thereby causing great economic losses. The use of botanical insecticides may prove beneficial in reducing environmental hazards as well as providing low cost of pest control agent. Hence, several indigenous plants were screened for insecticidal properties such as feeding and ovipositional deterrence or as ovicide against *P. gossypiella*.

Ten percent crude aqueous extracts of *Anona reticulata* leaves, *Abrus precatorius* seeds and *Tinospora rumphii* vines sprayed on young bolls reduced feeding by *P. gossypiella*. The amount of frass from larvae fed with each of these extracts were lesser than untreated check larvae. However, the amount of bolls consumed did not vary among the treatment larvae yet was lower than that by the untreated check larvae.

The crude aqueous (10%) extracts of *Piper betle* leaves and vines controlled egg hatching by about 53% and 63%, respectively. On the other hand, 10% ethanol extracts of *Curcuma longa* rhizome, *Acorus calamus* rhizome, and *A. precatorius* seeds controlled egg hatching by 65.5%, 61.1%, and 54.5%, in that order.

A low percentage of egg deposition was noted on bolls surfaced-treated with 10% aqueous extracts of *P. betle* leaves and vines, *Vitex negundo* leaves, *A. reticulata* leaves; 10% ethanol extract of *Pseudocalymna alliaceum* vines and leaves, *Blumea balsamifera* leaves and *A. precatorius* seeds, and 10% petroleum ether extract of *E. deglupta* and *T. rumphii*. These plants, therefore, had ovipositional deterrent property against *P. gossypiella* adults.

The insecticidal potential of the various test plants indicates further studies on the isolation and identification of the active principles responsible for the observed antifeeding, antiovipositional, or ovicidal properties against *P. gossypiella*.

Key words: Insecticidal action, indigenous plants, pink bollworm, ovipositional deterrence, antifeeding effect
67. MICROBIAL CONTROL OF ORIENTAL FRUIT FLY, *Bactrocera dorsalis sensu lato* (Hendel) INFESTING FRUITS OF PAPAYA, MANGO, AND BANANA

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Initial screening of *Bacillus thuringiensis* isolates against adult oriental fruit flies, *Bactrocera dorsalis sensu lato* was done. Out of 107 new local isolates and PG-14 mutants, 13 strains were found to cause mortality equal to or greater than 80%. A more efficient standard protocol for insect toxicity assay was developed. This method made use of sterilized materials and filter paper boxes to avoid fungal contamination and drowning of fruit flies, respectively. Final selection of *B. thuringiensis* isolates most toxic to oriental fruit fly showed relatively high insecticidal activity of six (6) *B. thuringiensis* strains. These strains were isolated from soil samples from San Cristobal, San Pablo City. Protein profile and plasmid profile analyses were done to differentiate these six isolates.

Key words: *Bacillus thuringiensis*, protein profile, plasmid profile, oriental fruit flies

68. INSECTICIDAL AND FUNGICIDAL EFFECTS OF SELECTED PLANTS AGAINST COTTON PESTS

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Today's high cost of pest control is generally attributed to the expensive chemical pesticides that comprise the bulk of production inputs. Alternatives to chemical pesticides such as those derived from botanicals should be tapped for reason of cost and environmental safety. The selected indigenous plants were evaluated for insecticidal effect on cotton bollworm, *Helicoverpa armigera* (Hubn.) and fungitoxic effect on *Glomerella gossypii*, *Sclerotium rolfsii*, *Diplodia gossypina*, and *Helminthosporium gossypii*.

Crude extracts were obtained from seeds of physic nut (*Jatropha curcas* L.); neem, (*Azadirachta indica* A. Juss.), and *Calophyllum inophyllum* L.; rhizomes of yellow ginger (*Curcuma longa* L.), and sweetflag (*Acorus calamus* L.); and leaf of betel (*Piper betle* L.) Ground plant samples were soaked in appropriate organic solvents and solvent was removed in vacuo to produce the fixed oils. Volatile oils from *P. betle* leaf and *C. longa* rhizome were derived by steam distillation.

The varying pesticidal effects exhibited by the different crude extracts and volatile oils from indigenous plants indicates selectivity of action on the target pest. This may warrant further investigation and identification of the active principles responsible for each activity.

Key words: Volatile oils, crude extracts, insecticidal effect, fungicidal action, cotton pests, ovidial effect, antioxidant effect
69. SELECTION OF THE ENTOMOPATHOGENIC FUNGAL ISOLATES FOR VIRULENCE TOWARD THE ORIENTAL MIGRATORY LOCUST

Locusta migratoria manilensis MEYEN

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Twenty isolates of the insect pathogenic fungi Beauveria bassiana and Metarhizium anisopliae were screened for virulence against the nymphs of Locusta migratoria manilensis Meyen. Three isolates of B. bassiana and one of M. anisopliae were the most virulent, causing more than 80% mortality. The media lethal times (MLTs) of the former isolates ranged from 1.6 to 2.8 days while that of the latter was 4.4 days. The isolates of B. bassiana were bioassayed at conidium density of 10^8/ml which was ten times that used for M. anisopliae isolates. In direct comparison of the two fungi at similar conidium densities, M. anisopliae was found to be more virulent than the B. bassiana isolates when nymphs were inoculated on the mouth parts or abdomen. Initial biolafety tests showed that the two fungal species were innocuous to several non-target beneficial insects. The results of the study indicate that the fungal isolates may have the potentials as biological control agents against the migratory locust.

Key words: Biological control, Locusta migratoria manilensis, Beauveria bassiana, Metharhizium anisopliae, isolate selection

70. GROWTH AND SURVIVAL OF SEX-REVERSED TILAPIA HYBRID
(Oreochromis niloticus x Oreochromis mossambicus) IN FLOATING NET CAGES IN BRACKISH WATER

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The influence of three stocking densities on growth and survival of sex-reversed tilapia hybrid (O. niloticus x O. mossambicus) in brackish water for 108 days was investigated. Fifteen floating net cages of approximately 1 m^3 each were stocked with sex-reversed tilapia hybrid fingerlings of 2-12 g weight at densities at 50, 100, and 200 fish/m^3. Feeding with commercial feed at a sliding feeding scheme of 10%, 6%, 4%, and 3% of the body weight was adopted. The highest mean weight gain per fish (186.1 g) was obtained with the stocking density of 200/m^3 followed by 100/m^3 (171.1g) and 50/m^3 (153.0g). Fish yield increased with increasing stocking densities. Mean weight of fish stocked at 50/m^3 was significantly different (P<0.05) compared with those fish stocked at 100 and 200/m^3, while those for fish stocked at 100/m^3 and those stocked at 200/m^3 were not significantly different (P=0.05).

Key words: Sex-reversed, tilapia hybrid, Oreochromis niloticus, O. mossambicus, brackish water, floating cage
71. ORETON FOR SEX REVERSAL OF NILE TILAPIA
(Oreochromis niloticus)

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This study was conducted at the Freshwater Aquaculture Center, Central Luzon State University to determine the efficacy of oreton in sex reversal of Oreochromis niloticus fry.

Oreochromis niloticus fry were fed with androgen-treated feed mixture in different dosage levels of 15, 30, 50, ug/g diet for 3, 4, 5, 6, weeks. After feeding with the treated feeds they were stocked in “hapa” up to a size of 45-70 mm for sex identification.

Androgen treated fish showed heavier weights than control. After 42 days of culture, androgen treatment using oreton resulted in a mean percentage of 54.07 of the total population. Sex ratios were closely related with the 1:1 expected ratio. Percentage recovery of the treated fish was low, being 19.9% at the end of the experiment.

Statistical analysis showed that feeding the fry with different dosage levels of oreton at varying periods of time revealed significant differences among treatment means (P>0.05). However, interaction effects were not significant. The treatment that used oreton in different dosage levels gave significantly higher percentage of males than the control. At three dosage levels, however, percentages of males did not differ significantly among treatment means, although percentages of males obtained in T₁ and T₃ were comparable. Interaction effect among treatments was not significantly different.

Key words: Oreton, Oreochromis niloticus, dosage level, “hapa”, androgen

72. PROTEIN-ENERGY REQUIREMENT OF NILE TILAPIA,
Oreochromis niloticus, FINGERLINGS

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This study was conducted to determine the effect of varying protein and energy levels on the growth, feed conversion ratio, survival, and carcass composition of Nile tilapia, Oreochromis niloticus, fingerlings; and to determine which energy (gross or digestible) was more applicable in expressing the energy requirement of the fish.

Twelve diets were formulated, each containing the prescribed percentages of protein and energy. Two main treatments consisting of 30 and 35% levels of protein and sub-treatments of gross and digestible energy with 4400,
4800, and 5200 Kcal kg\(^{-1}\) and 2600, 3000, and 3400 Kcal kg\(^{-1}\), respectively were used in the study. The diets were fed to Nile tilapia fingerlings (1-3g each) stocked at 20 fish per aquarium.

Results indicated that Nile tilapia had the best growth when fed the diets containing 30% protein with 4800 Kcal kg\(^{-1}\) gross energy. Growth did not improve when the dietary protein was increased to 35% and energy content was elevated to the next higher level. The varying levels of protein and digestible energy used in the diet did not produce any significant effect on the growth of the fish.

Feed conversion ratio and survival rate were not significantly influenced by the levels of protein and energy in the diet. Percent protein in the fish carcass showed significant retention in those given either 30 or 35% dietary protein at energy levels of 4400 and 4800 Kcal kg\(^{-1}\). Fat content in the fish carcass was influenced by the levels of energy at each dietary protein. Increasing the energy content at each dietary protein level significantly increased fat deposition in the fish. Digestibility of energy was better in fish fed varying levels of digestible energy.

This study showed that a dietary protein content of 30% and 4800 Kcal kg\(^{-1}\) gross energy are optimum requirements for Nile tilapia fingerlings. Energy requirement of Nile tilapia can be expressed more vividly in terms of gross energy.

Key words: Nile tilapia, growth, protein, energy, requirements, digestible energy

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**73. THE USE OF PHYTOPLANKTERS IN IMPROVING THE HATCHERY PRODUCTION OF COMMERCIALLY IMPORTANT PENAEID SHRIMPS IN ASIA**

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Four genera and ten species of penaeid shrimps found in Indo-West Pacific region were spawned for larval rearing studies. The objectives of the study were: to develop a method of producing healthy, pathogen-free “seedlings” of shrimps, and to determine the aquaculture potential of other shrimp species.

Gravid shrimps were bought from fishermen and spawned in the laboratory. The first protozoeae (PZ-1) were provided with phytoplankters. The myses were likewise fed with phytoplankters and/or zooplanklets until the first postlarval stage (PL-1). The larval appendages and feeding structures were dissected with fine needles, drawn using camera lucida, then correlated with survival rate and developmental stage. Nutritional values and particle size of the different live diets were evaluated. Mortality percentages due to the presence of harmful bacteria were also noted.

The results showed that the early larval stages of penaeid shrimps are filter feeders. When the postlarvae of *Peneaus monodon*, *P. japonicus*, *P. chinensis*, and *P. semisulcatus* metamorphosed into the first postlarval stage, morphological changes in the feeding structures were observed to correspond with the change in the larval feeding habit from filter feeder into raptorial omnivore. The postlarvae of *Peneaus latisulcatus* and *Metapeneaus ensis* continued to be filter feeders until about the fifth postlarval stage (PL -5); but those of *Trachypenaeus curvirostris* and *Metapenaeopsis barbata* were able to subsist on phytoplankters even at PL-15. These results proved that the early
larval stages of penaeid shrimps are still filter feeders and benefit much on a cheaper but nutritionally efficient natural diet of phytoplankton. Since phytoplankters inhibit the growth of virulent bacteria and are rich in nutrients, they are ideal live diet for penaeid shrimp larvae. The presently developed hatchery technique is also applicable to other species of penaeid shrimps which are not traditionally cultured. Adoption of this new technique in the shrimp hatchery management could boost the production of healthy, pathogen-free "seedlings", and greatly reduce the operating cost. This new hatchery technology will help revive the moribund shrimp industry in the country.

Key words: Shrimp hatchery, pathogen-free "seedlings", phytoplankters, biocontrol, live feeds

74. A NEW Pasteurella multocida TYPE B BACTERIN FOR THE PREVENTION OF HEMORRHAGIC SEPTICEMIA IN RUMINANTS: THE MOUSE AND GOAT MODELS

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An intraperitoneal mouse and intra-tracheal goat challenge procedure that consistently produce lethal Pasteurella multocida Type B infection was devised. Two commercially-available adjuvanted aqueous bacterin containing whole cell fraction of Pasteurella multocida Type B (PMB) culture was tested and compared in efficacy against the Department of Science and Technology (DOST) PMB Lot 2/3/4 Bacterin in oily adjuvant in vaccination-challenge studies in mice and goats. Nonvaccinated mice died 24 hours after intraperitoneal challenge with 100 mouse LD₅₀ whereas nonvaccinated goats died three days after intra-tracheal challenge with about 100 goat LD₅₀. Upon necropsy, pasteurellae colonies on soybean casein digest agar plates revealed Gram-negative coccobacilli. On McConkey's agar plates, no bacterial colonies were observed.

Mice vaccinated via the intraperitoneal route with PMB bacterin elicited 80% protection as compared to 60% protection with one commercially-available hemorrhagic septicemia (HS) bacterin. When compared to another commercially-available HS bacterin in a Relative Potency (RP) Test, the RP value was comparable in which the PMB challenge culture titered at least 1,000 mouse LD₅₀.

Goats intramuscularly vaccinated with two doses of the DOST PMB Lot 2/3/4 Bacterin, 14 days apart, recorded 100% protection where nonvaccinated goats died upon intra-tracheal challenge with about 100 goat LD₅₀.

The significance of the development of a new PMB Bacterin in an oily adjuvant as an aid in the prevention of hemorrhagic septicemia in cattle, carabao, goat, and sheep will be discussed.

Key words: Hemorrhagic septicemia, bacterin, Pasteurella multocida, vaccine, mouse model, goat model, lethal dose 50%, oily adjuvant, vaccination-challenge
Abstracts of Scientific Papers for Poster Presentations

HEALTH SCIENCES

75. MUTAGEN-INDUCED CHROMOSOME DAMAGE: IMPLICATION IN CANCER SUSCEPTIBILITY

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The objective of this study is to determine if bleomycin-induced chromosome aberrations can predict which individuals are at risk of developing environmentally-induced cancers. Peripheral blood samples were collected from thirty (30) head and neck cancer patients from two hospitals in Metro Manila. Twenty non-cancer, normal individuals, age and sex-matched with the cancer patients constituted the control group. Lymphocytes were cultured by the microculture method, incubated for 72 hours at 37°C, and treated with bleomycin (30ug/ml) 5 hours before harvest. Metaphase chromosomes were homogenously stained with Giemsa. From each individual 50-100 metaphase cells were screened for the presence of chromatid-type and chromosome-type aberrations. Preliminary data reveal that the mean frequency of chromatid breaks in the cancer group is 1.11 breaks per cell (b/c). This is above 0.8 b/c, established to be the indicator of sensitivity to bleomycin-induced chromosome damage. It is likewise higher than 1.0 b/c which is considered to indicate hypersensitivity in many toxicology cytogenetic studies. The mean frequency of chromatid breaks in the control group is 0.48 b/c.

Key words: Mutagen, chromosome damage, cancer susceptibility, head and neck cancer, metaphase, bleomycin, microculture method, lymphocytes, chromatid break, environmentally-induced
76. BREAST CANCER SUSCEPTIBILITY GENE 1 MUTATION IN HIGH RISK FILIPINO FEMALES

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BRCA 1 is a tumor suppressor gene whose mutation is association with susceptibility to breast cancer. Women who have an inherited mutation in BRCA 1 gene has an 85% chance of developing breast cancer during their lifetime compared to only 12.5% for the general population [Zsabo and King, 1995]. The aim of this study is to identify BRCA 1 gene mutations among Filipino breast cancer patients who have any two of the following criteria: (1) At least two members of the family have breast or ovarian cancer; (2) The patient has bilateral breast cancer; and (3) The patient developed cancer before the age of 35. A total of 51 breast cancer patients have been screened. Ten patients satisfy the inclusion criteria. The polymerase chain reaction was performed on the ten subjects using forward and reverse primers for BRCA 1 exons 2, 11a, 11b, and 20. These four exons have been shown to contain the most commonly identified germ-line mutations by complete screening of the BRCA 1 gene [Couch et al., 1996]. Initial results showed the absence of mutations in exons 11 a, 11 b, and 20 of 4 patients included in the study. The absence of mutations was confirmed by sequence analysis. Currently, exon 2 and the samples from 6 remaining patients are being evaluated.

Key words: BRCA 1 gene, tumor suppressor gene, mutation, breast cancer, PCR, exons 2, 11a, 11b, 20, sequency analysis

77. DEVELOPMENT IN TRANSFORMED TISSUES: BREAST CARCINOMA IN FILIPINO FEMALES

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The normal human mammary gland consists of lobes surrounded by loose connective tissues containing adipose cells. The dense cellular connective tissues divided the lobes into lobules. A lobule consists of several intralobular ducts with a simple cuboidal epithelium that rests upon the basal lamina. Fat droplets are observed in the cytoplasm and lumen of the alveoli in active glands.

Histological analyses done on twenty seven (27) clinical cases revealed three (3) types of pathological observations. The mucinous type has mucus secretions in the lumen. Epithelia consist of small, multilayered, light staining cells. Secretions are observed in the lumen. The ductal type exhibits hyperplasia of the intralobular duct with small cells arranged in several layers. The basal lamina is absent. In the medullary type, the cells are lightly staining.

Key words: Histopathogenesis, mammary gland, breast carcinoma, connective tissues, adipose cells, intralobular ducts, cuboidal epithelium, hyperplasia

78. DEVELOPMENT IN TRANSFORMED TISSUES: CERVICAL CARCINOMA IN FILIPINO PATIENTS

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A histological study of six cases of cervical carcinoma in Filipinos was performed. Changes noted under light microscopy were the following: erosion and various thickenings of the epithelial layer in some portions of the cervical epithelium facing the vaginal canal; loss of the orderly cellular patterns of the epithelium; invasion of the underlying lamina propia with tumor cells from the epithelial layer; presence of whorled masses of various sizes in the deeper portions of the lamina propia.

Key words: Transformed tissues, cervix, cervical carcinoma, epithelial layer, cervical epithelium, vaginal canal, lamina propia, tumor cells, light microscopy

79. FACTORS INFLUENCING DELAY IN DIAGNOSIS AMONG COLON AND RECTAL CANCER PATIENTS

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This prospective, descriptive study was conducted on all histologically proven cases of colon and rectal cancer admitted at our institution from January 1 to June 30, 1997, in order to determine the frequency of delayed diagnosis (defined as time interval from onset of symptoms to establishment of diagnosis of more than three months) and the factors that influence the delay. An open-ended interview was conducted on all patients with delayed diagnosis. A total of 78 cases of colon and rectal cancer were admitted, of which 46 (58%) presented with delayed diagnosis. Majority of patients had low educational attainment, originated from outside Metro Manila, and did not immediately consult a physician mainly for financial reasons. Only 56% initially consulted a physician, at an average interval of 5 months from onset of symptoms. A significant number of physicians were perceived by patients to have performed inadequate assessments, and only 47% considered the possibility of malignancy on consult. Amoebiasis and hemorrhoidal disease were the most common initial considerations. Nearly 90% of patients with delayed diagnosis presented with advanced stage of disease (Stage III or IV) on surgical exploration. Resectability was 88%. This study showed that socio-economic factors contributed to patient-related delay while physician-related delay was also significant. It demonstrates the need to further improve public awareness and primary physician education in order to enhance earlier detection of colon and rectal cancer and consequently improve results of treatment.

Key words: Colon and rectal cancer, delayed diagnosis

80. BINDING PATTERNS OF PROSTATE TISSUES TO SOME LECTIN AND NEOGLYCOPROTEIN PROBES

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As a source of corroborative data for medical diagnosis and prognosis, a lectin from Viscum album (VAA) was tested for the presence of binding sites in 21 cases of benign hyperplasia and 8 cases of adenocarcinoma of the prostate. Some neoglycoproteins (simple sugars conjugated with unreactive Bovine Serum Albumin), as well as fucoidan and heparin were also tested. Of the probes used, VAA, mannose, lactose, N-acetylglucosamine, and heparin were negative in both benign hyperplastic tissues (Benign Prostatic Hyperplasia) and adenocarcinoma. Towards N-acetylgalactosamine there was a strong positive reaction in adenocarcinoma found specifically in the connective tissues surrounding the prostate glands. The gland epithelia themselves were negative. Benign Prostatic Hyperplasia gave a weak positive response to N-acetylgalactosamine.

Responses to fucoidan are described.

Key words: Lectin, neoglycoprotein probes, prostate cancer
81. GENOTYPE ANALYSIS OF HIV-1 ISOLATES FROM RISK GROUPS IN METRO MANILA

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The human immunodeficiency virus (HIV), the causative agent of AIDS, has infected 12-13 million people worldwide, and continues to infect many more. There are two types of HIV which can be distinguished genetically and antigenically, the HIV-1 and HIV-2. HIV-1, which is most common in North America, Europe, and parts of Asia has been shown to be genetically diverse, comprising at least nine distinct genetic subtypes, A through I, plus a highly divergent subtype O. The presence of such genetically and antigenically diverse HIV-1 subtypes is of major concern for three important reasons: (1) implications in vaccine development, (2) differences in sensitivity of antiretroviral drugs, and (3) certain subtypes have higher heterosexual transmission efficiency, and therefore, major implications in transmission and epidemics.

From August 1995-December 1996, 37 blood samples from HIV (+) individuals were collected for genotyping, using Polymerase Chain Reaction (PCR) technique and Heteroduplex Mobility Assay (HMA) method. The most common subtype identified was subtype B (B1,2,3) in 19 samples (51.35%), followed by subtype E (E1,2,3) in 11 samples (29.73%), and Subtype C/A in 7 samples (18.92%). These findings presumably reflect the modes by which the virus strain was transmitted, and would give an idea of the risk group of the patient. Of special concern is the fact that subtype E is circulating in our country, the subtype which has higher heterosexual transmission efficiency, and therefore, has higher probabilities for epidemics. Knowledge of the most prevalent subtypes in our country will be helpful in coming up with potential candidate vaccine molecules most suitable for our population, and in determining appropriate therapeutic agents for each patient. These also have implications in the development of antibody-based reagents for laboratory diagnosis.

Key words: AIDS, HIV-genotypes, subtypes, vaccines, HIV-transmission

82. IGM-CAPTURE ELISA OF SERUM SAMPLES FROM FILIPINO DENGUE PATIENTS

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Dengue infection, an anthropod viral disease, is a major health problem in the Philippines. It is caused by four antigenically distinct dengue virus serotypes namely, D1, D2, D3 and D4. The present study is an attempt to identify the most useful assay antigen to detect dengue patients. Viral antigens for 4 dengue serotypes were produced in C6/36 Aedes albopictus cells. These were used as assay antigens for IgM-capture ELISA to detect IgM antibodies in sera of dengue patients from 3 hospitals in Metro Manila, Philippines. A total of 376 serum samples came from the National Children's Hospital (NCH), San Lazaro Hospital (SLH), and St. Luke's Medical Center (SLMC), from January to November 1995. Three hundred and three (303) out of 376 serum samples, or 80.58% showed positive IgM ELISA titer against at least one of the 4 assay antigens. D4 antigen detected antibodies in 62.5% (235/376) of these serum samples, whereas D1, D3, and D2 detected 60.11% (226/376), 50.26% (189/376), and 49.46 (186/376) respectively. The results indicate that D4 is significantly the best antigen to use in identifying dengue infections in the batch of samples used in this study.

Key words: Filipino dengue patients, C/636 Aedes albopictus cell lines, IgM-capture ELISA, antigen, arthropod viral disease, antibody, serotype

83. USEFULNESS OF SANDWICH ELISA IN PREDICTING THE DETECTION OF DENGUE VIRUS BY RT-PCR FROM INFECTED CULTURE FLUIDS OF C6/36 Aedes albopictus CELLS

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Serum samples of patient from 2 hospitals in Metro Manila, Philippines, were collected within 5 days from onset of fever and inoculated into C6/36 cells. Infected cells were cultured for 1 week and 282 infected culture fluids were harvested and subjected to sandwich ELISA for virus detection. Identification of dengue virus in the same culture fluid samples was done by RT-PCR using universal dengue primers. Optical densities (P) obtained from the fluid samples were compared with that of the culture media (N), which served as negative control. The ratio P/N was correlated with
RT-PCR results. In this study, a P/N ratio of at least 4.08 gave a positive RT-PCR. The value of the P/N ratio obtained by sandwich ELISA provides a convenient way of predicting the possibility of isolating the virus from a given serum sample.

Key words: Sandwich ELISA, dengue virus, reverse transcription-polymerase chain reaction, universal dengue primers, C6/36 Aedes albopictus cells, optical density, virus detection, infected culture fluid

84. COMPARATIVE NUCLEOTIDE AND AMINO ACID SEQUENCES OF THE NONSTRUCTURAL (NS1) GENE OF DENGUE VIRUS SEROTYPE 3 ISOLATED DURING A 1995 OUTBREAK IN METRO MANILA, PHILIPPINES

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The nonstructural (NS1) gene of dengue virus type 3 isolates from a 1995 outbreak in Metro Manila, Philippines was sequenced and compared to the prototype H 87 strain isolated in 1956. Nucleotide sequence homology shows greater than 94% homologies whereas deduced amino acid sequence indicated greater than 96% homologies, suggesting that the NS1 remains to be a highly conserved gene. Phylogenetic analysis indicates that the 1995 dengue outbreak was due to the re-emergence of an existing circulating strain rather than the introduction of a new variant virus. Of the nucleotide changes observed, 76% did not lead to any amino acid sequence change while 24% resulted in missense mutations. Functional regions such as the 2 N-glycosylation sites, 3 casein kinase II (CK2) phosphorylation sites, 7 protein kinase C (PKC) phosphorylation sites, 7 myristoylation sites, and the tyrosine phosphorylation site were not affected. An amino acid change from glutamic acid (E) to lysine (K) was observed between dengue hemorrhagic fever (DHF) and dengue fever (DF) isolates and a change in the amidation site from glutamine (Q) to proline (P) was observed in one DF isolate. This has brought about changes in the secondary conformation in this region of the protein molecule.

Key words: NS1 gene, dengue virus, dengue hemorrhagic fever, dengue fever, prototype H 87 strain, missense mutation, amino acid sequence, nucleotide sequence, sequence homology
85. ISOLATION, CULTURE, AND CHARACTERIZATION OF PHILIPPINE ISOLATES OF Helicobacter pylori


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Helicobacter pylori is a Gram-negative bacterium found to be the cause of approximately 95% of gastric ulcers and 100% of chronic gastritis. In the Philippines, gastritis caused by H. pylori is always confirmed histologically or by CLO (Campylobacter Like Organism) test and never by culture. In this study, the Microbiology Section of the Research and Biotechnology Division of St. Luke's Medical Center, using biopsies from the antrum of the duodenum, isolated H. pylori. Out of 26 gastric biopsies processed and cultured using Dent's Selective Medium, three strains of H. pylori were isolated. One isolate, HP-03 is spiral in form while another HP-06 is coccoid with few bacilli. HP-10 is bacillloid in form and metronidazole-resistant. All isolates give positive urease, oxidase, and catalase tests. Culture of these isolates is under microaerophilic conditions (5% O2, 10% CO2 and 85% N2). This paper is the first report of H. pylori isolates in the Philippines.

Key words: Helicobacter pylori; culture; CLO test; microaerophilic; gastritis; gastric biopsies; Dent's selective medium; spiral; coccoid; and bacillloid forms; metronidazole-resistant; urease positive

86. SURVEY OF BACTERIA ASSOCIATED WITH DRINKING WATER IN THE PROVINCE OF CAVITE

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Samples of drinking water were taken from faucets, deep wells, and springs. Counts of viable bacteria were higher in spring water than in water obtained from deep wells. Water samples taken directly from springs have a higher percentage of fecal contamination compared to water taken from deep wells.

About 257 bacterial isolates were obtained from water samples collected. These were tentatively classified under the genera Micrococcus, Flavobacterium, Sarcina, and Bacillus.

Key words: Viable count, fecal contamination
87. THE ANTIDOTAL EFFECT OF ORALLY ADMINISTERED 50% 
Amaranthus spinosus (URAI) LEAVES EXTRACT
IN PARALYTIC SHELLFISH POISONING IN MICE

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Paralytic shellfish poisoning (PSP), is caused by the ingestion of mussels infected with the red tide organisms. A search for a safe, available and inexpensive home remedy for the poisoning is ongoing. Coconut milk is reportedly being used in the coastal towns to counteract the effects of the poison but it has not been very effective. Urai, a weed, commonly found throughout the Philippines was tested for its antidotal effect on paralytic shellfish poisoning in mice. Poisoning was induced in four groups of the experimental animal by forced feeding each mouse with 2 ml crude toxin which was extracted from the contaminated shellfish obtained from sampling stations in Limay, Bataan. Three dose levels, 6, 15, and 30g/kg of the 50% water extract of urai leaves (LD50=60.7 g/kg), were administered to three groups of mice by oral feeding. The control group received distilled water. Treatments were given at 0, 15, 30, and 60 minutes after poison induction. The survival time was recorded and analyzed using survival analysis. Mice treated with 15g/kg of urai extract 15 minutes after poisoning survived longer (p=005). Using the Cox regression model, the 15g/kg dose was found protective and statistically significant (p=022). The effective dose was computed as 13.7 g/kg at the 15-minute interval. From the results of the study, urai extract, with a large margin of safety of 4.4 (LD50/ED50 = 60.7 g/kg/13.7 g/kg), can be a safe and effective household remedy for red tide poisoning.

Key words: PSP, red tide, antidote, urai, LD50, ED50, survival time

88. HEALTH SOCIAL SCIENCE CONCEPTS AND METHODS IN 
THE PREVENTION OF HIV/AIDS/STDS

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Health social science is a holistic multi- and interdisciplinary approach to health care in both its preventive, promotive, and maintenance aspects. Health is not just a biomedical as much as a psychosocial concern. In the case of HIV/AIDS, the disease currently afflicts 22.6 million people all over the world as of 1997. The daily infection rate is 7,000. These numbers are expected to rise from 10 to 15% by the year 2000. This study was undertaken in an effort to help in HIV/AIDS/STD prevention by using health social science concepts and methods. Social scientists in UP Manila closely collaborated with the medical doctors in preventive work among prostituted men and women, seafarers, and their sex partners.
Social science methods and approaches such as environmental and person sensing, Knowledge, Attitude and Practice (KAP), pre and post test assessments, iterative ethnographic interviews, focus group discussions, key informant interviews, seminar workshops and lectures, peer education, and value formation were some of the social science concepts and approaches used in preventive work against HIV/AIDS/STD among prostituted men and women, seafarers, and their sex partners for the past 5 to 6 years now.

Among the results documented were the following: marked improvement of KAP; since intervention work is always preceded by environment and person sensing, iterative ethnographic interviews, the results have been appropriate and culture sensitive intervention measures. Noticeable behavior changes have also been documented, among them, increased use of condom, better negotiation skills, better locus of control and heightened self-esteem, greater care in choice of partners, and many times, refusal to barfine. Some left their kind of trade altogether. There were also documented cases of ability to share information and to influence peers.

HIV/AIDS for which there is no known cure yet cannot be prevented by biomedical approaches alone. Only a close collaboration between the biomedical doctors and the social scientists, in what we call health social science, will lead to prevention or minimization of the disease through improved and accurate knowledge of the etiology of the disease leading to behavior modifications.

Key words: HIV/AIDS prevention, health social science, prostituted men and women, holistic health, behavior modification, health social science techniques, peer education, environment sensing, person sensing, health intervention, behavior change
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89. LAND OF CALAMITIES: A HISTORICAL SURVEY OF NATURAL AND MAN-MADE CALAMITIES AND THEIR IMPACT ON THE DEVELOPMENT OF THE PHILIPPINES, 1571-1910

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Historical studies about calamities in the Philippines are lacking despite the knowledge that they commonly occur every year. For example, existing studies focus on the present and none or few on the periods during the Spanish and early American eras. This paper, based on archival records, is intended to fill this gap. By identifying when a calamity hits a particular area of the country, the kind of calamity, its duration, and description of the extent of the damages wrought by said calamity on the inhabitants, statistical, documentary, and other background information on said occurrences are provided which should enable Filipinos to respond effectively against future occurrences. Covered in this study are such natural calamities like diseases (epidemics of smallpox, influenza, cholera), pests (infestations by locusts, rats, and worms), typhoons, floods, earthquakes, and volcanic eruptions; and man-made calamities (rebellions and wars). The study covers the period from 1571 to 1910.

Key words: Calamities, natural — Philippines, 1571-1910; calamities, man-made — Philippines, 1571-1910

90. ASSESSMENT OF DISASTER MANAGEMENT TRAINING PROGRAMS FOR HEALTH PROFESSIONALS IN THE WESTERN PACIFIC REGION

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With the increase in disasters that have been affecting the country and the region, there has been a corresponding effect on the provision of health services. This effects a burden on health professionals and there is a greater need to strengthen the capability of the health sector in the field of disaster management. As a result, several countries in the Western Pacific Region have developed training programs in disaster health management.

This study presents an assessment of the state of health services provision during disasters in the Western Pacific Region and it looks into the level of training programs for health professionals. The paper assesses the following factors in these programs: objectives, participants, delivery of instruction, evaluation mechanism, relevance to the community. Furthermore, the authors provide recommendations as to how training programs may be made more relevant to the unique needs of the region.

Key words: Disasters, disaster management, training programs, health professionals, health services management
91. COPING AND NETWORKING TO SURVIVE A DISASTER

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A survey was conducted to determine the coping mechanisms and social network of 120 rice farmer households in Mexico, Floridablanca, and Magalang, Pampanga in dealing with the problems brought about by the Mt. Pinatubo eruption. Quantitative and qualitative statistics were used to analyze the data.

The study underscores the imperative of having a comprehensive disaster response mechanism that will save lives and minimize damage to properties as natural calamities chronically buffet the country. As a significant component of disaster management, psychosocial services should be integrated. Crucial to the survival of these farmers is access to alternative or available resources. Economic projects should be implemented for them to gain alternative or supplementary employment to their farm activities. Dole-outs should gradually give way to Food/Cash-for-work schemes. A collaboration between the formal and informal networks should be explored as the strength of the latter was evident in the Mt. Pinatubo disaster.

Key words: Coping mechanism, social networks, Mt. Pinatubo eruption, rice farm households, lahar, Pampanga, disaster

92. BOOMTOWN’S INTEGRATED SOLID WASTE MANAGEMENT:
PROSPECTS FOR MATAHUM GENSAN,
MALINIS, MAGANDA, MAPAYAPA

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This paper describes how General Santos City experienced tremendous social and economic changes during the past three decades which greatly affected the lives of the people. Rapid industrialization led to the growth of factories and industrial establishments which mushroomed along the former unoccupied and barren areas. Migrants from nearby towns, provinces, and cities flocked toward the City in search for better opportunities. Domestic and foreign investors poured their resources in various agri-business and industrial firms. These led to economic gains. The people’s consumption level also changed. Urbanization and industrialization trends brought about environmental problems. Among these is the improper handling and disposal of solid wastes. For the past years, there were no clear systems on how garbage shall be handled and disposed. Garbage was dumped from place to place. The people had no clear idea on what to do with their “basura”.

Through a descriptive analysis, this paper will present how the City Government conceived the Integrated Solid Waste Management System to combat the garbage problem. It includes the important technology adopted for this purpose. The vital aspects of City Ordinance #08 which is also known as the Solid Waste Management Ordinance are discussed. This was launched last September 29, 1997. How the three components namely, education, engineering and reinforcement component work together towards the attainment of a clean, beautiful and peaceful Gensan is described in this paper. MATAHUM GENSAN became the theme for this project. (Solidwaste)

Key words: Solid waste management, Matahum Gensan, malinis, maganda, mapayapa
93. THE IPM PROGRAM AND ATOK’S BAREFOOT SCIENTISTS

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A beneficiary of the government’s Integrated Pest Management (IPM) Program, Atok, Benguet produced the country’s first crop of barefoot scientists. Over a thousand farmers graduated as barefoot scientists in several IPM classes since 1993 to the present.

Through the IPM program, farmers were taught the “discovery method of science”, teaching them to recognize and control the insect pests and diseases in their own fields.

Farmers underwent training on the use of Diadegma semi-clausum, a parasitoid insect that controls diamondback moth (DBM) of crucifers particularly cabbage plants. Diadegma provided 80 to 90% control of DBM. The IPM Program proved that farmers can share what they learn with their fellow farmers.

The IPM Program taught the farmers the need to guard their health and their environment, especially the source of water or watersheds, against pollution or contamination with chemicals.

Farmers became familiar with the growth stages of plants and different classes of insects, both the friendly and the harmful ones. They learned about the stages of insect development (specifically the destructive or damaging stages) and about some insect predators.

The IPM Program is not only bringing about protection to their crops, but is also bringing out the best in farmers, enhancing old Filipino values of cooperation, or “bayanihan”, love of God and neighbors, as well as the need to protect and love the environment.

Through the IPM course, the farmers developed a crop protection calendar for growing the following vegetables in Benguet: cabbage, garden pea, potato, and carrot.

Key words: Atok’s barefoot scientists, IPM Program

94. INITIATIVES EVALUATION: AIMING TO ALLEVIATE THE SOCIOECONOMIC EFFECTS OF RED TIDE AMONG THE METRO MANILA FISHERFOLKS

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This project is an endeavor to develop appropriate policy recommendations, in an attempt to alleviate the socioeconomic effects (SEE) of red tide (RT) among the fisherfolks (TS), accordingly, comprising 12% of our population but are one of the most marginalized sectors of the country. Two components are adopted in this study: (1) the documentation of the effects on livelihood and employment situations of the TS in Navotas and Parañaque: before, during, and after the RT outbreak; and (2) the assessment of initiatives such as the Red Tide Ban Drive...
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(RTBD), release of the Presidential Calamity Fund (PCF), dispersion of alternative livelihood projects (ALPs), water management programs through rehabilitation of the polluted Metro Manila waters (which do come from the following institutions: the national and local government and their agencies); the existing interest groups in the said areas; and, the individual efforts of the TS. The former is undertaken through surveys, while the latter uses key informant interviews. Utilizing the framework of sustainable development, the author deems the sectoral undertakings and real plights of the TS be indispensably assessed before an effective institutional initiative can be promoted. Initially obtained from the first phase of survey conducted is the adverse effect of the RTDB. This leads to income loss and temporary unemployment during RT outbreak due to inability of the TS to sell their catch.

Key words: Red tide, socioeconomic effects, fisherfolks, institutions, policy, Red Tide Ban Drive, Presidential Calamity Fund, Alternative Livelihood Program, water rehabilitation, market loss

95. THE IMPACT OF FOREIGN LOANS ON MATHEMATICS EDUCATION

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In the belief that higher inputs lead automatically to higher quality output, the Department of Education, Culture and Sports has been pursuing the policy of utilizing massive loans from the World Bank and the Asian Development Bank to improve the quality of basic education in the Philippines. In pursuing this belief to its logical conclusions, this study analyzes mathematics education as a factory production line: students and instructional materials as production raw materials, teachers and principals as line and supervisory production personnel, classrooms and laboratories as production facilities, and teaching methodologies as production processes. The quality of output is taken from recent studies and from results of internationally administered examinations in mathematics. Findings point to minimal or no impact at all from the infusion of foreign funding in the educational system. Conclusions suggest that restoration of accountability in the educational system is the main solution to the problem of deterioration in the delivery of instruction in the educational system and recommendations for the restoration of accountability require the implementation of hardnosed policies over a long period of time unless the governance of the educational system is developed to local governments.
The 19th Annual Scientific Meeting (ASM) held on July 9-10, 1997 at the Westin Philippine Plaza Hotel was very successful with the Honorable Salvador H. Laurel as the guest speaker and more than 600 participants from all over the country were present. The theme was "Science for Better Health". Plenary papers presented overviews on public health, environmental health, clinical medicine, and medical education, and identified problems which were later on became the basis in formulating the resolutions presented to the audience during the Closing Ceremonies.

Guest Speaker, former Vice President Salvador H. Laurel, delivered his message while listening on were (L-R): Academician Ramon F. Abarquez, Jr., NAST President Conrado S. Dayrit, DOST Secretary William G. Padolina, NAST Vice President Dolores A. Ramirez, and Academician Bienvenido F. Nebres, S.J.

The members of the S&T Centennial Movement, DOST Chapter, were sworn in by the Chairman of the Philippine Centennial Commission Salvador H. Laurel (left photo). Secretary Padolina received the plaque for the Chapter (right photo).
Dr. Elizer A. Albacea delivered his paper on "An Improvement of Blum's et al. Selection Algorithm". Nineteen papers were presented in the simultaneous divisional sessions.

The 1997 Outstanding Young Scientists with the guest speaker, officers, and some members of NAST.

Academician Conrado S. Dayrit, Dr. Cristina D. Padolina, Secretary William G. Padolina, and Mrs. Milagros M. Dayrit viewing one of the one-hundred fifty-seven posters presented in the 19th ASM.
Conferment of the rank and title of National Scientist by the President of the Republic of the Philippines is the highest honor given to a man of science in the country.

Selection of recommendees for National Scientist rank and title requires 60% vote of the full membership of the Academy.

Twenty two (22) Academicians have so far been accorded this honor.

<table>
<thead>
<tr>
<th>Year Conferred</th>
<th>Name</th>
<th>Field of Specialization</th>
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<tbody>
<tr>
<td>1978</td>
<td>Juan S. Salcedo, Jr., M.D. R</td>
<td>Nutrition and Public Health</td>
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<td>1978</td>
<td>Alfredo C. Santos, Dr.phil. R</td>
<td>Physical Chemistry</td>
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<td>1978</td>
<td>Gregorio Y. Zara, Dr. Sc. R</td>
<td>Engineering and Inventions</td>
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<tr>
<td>1980</td>
<td>Fe del Mundo, M.D., M.A.</td>
<td>Pediatrics</td>
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<td>1980</td>
<td>Eduardo A. Quisumbing, Ph.D. R</td>
<td>Plant Taxonomy, Systematics, and Morphology</td>
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<tr>
<td>1982</td>
<td>Geminiano T. de Ocampo, M.D. R</td>
<td>Ophthalmology</td>
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<td>1982</td>
<td>Casimiro del Rosario, Ph.D. R</td>
<td>Physics</td>
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<td>1982</td>
<td>Gregorio T. Velasquez, Ph.D. R</td>
<td>Phycology</td>
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<td>1983</td>
<td>Francisco M. Fronda, Ph.D. R</td>
<td>Animal Husbandry</td>
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<td>Francisco O. Santos, Ph.D. R</td>
<td>Agricultural Chemistry and Human Nutrition</td>
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<td>Carmen C. Velasquez, Ph.D. R</td>
<td>Parasitology</td>
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<td>1985</td>
<td>Teodoro A. Agoncillo, Litt.D. (h.c.) R</td>
<td>History</td>
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<td>1985</td>
<td>Encarnacion Alzona, Ph.D.</td>
<td>History</td>
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<td>1985</td>
<td>Hilario D.G. Lara, M.D., Dr.Ph.H. R</td>
<td>Public Health</td>
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<td>1986</td>
<td>Julian A. Banzon, Ph.D. R</td>
<td>Biophysical Chemistry</td>
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<td>1986</td>
<td>Dioscoro L. Umali, Ph.D. R</td>
<td>Genetics and Plant Breeding</td>
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<td>1987</td>
<td>José Encarnación, Jr., Ph.D.</td>
<td>Economics</td>
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<td>1987</td>
<td>Luz Oliveros-Belardo, Ph.D.</td>
<td>Pharmaceutical Chemistry and Essential Oils</td>
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<td>1988</td>
<td>Alfredo V. Lagmay, Ph.D.</td>
<td>Psychology</td>
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<td>1989</td>
<td>Paulo C. Campos, M.D.</td>
<td>Medicine</td>
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<td>Pedro B. Escuro, Ph.D.</td>
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<td>1994</td>
<td>Clara Y. Lim-Sylianco, Ph.D.</td>
<td>Biochemistry and Organic Chemistry</td>
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<td>1998</td>
<td>Dolores A. Ramirez, Ph.D.</td>
<td>Biochemical Genetics and Cytogenetics</td>
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<td>1998</td>
<td>Jose R. Velasco, Ph.D.</td>
<td>Plant Physiology</td>
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</tbody>
</table>

† deceased
MEMBERSHIP IN THE ACADEMY

The Academy is the highest recognition body for Filipino scientists. It is composed of outstanding members of the scientific community of the country. Members are called Academicians. They are Filipino scientists with doctoral degrees in any field of science from an accredited university and who have demonstrated and earned distinctions in independent research or significant innovative achievements in the basic and applied sciences. The doctoral degree is waived in highly meritorious and exceptional cases.

Membership in the Academy shall be for life unless terminated for cause.

<table>
<thead>
<tr>
<th>Year</th>
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<td>Paulo C. Campos, M.D.</td>
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<td>Alfredo V. Lagmay, Ph.D.</td>
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<td>Cecilio F. Lopez, Dr. phil.</td>
<td>Philippine Linguistics and Oriental Studies</td>
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<td>1978</td>
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<td>Tito A. Mijares, Ph.D.</td>
<td>Statistics</td>
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<td>Alfredo C. Santos, Dr. phil.</td>
<td>Physical Chemistry</td>
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<td>Discoro L. Umali, Ph.D.</td>
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<td>Raymundo A. Favila, Ph.D.</td>
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<td>Bienvenido O. Juliano, Ph.D.</td>
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<td>Melecio S. Magna, Ph.D.</td>
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<td>Magdalena C. Cantoria, Ph.D.</td>
<td>Botany, Pharmacognosy</td>
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<td>1980</td>
<td>Conrado S. Dayrit, M.D.</td>
<td>Pharmacology, Cardiology</td>
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<td>Emerita V. de Guzman, Ph.D.</td>
<td>Plant Physiology</td>
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<td>1980</td>
<td>Joventino D. Soriano, Ph.D.</td>
<td>Cytogenetics and Mutation Research</td>
</tr>
</tbody>
</table>
1981  Clare R. Baltazar, Ph.D.  Systematic Entomology
1981  Juliano A. Banzon, Ph.D.  Bihysical Chemistry
1981  Benjamin D. Cabrera, M.D. M.P.H.  Medical Parasitology and Public Health
1981  Amado M. Dalisay, Ph.D.  Agricultural Economics
1982  Emil Q. Javier, Ph.D.  Genetics and Plant Breeding
1983  Gelia T. Castillo, Ph.D.  Rural Sociology
1983  Jose O. Juliano, Ph.D.  Nuclear Chemistry and Physics
1983  Hilario D.G. Lara, M.D., Dr.P.H.  Public Health
1983  Bienvenido F. Nebres, S.J., Ph.D.  Mathematics
1983  Faustino T. Orillo, Ph.D.  Mycology
1983  Jose R. Velasco, Ph.D.  Plant Physiology
1985  Quintin L. Kintanar, M.D., Ph.D.  Environmental Medicine
1985  Quirino O. Navarro, Ph.D.  Nuclear Chemistry
1985  Gregorio F. Zaide, Ph.D.  History
1987  Solita F. Camara-Besa, M.D., M.S.  Biochemistry and Nutrition
1987  Filomena F. Campos, Ph.D.  Plant Breeding and Cytogenetics
1987  Lourdes J. Cruz, Ph.D.  Biochemistry and Marine Toxinology
1987  Edito G. Garcia, M.D.  Medical Parasitology
1987  Carmen L. Intengan, Ph.D.  Nutrition
1987  Dolores A. Ramirez, Ph.D.  Biochemical Genetics and Cytogenetics
1987  Benito S. Vergara, Ph.D.  Plant Physiology
1987  Prescillano M. Zamora, Ph.D.  Plant Anatomy-Morphology
1988  Ricardo M. Lantican, Ph.D.  Genetics and Plant Breeding
1990  Leopoldo S. Castillo, Ph.D.  Animal Science
1990  Apolinario D. Nazarea, Ph.D.  Biophysics
1990  Ruben L. Villareal, Ph.D.  Plant Breeding
1992  Mercedes B. Concepcion, Ph.D.  Demography
1992  Ernesto O. Domingo, M.D.  Internal Medicine
1992  Rafael D. Guerrero III, Ph.D.  Fisheries
1992  Evelyn Mae T. Mendoza, Ph.D.  Biochemistry
1993  Ramon F. Abarquez, Jr., M.D.  Cardiology
1993  Salcedo L. Eduardo, Ph.D.  Veterinary Parasitology and Systematic Helminthology
1993  Edgardo D. Gomez, Ph.D.  Marine Biology
1993  Teodulo M. Topacio, Jr., Ph.D.  Veterinary Medicine
1994  Perla D. Santos Ocampo, M.D.  Pediatrics
1995  Ledivina V. Cariño, Ph.D.  Public Administration
1995  Raul V. Fabella, Ph.D.  Economics
1995  William G. Padolina, Ph.D.  Phytochemistry
1996  Veronica F. Chan, Ph.D.  Virology, Immunology
1996  Andrew A. Gonzalez, Ph.D.  Linguistics

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- Academician Perla D. Santos Ocampo - Member
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- Academician Raul V. Fabella - Member
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- Academician Edgardo D. Gomez - Member
- Academician Clara Y. Lim-Sylilanco - Member
- Dr. Eliezer A. Albacea - Member
- Dr. Allan Benedict I. Bernardo - Member
- Dr. Ann Inez N. Gironella - Member
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- Dr. Joseph Anthony Y. Lim - Member
- Dr. Corazon M. Raymundo - Member

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- Academician Lourdes J. Cruz - Member
- Academician Salcedo L. Eduardo - Member
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- Academician Ricardo M. Lantican - Member
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National Scientist José Encarnación, Jr. - Member
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Mr. Redocindo L. Santillan - Information Officer V
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Mr. Carlo B. Castillo - Information Officer II
Mrs. Zenaida T. Mapua - Accountant III
Mrs. Chona S. Santos - Cashier III
Mr. Richard G. Apuyan - Stenographer II
Mr. Eliseo D. Raganit - Utility Worker I
Mr. Roberto N. Medina - Driver II
Mr. Ferdinand C. Gutlay - Clerk II
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