BOOK OF ABSTRACTS

THE 2ND INTERNATIONAL CONFERENCE ON
SCIENCE TECHNOLOGY & INNOVATION-MAEJO UNIVERSITY

ICSTI-MJU
2022

MARCH 18, 2022, CHIANG MAI, THAILAND

FACULTY OF SCIENCE, MAEJO UNIVERSITY

BOOK OF ABSTRACT

The 2nd International Conference on
Science Technology & Innovation-Maejo University
(2nd ICSTI-MJU)

Chiang Mai, Thailand
March 18, 2022

PREFACE

The 2nd ICSTI-MJU is hosted by Faculty of Science, Maejo University, Thailand. The conference looks for significant contributions to all major fields of Innovations in Science and Technology, Biological Science and Technology, Mathematics, Statistics, Computer, Data Science and related fields. The aim of the conference is to provide a platform to the researchers and practitioners from both academia as well as industry to meet and share cutting-edge development in the field. It is held online conference on March 18, 2022. It is honored by four keynote speakers: Professor Dr. Shigeo Maruyama, Department of Mechanical Engineering, School of Engineering, The University of Tokyo, Japan; Emeritus Professor Don McNeil, School of Mathematical and Physical Sciences, Macquarie University, Australia; Professor Dr. rer. nat. Andreas Schäffer, Director of the Institute for Environmental Research Chair of Environmental Biology and Chemodynamics Aachen University, Germany; and Professor Dr. Gomathi Velu, Department of Agricultural Microbiology, Directorate of Natural resource Management Tamil Nadu Agricultural University, India. A total of 37 papers from Thailand, Lao, India, Canada, United Kingdom, and Germany have undergone a strict peer-review process, and they are invited for oral presentation at the conference.

We would like to thank the organizing committees, session chairs, reviewers, and all technical staffs for their continuous hard work and professional efforts in organizing this conference. We would also like to extend our best gratitude to keynote speakers for their invaluable contribution and worthwhile ideas shared in the conference.

Keynote Speakers:

1. **Professor Shigeo Maruyama**
   Department of Mechanical Engineering, School of Engineering,
   The University of Tokyo, Japan

2. **Emeritus Professor Don McNeil**
   School of Mathematical and Physical Sciences, Macquarie University,
   Australia

3. **Professor Dr. rer. nat. Andreas Schäffer**
   Director of the Institute for Environmental Research Chair of
   Environmental Biology and Chemodynamics Aachen University,
   Germany

4. **Professor Dr. Gomathi Velu**
   Department of Agricultural Microbiology, Directorate of Natural resource
   Management Tamil Nadu Agricultural University, India

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Conference Agenda

Time	Friday 18 March 2022
8.00-8.30	Registration
8.30-9.30	Opening Ceremony
9.30-9.45	Coffee Break
9.45-10.30	**Professor Dr. Shigeo Maruyama** Department of Mechanical Engineering, School of Engineering, The University of Tokyo, **Japan**
10.30-11.15	**Emeritus Professor Dr. Don McNeil** School of Mathematical and Physical Sciences, Macquarie University, **Australia**
11.15-11.15	Oral Presentation
12.15-13.00	Break
13.00-13.45	**Professor Dr. rer. nat. Andreas Schäffer** Director of the Institute for Environmental Research Chair of Environmental Biology and Chemodynamics Aachen University, **Germany**
13.45-14.30	**Professor Dr. Gomathi Velu**; Department of Agricultural Microbiology, Directorate of Natural resource Management Tamil Nadu Agricultural University, **India**
14.30-17.30	Oral Presentation (continue)
17.30	Conference Closing

Note : THAILAND/Bangkok; Time Zone: UTC/GMT+7

Conference Schedule

2nd ICSTI-MJU 2022, Maejo University, Chiang Mai, Thailand

Time	18 March 2022	
8.00-8.30	Registration	
8.30-9.30	Opening ceremony	
9.30-9.45	Coffee break	
9.45-10.30	Keynote speaker: Professor Dr. Shigeo Maruyama Japan	CVD synthesis and application of 1D vdW hetero-structures based on single-walled carbon nanotubes
10.30-11.15	Keynote speaker: Emeritus Professor Dr. Don McNeil Australia	Mapping, Graphing and Forecasting Global Land Surface Temperature using Data from NASA

Note : THAILAND/Bangkok; Time Zone: UTC/GMT+7

	Session 1: Mathematics, Statistics, Computer & Data Science	Session 2: Innovations in Science & Technology	Session 3: Biological Science and Environmental
	Oral Presentation Session		
11.15-11.30	iAB65002: Effects of educational campaigns on mathematical models to control the spread of rotavirus infection (Thailand)	iAB65001: Gallic acid, the isolation and method development for the quantitative determination from Phyllanthus emblica L. extract (Thailand)	iAB65004: On-site diagnosis of acute hepatopancreatic necrosis disease in shrimp farms using visual detection of isothermal nucleic acid amplification (Thailand)
11.30-11.45	iAB65005: Estimation of population size based on zero-truncated, one-inflated, and covariate information (Thailand)	iAB65003: Blood glucose biosensor based on glucose oxidase co-immobilized with copper(I) oxide at manganese (IV) oxide on graphene quantum dots in chitosan scaffold (Thailand)	iAB65006: Development of hybrid tofu with dietary fiber supplementation as an alternative for dietary protein (Thailand)
11.45-12.00	iAB65008: Construction of Bivariate Copulas for Multivariate Statistical Process Control: a review (Thailand)	iAB65009: Facile synthesis of platinum-gold nanoparticles@carbon dot-graphene oxide and characterization by deposition with chitosan on electrode surface (Thailand)	iAB65007: The integration of passive and active satellite sensors for water resources extraction and mapping for sugarcane plantation area in Northeastern, Thailand: Geoinformatics approaches (Thailand)
12.00-12.15	iAB65010: Modelling Road Accidents Injuries and Fatalities in Suratthani province of Thailand using Conway-Maxwell-Poisson Regression (Thailand)	iAB65013: Drying Kinetics Equation of Curcuma comosa (Curcuma xanthorrhiza Roxb.) (Thailand)	iAB65012: Effect of various extraction solvents on efficiency of natural pigment based dye sensitized solar cell (Thailand)

12.15-13.00	Break		
13.00-13.45	**Keynote speaker:** **Professor Dr. rer. nat. Andreas Schäffer** **Germany**	**Pesticide mixtures - Gaps in environmental risk assessment**	
13.45-14.30	**Keynote speaker:** **Professor Dr. Gomathi Velu** **India**	**Role of biopolymers in sustainable environment**	
Oral Presentation Session (Continue)			
	Session 1: Mathematics, Statistics, Computer & Data Science	**Session 2: Innovations in Science & Technology**	**Session 3: Biological Science and Environmental**
14.30-14.45	iAB65011: Travel time impact in multi-modal mode: a case study of the new railway line Ban Phai to Nakhon Phanom (Thailand)	iAB65018: Smart Application for Finding Parking and Car Owners (Thailand)	iAB65015: A low-cost alternative photosensitizer for dye-sensitizied solar cells using Sandoricum koetjape natural dye (Thailand)
14.45-15.00	iAB65016: Reward-Based Crowdfunding under Blockchain for Beauty Industry (Thailand)	iAB65027: Improving the properties of paper from rice straw (Lao)	iAB65020: The Natural resources management on basis of biodiversity and community utilization in Mae Hong Son Province: A case study at Ban Na Pla Chad (Thailand)
15.00-15.15	iAB65017: Question Generation from Thai Wiki paragraphs by using Transformer (Thailand)	iAB65029: Development of electrochemical dopamine sensor based on conducting polymer-gold nanoparticle composites (Thailand)	iAB65021: The Reduction of Forest Fire by the Local Community Participation on Resources Management in Mae Tha Lu Village, Mae Hong Son Province (Thailand)

	Session 1: Mathematics, Statistics, Computer & Data Science	Session 2: Innovations in Science & Technology	Session 3: Biological Science and Environmental
15.15-15.30	iAB65022: Forecasting air pollution particulate matter (PM2.5) in Chiangmai, Thailand (Thailand)	iAB65031: Synthesis of Biphasic calcium phosphate (BCP) from Lime Mud (Thailand)	iAB65023: Application of needle flowers, portulaca flowers and teak leaves as natural sensitizers for dye-sensitized solar cells (Thailand)
15.30-15.45	**Coffee Break**		
15.45-16.00	iAB65026: Estimating under-reporting of COVID-19 in infected cases in Chiangmai (Thailand) by capture-recapture methods (Thailand)	iAB65034: Biomass derived activated porous carbon from Manilkara kauki L bark as potential adsorbent for the removal of Congo red dye from wastewater: adsorption isotherm and kinetic studies (India)	iAB65024: Plant-growth media from hydrogels based on poultry-feather waste (Germany)
16.00-16.15	iAB65028: The Parameters Estimation for the Discrete Weibull Regression Model With Type-I Right Censored Data (Thailand)	iAB65035: Purification humic acid as precursor to synthesize reduced graphene by hydrothermal method with microwave assisted method (Thailand)	iAB65025: The reduction of unpleasant odor in pseudo ceramic by using natural filler (Thailand)
16.15-16.30	iAB65030: On the asymptotic normality of the estimator for ratio of Binomial proportions (Thailand)	iAB65037: Characterization of bioplastic (Poly Hydroxy Butyrate) producing bacteria from termite mound soil (India)	iAB65036: Decolorization of Methylene Blue (MB) by Biosorption of Termite Fungus Termitomyce sp. (India)
16.30-16.45	iAB65032: Estimating the number of cannabis abuse in Chiangmai (Thailand) using single source data (Thailand)	-	iAB65039: Organic soil amendments' impact on the fate of the herbicide MCPA and microbial communities (Germany)

	Session 1: Mathematics, Statistics, Computer & Data Science	Session 2: Innovations in Science & Technology	Session 3: Biological Science and Environmental
16.45-17.00	iAB65033: application of the Horvitz Thompson estimator based upon Poisson Shanker model for capture-recapture data (Thailand)	-	-
17.00-17.15	iAB65038: Impacts of Road Characteristics and Weather Conditions on Fatal Accidents in Surat Thani Province of Thailand (Thailand)	-	-
17.15-17.30	iAB65040: Mathematical Modeling on Transmission and Optimal Control Strategies of Corruption Dynamics (Thailand)	-	-
17.30	**Conference Closing**		

List Oral Presentation Abstracts

Conference Topic 1:
Mathematics, Statistics, Computer & Data Science

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Abstract: Oral Presentation

Conference Topic 1:

Mathematics, Statistics, Computer & Data Science

Effects of educational campaigns on mathematical models to control the spread of rotavirus infection

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Abstract

In the modern-day manufacturing, multivariate statistical process control (MSPC) is an important for monitoring more than one quality characteristic. A multivariate control chart approach is developed by the construction of bivariate copulas model. Most multivariate detection procedures based on multi-normality assumptions are independent. However, these assumptions are rarely met in real situations. Therefore, construction of bivariate copulas can be applied to determine the performance of multivariate control charts in terms of *ARLs*. This paper presents various types of copulas modelling based on bivariate copulas constructed. Furthermore, the Monte Carlo simulation technique was used to determine the approximate *ARLs* based on the construction of new class of bivariate copulas on multivariate control charts.

Keyword: Copula, control chart, Monte Carlo simulation, joint distribution

Estimation of population size based on zero-truncated, one-inflated and covariate information

Tita Jongsomjit[1,*], Rattana Lerdsuwansri[1], Krisana Lanumteang[2]

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[2] Division of Statistics, Faculty of Science, Maejo University, Thailand

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Abstract

To estimate the unknown size of the population that is difficult or hidden to enumerate, the capture-recapture method is widely used for this purpose. We propose the one-inflated, zero-truncated geometric (OIZTG) model to deal with three important characteristics of some capture–recapture data: missing zero counts, excess ones, and observed heterogeneity. The OIZTG is generated by two distinct processes, one from a zero-truncated geometric (ZTG) process, and the other one-count producing process. To explain heterogeneity at an individual level, the OIZTG provides a simple way to link the covariate information. A simulation study shows that there are differences among population size estimates. The OIZTG gives asymptotic unbiased estimator where as existing population size estimators seem to be quite biased. Finally, we applied the OIZTG to estimate the number of heroin users in Chiang Mai from 2013 to 2018, and the likelihood ratio test was examined for the presence of one-inflation.

Keyword: Capture-recapture, Zero-truncation, One-inflation, Unobserved heterogeneity, Geometric regression

Construction of Bivariate Copulas
for Multivariate Statistical Process Control: A Review

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Abstract

In the modern-day manufacturing, multivariate statistical process control (MSPC) is an important for monitoring more than one quality characteristic. A multivariate control chart approach is developed by the construction of bivariate copulas model. Most multivariate detection procedures based on multi-normality assumptions are independent. However, these assumptions are rarely met in real situations. Therefore, construction of bivariate copulas can be applied to determine the performance of multivariate control charts in terms of *ARLs*. This paper presents various types of copulas modelling based on bivariate copulas constructed. Furthermore, the Monte Carlo simulation technique was used to determine the approximate *ARLs* based on the construction of new class of bivariate copulas on multivariate control charts.

Keyword: Copula, control chart, Monte Carlo simulation, joint distribution

Modelling Road Accidents Injuries and Fatalities
in Suratthani province of Thailand
using Conway-Maxwell-Poisson Regression

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Abstract

Thailand has the highest casualties in road traffic accidents among the ASEAN countries and ranked second in the world as reported in the 2015 World Health Organization survey (36.2 deaths per 100,000 population). Road safety has become a critical problem for the country, especially in provincial areas. Suratthani province has been one of the top ten provinces facing road traffic accidents for many years and the largest number of accidents in the southern region. In this study, we investigated factors associated with the injury and fatality counts per accident using the Conway-Maxwell-Poisson regression model, based on data collection of 2,887 accidents in 2015. Six covariates considered were road type, road skin, accident point, atmosphere, light condition, and accident month. The results showed that the distribution of injury and fatality count data was under-dispersed, which is rare. Road type, light condition, and accident month were statistically significant factors associated with the count response. The mean injury and death count is 2.87 times higher when driving on the National Highways than on the Rural Roads, when holding other variables constant. Driving at night, such numbers were reduced by a factor of 0.49 with streetlights, compared to that without. Our findings also show that when using September as a reference month January, February, March, and August play a crucial role in reducing human injuries and deaths on the road. These findings could be useful to set up preventive measures at the road level in this province and the method can be applied to wider regions.

Keyword: road crash fatalities; fatal accident; nonfatal accident; count model; underdispersion

Travel time impact in multi-modal mode:
a case study of the new railway line Ban Phai to Nakhon Phanom

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Abstract

Setting a new rail network is one of important projects that that have been developed to support public transportation in Thailand. This study examined the impact of travel time on a new rail line (Ban Phai-Nakhon Phanom) which is a double-track train that will be finished in 2025 (STATE RAILWAY OF THAILAND, 2019). Comparing with taking any combination of public transportations, we showed that combining a conventional rail, which is a single-track train, from Bangkok can reduce the travel time to any destination along Ban Phai-Nakhon Phanom rail line. Therefore, it might be worthy to upgrade the single-track railway in Bangkok to be a double-track in order to further decreasing travel time. Exploiting the travel time on Ban Phai-Nakhon Phanom rail line, we studied the impact of travel time between provinces above and below the the railway. To do so, we considered different travel options (single-track, double-track, cars and buses) and a combination of these options and compare their travel times. The results showed that traveling with the new double-track train spent less or equal to the travel time of driving a car except the case of Khonkaen to Yasothon due to the train station is far away from bus station that travellers need to transfer. On the other hand, comparing with taking a bus, which is a traditional public transport in this area, we found that traveling with the new double-track train extremely save the travel time. Thus, it might be suitable to have a public transportation linking between train and bus stations or to expand the double-track railway toward the cities along the main line.

Keyword: travel time, double-track, railway, multi-modal mode.

Reward-Based Crowdfunding under Blockchain for Beauty Industry

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Abstract

The objectives of this research is to develop platform for Reward-Based Crowdfunding under Blockchain for Beauty Industry. In this study bases on the software development cycle: problem definition, feasibility study, user requirement, system analysis and design, testing and evaluation. A survey of 20 Agents found the agents do not have much money to invest same as dealers, interested in transparency investment, reliable investment, need extra income but still worried about payment with cryptocurrency. The platform development of Reward-Based Crowdfunding under Blockchain for Beauty Industry via website https://dealerstd.com/ including 1. Agent management system 2. Products management for crowdfunding 3. Reward-Based Crowdfunding 4. Payment system via Omise who supports with cryptocurrency by connect with wallet MetaMask). 5. Utility token redeem rewards via Binance Smart Chains. The Website Performance Test Results via www.gtmetrix.com is grade A including 89 % performance, 95% of a good website structure and interactive layout shift (CLS) of 0.2. The satisfaction evaluates from 32 users, Investments based on the concept of Reward-Based Crowdfunding through the website are interesting in a score of 5 equals 35.7% and 57.1%. The users are knowledgeable in blockchain technology, they will be interested in using token as Rewards with a score of 3. On-going research, to develop a notification system for making online payments completely and the crowdfunding is met with a target.

Keywords: agent, crowdfunding, blockchain, reward-based

Question Generation from Thai Wiki paragraphs
by using Transformer

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Abstract

Question Generation (QG) is one of the tasks in natural language processing that allows computers to understand text and human language. As an important task in education, QG generates interrogative sentences, similar to that of humans. There are various techniques from numerous research studies related to the generation of question in the Thai language; however, they employ additional features and mechanisms, as well has having very complex model architecture. In the study herein, we present a method for a *wh*-question (what, when, where, who, and which) generation model in Thai with transformer neural networks; and, without the need for extra techniques in the training model. We generated questions in two ways: 1) normal input paragraphs, and 2) adding keywords. We found it necessary to generate the same number of questions (4204) for each method. We developed an algorithm to measure the performance of diverse questions and to remove recurring questions from both methods. As a result, the process of adding keywords obtained 2968 questions and 1494 questions from the normal input paragraphs.

Keyword: Question Generation, Natural language processing,
Natural language understanding, Thai language processing

FORCASTING AIR POLLUTION PARTICULATE MATTER (PM2.5) IN CHIANG MAI, THAILAND.

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Abstract

Dust with a diameter of not more than 2.5 microns is caused by combustion from vehicles, burning agricultural materials, forest fires, and industrial processes can reach the air sacs in the lungs affecting people's health. Chiang Mai, a large city in northern Thailand, suffer air pollution problem. It is found air quality index is higher than standard level, especially in summer. The objective of this study was to proposed a multiple linear regression model for predicting PM2.5 in Chiang Mai by climate variable including rain, relative humidity, temperature and wind speed. Data was collected from The Pollution Control Department and Thai Meteorological Department during 11 July 2016 – 31 December 2020, totalling 234 weeks. In this study, we have developed the model using Box-Cox transformation under various power parameter. The results indicated that the efficiency of PM2.5 model transformed using power parameter lambda = -0.5 outperforms others with the smallest mean absolute percentage error.

Keyword: pm2.5, multiple linear regression, Box-Cox transformation, mean absolute percentage error.

ESTIMATING UNDER-REPORTING OF COVID-19 INFECTED CASES IN CHIANGMAI (THAILAND) BY CAPTURE-RECAPTURE METHODS

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Abstract

Globally, the number of new Covid-19 cases and deaths are reported day by day. For Thailand, Chiangmai was ranked the top ten cities of the highest number of infected patients during the end of 2021. Estimation of the true number of Covid-19 infections is still being a major open research topic for decision of policy makers. We examine lower bound estimators for the number of undetected Covid-19 infected cases. Chao estimator and Lanumteang-Böhning estimator based on population heterogeneity were applied for Chiangmai Covid-19 infection per day from December 2021 to January 2022. We found that Lanumteang-Böhning estimator provides the smaller variance of estimation than Chao estimator. The number of undetected Covid-19 cases in Chiangmai is approximately 120.31 cases per day and it yields an average 0.39% of the under-reporting infected patients.

Keyword: population heterogeneity, zero-truncated data, undetected cases, Chao estimator, Lanumteang-Böhning estimator

The Parameters Estimation for the Discrete Weibull Regression Model with Type-I Right Censored Data

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Abstract

This research aimed to study the parameters estimation for the discrete Weibull regression model with type-I right censored data by linking both the shape parameters which are the log-log link function and the log link function. Moreover, this study compared the performance of the Bayesian estimation under the three different prior distributions; uniform noninformative prior, Laplace prior, and normal prior using the random walk Metropolis algorithm and the maximum likelihood estimation. A simulation study was conducted to compare the performance of four different estimation methods under three explanatory variables and over-dispersion response data by using the mean square error. The results from the simulation study showed that the Bayesian estimation with Laplace prior is more appropriate for the discrete Weibull regression model with type-I right censored data than other methods.

Keyword: Bayesian estimation, discrete Weibull regression,
maximum likelihood estimation, random walk Metropolis algorithm,
type-I right censored

ON THE ASYMPTOTIC NORMALITY OF THE ESTIMATOR FOR RATIO OF BINOMIAL PROPORTIONS

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Abstract

In this article we investigate the accuracy of normal approximation for the distributions of the estimators for the ratio of probabilities in Bernoulli trials. The construction of estimators is done under two experimental schemes: direct binomial sampling with the fixed number of trials n, and inverse, when the observations are continued until m successes appear in the trials. The estimators are simulated by the Monte Carlo method and their variances are calculated. The empirical distribution functions are constructed by the data of statistical modeling. The divergence between empirical distribution function and its normal approximation distribution function in uniform metric are considered, and also quantile points (0.05 and 0.95) are compared. The accuracy properties of the normal approximation are investigated. In this article, the investigations of the accuracy of asymptotic normality are given for all possible schemes of experiments: direct–direct, direct–inverse, inverse–direct, inverse–inverse. Then, the obtained table values allow to rank the accurate performance of four schemes of Binomial experiments. According to the results of presented calculations, recommendations for a usage of particular trials are given. Moreover, we consider the two Special Cases: direct–inverse and inverse–direct. The feature of Special Cases is using the value from the first sample for construction the second sample. Eventually, we would compare the accurate performance of two Special Cases between the direct–inverse and inverse–direct from normal cases.

Keyword: Asymptotic normality, accuracy properties of estimators, Binomial distribution, parameter estimation.

ESTIMATING THE NUMBER OF CANNABIS ABUSE
IN CHIANGMAI (THAILAND) USING SINGLE SOURCE DATA

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Abstract

Drug abuse has become a serious health and social problem for many countries. People with drug use disorders need treatment, social care and rehabilitation. To accomplish the sustainable development goals, predicting the number of drug addicts is crucial. Cannabis continues to be the most widely used drug worldwide including Thailand. We estimate the size of the population of cannabis abuse in Chiangmai (Thailand) by using a single source data via capture-recapture method. Homogeneity and heterogeneity Poisson models are also applied leading to the prevalence rate of cannabis users in ChiangMai (Thailand) approximately $55.53-102.37$ per 100,000 population. A zero-truncated Poisson regression shows significant covariates affecting repeated visiting the contact treatment center. The results show that the counts of receiving treatment are determined by age group and reasons for receiving treatment.

Keyword: capture-recapture method, homogeneity and heterogeneity Poisson models, zero truncated Poisson regression

An application of the Horvitz Thompson estimator based upon Poisson Shanker model for capture-recapture data

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Abstract

Estimator for population size has been developed a long history for capture-recapture data. In this study, I have proposed an alternative estimator based upon Poisson Shanker model to estimate hidden population size. This model can represent count data for both homogeneity and heterogeneity. As a result of unknown zero frequency, Horvitz Thompson estimator based on the zero truncated Poisson Shanker has been constructed. The parameter of model is estimated using maximum likelihood estimation. Here, I illustrate the new estimator applying to real capture-recapture data sets for point and interval estimation. The results show the new estimator provides good efficiency for heterogeneity in population comparing with the zero truncated Poisson model.

Keyword: zero truncated distribution, Poisson Shanker, mixture of Poisson

Impacts of Road Characteristics and Weather Conditions on Fatal Accidents in Surat Thani Province of Thailand

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Abstract

The objective of this study was an identification of road and environmental factors for road traffic accidents in Surat Thani province of Thailand in 2015 using a binary logistic regression analysis. This province was chosen for this study because it has faced many accidents for several years. A total of 2,887 crashes were recorded during the study. A response variable is fatal or non-fatal accidents and covariates are road type, road surface, accident point, weather, and light condition. Our findings show that driving on roads connecting cities was 22% less likely to be involved in a fatal accident, compared to travelling on local roads. Compared to daylight, drivers were 2.647 times more likely to die in crashes with adverse road conditions without streetlight. Fatal accidents were 2.860 times more likely to happen on curves than on straight roads. Weather and road surfaces were not statistically significant factors for road safety. Other factors such as human behaviors and law enforcement may be considered in future study.

Keyword: road traffic injuries, road accident fatalities, road safety, odds ratio, accident prediction

Mathematical Modeling on Transmission and
Optimal Control Strategies of Corruption Dynamics

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Abstract

In this research, we examine a deterministic mathematical model to investigate the prevalence of corruption in society. We assume that corruption in society spreads like an infectious disease, and our model is based on this notion. The model's equilibria are identified, and the stability of these equilibria is studied in depth. At the Corruption Free Equilibrium Points (CFEP), the next generation matrix technique is used to estimate the corruption model's Corruption Transmission Generation Number (R_c). The CFEP is stable when $R_c < 1$, however when $R_c > 1$, the corruption persistence equilibrium points (CPEP), indicates the existence of corrupted persons in society. A forward bifurcation can occur when $R_c =1$. The worldwide asymptotic stability of CFEP is determined by further investigation. The goal of this work is to identify the parameters of interest for additional research, with the objective of informing and supporting policymakers in maximizing the effectiveness of preventive and therapeutic efforts.

Keyword: Mathematical Model, Corruption Dynamics, Stability, Sensitivity Analysis, Optimal Control

Abstract: Oral Presentation

Conference Topic 2:

Innovations in Science & Technology

Gallic acid, the isolation and method development for the quantitative determination from *Phyllanthus emblica* L. extract

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Abstract

The isolation of *Phyllanthus emblica* L. fruits extract led to the isolation of gallic acid. The structure of this compound was characterized spectroscopic data especially ^{1}H and ^{13}C NMR data. The method validation for qualification of gallic acid was developed by using RP-HPLC. The chromatographic separation was achieved with VDSpher PUR C18-E column (4.6 x 250 mm, 5 μm), injection volume 10 μL. The mobile phase consisting of ACN and 0.5% H_3PO_4 was flowed with 1.0 mL/min and detected at 272 nm. The resulting of calibration curve showed a good linearity with R^2 = 0.9995. LOD and LOQ values were 8.36 and 25.34 ug/mL, respectively. The accuracy showed the %recovery between 96.73 – 103.34%. This developed method was applied to determine gallic acid in *P. emblica* extract and the result were calculated to contain 2.67 %w/w.

Keyword: Gallic acid, Phyllanthus emblica, HPLC, Method validation

BLOOD GLUCOSE BIOSENSOR BASED ON GLUCOSE OXIDASE CO-IMMOBILIZED WITH COPPER (I) OXIDE AT MANGANESE (IV) OXIDE ON GRAPHENE QUANTUM DOTS IN CHITOSAN SCAFFOLD

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Abstract

The fabrication of glucose biosensor for real blood application based glucose oxidase (GOx) co-immobilized with copper (I) oxide at manganese (IV) oxide ($Cu_2O@MnO_2$) on the graphene quantum dot (GQD) in chitosan scaffold (CHIT) on the glassy carbon electrode (GOx/CHIT-GQD@$Cu_2O@MnO_2$/GCE) was developed. The cyclic voltammetric and amperometric techniques were used for the current detection from the produced H_2O_2. The optimized parameters as applied potential, GOx loading, GQD content, $Cu_2O@MnO_2$ were found at +0.80 V, 15 units, 300 μg, and 300 μg, respectively. The GOx/CHIT-GQD@$Cu_2O@MnO_2$/GCE biosensor showed 2 linear ranges of 0.05 mM – 1.0 mM (y = 112.38x + 102.77, R^2 = 0.9946) and 1.0 mM – 30.0 mM (y = $1_{83.69}$x + $_{4.222}$, R^2 = 0.9$_{903}$) with a limit of detection at $_{1.49}$ mM and no effect from the common interferences. This GOx/CHIT-GQD@$Cu_2O@MnO_2$/GCE biosensor was applied to detect glucose in real blood samples and it was validated with the commercial glucose biosensor.

Keyword: Glucose biosensor, Graphene quantum dot,
Copper (I) oxide at manganese (IV) oxide

FACILE SYNTHESIS OF PLATINUM-GOLD NANOPARTICLES@CARBON DOT-GRAPHENE OXIDE AND CHARACTERIZATION BY DEPOSITION WITH CHITOSAN ON ELECTRODE SURFACE

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Abstract

Metal nanoparticle and carbon materials have significant impact on biosensor due to their precise biomolecular interaction, excellent selectivity, and unpoised effect of the electrode. Bimetallic alloys based on platinum-gold nanoparticles was successfully synthesized at carbon dot-graphene oxide (PtAu@CDs-GO) by the one-step hydrothermal method in ethylene glycol-water system. The nanocomposite was characterization by x-ray diffraction spectroscopy, transmission electron microscopy, scanning electron microscopy, energy dispersive spectrometry, ultraviolet-visible spectrophotometry, and Fourier transform infrared spectroscopy. The PtAu@CDs-GO was mixed with the chitosan (CHIT) to enhance the biocompatibility and modified on the glassy carbon electrode (GCE). Electrochemical techniques such as cyclic voltammetry and electrochemical impedance spectroscopy (EIS) on PtAu@CDs-GO-CHIT/GCE in 5.0 mM $K_3Fe(CN)_6$ containing 0.1 M KCl were studied. The voltammetric response showed low potential of -0.23 V and high anodic peak current of 0.18 mA, while the EIS result shows polarized resistance (R_p) decreased from 4980 Ω to 136 Ω compared with the bare GCE.

Keyword: Platinum-gold nanoparticle, Carbon dot, Graphene oxide

Drying Kinetics Equation of Curcuma comosa (Curcuma xanthorrhiza Roxb.)

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Abstract

Curcuma comosa, a flowering plant native to Asia and belonging to the Zingiberaceae family, is one of the herbaceous plants widely used as a traditional herbal remedy due to the antioxidant properties of the extracts and the powerful estrogen-like activity of the plant. It is commonly used in Thai traditional women's medicines from fresh and dried species, including the essence extraction from the herbal powder. Herbs have a moisture content of less than 10% of the wet standard, implying that drying is critical in industrial production, in addition to storage and transportation. The thin layer drying kinetics of Curcuma comosa were investigated in this study utilizing a hot air oven at different temperatures combined with infrared irradiation to remove the moisture from the rhizomes. Before being under drying process, rhizomes were sliced to a thickness of no more than 5 mm, and the initial moisture content was determined to be around 600%db. Results revealed that the moisture content was effectively decreased to less than 10%db after 8.5h at a temperature of 60ºC, including a simultaneous 3.5h of infrared irradiation. Additionally, the moisture ratio of the Curcuma comosa drying was successfully predicted by a mathematical model of thin layer drying of 10 models analyzed by non-linear regression method. As a result, this model provides the most accurate description of the drying curves of Curcuma comosa slices under all drying processing settings.

Keyword: Curcuma comosa, Drying Kinetics, Hot air drying, Infrared drying

Smart Application for Finding Parking and Car Owners

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Abstract

Currently, Nakhon Ratchasima Rajabhat University has a large number of cars each day, but on-campus parking is limited, making it time-consuming to locate and sometimes drivers are required to park in restricted areas. Therefore, causing problems in the parking lot blocking the entrance, causing the car to not get in and out. This research has developed an application to solve problems encountered in Nakhon Ratchasima Rajabhat University. There are real users of parking spaces in all 30 buildings in Nakhon Ratchasima Rajabhat University. This application can be used for both cars and motorcycles. The results of the test using all applications including administrators, faculty members, student staff, etc., a total of 44 people, resulted in an average application satisfaction score of 4.06.

Keyword: Mobile application, Smart application, Car owners, Parking application

Improving the properties of paper from rice straw

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Abstract

This research investigated the improvement of properties of rice straw paper by using two types of additives, which were rice flour and tapioca starch, in order to make the rice straw paper of a better quality. The results of the study found that rice straw paper modified with tapioca starch and rice straw paper modified with rice flour saw as increase in tensile strength compare with unmodified rice straw paper at a 95% confidence level. The highest tensile strength was found in rice flour modified paper at 3.04 ±0.37 N/mm^2, followed by tapioca starch modified paper at 2.12 ± 0.39 N/mm^2 and finally, rice straw paper at 3.04 ± 0.37 N/mm^2. Compression was another way to increase the tensile strength of rice straw paper using a compressive strength of 2,500 pounds per inch at a temperature of 150 ˚C for 5 minutes, the results showed that compression every type of paper had higher tensile strength. However, only rice straw paper and tapioca starch modified paper to have tensile strengths that were statistically different at the 95% confidence level. The rice flour modified paper was found that no statistically significant difference in the tensile strength between uncompressed and compressed paper. In conclusion, rice straw paper modified with rice flour is the strongest paper and could by apply for use as packaging in the future.

Keyword: Pulp paper, Rice straw, Rice Flour, Tapioca starch, Tensile strength

Development of electrochemical dopamine sensor based on conducting polymer-gold nanoparticle composites

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Abstract

In this research, polypyrrole/polypyrrole-3-carboxylic acid/gold nanoparticle (PPy/PP3C/Au) composites material was developed for electrochemical determination of dopamine (DA). PPy/PP3C/Au composites thin film was synthesized by electropolymerization on fluorine doped tin oxide (FTO) coated glass slide. The cyclic voltammetry and amperometry techniques were used to study the efficiency of the obtained conducing polymer-gold nanoparticle composites thin film for the determination of dopamine. It was found the presented PPy/PP3C/Au composites thin film exhibited a good electroactivity property in neutral PBS solution and selectivity for the detection of dopamine with a wide detection linear range from 20 to 200 mM. Therefore, it can be concluded that electrochemically fabricated PPy/PP3C/Au composites thin film can be applied as an electrochemical sensor for the detection dopamine.

Keyword: Conducting polymer, Gold nanoparticle, Dopamine, Electrochemical, Sensor

Synthesis of Biphasic calcium phosphate (BCP) from Lime Mud

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Abstract

The present work proposed the synthesis of biphasic calcium phosphate (BCP) using lime mud as a precursor. BCP was synthesized through a thermal conversion method where a simple precipitation followed by calcination was employed. It was found that AB-type hydroxyapatite (HA) was obtained after chemical precipitation. Upon calcination at temperatures ranging from 1000 ◦C to 1200 ◦C, the calcined samples consisted of HA and beta-tricalcium phosphate (β-TCP). The concentration of toxic elements contained in the samples met the standard suggested in ASTM F 1088-04a, specification for calcium phosphate for surgical implantation. This suggests that the biphasic calcium phosphate synthesized in this work can be used as a medical material.

Keyword: biphasic calcium phosphate, hydroxyapatite, Tri-calcium phosphate, lime mud

BIOMASS DERIVED ACTIVATED POROUS CARBON FROM *MANILKARA KAUKI L* BARK AS POTENTIAL ADSORBENT FOR THE REMOVAL OF CONGO RED DYE FROM WASTEWATER: ADSORPTION ISOTHERM AND KINETIC STUDIES

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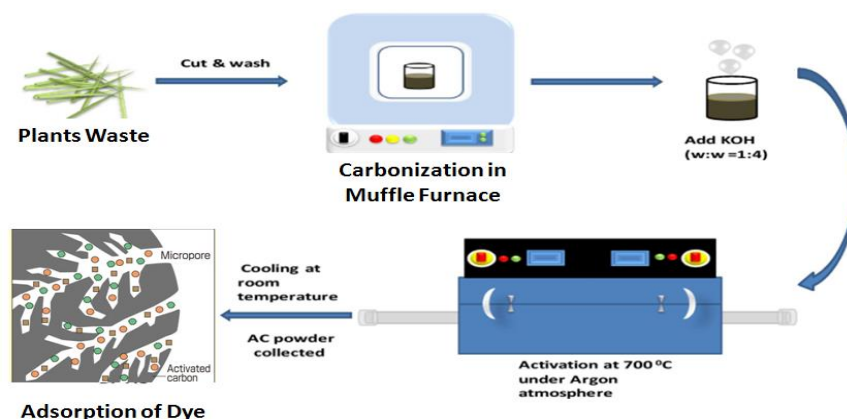[3]Program in Biotechnology, Faculty of Science, Maejo University, Chiang Mai – 50290, Thailand
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Abstract

The use of low-cost and eco-friendly adsorbents has been employed as an ideal alternative to the current expensive methods of removing dyes from wastewater. This study explores preparation (thermally) and activation (chemically) of activated carbon from *Manilkara Kauki L* bark (MKB) for the removal of Congo Red (CR) dye by batch adsorption method. The surface characteristics of the *Manilkara Kauki L* bark carbon (MKBC) was studied by FTIR, TGA and SEM analysis. Adsorption ability of MKBC to remove CR has been investigated by varying various experimental parameters such as initial concentration, contact time, dose and pH of the dye solution and the results were compared with commercial activated carbon (CAC). Alkaline pH was more favorable for CR adsorption and the equilibrium adsorption data was well described by the Langmuir model with adsorption capacity of 3.029 mgg^{-1} for MKBC and 148.08 mgg^{-1} for CAC. The adsorption kinetics was found to be best represented by the pseudo-second-order kinetic model. As a result, the optimum MKBC can serve as cost effective and efficient adsorbent for removing dyes from industrial wastewater.

Keyword: *Manilkara Kauki L* Bark, CR dye; Batch adsorption; Isotherm and Kinetic studies

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Purification humic acid as precursor to synthesize reduced graphene by hydrothermal method with microwave assisted medthod

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Abstract

Humic acid is a naturally occurring substance.It is inexpensive material. the value of humic acid must be increased by used as the precursor to synthesize reduce graphene oxide, which has electrical conductivity property. In this research, Humic acid from laboratory section, Mae Moh mine, Lampang province, has 11 % of carbon. Therefore, humic acid must be purified. The humic acid was dissolved in 2.0 M of sodium hydroxide and left at room temperature for 24, 48 and 72 hours. The precipitation was using 2.0 M of sulfuric acid, then adjusted the pH to 1-2. After that the mixture was centrifuged at 3000 rpm, filtered and dried. The results revealed that the soaking of humic acid in sodium hydroxide for 72 hours provided the highest the percentage of yield was 5.79. The humic acid was confirmed by X-ray diffractometer. The humic acid was purer and more crystalline. Further, it was used as the precursor to synthesis reduced graphene oxide by hydrothermal with microwave assisted method The parameters of synthesis were studied the watt of microwave in range of 300-700 watt and reaction time for 3-12 min. The products were investigated by UV-Vis spectroscopy and Fourier transform infrared spectroscopy.

Keyword: Humic acid, Reduced graphene oxide, Hydrothermal with microwave assisted method

Characterization of bioplastic (Poly Hydroxy Butyrate) producing bacteria from termite mound soil

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Abstract

Globally, there is an increasing demand for bio-degradable polymers intended for various applications from household to industries, which resulted in the production of biopolymers from micro-organisms. Polyhydroxybutyrate (PHB) is considered as bio-plastic produced by broad group of prokaryotes and eukaryotes. This study was aimed to explore the character of potential PHB producing bacteria from termite mound soil and attempts were made to extract the bio-degradable polymer from the bacterium *Bacillus.* The characterization of polymer was carried out by FTIR and XRD.

The presence of specific functional group at the wave numbers (400 to 4000 cm^{-1}) clearly denoted, analyzed by Fourier Transform InfraRed Spectroscopy (FTIR). The absorption peak denoted in the extracted PHB from the bacterium at wave number ranging from 500 to 3000 cm^{-1}. The peak at the wave number 1452 cm^{-1}, 1720 cm^{-1}, 2972 cm^{-1} corresponds to (-C=C-) stretch and symmetric stretch. The vibration of –CH$_3$ methyl group was indicated by 1376 cm^{-1} confirms the presence of polymer group present in the extracted PHB.

X-Ray Diffraction (XRD) was used to confirm the crystalline structure of the extracted PHB from *Bacillus.* The XRD diffractogram represents the prominent peaks at 13.59°, 16.96, 20.12°, 21.50°, 22.70°, 25.54°, 27.17°, 29.81°, 30.95°, 34.80°, 37.21°, 40.72°, 44.30°, 48.83. The presence of intense peak at 13.59°, 16.96° indicates the crystalline nature of the polymer. The functional group and crystalline structure of the extracted PHB was studied clearly. *Bacilli* (PHB producers) will be further utilized for the production of PHB using various nutrient sources to ensure sustainable production of bio plastics that have greater potential in various fields.

Keyword: Polyhydroxybutyrate, bio-plastic, XRD, FTIR.

Abstract: Oral Presentation

Conference Topic 3:

Biological Science and Environmental

The 2nd International Conference on

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On-site diagnosis of acute hepatopancreatic necrosis disease in shrimp farms using visual detection of isothermal nucleic acid amplification

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Abstract

Acute hepatopancreatic necrosis disease (AHPND) is currently the most important bacterial disease of shrimp, causing significant economic losses globally each year. Traditional histopathological diagnosis fell far short of the need for effective monitoring, and polymerase chain reaction (PCR)-based molecular diagnostic methods that rely on sophisticated thermocyclers and trained personnel are hardly applicable in the field. Combining the loop-mediated isothermal amplification combined with Xylenol orange (LAMP-XO), a diagnostic method suitable for on-site everyday monitoring of AHPND has been established in this study. This LAMP-XO method targeted the binary toxic photorhabdus insect-related gene PirA as a virulence plasmid of the AHPND-causative *Vibrio parahaemolyticus* strains. The diagnostic test was completed within 60 min at 65°C and showed good specificity and good sensitivity of 10 fg DNA of the AHPND shrimp or 10 colony-forming units of the causative bacterium per reaction, which was comparable to the administration-approved standard PCR-AP4 assay. Crude templates from samples extracted using rappid extraction could be directly used. Tests of clinical samples showed 100% consistency of this method with the standard PCR-AP4 assay. This LAMP-XO method can be a good choice for on-site diagnosis of AHPND with quick response time, easy procedure and low demand for resources, and should have significant value for the control of the spread of this dangerous disease in farmed shrimp.

Keywords: visual; LAMP; Xylenol orange; AHPND; shrimp

Development of hybrid tofu with dietary fiber supplementation as an alternative for dietary protein

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Abstract

Tofu, a well-known product made from soybeans, has been widely popular among people around the world as an alternative source of dietary protein. The tofu is considered as high-quality protein for healthy adults whilst low quality protein for growing children. However, tofu contains lowest the sulfur-containing amino acids and limited amount of dietary fiber. This study aimed to develop hybrid tofu (HT) from soymilk and cow milk with dietary fiber supplementation from mushroom. Optimization of every single steps of tofu production was primarily conducted and the HT was produced along the optimized conditions. Then, the HT was subjected for proximate, texture, and amino acid component analyses in comparison with conventional tofu (CT). For 50 g dried soybeans, it was found that the optimized water for soymilk production was 1000 mL (1:20 w/v) and it was required 4 times of extraction within the initial water volume (250mL each extraction). Suitable coagulant was 0.2 % w/v citric acid while 5 - 10% w/v cow milk supplementation was optimized with the coagulant. 10% ground mushroom became optimized for this supplementation. The HT was successfully produced using the above optimized parameters. Proximate analyses revealed that the HT contained higher humidity (p=0.000) and fibers (p=0.000) while contained lower nitrogen (p=0.000), protein (p=0.021), and fat (p=0.000) contents compared to CT. Texture analyses indicated insignificant hardness, chewiness, and gumminess, whilst cohesiveness (p=0.003) and springiness (p=0.003) were significantly higher in CT. The microstructure of HT was revealed by obvious dietary fiber distribution on rough surface topography. Lactose contents were not detectable in the HT. However, amino acid contents revealed a significantly less in both essential and non-essential amino acids in the HT. In conclusion, we successfully produced HT, as an alternative source of dietary protein, having similarly overall characteristics to CT with lower nutritious, especially fat and protein but higher dietary fibers. The HT might be suitable for certain groups such as patients with liver and kidney diseases, whose protein intake must be limited, as well as individuals with obesity, whose fat and caloric intake must be limited.

Keyword: hybrid tofu, conventional tofu, dietary fibers, dietary protein, alternative protein

The integration of passive and active satellite sensors for water resources extraction and mapping for sugarcane plantation area in Northeastern, Thailand: Geoinformatics approaches

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Abstract

The study presents water resources extraction and mapping for sugarcane plantation area in NE, Thailand by integrating of passive and active satellite sensors and imageries, namely Sentinel-1A (Microwave active instrument) and LANDSAT 8 OLI satellite data (Passive sensor) by applying of 4 approaches covered of 8 provinces, within in 2 periods in the same year (March and November 2019), namely (1) Unsupervised classification (2) Density slicing (3) Normalize differential Water Index (NDWI), and (4) water area extracted directly from Sentinel-1A imageries. The results *indicated that* in the process 1 and process 2 surface water resources obtained from process 1 located in Nakhon Ratchasima province by the water area of 398.86 square kilometers. In process 2, the water resource found 616.12 square kilometers. Process 1 and 2 showed that the results were much more different in water area, while some area showed the small fluctuated changes. In process 3, the moisture index was used from the wavelength information using NDWI indices. The results showed that Nakhon Ratchasima and Ubon Ratchathani provinces with the highest moisture index by 1 scattered in some areas, while other provinces showed surface moisture index are between 0.3-0.4, respectively. In process 4, water resources was directly extracted from Sentinel-1A imageries by using the backscattering coeffient (σ) between -10 and -15 dB, which the surface water resources area effectively shows spatial relationships and backscattering coefficients. The results showed that the most area of water resources were found in March located in Khon Kaen province by area 418.64 square kilometers, and the most area found in November located in Ubon Ratchathani province, with the area of 353.78 square kilometers, respectively.

Keyword: water resources extraction, remote sensing, Sentinel-1

EFFECT OF VARIOUS EXTRACTION SOLVENTS ON EFFICIENCY OF NATURAL PIGMENT BASED DYE SENSITIZED SOLAR CELL

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Abstract

Natural dye has been utilized as substitute for ruthenium-based dyes in Dye-Sensitized Solar Cell (DSSC). Natural dye was successfully extracted from *Ficus benjamina* using ethanol, methanol and double distilled water as a solvent. And the effect of solvents on efficiency of as prepared DSSCs has been studied extensively. Results revealed that pigment extracted with methanol has demonstrated the highest efficiency(η) of 0.198%, open circuit voltage (V_{OC}) 61.6 mV and short circuit current (I_{sc}) 0.424 mA for *Ficus benjamina*. It has been observed that methanol has enhanced the efficiency of DSSC by 15.67% compared to double distilled water and 11.05% compared to ethanol for *Ficus benjamina*. The pigment concentration analysis showed that *Ficus benjamina* is dominated by chlorophyll-a and the composition is chlorophyll-a: 7.56 µg/ml, chlorophyll-b: 1.957 µg/ml & carotenoid: 3.107 µg/ml. Further, UV spectrophotometer is used to analyze the absorption characteristics of prepared natural dyes.

Keywords: DSSC, Natural Dye, Solvents, *Ficus benjamina, Biosolar*

A LOW-COST ALTERNATIVE PHOTOSENSITIZER FOR DYE-SENSITIZED SOLAR CELLS USING SANDORICUM KOETJAPE NATURAL DYE

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Abstract

In the recent past, low-cost high efficiency natural dye alternate for Dye-Sensitized Solar Cell (DSSC) has been important open problem. In this work, we have studied the light harvesting ability of red and green pigmentation occurring in *Sandoricum koetjape*. Dye containing the red pigment showed 8-fold increase in the efficiency(η) of the DSSC with the value of 0.0866%, open circuit voltage (VOC) 0.345 V and short circuit current (Isc) 0.089 mA. The enhanced efficiency for red pigment is explained by its relatively lower concentration of chlorophyll-a compared to green pigmentation. The pigment composition comprises of chlorophyll-a: 0.506 µg/ml, chlorophyll-b: 0.386 µg/ml & carotenoid: 1.337 µg/ml. It is observed the red pigment is dominated by carotenoid that critically contributes in photoconversion in DSSC. Further UV-Vis analysis was conducted to study the absorption regions of dye solution

Keyword: DSSC, Natural Dye, *Sandoricum koetjape*, Carotenoid, Biosolar

The Natural resources management on basis of biodiversity and community utilization in Mae Hong Son Province: A case study at Ban Na Pla Chad

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Abstract

Mae Hong Son province is considered one of the most biologically diverse and socio-culturally rich biosphere reserves in Thailand. The aim of the study in Natural resources management based on biodiversity and community utilization in Mae Hong Son Province at Ban Na Pla Chad is to investigate the biodiversity and natural resources that the local communities use for daily life and utilization. The hypothesis of this study was to establish the local natural resources and utilization data that would be a tool for enhancing local participation and awareness. In order to broaden the understanding of natural resource management to include social factors, this project was a new approach that conducted the data collection with Chiang Mai Rajabhat University researcher and local researcher in the year 2021-2022. The methods used in this study include thematic and chronological analysis of conservation project reports, interviews with project managers, collection of primary data on the specific activities, and focus group discussions with participants of livelihoods support activities in Na Pla Chad. Eighty types of utilization including the modern and the local indigenous used were collected in this village. The most local used as a plant for food and herb that belonged to 9 families of fourteen species, followed by animal and fungi. The result shows that the amount and frequency of the utilization were depended on the season and specific indigenous knowledge.

Keyword: Indigenous knowledge, Mae Hong Son, Diversity

The Reduction of Forest Fire by the Local Community Participation on Resources Management in Mae Tha Lu Village, Mae Hong Son Province.

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Abstract

This study aims to reduce the forest fire area by using the integrated natural resources management by the local participation in Mae Tha Lu Village, Mae Hong Son Province. The activities were in order to increase the potential local natural resources management and management balance, the data from environmental indices were also investigated in this study. The environmental indices were conducted by survey method and interpreted by using the local data collection model and GIS program. The natural resources data were collected and compared in different conditions including wet and dry seasons. The geographical and moist data were collected from the selected sampling sites in the community forest. The overall data were analyzed by cluster analysis and another mathematical model for testing 2 main hypotheses 1. The local integrated management by local participation was related to the fire problem 2. Some environmental properties in wet fire brake were different from other areas The result has shown that the Mae Tha Lu Village was located at a middle stream of Yuam River which is one of the major tributaries of the Salween watershed. The water stock balance of this area was 3,672,678.96 m^3 mainly from precipitation. The water consumptions were 618,378.66 m^3 and used by agricultural and domestic propose. The village selected 800 meters along with the Huay Tad for the wet fire brake investigation. The impacts of the wet fire brake were revealed as the soil moisture component had significantly higher than the other areas, especially in dry seasons. Not only the water stock but the indigenous check dam was a potential solution for fire prevention but the riparian plant was a part of the wet fire break. Moreover, the biological indices were indicated by the fire break line, land used, soil moisture, pH but not by the density of fire fuel in the study area.

Keyword: Forest fire, Mae Hong Son, Local Community Participation

APPLICATION OF NEEDLE FLOWERS, PORTULACA FLOWERS AND TEAK LEAVES AS NATURAL SENSITIZERS FOR DYE-SENSITIZED SOLAR CELLS

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Abstract

In past decade, the natural dyes for DSSC has been extensively studied due to its advantages over ruthenium based dyes such as complete zero toxicity, complete bio-degradability, high cost to efficiency ratio. This independent study envisioned Dye-sensitized solar cell (DSSC) as a renewable energy device that can be used to produce electricity for indoor applications. The Power Conversion Efficiency (PCE) and the cost production of DSSCs are highly susceptible to light harvesting ability of dyes used. In this work, we prepared natural dye pigments that were extracted from three different sources such as needle flower, *Portulaca* flower and teak leaves. The results showed teak leaves has the highest efficiency of 3.321% compared to *Portulaca* flower and needle flower. The pigment analysis of dye extracts revealed *Portulaca* and needle flower extract is dominated by carotenoid. And *Portulaca* based dye showed better photo conversion characteristic compared to needle flower. This is mainly due to the high carotenoid to chlorophyll ratio in *portulaca* extract, chlorophyll-a: 0.501 µg/ml, chlorophyll-b: 0.246 µg/ml and carotenoid: 5.245 µg/ml. The efficiency of natural dye depends on strength of interaction between with dye and TiO_2 photoanode. The carotenoid to chlorophyll ratio mainly dictates this interaction, because different pigments interact differently with the photoanode. This explain the higher efficiency of *Portulaca* dye extract over needle flower.

Keyword: DSSC, *Portulaca*, Needle Flower, Teak, Natural Dye

Plant-growth media from hydrogels based on poultry-feather waste

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Abstract

The climate change is causing seemingly contradictory phenomena. While some regions are fighting floods and heavy rainfalls, others face large-scale deterioration of arable land. This leads to and increasing spread of semi-arid and arid regions. Polymers can help in a number of ways, but most polymers are petrochemical products, which are not biodegradable. According to a recent EU regulation, such products must not longer be used in agriculture. In this context, we have developed a method by which goose feather waste can be transformed into hydrogels for use as a plant growth medium. Feathers make up for approximately 10 % of the weight of poultry and the estimated annual amount of feathers produced in poultry farms is approx. 5 million tons. To prepare the hydrogels, the feathers are solubilized in water by cleaving the intermolecular cross-links. During evaporation of the solvent, these cross-links reform but not in the form of a solid and tough material, but as hydrogel. The drying conditions were found to be crucial as slower evaporation affords gels with higher degrees of swelling at the cost of reduced gel yields. In a first proof of concept, garden cress (*Lepidium sativum*) was grown on the gel and was found to show the required germination. This also indicated the absence of toxic substances in the gel. The gel strongly adheres to the roots, thereby protecting the plants from drought stress as long as the gel still contains moisture. As fully natural, non-toxic, and recycled waste material, the gels are potentially interesting as soil enhancers or substrates for hydroponic vats. Since feathers chemically belong to the large class of keratins, the method can be adopted to transform other keratin waste such as wool, hair, and hooves into similar hydrogels.

Keyword: waste utilization, keratin hydrogel, moisture control; soil enhancer.

The reduction of unpleasant odor in pseudo ceramic by using natural filler

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Abstract

This research is aimed to reduce the level of unpleasant odor in pseudo ceramic by using natural filler, such as defatted rice bran oil and ground coffee. The natural fillers were used as odor reducing fillers ant the content was varied at 0, 10, 20 and 30wt%. Firstly, the suitable content of odor reducing filler by using sensory method was determined. It was showed that the addition of natural odor reducing filler caused a decrease in the level of unpleasant odor. Especially, the pseudo ceramic filled with 20wt% of defatted rice bran oil and the pseudo ceramic filled with 30wt% of ground coffee gave the low level of unpleasant odor. Secondly, the odor chemical compound by using gas chromatography-mass spectrometry technique, water adsorption, flexural strength and abrasion resistance were evaluated. It was showed that only ground coffee, not defatted rice bran oil, caused a reduction in the average of relative peak area of N.N diethylformamide generated from pseudo ceramic. The present of natural odor reducing filler gave an increase in the percentage of water adsorption, but a decrease in flexural strength and abrasion resistance of clay-compound latex composite. The pseudo ceramic filled with 30wt% of ground coffee gave the lower percentage of water adsorption (23.80%) and lower abrasive volume (242mm^3) with higher flexural strength than those of pseudo ceramic filled with 20wt% of defatted rice bran oil.

Keyword: Pseudo ceramic, Natural filler, Natural rubber latex, Ground coffee

Decolorization of Methylene Blue (MB) by Biosorption of Termite Fungus *Termitomyce* sp.

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Abstract

Termitomyces sp. were isolated from termite mound soils and fruiting body collected from Western Ghats of Tamil Nadu, India. Fungal isolates were screened based on their ligninolytic activity *viz.*, Cellulase, Xylanase and β 1-4 glucosidase (cellobiase) and efficient isolate TMS1 was selected and identified as *Termitomyces* sp. by ITS 1 and ITS 4 (MW694830).

In the present investigation effect of Termitomyces fungal biomass on the degradation of methylene blue (MB) were analyzed through FT-IR. Fungal mat before and after dye biosorption were taken and their compositional changes were assayed.

Analysis of fungal mat and MB adsorbed fungal mat shows, two strong absorbance peaks in the single bond region (2500-4000 cm^{-1}), assigned to Methylene C-H, asym./sym. Stretching at 2923.9 cm^{-1} and sharp, ~C-H stretch at 3275.3 cm^{-1}. Results clearly says, there is a change in spectral window of Methylene blue, indicated by shift in absorbance, due to the interaction between fungal cell wall compounds with degraded products of MB.

Appearance of new peaks in the fungal mat after methylene blue adsorption (3740 cm^{-1} and 3828.6 cm^{-1} denotes the Primary amines) confirms that, degradation and biosorption occurs in MB by the influence of *termitomyces* hyphal mat.

Keyword: *Termitomyces* sp. - biosorption- Methylene Blue- FTIR.

Organic soil amendments' impact on the fate of the herbicide MCPA and microbial communities

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Abstract

Organic amendments increase the organic matter in soil and therefore impact sorption of pesticides and microbial activity in soil. This can reduce the mobility of pesticides in soil and enhance their biodegradation, which reduces the exposure of soil organisms and the contamination of groundwater. However, pesticide sorption and microbial biodegradation are two counteracting processes that depend on the properties of both the organic amendment and the pesticide compound. We investigated the effects of different organic materials (biochar, biogas residues, compost and straw) on the microbial activity (DMSO reductase activity) and microbial community structure (16S and ITS DNA sequencing) in soil, as well as their effect on the degradation of ^{14}C-labeled herbicide MCPA. Straw amended soils showed the strongest increase in microbial activity, a shift in the microbial community structure and enhanced degradation of MCPA. However, mineralization was reduced, probably due to increased formation of biogenic residues. Biochar, on the contrary, had no major effect on the microbial community structure or activity, but reduced the water-extractable and mineralized amounts of MCPA. Compost even increased the water-extractable amounts, probably due to input of dissolved organic matter, while biogas residues did not have a strong impact. The organic amendments had very different effects on the microorganisms and the fate of MCPA in soil. Microorganisms were more affected by less processed materials, like straw, than biochar. The provision of biodegradable C for microorganisms contributed to the degradation of the biodegradable herbicide MCPA. Sorption onto biochar reduced the availability of MCPA and consequently slowed down mineralization.

Keyword: microbial activity, DNA sequencing, biodegradation