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# A NEW HYBRID WYL-AMRI CONJUGATE GRADIENT METHOD WITH SUFFICIENT DESCENT CONDITION FOR UNCONSTRAINED OPTIMIZATION

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**Abstract:** Conjugate gradient method has played a significant role in solving large scale unconstrained optimization. Numerous survey and modifications have been done recently to improve this method. In this paper, we proposed a new hybrid method of Wei-Yao-Liu (WYL) method and the Abdelrhaman et al (AMRI) method, which possesses the sufficient descent condition under exact line search. The result of the numerical experiments show that the new proposed hybrid method perform better when compared with the WYL and AMRI methods. A set of test problems with different initial points are used, most of them are from Andrei (2008).

**Keywords:** Exact line search, Conjugate gradient Method, Unconstrained optimization, sufficient descent condition.

# EFFECT OF DISCHARGED INDUSTRIAL EFFLUENT ON STOMACH FOOD CONTENT DISTRIBUTION OF

# FISH SPECIES COLLECTED FROM JAKARA DAM, KANO, NIGERIA

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**Abstract:** Surface water temperature fluctuated between 19.3$^{o}$-27c.The Lake Ph was slightly acidic (6.3) in the rainy season and slightly alkaline in the dry season (8.4).Dissolved oxygen concentration ranged between 3.7mg/ to l-5.1mg/l. The concentration of Zinc, Lead, Chloride, total dissolved solids, conductivity and turbidity showed seasonal variations; with the lowest readings of 0.02mg/l, 0.02mg/l, 0.5mg/l, 43.3mg/l, 87.5µs/cm and 19.8FAU respectively, while the highest readings of 0.08mg/l,0.05mg/l,1.4mg/l,58.6mg/l,117.3us/cm and 90FAU of Zinc, Lead, chloride, TDS, conductivity and turbidity were recorded respectively. Transparency reading was low in the rainy season while highest value was obtained in the dry season. The diet composition of four fish species belonging to two families; Sarotherodon gallilaeus**,** Oreochromis niloticus, Tilapia zilli and Clarias gariepinus were recorded. The relative fish species composition obtained were S. gallilaeus (32%), O. niloticus (32.9%), T .zilli (26.3%), and C. gariepinus (8.8%).A total of 300 samples of S. gallilaeus were examined, 214 samples (71.3%) had food items in their stomach while 86 samples (28.7%) had an empty stomach. Out of 246 T. zilli samples examined, 190 samples (77.2%) have been found with food items in their stomach and 56 samples (22.8%) had an empty stomach. 308 samples of O. niloticus stomach were examined, out of which, 240 samples (79.9%) were found to have food items in their stomach while 68 samples (22.1%) stomach were empty. The total number of C. gariepinus samples examined was 82, 70 samples (97.2%) had identified food items consisting of 16 samples (22.2%) containing insect part, 29 samples (40.3%) smaller fishes and 25 samples (34.7%) insect larvae. A total of 2 samples (2.8%) had unidentified food. Highest percentage of occurrence during the rainy season was recorded than in the dry season. Plant materials, insects, insect larvae and smaller fishes are the predominant food items identified.
**Key words**: Effluents, Stomach, Food, fish species, Jakara dam.

# THE INFLUENCE OF LiO LIGAND ON THE STRUCTURE OF THE PALLADIUM COBALT NANOALLOYS

**Mikail Aslan, Ali Sebetci**

**Abstract**— The structural, electronic, and magnetic properties of small, neutral, bimetal with LiO structure was studied by using DFT method (with a GGA xc-functional). The lowest lying isomers are obtained. The effect of LiO molecule was examined. LiO molecule can adsorb topside or bridge side. In this study, LiO molecules do not prefer hollow side. Furthermore, when LiO molecule is adsorbed, the valence electrons are shared between cobalt and oxygen instead of oxygen and Palladium. Oxygen atoms have 3-fold or 4-fold bonding in this study.

**Keywords**—DFT,metal lnanocluster, nanoalloy.

# GP-based Prediction for Punching Shear Capacity of FRP-reinforced Two-way Slabs

**Ahmet Emin Kurtoglu*, Abdulkadir Cevik, Mahmut Bilgehan**

**Abstract—**In this study, a new genetic programming (GP) based design model for the prediction of punching shear capacity of FRP-reinforced two-way slabs is proposed. The proposed model is an empirical model based on 53 experimental studies available in the literature. As opposed to existing equations in the literature, the span length of slab (L) has been included in the proposed formulation in order to increase the performance of prediction. The generalization capability of the model is verified by means of extensive parametric studies. The proposed model is also compared with existing design codes and formulations available in the literature and is found to be more accurate. The results are illustrated both in tabular and graphical form.

**Keywords**—genetic programming, punching shear, concrete slabs, FRP

# In-Memory vs. Traditional Relational Database - comparative Study

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**Abstract:** Nowadays, Big data as a new challenge requires high speed performance for query processing, existing traditional database management system, Disk-Resident Database (DRDB) are still have their bottlenecks, especially when processing huge data. Dramatically reducing memory price makes it possible to have a large memory space that will fit to keep large amount of data within it, this is called In-memory database. This paper will describes In-Memory new techniques compared with traditional DRDB.

**Keywords-** In-memory; IMDB; MMDB; DRDB; memory based database.

# SEASONAL VARIATIONS OF SOME PHYSICO-CHEMICAL

# PARAMETERS OF WATARI RESERVOIR, TREATED AND POTABLE WATER, IN KANO STATE NIGERIA.

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**Abstract:** Seasonal variations of selected physico - chemical parameters were investigated for three seasons of the year to determine the drinking water quality of Watari reservoir, Kano state, Nigeria, between the months of November - February (cold season); March - June (dry season) and July - September (rainy season). Five stations were chosen on the reservoir at the intersect of the adjourning rivers. Treated water was collected from the treatment plant and potable water from the consumer end. pH, temperature, TDS, conductivity, turbidity, total hardness, suspended solids, DO, BOD, $Cl^-$, $NO_2^-$, $NO_3$, COD and $PO_4^{2-}$ were analyzed using standard procedures. The mean values of these parameters indicate the effectiveness of the treatment process on turbidity, color, suspended solids and $NO_3$.The high values for nitrates observed may be as a result of the use of nitrous based fertilizer in the localities. There is significant variation ($P < 0.05$) between the values of temperature, suspended solids, conductivity, color, nitrate and phosphates observed for the three seasons. The overall quality of Watari reservoir was found to be within the WHO recommended value for drinking water. However, denitrification and nutrient control need to be ensured to halt the impending threat on the reservoir.
**Key words:** seasonal variation, physico - chemical, reservoir, treated water, potable water.

# Impact of lead and cadmium in drinking water

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**Abstract:** In this study drinking water and urine of people living in Gwalameji,Yelwatudu, Shadawanka barrack, Wunti and Wunti Dada within Bauchi metropolis ofBauchi state of Nigeria were analysed for their lead(Pb) and cadmium (Cd) content. This is done in order to know the relationship between chronic disease, like Renal failure that have been frequently reported in these areas, and the heavy metals. Renal failure is related to contaminated drinking water withPb and Cd. A strong relationship between contaminated drinking water with heavy metals like Pb and Cd from above named areas and Renal failure has been identified in this study. This study revealed that frequent occurrence of this disease in the above named area is related to agricultural activities and industrial wastes that release hazardous and toxic materials into ground

water and thus contaminate drinking water. Judging by the results obtained from this study, the highest level of Cd in drinking water was recorded from Gwalameji with a concentration of 0.23mg/L and the lowest was detected from Yelwa and Wunti dada with a concentration of 0.02mg/L. While lead depicted a range of (0.02 – 0.24) with highest concentration coming from Wunti and lowest from Wunti-dada. For urine samples analysed for Cd, Cd exhibited a concentration range of (0.01 – 0.16mg/L). Gwalameji gave the highest value of 0.16mg/Lwhile all other areas recorded the lowest value. Gwalamejialso recorded the highest Pb level of 0.14mg/L in urine with Wunti, Wunti dada, Shidawanka Barracks showing the lowest level of 0.01mg/L.

Generally, in majority of the areas sampledPb and Cd levels in both water and urine exceeded the maximum allowable limits of 0.1mg/L and 0.01mg/L respectively.

**Key Words**: Lead (Pb), Cadmium (Cd), Urine, Water and disease.

# WEIGHTED PSEUDO ALMOST AUTOMORPHIC MILD SOLUTIONS FOR ABSTRACT FUNCTIONAL DI_ERENTIAL EQUATIONS

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**Abstract:** In this paper, by using the theory of semigroups of operators to evolution families and Banach _xed point theorem, we prove the existence and uniqueness of the weighted pseudo almost automorphic mild solutions of a class of abstract functional di_erential equation in Banach space under some suitable hypotheses, which extend some known results.

# Multivariate Rainfall Disaggregation Using MuDRain Model: Malaysia Experience

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**Abstract:** Disaggregation daily rainfall using stochastic models formulated based on multivariate approach (MuDRain) is discussed in this paper. Seven rain gauge stations are considered in this study for different distances from the referred station starting from 4 km to 160 km in Peninsular Malaysia. The hourly rainfall data used are covered the period from 1973 to 2008 and July and November months are considered as an example of dry and wet periods. The cross-correlation among the rain gauges is considered for the available hourly rainfall information at the neighboring stations or not. This paper discussed the applicability of the MuDRain model for disaggregation daily rainfall to hourly rainfall for both sources of cross-correlation. The goodness of fit of the model was based on the reproduction of fitting statistics like the means, variances, coefficients of skewness, lag zero cross-correlation of coefficients and the lag one autocorrelation of coefficients. It is found the correlation coefficients based on extracted correlations that was based on daily are slightly higher than correlations based on available hourly rainfall especially for neighboring stations not more than 28 km. The results showed also the MuDRain model did not reproduce statistics very well. In addition, a bad reproduction of the actual hyetographs comparing to the synthetic hourly rainfall data. Mean while, it is showed a good fit between the distribution function of the historical and synthetic hourly rainfall. These discrepancies are unavoidable because of the lowest cross correlation of hourly rainfall. The overall performance indicated that the MuDRain model would not be appropriate choice for disaggregation daily rainfall.
**Key words:** Rainfall Disaggregation, Multivariate disaggregation rainfall model.

# Acute toxicity and behavioral effects of organophosphorus on the African catfish Clarias gariepinus (Burchell, 1822)

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**Abstract:** Diazinon is a widely used organophosphorus pesticide in agriculture and environmental health, hence it is adverse effects on nontarget animals, especially on fish is to be determined. The present study therefore aimed to determination the $LC_{50}$ of Diazinon on adult's African catfish; Clarias gariepinus (11.76 mg $L^{-1}$) and behavior changes caused by diazinon.
**Keywords:** Diazinon; catfish.

# PROTECTIVE ROLE OF SOME ANTIOXIDANTS AGAINST ACUTE RENAL FAILURE LABORATORY

# INDUCED BY ONE OF ENVIRONMENTAL POLLUTANTS IN ADULT MALE ALBINO RATS

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**Abstract:** Mercuric chloride ($HgCl_2$) is a well - known human and animal nephrotoxicant. Mercury exerts many toxic effects inside the body; it is considered as an internal source of reactive oxygen and nitrogen species, which increases level of lipid peroxidation, DNA damage and diminish glutathione level and leads to renal cell injury.

Curcumin is considered as a safe nutritional component and a highly promising natural antioxidant with a wide spectrum of biological function (it has anti inflammatory, antioxidant, anticancer properties) it has been examined in several metal toxicity studies.

Selenium (Se) is an essential trace element in human and animal nutrition. It acts as an antioxidant, where it is considered as a vital component of the antioxidant enzyme; glutathione peroxidase. It has been reported that, low plasma level of selenium is associated with renal injury, indicating that it plays an important role in protecting kidney tissue from different oxidants which generated as a result of accumulation of mercury in kidney tissue.

This study was designed to evaluate the role of curcumin and selenium as antioxidants that prophylactic against oxidative stress damages laboratory induced by mercuric chloride injection. Thirty six adult male rats were used for this study. Their weights ranges between 120 to 140 g All animals were housed in normal conditions; at room temperature, good ventilation , adequate stable diet and water was allowed ad libitum.

# Growth of nanocrystalline CdS thin films on Silicon (100) via microwave-assisted chemical bath deposition: Synthesis and characterization

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**Abstract:** Nanocrystalline cadmium sulfide (CdS) thin films were successfully grown on Si(100) substrates using microwave-assisted chemical bath deposition. Aqueous solutions of cadmium chloride ($CdCl_2$) and thiourea [$SC(NH_2)_2$] were used as cadmium $Cd^{+2}$ and sulfur $S^{-2}$ ions sources, respectively. The effect of reagents molar concentration on the quality of the deposited thin films was investigated. Structural, morphological and optical analyses showed that the quality of the grown CdS thin films was significantly affected by the molar concentration of the precursors in the prepared solutions. Results revealed that good quality nanocrystalline CdS thin films are possible to be obtained by varying the molar concentration of the reagents, for optoelectronic applications.
**Keywords:** Nanocrystalline CdS thin films; molar concentration; microwave-assisted

# Controlled Drug Delivery from Hydrogel Prepared by Ultrasound chemical bath deposition

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**Abstract—**Stimuli-responsive polyacrylic hydrogels were synthesized by the copolymerization of acrylic acid (AA) and acrylamide (AAm) by ultrasonic methods. polyacrylic hydrogels are crosslinked networks composed of positively and negatively charged repeating units. In this work, poly(acrylic acid acrylamide) hydrogels were prepared in different molar ratio in feed composition. The structures of hydrogels were characterized by FTIR analysis. Thermal stabilities of the hydrogels were investigated using TGA analysis. The swelling behavior of hydrogels investigated by some parameters such as pH, salt concentration and temperature. In addition, we investigated the effects of different salts such as NaCl, $CaCl_2$, $AlCl_3$ on swelling properties. These findings provide a better understanding of hydrogel synthesis and enable us to control the pertinent parameters.
**Keywords—**ciprofloxacin, drug delivery, hydrogel, pH sensitive, polymerization, ultrasound.

# Design, Implementation and Evaluation of Potato Yield Monitoring System

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**Abstract—**in this paper the design, implementation, monitoring and evaluation system at a workshop a potato yield monitoring has been studied. This study developed a method is accurate for potato yield mapping. First a yield monitoring system consists of a tray weighing, 2 load cells, Encoder, PLC controller and a mobile computer on a potato harvesting machine was mounting. In this study, PLC as a controller in communication with a mobile computing and control applications developed with Visual Basic Win-Pro-ladder and is capable of Encoder and Load cells data received and can be received on the data planning was necessary. Workshop was designed to evaluate the system and get the best performance of this system, laboratory tests were conducted on potato harvesting machine. The independent variables tested were: traveling speed, angle, plate thickness and shock absorber. In order to analyze and compare the results of laboratory analysis of variance with Duncan's test with a confidence level of 5 percent was used. In order to investigate the interactions of various factors of the factorial experiment in completely randomized design was used. In examining the interaction angle, speed and performance-related shock absorber on the best product to the tray angel 37 degrees, traveling speed of 2 $km.h^{-1}$ and without shock absorber with 2.81 percent error was the best. In this situation the best performance in reading and data entry system designed for mass (yield) is found.

**Keywords—** crop yield monitor, load-cell, PLC controller, shaft encoder, tray weighing.

# DETERMINATION OF SOME HEAVY METALS IN SOME COMMERCIAL LIP STICKS IN BAUCHI METROPOLY, BAUCHI STATE NIGERIA.

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**Abstract:** Heavy metals toxicity to humans and animals occurs as a result of long term low or high level exposure to pollutants that are common in our environment. These include the air we

breath, water, food and cosmetics. Apart from those numerous consumer products, lipsticks have been reported as a source of heavy metals exposure to human being. Heavy metals like lead and cadnium were determined in different lipstick product from local market using atomic absorption spectrophotometer (AAS)

**Key words:** Lead, Cadnium, Lipstick product

# Synthesis and Characterization of $Wo_3$-Based Materials as Selective Sensors Towards Dimethyl Methylphosphonate

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**Abstract:** Several methods were used to prepare nano-sized $WO_3$-based materials. All of these methods begin with a standard preparative method where tungstic acid is first generated by passing a sodium tungstate solution through a cation-exchange resin. It is shown that high surface area particles are produced by dripping the $H_2WO_4$ exiting from the ion exchange column into a solution containing oxalate and acetate exchange ligands or alternatively, into a water-in-oil based emulsion. The surface properties were investigated by the water desorption isotherm, the pyridine adsorption, and the adsorption properties of dimethyl methylphosphonate (DMMP) that are monitored by FTIR spectroscopy. The adsorption properties were found to depend on the evacuation temperature of the $WO_3$ surface as this alters the relative number of the Lewis and Brønsted acid sites along with the amount of adsorbed water. Changing the architecture of $WO_3$ powders leads to a size selective approach to improving selectivity in semiconducting metal oxides sensors. The key for achieving high selectivity is based on testing the response on a porous $WO_3$ powder sensor compared to the response on a nonporous $WO_3$ powder sensor. Detection selectivity between methanol and dimethyl methylphosphonate (DMMP) is obtained because the access of a gas molecule in the interior pore structure of $WO_3$ is size dependent leading to a size dependant magnitude change in the conductivity of SMO sensor.

# Photodegradation of Pirimicarb Catalyzed with Silver-Y Zeolite

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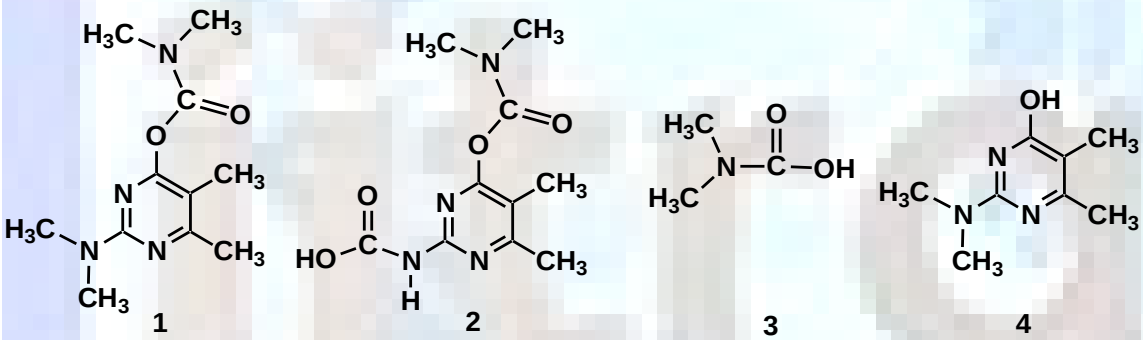
**Abstract:** Silver nanoclusters encapsulated into Y zeolite framework were found to act as good photocatalyst towards the degradation of pirimicarb **1**. Spectroscopic analyses including X-ray fluorescence (XRF), X-ray photoelectron spectroscopy (XPS), and low-temperature steady-state luminescence showed the formation of metallic silver as well as ionic clusters in the catalytic system. This catalyst was used to enhance the photodecomposition of the pirimicarb **1** pesticide. The rate constant for the uncatalyzed irradiated **1** solution was 2.2 x $10^{-2}$ $min^{-1}$. Whereas, the catalyzed reaction has a rate constant of 7.0 x $10^{-4}$ $min^{-1}$. Moreover, in the presence of the catalyst, GC-MS indicates the formation of a selective oxidation product carbimic acid **2**, whereas, without a catalyst two hydrolyzed products namely; N,N-dimethylcarbamic acid (**3**) and 4-pyrimidinol **4** were identified.




# Phytochemical screening and Antimicrobial activities of Crude Methanolic Extract of Pteleopsis habeensis (Aubrev ex Keay) Stem bark against Drug Resistant Bacteria and Fungi

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**Abstract:** Herbal medicines have been in use since ancient times for many age related diseases for which no modern medicine or only palliative therapy is available. The screening of plants extracts has been of great interest to scientists for the discovery of new drugs effective in the treatment of several diseases. The leaves, fruits and stem barks of Pteleopsis habeensis were collected from Yankari Game Reserve Bauchi, Nigeria in June, 2012. The plant was authenticated at the Department of Biological sciences, Ahmadu Bello University,Zaria, Nigeria. Phytochemical screening of crude aqueous stem bark extract of Pteleopsis habeensis revealed the presence of steroid, triterpenes, cardiac glycoside, saponins, tannins, alkaloids and flavonoids. Crude extract exhibited antimicrobial activities against drug resistant Escherichia coli and Methicillin resistant Staphylococcus aureus using agar well diffusion and broth dilution methods. The MIC of the extract against the test organism was 3.125 and its MBC was 1.562mg/ml. However, the extract had no activity against drug resistant Candida albicans. This study has therefore showed that Pteleopsis habeensis aqueous stem bark extract has only antimicrobial activity and hence a potential source of a candidate drug for the treatment of infection(s) associated with drug resistant bacteria.

# The Relationship between Heavy Metal Concentrations and lengths of two Important Fishes from Kapar Coastal Waters, Malaysia

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**Abstract:** The bioaccumulation of cadmium, copper, lead and zinc was determined in muscle, liver and gill tissues of two commercially fish species, Arius thalassnius and Johnius belangrei collected in March, April from Kapar on the western coastal water, Peninsular Malaysia. The levels of Cu, Zn, Cd and Pb in the muscles of the examined fish were (1.33–3.39), (20.62–32.95), (0.03–0.08) and (0.15–0.44) µg/g dry weight, respectively. Moreover, the relationship between metal concentrations in these fish's tissues, and lengths were also examined. Generally, Metal levels in muscles were lower than those in livers and gills. Zn concentration was found highest in all species. However, Pb concentrations in the muscle were higher than the maximum levels set by FAO/WHO but still below the Malaysian Food regulation standard. Positive relationships between the Cu, Zn and fish lengths were observed, whereas weak relations between Cd, Pb and body lengths were documented. However, the findings of the

research indicated that heavy metals in the edible parts of the investigated fish are in the permissible safety levels for human consumptions.

**Keywords**: Bioaccumulation, safety level, marine fish, trace elements, ICP-MS.

# DETERMINATION OF HEAVY METALS IN SOME MEDICINAL PLANTS COMMONLY USED IN KURA LOCAL GOVERNMENT AREA OF KANO STATE, NIGERIA

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**Abstract:** The study was carried out to assess the level of heavy metal concentration in four selected medicinal plants locally consumed in Kura Local Government Area, Kano State Nigeria. The concentration in mg/Kg of heavy metals (Ni, Pb, Zn, Co, Fe, Cr and Cu) were determined in Guiera Senegalensis (Sabara), Boswellia papyrifera (Ararrabi), Bolsamina momordica (Garafuni) and Cassia occcidentalis (Rai dore) samples using the Atomic Absorption Spectrometry. The mean concentration of the metals in the selected medicinal plants were found to be 0.0177mg/Kg Zn, 0.0385mg/Kg Ni, 0.0136 mg/Kg Pb, 0.0192 mg/Kg Co, 0.0185mg/Kg Fe, 0.0364mg/Kg Cu and 0.0011mg/Kg Cr. The mean concentration of the heavy metals in the plant samples was within the permissible limit of the recommended range by WHO/FAO. The result indicates no potential heavy metal risk as a result of the consumption of the mentioned traditional medicine in the study area.

**Keywords**: Guiera senegalansis, Balsamina momordica, Bosiwellia papyrifera, Cassia occidentalis.

# CONSTRUCTION OF CONNECTED OPTIMAL DESIGNS IN DIFFERENT REPLICATES

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**Abstract:** The long computational time required in constructing optimal designs has limited their uses in practice. In this paper, a new algorithm for constructing optimal experimental designs that are connected with different replications to determine the minimum replicates required for a

design to be connected and optimal using Visual Basic Programming. The algorithm is capable of generating designs in different replicates and minimizing or maximizing any differentiable optimality criterion. We have focused on three such criteria, A-, D- and E-optimality. The proposed algorithm is compared to existing techniques and found to be more efficient in terms of computation time; the number of replicates is also flexible to construct various classes of optimal designs to retain certain desired structural properties.

**Keywords**: Optimal design, algorithm, replicates.

# DEVELOPMENT AND EVALUATION OF A VEGETABLE TRANSPLANTER

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**Abstract:** Design, construction and evaluation of fully automatic tomato transplanter were the main aim of this study. The designed machine include a main chassis, transfer mechanism of seedling trays to pick up armposition, the seedling pick up arm mechanism of the tray, crash tube, furrower and control system. The actuators include pneumatic cylinders and PLC controller was used to control system. A step mechanism gradually guides the tray to the left, right and down sides so that pick up arm will be able to penetrate the needles inside soil into the cell and lift a seedling. The pickup arm then moves to the position of the crash tube and release seedling with soil pot. Then seedling falls into the furrow created by furrower. In order to evaluate performance of transplanter, a field test was conducted. Mechanical damage to seedlings, seedling establishment angle from the vertical line and seedlings distance on the row was investigated. Tests were conducted using a factorial experiment based on Randomized Complete Block design with three repeats. The treatments consisted of three levels of forward speed, including of 1, 1.5 and 2 $km.h^{-1}$ and two levels of cultivation depth, including of 5 and 10 cm. Results showed that forward speed and cultivation depth on distance between planted seedlings, seedling establishment angle and damage to seedlings at thelevel 5% has been effective. With a forward speed of 1 $km.h^{-1}$, the theoretical capacity of the single-row machine, 0.06 $ha.h^{-1}$ was determined.

**Keywords**: Automatic Transplanting Machine, Tomato Seedling, Tray.

# THE DISTRIBUTION OF WEED SEEDBANK EXPERIMENT WITH THREE WATER LEVEL

# CONDITIONS IN BALIK PULAU RICE FIELDS AGRO-ECOSYSTEM

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**Abstract:** Weed seedbank experiment was conducted in plant house of School of Biological Sciences USM from 20th of December 2013 until 20th of May 2014. The experiment was started by soil sampling at four different rice field plots (Pokok Kenanga, Tok Kiat, Fasa 3, and Sungai Burung Darat) in Balik Pulau rice fields agro-ecosystem. There were four types of soils that were sampled including sandy soil, mangrove soil, muddy soil, and also clay soil. The soil samples were brought back to USM to be examined. In addition, there were three water level (saturated, partial, and flooded) conditions applied in this experiment. Subsequently, the emergence of weed seedlings was counted and recorded as 'absence' and 'presence'. From the observation, there were 12 weeds species that emerged in this experiment such as *Echinochloa crus-galli* (L.) Beauv, *Echinochloa colona* (L.) Link, *Ischaemum rugosum* Salisb., *Leptochloa chinensis* (L.) Nees., *Oryza sativa* complex (L.), *Cyperus difformis* (L.), *Cyperus iria (L.), Fimbristylis milliacea* (L.) Vahl, *Lemna minor L., Ludwigia hyssopifolia* (G.Don) Exell, *Monochoria vaginalis* (Burm.f.) Presl, and *Sphenoclea zeylanica* Gaertn.. The highest emergence of weeds species in sandy, mangrove, muddy, and clay soils were *Monochoria vaginalis, Leptochloa chinensis, Echinochloa crus-galli, and Sphenoclea zeylanica* respectively. The total number of weeds seedlings present were higher in sandy soil (86 seedlings) followed by clay soil (69 seedlings), mangrove soil (44 seedlings), and muddy soil (26 seedlings). As a conclusion, the grasses and sedges weeds were higher in saturated and partial water level conditions meanwhile broadleaved weeds mostly can be found in flooded water level condition.

**Keywords**: Weeds, Seedbank, Soils, Water Level Conditions

# Design and Construction of Fully Automatic Tomato Transplanter

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## Abstract

Design, construction and evaluation of fully automatic tomato transplanter were the main aim of this study. The designed machine include a main chassis, transfer mechanism of seedling trays to pick up armposition, the seedling pick up arm mechanism of the tray, crash tube, furrower and control system. The actuators include pneumatic cylinders and PLC controller was used to control system. A step mechanism gradually guides the tray to the left, right and down sides so that pick up arm will be able to penetrate the needles inside soil into the cell and lift a seedling. The pickup arm then moves to the position of the crash tube and release seedling with soil pot. Then seedling falls into the furrow created by furrower. In order to evaluate performance of transplanter, a field test was conducted. Mechanical damage to seedlings, seedling establishment angle from the vertical line and seedlings distance on the row was investigated. Tests were conducted using a factorial experiment based on Randomized Complete Block design with three repeats. The treatments consisted of three levels of forward speed, including of 1, 1.5 and 2 $km.h^{-1}$ and two levels of cultivation depth, including of 5 and 10 cm. Results showed that forward speed and cultivation depth on distance between planted seedlings, seedling establishment angle and damage to seedlings at thelevel 5% has been effective. With a forward speed of 1 $km.h^{-1}$, the theoretical capacity of the single-row machine, 0.06 $ha.h^{-1}$ was determined.

**Keywords:** Automatic Transplanting Machine, Tomato Seedling, Tray