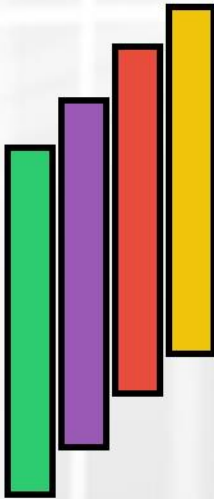


ISSN: 2591-7064

Vol. 2, No. 3, April 2018



**Ascendens Asia Journal
of Multidisciplinary
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Recommended Citation

(April 2018) "1st SIMP-AAG-NSEF Philippines Abstracts," Ascendens Asia Journal of Multidisciplinary Research Abstracts, Vol.1, No.1. Available at: "<http://aaresearchindex.com/ojs/index.php/AAJMRA>".

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SCIENCE PROJECTS

Neodymium Magnet in Memory Retrieval: The Effects of High-Static Magnetic Exposure in Enhancing Spatial Learning and Working Memory in Albino Rats (*Rattus norvegicus*)

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Abstract

In cognitive psychology and neuroscience, recording information about one's environment and its spatial orientation relies on the spatial memory, governed by the hippocampus (a medial temporal lobe structure). Various studies demonstrated stimulation of neural activity using strong magnetic fields. Neodymium (NdFeB) magnets can emit a static magnetic field suitable for magnetic therapies. This study determined the effects of non-invasive magnetic exposure in enhancing spatial memory retrieval and working memory of albino rats using Neodymium magnet with grades of N38, N42 and N48. The effects of Neodymium magnets on the samples' cognitive processes were measured using Morris Water Maze (retrieval of spatial memory) and T-maze (working memory). Thirty-two 12-weeks old male albino rats were used for the experimentation wherein eight were selected for each group (control, N38, N42 and N48). The exposure was directed to the temporal lobe with a headphone-like apparatus. Exposure to Neodymium magnet resulted in significantly lower average escape latency in the MWM (declining each trial) when compared to not using a magnet ($p=.000$). For T-maze, exposure to Neodymium magnet has resulted insignificantly greater average scores of the rats compared to the absence of the magnet ($p=.000$). However, applying to both protocols, comparison among the magnet groups resulted in p-values greater than 0.008 (adjusted p tabular value), implying no significant difference. Accordingly, varying grades (N38, N42 and N48) of Neodymium magnet are relatively equal in effectiveness in enhancing retrieval of spatial memory and working memory, with effectiveness directly proportional to exposure duration.

Keywords: neodymium magnet, NdFeB, spatial learning, memory retrieval, working memory, Morris Water Maze, T-maze

Surface Microstructures and Hydrophobicity Evaluation of *Allamanda cathartica* (Yellow Bell) and *Plumeria acuminata* (Kalachuchi) Flower Petals

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Abstract

Surface hydrophobicity in nature has inspired many scientists to develop innovative products that could help us in our daily lives. Together with this ongoing trend, the surface wettability and hydrophobicity of the petals selected local flowers such as *Allamanda cathartica*, and *Plumeria acuminata* were investigated. Scanning Electron Microscopy and HD digital microscope were used in the analytical imaging of the flower petal samples. On the other hand, the surface hydrophobicity of selected flower petals with ten replications was evaluated based on their actual contact angle measurements using the optical tensiometer. It was found that there was a significant difference between the contact angles of *A. cathartica* and *P. acuminata* ($t=2.247$; $p=0.04$) with mean contact angles of 129.121° and 117.179° , respectively. This implied that both flower petals were indeed hydrophobic. The obtained hydrophobicity potential was associated to the generated micrographs of the flower petal samples wherein *A. cathartica*, had uniform cellular structures in terms of shape, size, and textural orientation making the sample nearly super-hydrophobic while in *P. acuminata*, an aberration on the cellular structures was more evident which led water droplets unease and tended to spread over time. Also, the presence of cuticular wax on both petals was also identified, which probably contributed to the observed hydrophobic capacity of both petals. In conclusion, both petals could be viable models in developing hydrophobic nano-sculptured surfaces of several non-wetting products.

Keywords: hydrophobic surface model, contact angle, surface morphology, kalachuchi, yellow bell

Cytological Study on *Allium cepa* (onion) Root Tip Treated with *Annona muricata* (guyabano) Bark and Leaves Extract

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Abstract

Normal cell division is important in maintaining health. Otherwise it will result in abnormalities and mutations. A potential consequence of these abnormalities and mutations is cancer, wherein the cells are multiplied by uncontrolled mitosis. One of many other ways to observe cell activity is the *Allium cepa* root tip assay since plant system can detect a wide range of genetic damage, including gene mutations and chromosome aberrations. Thus, this study aims to investigate the potential of *Annona muricata* (guyabano) bark and leaves extract in the mitotic activity in the meristem root tips of *Allium cepa*. *Annona muricata* bark and leaves were sun-dried, and air dried respectively and macerated for 24 hours. Phytochemical analysis was conducted to determine the presence of phytoconstituents in the plant extract. Moreover, different concentrations (3%, 5% and 7%) of the bark and leaves extract were observed via *A. cepa* root tip assay. The percentage root growth inhibition after treating with guyabano leaves and bark extract was measured at different time intervals. Meanwhile, mitotic index and cell aberrations were observed and measured under a light microscope. Results showed that both extracts disrupted the cell mitosis of the *Allium cepa* root tips. However, *Annona muricata* leaves extract demonstrated better results than the bark extract in terms of root length, mitotic index and cell aberrations. Observations proved that *Annona muricata* demonstrated cytotoxic effects on mitosis. The results of the study could be a pivotal pipeline to develop a medicine that could slow the progression of cancer cells.

Keywords: *Allium cepa*, *Annona muricata*, leaves extract

Pesticidal Activity of Spent Coffee Grounds Extract on Rice Black Bugs (*Scotinophara coarctata*)

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Abstract

Rice Black Bugs (*Scotinophara coarctata*) is one of the most difficult to manage insect-pest in the Philippines. Therefore, an investigation of their control measures is now of considerable interest. This study highlighted the pesticidal activity of spent coffee grounds against *S. coarctata*. The spent coffee grounds extract were obtained using ethanoic extraction and concentrated in a rotary evaporator. The different concentrations of the extract were prepared. Percentage mortality was determined after treatment application through spraying. There were three replicates per treatment, and each replicate has five black bugs. Results revealed that 50% and higher concentrations of the extract showed 100% mortality while 25% of extract had 86.67% mortality. These results suggest that the extract of spent coffee grounds has pesticidal property against rice black bugs. Thus, spent coffee ground extracts is feasible to develop an eco-friendly, effective and cheaper pesticide to address the problems of rice black bugs.

Keywords: coffee grounds, rice black bugs, pesticidal activity

Antiepileptic Property of Banaba (*Lagerstroemia speciosa* Linn.) Methanolic Leaf Extracts Against Maximal Electroshock-induced White Mice (*Mus musculus*)

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Abstract

Epilepsy is a widespread neurological problem. It is manifested in an erratic and periodic disturbance of neurologic activity called seizures. A preclinical study was conducted at the College of Pharmacy, Virgen Milagrosa University Foundation, San Carlos City (Pangasinan) to investigate the antiepileptic property of the methanolic leaf extracts of *Lagerstroemia speciosa* Linn. In white mice using Maximal Electroshock-induced (MES) seizure model. The extract was dissolved using methanol. Three different doses (10 mg, 25 mg, and 50 mg) of the nontoxic experimental extract were administered intraperitoneally. Protection from Tonic-clonic types of seizures, and common symptoms such as loss of consciousness, rapid blinking, hair horripilation, and breathing mechanism were observed in the MES model induced at 50mA, 30 minutes after the administration of the different treatments. All doses of the methanolic leaf extract of Banaba significantly inhibited the occurrence of seizure-induced convulsions by the MES ($p=0.002$). The experimental extracts also exhibited protection against rapid blinking of the eyes ($p=0.005$) and hair horripilation ($p=0.000$). 10 mg and 50 mg of Banaba methanolic leaf extracts had the highest percentages of protection and prevented the onset of seizures and some other forms of symptoms. The descriptive observations were scaled from one to two, according to the level of severity. The results were statistically analysed by Chi-Square test. Phytochemical analysis yielded flavonoids, steroids, terpenoids, and saponins. The results gathered suggest that the methanolic leaf extracts of Banaba are a potential source for anticonvulsant agents and possesses anticonvulsant activity against MES-induced seizures in white mice.

Keywords: Epilepsy, Gamma-Amino-butyric acid (GABA), Phenytoin, Anticonvulsant, *Lagerstroemia speciosa* Linn.

A Comparative Study of Xylitol and Licorice Root Extract in Inhibiting *Streptococcus mutans* Growth

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Abstract

Streptococcus mutans is a gram-positive bacterium found to be the main cause of dental caries, a primary health problem that Filipinos currently face. Determined to find an alternative to xylitol, a common ingredient in oral health products, this study tested the hypothesis that licorice root (*Glycyrrhiza glabra*) extract has a greater inhibitory effect against *S. mutans*, compared to xylitol. Initially, the growth of the *S. mutans* bacterial sample obtained from saliva was enhanced using Buffered Peptone Water (BPW). Afterwards, four Mannitol-Salt (MS) agar plates were prepared. Licorice root extract was diluted into concentrations of 10%, 30%, 70%, and 100%, and then tested using the Kirby-Bauer disk diffusion susceptibility test protocol, along with a 100% xylitol solution. The zone of inhibition of each solution was then measured and recorded. Different concentrations of the licorice extract showed to have a direct correlation on the zones of inhibition when applied to the bacteria. Their diameters were 8.33mm, 9.45mm, 10.23mm, and 10.96mm, respectively. On the other hand, the zone of inhibition displayed by the xylitol had a measurement of 10.18mm in diameter. In the final analysis, the results supported the hypothesis, concluding that compared to xylitol, the licorice root extract was more efficient in inhibiting the growth of *S. mutans*. This suggests the use of licorice root extract as an anti-cariogenic component in oral health products.

Keywords: xylitol, licorice root, extraction

A Comparative Study Between the Efficacy of Calamondin Extract and Isopropyl Alcohol in Inhibiting *Salmonella typhi* Growth

James Bryan Louis L. Ang
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Abstract

Typhoid fever is a disease caused by the gram-negative bacteria, *Salmonella enterica* serovar Typhi. It is especially widespread in underdeveloped communities. Together with bacterial diarrhoea and hepatitis A, it is among the most common food-borne and water-borne infectious diseases in the Philippines. In rural communities of the Philippines, where many Filipinos have very limited means of managing the spread of bacteria, as well as sanitising themselves, they become prone to contracting not only Typhoid fever but other diseases as well. In hopes of providing a cheaper alternative to rubbing alcohol, the antimicrobial effects of *Citrus microcarpa* (calamondin) extract, in different concentrations, were tested on the *S. enterica* serovar Typhi bacteria. The researcher hypothesised that the 70% calamondin extract would be able to exceed the efficacy of the 70% alcohol. The researcher first extracted the fruit juice, peel, and sacs. By conducting the agar diffusion test, the researcher was able to obtain the diameter of the zone of inhibition of the different concentrations of the citrus extract and 70% isopropyl alcohol. The 70% isopropyl alcohol was set as the standard, and the diameter of the extracts' zone of inhibition was then compared to the diameter of the alcohol's zone of inhibition. Five trials of this experiment were done to increase the validity and accuracy of the data. Although the results of the experiment showed that only the 100% calamondin extract exceeded the efficacy of the alcohol, the results evidenced the promising potential of the fruit as an antimicrobial agent. The difference between the zone of inhibition of the 70% isopropyl alcohol and the 70% calamondin extract is not too large either. The diameter of the zone of inhibition of the alcohol, 10%, 30%, 70%, and 100% calamondin extract is 9.65 mm, 7.50 mm, 8.10 mm, 9.25mm, and 10.65 mm respectively.

Keywords: calamondin extract, isopropyl alcohol, salmonella

Betacyanin pigment in red Dragon Fruit (*Hylocereus polyrhizus*) peel extract as an alternative tracking dye for gel electrophoresis

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Abstract

The advent of molecular and genetic engineering resulted in an increasing fascination with everything related to DNA. Bromophenol blue (BPB), Orange G, Pyronin Y, Xylene Cyanol are the usual colour markers used to monitor the process of agarose gel electrophoresis. However, studies show that the chemical, physical and toxicological properties of these colourants are harmful to users. This study endeavours to investigate the potential of the betacyanin pigment from red dragon fruit peel extract as an environment-friendly, biodegradable and cheaper alternative loading and tracking dye for gel electrophoresis. Using UV/Vis Analysis, the researcher finds that betacyanin was present at 534 nm of the spectrophotometer. Using the standard protocols of 100 volts and 60-minute monitoring on the electrophoresis apparatus, the sustainability of betacyanin from the dragon fruit peel extract was tested both as loading and as tracking dye. During the process, the Dragon Fruit extract applied to the DNA sample did not float and stayed put. This may be caused by the glucose content of the fruit peel, which is an essential component of loading dyes as preventive measures in any case wherein the DNA samples may float. It travelled across the gel at the same rate and time as the commercially available tracking dye. Photographed images show that the bands of the DNA tracked by the betacyanin extract are comparable to the commercially available tracking dye. In conclusion, the betacyanin extract from dragon fruit peel is a viable alternative tracking and loading dye for gel electrophoresis.

Keywords: dragon fruit, extraction, electrophoresis

Preliminary Phytochemical Screening and In-vitro Evaluation of Inhibitory Activity of Cottonfruit (*Sandoricum koetjape*) Crude Ethanolic Fruit Peel Extract against *Aeromonas hydrophila*

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Abstract

Bacterial infections are the major reasons for fish mortality in the aquaculture industry. Vaccines and antibiotics against specific fish pathogens have been developed with varying degree of success. However, the use of antibiotics and chemotherapeutics in intensive aquaculture has been widely criticized due to their negative impacts like an accumulation of drugs in fish tissues and immunosuppression. This study evaluated the phytochemical constituents and assessed the antibacterial activity of the underutilised and lesser-valued part of the cottonfruit tree, specifically its fruit peelings against *Aeromonas hydrophila*, a fish pathogen in fishes. Crude ethanolic extract (CEE) of cottonfruit peelings was initially assessed for the presence of phytochemicals. The antibacterial activity of the different concentrations of the extract against *A. hydrophila* was tested using the disc diffusion assay. Phytochemical screening detected phlobatannins, saponins, and coumarins in CEE of cottonfruit peelings. The result of the antibacterial testing showed that all the treatments of the extract inhibit the growth of *A. hydrophila*, with T4 (100 µg/mL) having the greatest mean zone of inhibition of 14.33 mm. It can be noted that as the concentration of the extract increases, the mean zone of inhibition of all the treatments of the extract also increases. The results showed that phytochemical screening of CEE of cottonfruit peelings revealed the presence of bioactive compounds. It can also be concluded that it is capable of inhibiting *A. hydrophila* and thus, it can be an antibacterial agent and has promising potential in improving the current state of the field of aquaculture.

Keywords: Phytochemical screening, *Sandoricum koetjape*, disc diffusion assay, *Aeromonas hydrophila*

Antibacterial Activity of Green Synthesized Silver Nanoparticles using Himbabao (*Broussonetia Luzonica Blanco*) Leaves' Extract

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Abstract

The antibacterial resistance of pathogenic bacteria is a major roadblock in the successful treatment of infectious bacterial diseases. Advancements in nano medicine opened new avenues in treating AMR. This study investigated the ability of endemic plant Himbabao (*Broussonetia luzonica* Blanco) to synthesize silver nanoparticles and its inhibition on the growth of *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Enterococcus faecalis* and *Staphylococcus aureus*. Silver nanoparticles were synthesized using a green synthesis of 30mL 1mM silver nitrate (AgNO_3) and 15mL leaf extract. Three variations were grown at different temperatures: V1 (70°C), V2 (80°C), and V3 (90°C). AgNO_3 and the leaves' extract were prepared as a negative control while Chloramphenicol as a positive control. The prepared samples were subjected to antimicrobial assay against the given bacteria. V3 showed the largest zone of inhibition at 19.5mm for *K. pneumoniae*, 17mm for *P. aeruginosa* and 9.4mm for *S. aureus* while V2 inhibited *E. faecalis* better at 6.4mm among the variations on the average. Results of the SEM showed that the size of the synthesized copper nanoparticles fits within category 2 (500 nm > size >100 nm). Shapes of the grown copper nanoparticles were mostly irregular: nanorods, nano-spheres, and truncated triangles. Results of the EDX proved that the synthesized products' elemental composition is mostly silver further proved by UV-VIS absorption of 375 to 450nm. This study proved that an endemic and indigenous plant such as Himbabao (*Broussonetia luzonica* Blanco) could be used to biosynthesize silver nanoparticles that had significant antibacterial activity against antibacterial resistant *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, and *Enterococcus faecalis*.

Keywords: antibacterial, green synthesis, himbabao

The Potential of *Mangifera indica* (Mango) Leaf Extract for Anti-Angiogenesis Using Duck Chorioallantoic Membrane Assay

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Abstract

The formation of blood vessels (angiogenesis) plays a critical role in cancer since it serves as a supplier of oxygen and nutrients to growing tumours. Using duck chorioallantoic membrane assay (CAM), I investigated the capacity of *Mangifera indica* to inhibit angiogenesis in terms of vascularity inhibition, the growth of eyes, and growth of the embryo. Fifty-four fertile duck eggs were incubated and grouped into three per treatment (negative control, 25%, 50%, 75% and 100%). On the 8th day of incubation, the eggs were windowed and inoculated with 0.03mL of different concentrations. These windows were reopened, transferred into Petri dishes and photographed in 12, 14, and 16 days. The images obtained were analysed on ImageJ software and Angioquant for the changes that the botanical extract has brought to the angiogenesis process in the chorioallantoic membrane assay of the developing chick embryo. Arithmetic mean was employed for the observed experimentation. The mean values on the CAM vascularity inhibition in day 12, 14, and 16 are (39.72%, 59.12%, and 65.19%); (39.92%, 58.21%, 73.60%); (40.97%, 64.23%, 82.64%). It was revealed that the mean values on the length of the eye in day 12, 14, and 16 are (9.48, 8.95, 6.62, 6.05 mm); (8.32, 7.57, 6.55, 5.76mm); (8.07, 7.89, 7.24, 6.42 mm) respectively. The inhibition of the blood vessels, reduction of eyes, and embryo were dependent on the different concentrations of the crude ethanolic extracts of *Mangifera indica*, which suggests that *Mangifera indica* has potential as an anti-angiogenesis agent that might have a promising approach for anticancer therapy and other diseases.

Keywords: mango leaf extraction, anti-angiogenesis

**Bioactivity Evaluation of *Mangifera indica* (Mango) Leaves Ethanolic
Extract on 3rd - Early 4th Instar *Aedes aegypti* Larvae**

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Abstract

Aedes aegypti is the main vector of dengue, which causes morbidity. In response to this, various low cost and easy to prepare plant-based larvicides have been developed. In this study, *Mangifera indica* (Mango) leaves were evaluated for its bioactivity on 3rd – early 4th instar *Aedes aegypti* larvae. Sundried and ground mango leaves were macerated in 95% ethanol and purified using rotary evaporation. The ethanolic extract was serially diluted into different concentrations: 10,000 ppm, 15000 ppm, 20,000ppm, 25,000ppm, 30,000ppm, 50 ml crude extract and distilled water as negative control. Ovicidal/Larvicidal traps were used to collect *Aedes aegypti* eggs and continuously reared in black plastic cups. The mortality of the larvae was recorded and evaluated for its actual morphology during and after exposure to the extract. One-way ANOVA result showed a significant difference among the treatments in terms of the mortality rate [F = 3.101, p = 0.027] wherein the crude treatment obtained the highest average mortality rate. This testified that *M. indica* leaves extract was dose-dependent with lethal concentration to kill 50% and 90% of the larvae at 30511.612 ppm and 86963.689 ppm respectively. The morphology of *Aedes aegypti* larvae affirmed serious aberration on the mid-gut and proventriculus. There was also the peculiar preservation of the larvae's body observed after eight days due to the constituent tannin-an astringent that caused the tissues to contract. Therefore, *M. indicaleaves* ethanolic extract could be a potential bio-larvicide, which can be utilisedto control *Aedes aegypti* which is the primary vector of the dengue virus.

Keywords: plant-based larvicide, *Mangifera indica*, *Aedes aegypti*, larvae abdominal morphology

Digestive Gland Aberration and Mortality of *Pomacea canaliculata* (Golden Apple Snail) applied with *Gliricidia sepium* (Kakawate) Leaves Ethanolic Extracts: A Potential Bio-Molluscicide

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Abstract

Pomacea canaliculata (golden apple snail) is an invasive pest of rice. It can destroy 1 m² of field overnight resulting in 50% yield loss (Rice Knowledge Bank, 2017). Several studies observed how various plant extracts affect this pest. One is through its digestive gland that produces various chemicals to break down its food. Thus, the study investigated the possible mortality and aberration in the digestive gland of *Pomacea canaliculata* applied with *Gliricidia sepium* (Kakawate) leaves ethanolic extracts. The extraction was done through maceration and rotary evaporation with a sufficient amount of 95% ethanol. The extracts were tested for their phytochemicals. Five treatments replicated four times were prepared: T₁= 164 mg/ml, T₂= 328 mg/ml, T₃= 492 mg/ml, T₄= 39.36x10³ mg crude extract and T₅=negative control (distilled water). Ten snails were placed in each set-up. The set-ups were sprayed with various treatments and observed for seven days. Morphology of the digestive gland and mortality of the snails were evaluated. Results revealed that alkaloids, phenols, glycosides, terpenoids, saponins, flavonoids and tannins were present in the plant extract. One-Way ANOVA showed a significant difference in the number of dead snails among treatments (F=236.44; p=.000). Scheffe test showed that among the treatments, T₄= 39.36x10³ mg crude extract of *G.sepium* has the highest number of snails killed (\bar{x} =9.75). Morphology of the internal anatomy of the dead snails showed constricted and aberrated digestive gland with white cracks that caused their paralysis and rapid decomposition. The results proved that *G.sepium* was more effective at higher concentrations against golden apple snail.

Keywords: golden apple snail, morphology, phytochemicals, internal anatomy, digestive gland

Molluscicidal Activity of Kukul-lasi (*Commelina benghalensis*) Leaves Extract on Golden Apple Snail (*Pomacea canaliculata*)

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Abstract

One of the serious problems of organic rice producers in the Philippines is the infestation of the Golden Apple Snail (*Pomacea canaliculata*) invading almost all rice fields. Therefore, investigation of their control is now of considerable interest. This study evaluated the molluscicidal activity of *Commelina benghalensis* (also known as kukul-lasi) against the juvenile and adult *P. canaliculata*. The active components of *C. benghalensis* were obtained through ethanolic extraction and concentrated in a rotary evaporator. Juvenile and adult *P. canaliculata* were exposed to the different concentrations of the extracts. The percentage mortality was recorded after 24 hours of exposure, and the unusual behaviours were also noted. Results revealed that 100% mortality of both juvenile and adult was recorded in all extract concentrations. Unusual behaviour such as lack of movement, lack of response, secretion of mucus, and bubbling was observed. Therefore, *C. benghalensis* extract has molluscicidal activity against the juvenile and adult *P. canaliculata*, which indicates the great potential of this plant in developing effective natural molluscicide.

Keywords: kukul-lasi, leave extraction, apple snail

Comparative Analysis of Paper Decomposition by Cellulase-producing *Actinomyces* Isolates

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Abstract

Land pollution is a common problem caused by improper solid waste management in Metro Manila. Seventeen percent of this is contributed by paper due to minimal recycling practices. Researchers hypothesized whether cellulase-producing *Actinomyces* isolates could decompose paper by measuring the decomposition rate. *Actinomyces* isolates were tested for cellulase. Yeast Malt Broth and minimal media containing 0.5g of cellulose were steamed. YMB media was used to revive the isolates. Isolates were inoculated into the minimal media. The positive growth of spores was screened. Components of YMB media were steamed, and isolates from first screening were inoculated into the media. The broth was screened for the growth of isolates, and the positives were used for paper decomposition. These were tested into three replicates using both of isolates that grew in YMB and its counterpart in minimal media. The observation lasted for 50 days. Decomposition rate was measured afterwards. One-way ANOVA and two-way ANOVA were used to analyse data. It showed that F-value (4.36682) was greater than the F-critical value (3.47805) in one-way ANOVA. VYMA 6 YMB had the greatest decomposition rate of 25.67%, making it the most effective based on the mean. The research showed that there was a significant difference in the decomposition ability of all the setups with yeast malt broth. There was a significant interaction between the isolate used and the media used. This study showed that cellulase-producing isolates could decompose paper and the decomposition of the isolate was affected by the media it is in, whether minimal media or yeast malt broth.

Keywords: paper decomposition, actinomyces isolates

Bioethanol Production from *Allamanda Cathartica*

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Abstract

The study entitled Bioethanol Production from *Allamanda Cathartica* was conducted at Tagaytay City Science National High School from July to August 2017. The main objective of this study is to produce effective bioethanol from the yellow bell flowers. It also provides information that the produced bioethanol is cheaper and more effective than the commercial ones. This study sought to compare the difference between commercialised alcohols to the yellow bell extract regarding odour, colour and physical appearance. The researchers hypothesised that there is a significant difference of bioethanol produced from the yellow bell and commercial alcohol. The procedures involved were collecting, cleaning the yellow bell, extracting, boiling, application of the yeast, fermentation and distillation. Three trials were made, set-up A- was fermented in two weeks, set-up B- was fermented in three weeks and set-up C – was fermented in four weeks. The amount of the yellow bell flowers, amount of water, amount of yeast, the boiling point were all the same. It only varies in the time of fermentation. Results were analysed statistically which proved that the set-up B is more flammable than set-up A, which is fermented in two weeks. With the outcome of the study, the researchers strongly recommend the use of *Allamanda Cathartica* as bioethanol. It was proved to be effective regarding its flammability, and the contents were pure biodegradable. Furthermore, follow up studies on the use of biodegradable materials are recommended. One hundred forty grams of yellow bell flower was added. The yellow bell was extracted using a juicer. One hundred millilitres of water was added to the residue and squeezed it again using cheesecloth. The total volume of water and yellow bell extract was one hundred millilitres. It was boiled for two minutes. Five grams of dried yeast dissolved in ten millilitres was added to the lukewarm yellow bell juice. This was mixed by stirring with the main body of the juice, and the mixture was transferred into the canister covered with a cheesecloth and rubber band. This is to prevent the entrance of air and allow the entrance of carbon dioxide from the juice. Each set-up was fermented in corresponding weeks. Set up (A) was fermented within two weeks, set-up (B) was fermented three weeks, and set-up (C) was fermented four weeks. The appearance of the bubbles was the signal that fermentation was being processed. The set-ups were filtered using cheesecloth to remove the remaining sediments to the main solution before the distillation. The fermented extract was distilled using a simple distillation process. One hundred millilitres of the fermented solution was placed in a distilling flask. It was heated by an alcohol lamp, as soon as the first bubble appeared, boiling point was recorded. The temperature was maintained. After the distillation process, bioethanol was produced.

Keywords: bioethanol, *Allamanda cathartica*

Blood Coagulation Activity of Chitosan Extracted from bracket Fungi (*Trametes sp.*) on the Blood of Male Albino Mice

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Abstract

The most widely recognised wellspring of chitosan are crustaceous shells; but, mushrooms and fungi are an elective hotspot for chitosan. This study aimed to determine the blood coagulation activity of chitosan extracted from Bracket Fungi (*Trametes sp.*). The chitosan was extracted from Bracket Fungi using alkaline and acid treatment, and it was placed in a rotary evaporator at 60 degrees angle for an hour. Thirty percent of concentrated extract underwent evaporation to be in a semi-solid state. 0.5 mL, 1.0 mL, and 1.5 mL of chitosan and 0.2 mL of distilled water (negative control) were placed on each vial. 0.2 mL of blood from male albino mice was introduced on each vial, one at a time. Two replicates were made for each set-up. Each set up was observed until the blood already coagulated. The data were recorded and analyzed using Duncan Multiple Range Test. The 1.50% of chitosan solution had the fastest coagulation time with an average time of 4.73 seconds, while the slowest set-up is the negative control with 23.63 seconds. Among the blood coagulation time for the chitosan solutions, 1.00% and 1.50% were significantly faster than the 0.50% chitosan solution. Likewise, the 1.00% and 1.50% chitosan solutions were significantly faster than the negative control. All the chitosan solution exhibited faster coagulation time compared to the negative control, thus, the results of this study showed that chitosan can induce blood coagulation activity.

Keywords: fungi, blood coagulation, albino mice

Pomelo Peel (*Citrus maxima* peel) as an alternative component in Medicinal Soap Making

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Abstract

This study is entitled “Pomelo peel (*Citrus maxima* peel) as an alternative component in medicinal soap making”. It was conducted at Tagaytay City Science National High School from August 19 to November 20, 2017. Through this research project, the researchers aimed not only to make a medicinal soap but also to help people cure acne. The researchers chose medicinal soap making as an additional income generations project. The ingredients are coconut oil, pomelo peel, lye and rubbing alcohol. The researchers make 3 setups. Set up A, B and C. In set up A the researchers put 2 ml of rubbing alcohol, 50 ml coconut oil, 50 ml lye and a $\frac{3}{4}$ -gram of pomelo peel. In setting up B, the researchers put 2 ml of rubbing alcohol, 70 ml of coconut oil, 70 ml lye and 1 gram of pomelo peel. In set up C the researchers put 2 ml of rubbing alcohol, 100 ml of coconut oil, 200 ml of lye and 2 grams of pomelo peel. After it is done, the researchers tested the product with 2 respondents. Respondent A tried using the products for 10 days, and Respondent B used the product for 3 weeks. Furthermore, the researchers used a questionnaire using a voting scale of yes, no or maybe to test the characteristics of the medicinal soap and to test the effectiveness of the product. Base on the result of the study, medicinal soap out of pomelo peel can be used as an effective component for medicinal soap. The medicinal soap out of pomelo peel can help people to cure their acne. The data gathering used in the study is a self-constructed questionnaire which undergone content validation. Items included in the questionnaire were based on the researchers reading, difficulties and dissertations, finding and discussion, and feedback from people who had experienced body blemishes. After using the medicinal soap, the respondents proved that it is effective. All the blemishes were removed. It also shows that it has good appearance and the texture. The researchers chose to make a medicinal soap out of pomelo citrus fruit because it has many health benefits. Pomelo medicinal soap can clear acne. It also applies to other customers who have the same problem so that they can save their money. The study was conducted at Tagaytay City Science National High School (TCSNHS). The researchers used pomelo peel as the main material in the medicinal soap due to its availability in the locality of the researchers. This research focuses on the identification of its active components of pomelo. The researchers made the study from August 19 to November 20, 2017.

Keywords: pomelo peel, medical soap

An Assessment of *In Vitro* Antioxidant, Cytotoxic and Antibacterial Activity of *Bambusa vulgaris* Methanolic Extract

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Abstract

Complementary and Alternative Medicine (CAM) is any diagnosis, treatment or prevention that supplements standard medication by adding to a typical entire by fulfilling a request not met by conventionality or by enhancing the calculated structure of drug (Mollassiotis *et al.*, 2005). Over a period, modern pharmaceutical companies have encountered many cases of antibiotic resistance emerged in susceptible pathogens (Bush, 2004). *Bambusa vulgaris* or commonly known as bamboo or kauayan-killing, is a well-known species of bamboo cultivated in South East Asia. Globally, recent scientific studies show the emerging proliferation of cases of cancer and tumour, and bacterial infections (Whole *et al.*, 2006). Likewise, therapeutic agents for these well-known diseases are highly expensive and limited. Generally, the study aims to evaluate the antioxidant, cytotoxic and antibacterial activity of the methanolic extract of *Bambusa vulgaris*. The research study goes with the following methodology: (1) Collection of plant material (*Bambusa vulgaris*) in Golden Haven, Las Piñas City. (2) Extraction of a methanolic and crude extract of *Bambusa vulgaris*. (3) Phytochemical Screening of the crude extract in different tests. (4) Antioxidant Activity of *Bambusa vulgaris* sample using DPPH free radical scavenging assay. (5) Cytotoxic Activity using Brine Shrimp Lethality Assay. (6) *In vitro* Antibacterial Activity of *Bambusa vulgaris* using Kirby Bauer Susceptibility Test and Resazurin Microtiter Assay Plate Testing. (7) Statistical Analysis and Risk Assessment. *Bambusa vulgaris* contains phytochemical compounds such as proteins, phenols, flavonoids, glycosides, alkaloids, steroids and terpenoids. The antioxidant activity of crude methanolic extract has 38% DPPH Scavenged at the highest concentration (1000µL/mL) which has little activity using DPPH Free Radical Scavenging Assay. On the other hand, the cytotoxic activity of the plant extract has 69% lethality at 1000µL/mL. In the antibacterial activity, using Kirby Bauer Susceptibility Plate Test, the statistical analysis shows that *S. aureus* has 0.3632 p-value and 0.0000 in *E. coli*. While, in Resazurin Microtiter Plate Assay, *S. aureus* has 3.88 p-value and 0.0013 value in *E. coli*. In conclusion, there are no significant differences in the concentrations of *Staphylococcus aureus*, while the concentration of the plant extracts has significant differences in *Escherichia coli*. The research results, therefore, conclude that the concentrations of methanolic extract of *Bambusa vulgaris* have significant differences in the antioxidant activity and cytotoxic activity. Significantly, the Kirby Bauer Susceptibility Test and Resazurin Microtiter Plate Assay show that the extract of Bamboo has significant differences in *Escherichia coli* but has no significance in *Staphylococcus aureus*.

Keywords: vitro antioxidant, cytotoxic, BambusaVulgaris

Effect of Onion (*Allium Cepa*) Extracts to the Locomotor Activity of Young Male Albino Mice
(*Mus Musculus Domesticus*)

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Abstract

Due to the fast phase world, people are experiencing too much exhaustion and stress caused by school or work which can affect physical health. Thus, this study aimed to produce an alternative medicine for a muscle relaxant. Albino mice were utilized as the test subjects of the study; mice were given different amounts of onion extract. Oral gavage was used as the administration method. Data were obtained from the tests then compared to mice given with regular food and water and to those administered with commercial niacin dissolved in water as the controlled groups. Four types of tests were conducted specifically acute toxicity test, rotarod test, hole board test and inverted screen test. These tests determined the effect of onion extract and commercial niacin upon the locomotor activity and anxiousness of the albino mice. 1.6 mL was recorded to be the lethal dose of onion extract on albino mice. Mice group E, which consumed 1.2 mL of extract produced the lowest overall mean in accordance to the rotarod and inverted screen test while mice group A which was fed with regular food and water produced the highest overall mean on these tests. Hole board test showed that the locomotor activities of mice were reduced. There is an existing significant value gap between the overall means of mice groups in the rotarod test and locomotion. Based on the experiments conducted, the onion extract had a significant effect on the muscle relaxant activity of the mice regarding locomotion and rotarod test.

Keywords: male albino mice, onion extraction, locomotor activity

Tea Production out of Malunggay Leaves (*Moringa oleifera*)

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Abstract

The research study is entitled Tea Production out of Malunggay Leaves (*Moringa Oleifera*). The researchers believed in the idea of producing tea out of *malunggay* leaves which can help maintain blood sugar level. It aims to offer a cheaper alternative to proven the rapeutic tea. High blood sugar level is commonly caused by excessive consumption of sugar or sweets. The researchers harvested green compound leaves that show no signs of yellowing. Place the collected leaves in a dry place. The researchers cleaned the collected leaves and placed it in a newspaper for air dry and placed it in the oven for oven dry; thisis done for 2-3 minutes. After, the researchers put the leaves in a tray and let the leaves be cooled. In making the tea, the researchers placed one teaspoonful of dried leaves of *malunggay* in a tea bag. Seal the bag using a mechanical sealer or a small stapler. Malunggay leaves contain a high amount of nutrients and are commonly extracted and used as a nutritional supplement. 19 respondents from Sta. Monica Sungay West, Tagaytay City, answered the given questions by the researchers about maintaining blood sugar level. The researchers proved that their product is safe and effective with the helped of De La Salle Health Sciences Institute.

Keywords: tea production, malunggay leaves

Mucilage Extracted from *Opuntia cochenillifera* (Dilang Baka Cactus) Pads as Potential Binder for Tablets

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Abstract

Numerous illnesses spread because of the rapid changes in the environment resulting in higher demand for medications whose price increases as its production costs increases. Using synthetic polymers also can have negative tendencies on the tablet quality. The study aimed to determine the potential of using *Opuntia cochenillifera* mucilage in making tablet binder to solve an increase in expenditure for producing synthetic polymers commonly used in tablet binding. The mucilage of *Opuntia cochenillifera* was extracted through the ethanolic method. The collected mucilage was freeze-dried and turned into granules by using the wet granulation method for tableting. The mucilage and granules were tested using flowability tests. The tablets were tested for disintegration time and hardness. The Correlation Analysis was used to analysed the data. The angle of repose of the mucilage and granules were 26.57 degrees and 11.31 degrees respectively. The bulk and tapped density volume for the mucilage and granules were 6.8 ml, 6.55 ml and 8.4 ml and 8.1 ml. The percent compressibility index and Hausner's ratio for mucilage and granules were 2.94%, 1.03% and 3.6%, 1.03% respectively. Based on the data analysis, there was a high linear positive relationship (0.8147) between the tablet hardness and the disintegration time of the placebo tablets – the higher the tablet hardness, the longer the disintegration time. The result of the flowability tests was excellent also the tablets produced passed the disintegration time and hardness test. Therefore, the mucilage extracted from *Opuntia cochenillifera* can be used as a tablet binder.

Keywords: mucilage extraction, tablets

Bioluminescence Method as a Screening Test of Mercury Content in Whitening Products

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Abstract

A variety of whitening products contain mercury, which imposes a health concern. This study was undertaken to assess the chemical toxicity of mercury using the bioluminescence method and its relation to the chemical present in whitening products. Different whitening products were gathered and labelled as Brands X, Y, and Z. *Aliivibrio fischeri* were isolated from the squid's ink, and were streaked multiple times at Tryptone Yeast Extract Glycerol Salt Water Plate and was incubated at 24°C for 10 hours. A brightly luminous colony was harvested and inoculated into freshly prepared artificial seawater. 4 drops of each whitening product in 0.01 v/v concentration was placed in each test tube. The result of ICP – OES showed that brand X has the highest mercury content with 0.589 % while brand Z have the lowest mercury content with 0.182%. Spectrometry proved that brand Y has the highest related intensity ranging from 0% to 0.42% among the whitening product samples. The relative intensity of bioluminescence in whitening products decreases by 0.13% to 0.01%, 0.22% to 0.1 %, and 0.16 % to 0.1% respectively. Brand X is the fastest while brand Z is the slowest. The computed F is 7.232 which exceeds $F_{0.01} = 5.3905$ that means the intensity of light of bioluminescence differs significantly across whitening products with different mercury content. The computed R is -0.991, which indicates very high correlation and highly significant ($p < 0.05$). As the mercury content of whitening product increases the intensity of light of the bioluminescence decreases and vice versa.

Keywords: whitening products, bioluminescence method

MUSASA: An Antibacterial Multipurpose Wax out of Banana (*Musa sapientum*) Peel and Calamansi (*Citrofortunella microcarpa*)

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Abstract

MUSASA started as a simple floor wax way back 2015 when the researchers. Through the years, it continued to improve in different levels. From a simple floor wax made out of Banana peels to a multipurpose wax that could shine other substances such as wood, leather and stainless. Now, MUSASA has reached its peak: a multipurpose antibacterial wax that has another purpose aside from shining surfaces – it could now clean and remove bacteria. The purpose of the study was to help students and other people who normally do the cleaning in the house. With this product, cleaning and taking care of other belongings such as leather shoes could be easy and fast. In this research, the researchers aimed to make a multipurpose wax out of Banana peel. The set-up was composed of 50g of banana peels, 10g of the used candle, 5mL of cooking oil and 10mL of calamansi extract. The product was put in observation to see if it was able to clean and shine compared to commercialised wax. At the end of the observation, the researchers found out that MUSASA was an effective antibacterial multipurpose wax compared to the commercialised ones. Like a common wax, it shone surfaces, but the only difference was that it could also clean and remove bacteria. The product worked on wood, stainless steel, leather, and cemented floors.

Keywords: MUSASA, multipurpose wax, banana peel, calamansi

Characterization of Thermoplastic Starch from Bitter Cassava (*ManihotesculentaCrantz*) with Undirectional Abaca Fibers (*Musa sp.*) and Titanium Dioxide Particles

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Abstract

Major problems in plastics have caused unexpected calamities all throughout the Philippines specifically in urban areas like Pasay City. Thermoplastic starch which is renewable, biodegradable and environmental-friendly plastic was investigated to fill-in this dilemma. Fabricating and characterising thermoplastic starch from bitter cassava with unidirectional abaca fibres and titanium dioxide particles was studied. Thermoplastic starch from bitter cassava was produced by wet extraction process at room temperature using glycerol as plasticiser and water and kappa carrageenan as gelatinising agents. Four setups (A, B, C and D) were formulated to contrast the effectivity of each variable. All setups were mixed under IKA RW 20 digital at 550 rpm for 5 minutes and degassed within 10 minutes after it was mixed. The mixtures were compression moulded and characterised by different tests under surface morphology, tensile strength test and thermal ageing test. All setups differ in physical properties regarding colour and texture except for the odour. Results showed that Setup C, which is the thermoplastic starch with abaca fibres has the highest significant tensile strength among the other setups. While Setup D which has both the abaca fibres and titanium dioxide exhibited the best weatherability design above all. The use of abaca fibres and titanium dioxide increased the tensile strength and weatherability properties of thermoplastic starch making them a suitable and very promising component in TPS compositions.

Keywords: thermoplastic, bitter cassava, abaca fibres

Fabrication of an Electrospun Lithium-ion Battery Membrane Separator with Aqueous Polyvinyl Alcohol and Zinc Oxide Nanoparticles

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Abstract

Li-ion batteries are ideal yet face safety concerns since it may lead to fire and explosions due to an unstable battery separator. Thus, this study aimed to fabricate an improved electrically and thermally stable battery separator by electrospinning 10%wt. Polyvinyl alcohol (PVA) and 1%wt. Zinc oxide (ZnO) nanoparticles solution. The surface morphology of the battery separators was assessed through obtaining scanning electron microscopy images that showed the presence of the nanoparticles and that the battery separator with ZnO had closer fibre and less grey areas. It was also determined through thermo gravimetric analysis that after exposure to temperatures from 30°C-600°C, the PVA battery separator can withstand up to 216.85°C before it degrades with 95.12%wt. Left and 13.08%wt. Residue; while the battery separator with ZnO nanoparticles can withstand up to 225.48°C with 97.31%wt. Left and 15.41%wt. Residue. The battery separators were also good insulators since it had zero conductivity and $\infty\Omega$ resistance based from the electrical property testing obtained using the multimeter and galvanometer. Data were analysed using one-way ANOVA Post Hoc test by comparing the battery separators with and without ZnO to the commercial polypropylene (PP) battery separator. Analysis showed that the fabricated battery separators had the same electrical properties and weight loss but the battery separator with PVA and ZnO was the most thermally stable. This study concluded that PVA and ZnO nanoparticles were effective in making battery separators withstand a higher temperature while maintaining its electrical properties, thus ensuring the safety and reliability of batteries.

Keywords: lithium ion, zinc, polyvinyl alcohol

MATHILDA: Website Application Learning System for better advancement in Mathematics

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Abstract

All children are born with an ability to appreciate numerosity. The approximate number system does not support precise counting, but allows for comparison judgements of “more than” or “less than.” In school, this ability is being enhanced by teaching them any other lessons about Mathematics. Most of the learners find this subject hard and uninteresting. Conducting the research will aid the student to advance in the subject through systematic, interactive and interesting learning with technology. The researchers programmed the website containing the lessons using the DepEd’s budgeted course guide. Programming language and methods are also implied to attain a valuable and attention-grabbing page. The researchers asked 45 students per grade level to answer a diagnostic test before and after using the website. The researchers used the non-numerical data to give descriptions and applications stating that because of graphics, organised data and technology-related features of the product, the respondents were able to have advancement and better understanding. Numerical data states that the result with MATHILDA is 6.87 higher than the traditional learning system. Having factors like; the inclusion of technology, organised data and even the site’s instructiveness thru quizzes and interactions, the project can attain positive results. Therefore, there is a potential in using MATHILDA as an alternative learning system in Mathematics.

Keywords: website application, MATHILDA, mathematics

Fabrication, Characterization, and Corrosion Protection of Hot Dip Aluminized Coatings for Steel Using Discarded Soda Cans

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Abstract

Corrosion, which seriously affects the quality and functionality of steel can be reduced by hot dip aluminising which involves dipping substrate to a molten aluminium bath. Thus, this study aimed to produce a hot dip aluminised coating for steel-using discarded soda cans. A total of 80 steel nails with a length of 65.62 ± 0.56 mm were used wherein 40 nails were intended for the hot-dipaluminising process at $650\text{-}700^\circ\text{C}$ with an average coating mass and thickness of 547g/m^2 and $170\ \mu\text{m}$, respectively, with a density of 2.627g/cm^3 following ASTM standards. Compared to the non-coated setups, the fabricated aluminium coating reduced 0.178g and 0.092g of corrosion products accumulation after immersions on H_2O_2 and NaCl solutions for 7 days and 4 weeks, respectively. Optical analysis of surface and cross-sections of the coated samples showed less pitting and corrosion products. Aluminium coating tends to pit that starts from small cracks and fractures when immersed in the corrosive medium. Moreover, scanning electron microscopy showed that the coated nail sample experienced minimal corrosion in the form of thin cracks compared to non-coated nails, which had a relatively rough surface as a result of heavy corrosion. Also, a t-test showed a significant difference between the accumulated corrosion products' weights of coated and non-coated setups after immersing in NaCl ($t=-13.801$; $p=0.000$) and H_2O_2 ($t=-31.005$; $p=0.000$) wherein less corrosion product was obtained by the coated set-up ($\bar{x}=0.036$ (H_2O_2) and $\bar{x}=0.028$ (NaCl)). Thus, the results proved that the produced aluminized coating from waste soda cans provides a significant corrosion protection on the steel substrates.

Keywords: fabrication, characterisation, corrosion protection, steel, soda cands

Thermal Insulation Potential of Selected Solid Wastes Fibers

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Abstract

Materials based on highly porous fibres are now becoming increasingly popular as thermal insulators to fight severely increasing temperatures due to climate change (Khedari et al., 2004). In this study, fibres from solid waste materials like coconut husk and absorbent pads of used disposable diapers were evaluated for their synergistic effect as thermal insulation medium. Dried coconut husk fibres and cleaned used disposable diapers were heated at 150^oC-300^oC for 2 hours and then moulded to make pads. Scanning Electron Microscopy and HD digital microscope were used in the analytical imaging of the fibres. Fibre pads from coconut husk fibres, used disposable diapers and their combination, and polyethene foam (+control) were evaluated for their burning rate based on ASTM D 1992 while thermal conductivity and thermal resistance were obtained using the fabricated testing hot box (Frawley & Kennedy, 2007). The morphology of the coconut husk fibres with used disposable diapers showed thicker and rougher surface with foamy coatings which confirmed a porous fibre structure. One-Factor ANOVA showed significant difference among the different set-ups for burning rate (F=926.506; p=0.000), thermal conductivity (F=203.993; p=0.000), and thermal resistance (F=197.820; p=0.000) wherein the set-up for the combination of the coconut husk fibres and used disposable diapers exhibits satisfactory burning rate (M=3.268), lowest thermal conductivity (M=0.037) and highest thermal resistance (M=0.273). The results affirmed that the natural coconut husk fibres and used disposable diapers have a synergistic effect for better thermal properties which can be utilised as a better thermal insulation medium to fight high-temperature problems.

Keywords: thermal insulators, coconut husk fibres, used disposable diapers, solid waste disposal, wiser recycling

Influence of Oil-Biodegrading Effect of Compost Organic Wastes in Phytoremediation of Crude Oil-Contaminated Soil Using *Zoysia matrella* (L) Merr. (Manila grass)

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Abstract

Soil degradation has been a serious problem throughout the world; it is more rampant in tropical areas wherein the nature of the properties of the soil is far different from the temperate region. In the Philippines, it is one of the most serious ecological problems thus identified as a major threat to food security. Numerous investigations opted phytoremediation as an environmental-friendly technology to remediate contaminants. However, phytoremediation takes time to fully remediate the contaminated site leading to delayed preservation of the soil's flora and fauna. Hence, this study aimed to investigate the effects of the addition of cow dung in the phytoremediation of crude oil contaminated soil utilising *Zoysia matrella* (L) Merr. (Manila grass). In focus, four set-ups SS-NT (No Treatment), SS-CD (Cow Dung Application), SS-PT (Plant Application) and SS-CDPT (Plant + Cow Dung Application) were tested for pH and NPK and assessed for SEM and FTIR before and after contamination process. Each of which contained the same amount of soil and crude oil but only varied in terms of the treatment. Results revealed that SS-CD and SS-PT restored the soil after the contamination process, however, didn't brought the normal state of the soil in accordance to their infrared spectrums. Concurrently, SS-CDPT presented data signified that it was the best for it was capable of remediating crude oil contaminated soil and bringing it back to its natural condition. Thus, cow dung provides the huge impact that could greatly enhance phytoremediation of crude oil contaminated soil using *Zoysia matrella* (L.) Merr. (Manila grass).

Keywords: soil degradation, compost organic wastes, oil-contaminated soil

Assessing Phytoremediation Potential of *Daucus carota* (Carrot) in Artificially Lead-Contaminated Soil

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Abstract

For the past years, industrial development demanded a sacrifice of the great land mass. The researchers desired to rehabilitate the wasted land. With a high level of lead, phytoremediation becomes an alternate technology in removing substances in soil. Testing the phytoremediation potential of *D. carota* in contaminated soil was the main objective of this study. The researchers collected soil samples from the dumpsite in Brgy. Tapia, City of General Trias, Cavite. They prepared three set-ups in four weeks' time: planted, extracted, decomposed *D. carota*. The soils were placed under the same condition of sunlight and amount of water. The level of acidity of the soil was measured through the pH soil tester. Data were analysed using two-tailed t-test. On the first set-up, with the planted *D. carota* in the contaminated soil, the average soil acidity was 6.35; on the second set-up, with the extracted *D. carota*, 6.20; and on the third set-up, with the decomposed *D. carota*, 6.30. Using the t-distribution, ($\alpha=0.20$, $N=4$, $df=3$, the following data were revealed: MD=1.425, SD=1.68, $t=1.70$ (first set-up); MD= 1.350, SD= 1.58, $t=1.71$ (second set-up); and MD=1.375, SD=1.61, $t=1.71$ (third set-up). All the values were higher than $t_{critical} = 1.638$ and within the rejection region, therefore, all the null hypotheses were rejected. The study showed that *D. carota* was proven to be effective in phytoremediation of lead contaminated soil. The most effective way was through the planting of *D. carota*, because it is a living species which makes it a better hyper accumulator of pollutants from the soil.

Keywords: phytoremediation, contaminated soil

Insecticidal Activity of *Annona squamosa* and *Annona muricata* Ethanolic Leaf Extracts against *Scotinophara coarctata*

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Abstract

The use of conventional insecticides has raised some concern about their threat to the environment and development of insecticide resistance in insects. Making alternative insecticides from plant extracts has been long suggested to control insects. In this study, toxicity and insecticidal activity of ethanolic leaf extract of *Annona squamosa* and *Annona muricata* against *Scotinophara coarctata* were investigated. Leaves of *A. squamosa* and *A. muricata* were collected, dried and macerated in 95% ethanol. The macerated samples were filtered and squeezed to obtain the extracts and were placed in beakers. The solvent was then removed by evaporation and concentrated in a water bath. Different concentrations (1ppm, 10ppm, 100ppm and 1000 ppm) were prepared through serial dilution. Five replications were done for each concentration. The preliminary phytochemical investigation was carried out to identify the various constituents present in the extracts. Cytotoxicity was evaluated regarding LC₅₀, and Glass-vial Assay was conducted to test its insecticidal activity against adult *S. coarctata*. The phytochemical test revealed the presence of alkaloids, coumarin, flavonoids and phenol on both leaf extracts. However, the presence of saponins was only found in *A. squamosa*, and the occurrence of Quinone was only found in *A. muricata*. LC₅₀ of *A. muricata* ethanolic extract using BSLA and GLA were identified at 159 ppm and 62 ppm while *A. squamosa* had an LC₅₀ of 32 ppm and 8 ppm respectively. Maximum mortalities (100%) for both extracts were observed at 1000-ppm concentration. These results suggested that *A. squamosa* and *A. muricata* have a good potential for development as a botanical insecticide for eco-friendly management against *S. coarctata*.

Keyword: leaf extraction, insecticidal activity,

Phytoremediation Capacity Assessment of Copper (Cu) and Lead (Pb) Contaminated Soils Using *Helianthus annuus L.* (sunflower plant)

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Abstract

Heavy metal contamination is an overlooked, dangerous by-product of pollution that harms human and environmental health. Phytoremediation is a proven cheap alternative to cleaning up heavy metals. To significantly contribute to heavy metal pollutant research, this paper aims to assess the phytoremediation capability of the plant sunflower (*Helianthus annuus L.*) against two prominent heavy metals, Cu and Pb, using artificially infused and naturally-contaminated soils. Two sets of experiments were performed wherein healthy soil from Trece Martires, Cavite was used for the artificially infused setup and soil was collected from Binakayan, Cavite for the naturally contaminated soil setup. Initial AAS analysis for the two setups revealed 2.14mg/kg Pb and 6.22mg/kg Cu were present in the artificially infused set-up while 2.03mg/kg Pb and 5.17mg/kg Cu were present in the naturally contaminated setup. Sunflower seeds were planted on both setups to determine the phytoremediation capability assessment of the specimen. In the naturally-contaminated soil, compared to the pre-analysis (mean of 4.615mg/L, SD 0.085mg/L), post analysis has significantly less heavy metal content (mean of 2.265mg/L, SD 0.035mg/L, $p < 0.005$, $t > 2.132$). Another who is in the metal-infused set-up, compared to the pre-analysis (mean of 4.18mg/L, SD 0.165mg/L), post analysis also has significantly less heavy metal content (mean of 3.41mg/L, SD 0.1mg/L, $p < 0.035$, $t > 2.132$). Overall, this study demonstrated that sunflower could be a promising phytoremediating plant against copper and lead contamination. Further in-depth studies should focus on (1) determining the biomolecular, metal-specific, phytoremediating mechanism of sunflower; and (2) further assess the phytoremediating property of fully-grown sunflowers through optimised experiments.

Keywords: copper, contaminated soil, phytoremediation

The Characteristics of a Solar-powered Arduino Device Compared to a PASCO Anemometer

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Abstract

A wide variety of crops can grow in the Philippine climate, but there exists crops-in-demand, which are highly sensitive to temperature and humidity. To assist in growing these plants, the researcher proposed to produce a relatively inexpensive means of measuring and presenting these data in real time. The question now is if there is a significant difference in the results of the solar-powered Arduino device and the PASCO anemometer in measuring both temperature and humidity. The working Arduino model was produced, and the PASCO device was secured before the investigation. The gathering of data was done in four different locations each with varying atmospheric conditions. The tests were done (1) outside the building of the school, (2) inside a non-air-conditioned classroom, (3) inside an air-conditioned classroom, and (4) inside a refrigerator. There were five runs per location, and only the fifth run was considered to accommodate for possible delays in adjusting to the new environment. Each run collected data every second for 50 seconds. At a 95% confidence interval, the Arduino's and PASCO anemometer's ability to measure temperature (p-value, 0.7717) and humidity (p-value, 0.3248) have no significant difference. In comparison to a third value, standards such as actual weather readings, room temperature, air-conditioning unit's readings, and refrigerator unit's readings, the Arduino device proved more accurate than the PASCO anemometer regarding measuring temperature. Based on the data gathered by both devices and the statistical tests that were performed, the hypothesis that there is no significant difference between the results of the solar-powered Arduino device and the PASCO anemometer in measuring both temperature and humidity is proven true. This means that using the lower-costing solar-powered Arduino device would yield accurate results and would be a valid substitute.

Keywords: solar-powered, PASCO anemometer, device

Rhizofiltrating Impact of *Nymphaea nouchali*(Blue lotus) Plant in a Source of Wastewater

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Abstract

Recently, water pollution has disrupted almost every aspect connecting people and nature as it affects all the major water bodies such as rivers, in urban or rural areas. One of the ways in treating bodies of water is rhizofiltration, which uses plants, specifically macrophytes, capable of absorbing heavy metals and contaminants. Utilizing rhizofiltration set-ups, we tested the hypothesis that *N. Nouchali* plant can lessen the Chemical Oxygen Demand (COD) of a wastewater source. Two set-ups were prepared to have 1.75 L of wastewater with five *N. nouchali* plants and three *N. nouchali* plants, respectively. Ten mL from each set-up was subjected to the COD test for four weeks. One-way ANOVA was employed to determine the significant difference between the pre-test having 110 ppm and post-test having 95.365 ppm and 97.168 ppm. The value of computed $F = 6.2135$ was compared to $F_{critical}$ in 0.05 level which is 0.0016 and 0.01 level which is 2.7729 (two-tailed test). Thus, there is a significant difference on the effect of rhizofiltrating using *N. Nouchali* plant on the wastewater samples. Findings revealed that the two set-ups showed remarkable changes on the COD, specifically the set-up with five *N. nouchali* plants, which decreased 14.635 ppm on the baseline COD. The study showed that using *N. nouchali* could decrease the COD of contaminated water and purify the aquatic ecosystem. With the use of the *N. nouchali* plant, the rivers that are connected to canals would not be contaminated because of their low heavy metal content as a result of rhizofiltration.

Keywords: blue lotus, wastewater

Exploring the Potentials of Water Hyacinths and Agricultural Wastes as a Botanical Medium for Urban Farming

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Abstract

Unfortunately, water hyacinths grow in abundance along river stretch causing different places in the Philippines submerged in floodwaters. Vivika, S, and Grace B.L. (2009) note that water hyacinth has appropriate macro and micro nutrients that support the plant growth. With this, the potential of water hyacinth with agricultural wastes to generate alternative botanical medium for rural and urban settlers was investigated. Water hyacinths were gathered and chopped into small pieces. Coconut coir, cacao leaves, dried carbonised rice hull, rice bran, served as agricultural wastes and were mixed with water hyacinths. Indigenous microorganism (IMO) was sprayed on mixed materials. It was fermented for 20 days. After fermentation, different mixtures were placed in a black plastic container where monggo seeds were planted. Results showed after 3 days, seeds in the commercial soil germinated followed by mixture 2 and 3. After 5 days, mixture 1 and problem soil germinated. After 10 days, monggo plants in mixture 2 had greatest average length followed by commercial soil and problem soil. Mixture 3 had least average length after mixture 2. *V. radiate* seedlings planted in each medium have leaves all appeared in light green colours. Therefore, used of water hyacinths and agricultural wastes have the potential as a botanical medium because monggo planted on it grew similarly like the soil with fertiliser.

Keywords: water hyacinths, agricultural waste, botanical, urban farming

Astaxanthin Accumulated from Milkfish (*Chanos chanos*) Scales as a Proliferating Agent in the Oxidation of Low-density Polyethylene

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Abstract

The use of plastics had resulted in numerous disasters like unstoppable flashfloods and danger to animals of all forms due to its improper disposal. Astaxanthin from Milkfish scale wastes was added to Low-Density Polyethylene (LDPE) to produce a fast degrading plastic. Astaxanthin was extracted in milkfish scales using ethanol and palm oil. The strips of LDPE were then immersed in the astaxanthin for 24 hours and were air suspended to remove excess oil. The Intensity of IR waves, permanganate value and functional groups were used to identify whether the product was able to oxidise compared to commercialised LDPE. The Fourier Transform Infrared Spectroscopy has shown the functional groups of Aldehyde, which are found in controlled setup and Aldehyde, Ketone and Ester in the experimental setups (1:1, 1:2, 1:3). The permanganate value consumption has shown that setup with 1:3 ratio had the highest total oxidizable material while the controlled setup has shown negligible values. The Intensity of IR waves has proved that the LDPE could be degraded using a different electromagnetic wave aside from UV light. As an over-all assessment, the setups have shown a significant difference regarding permanganate consumption and intensity of infrared Waves. The results have also shown that using astaxanthin as a proliferating agent is effective for faster oxidation for LDPE plastic, especially with the 1:3 ratio (100 grams of Astaxanthin and 95% concentration of ethanol). It is recommended to determine the Ultraviolet Reflectance and Absorbance to determine the UV degradation of the polyethylene.

Keywords: milkfish, oxidation

Cilantro (*Coriandrum sativum*) leaves as an Adsorbent of Lead in Aqueous Solution

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Abstract

Water impurities deprive the environment of safe drinking water that serves as one of the major needs of different organisms including the human population. The researcher aimed to determine if Cilantro is an effective agent in the accumulation of Lead (Pb). Samples of aqueous solution contaminated with Lead were prepared with a constant concentration of 150ppm and were mixed with a different amount of pulverised Cilantro leaves to accumulate the heavy metal and was filtered afterwards. Cilantro leaves are significantly effective upon using it as a heavy metal accumulator because of its adsorption properties within its outer wall structure. Previous studies showed that, there is a hydroxyl group present in the outer wall of the cilantro that is ideally for absorbing and adsorbing heavy metals. The scanning electron microscope revealed that there are holes and spaces on the structure of the cilantro leaves, which is one of the reasons why it is capable of adsorbing lead. Determination of the heavy metal accumulation was done by conducting Atomic Absorption Spectroscopy. Setups A, B, and C were effective in accumulating Lead in the aqueous solution because all of it gave a zero concentration of Lead and a 100% bio sorption based on the formula. In obtaining the significant difference, analysis of variance was used. It shows a significant difference between the three setups and activated carbon. Therefore, it was concluded that Cilantro is a feasible agent in the adsorption of Lead in aqueous solution.

Keywords: cilantro leaves, adsorbent

Preliminary Assessment on the Salt Content Using UV Vis Spectroscopy and the Physicochemical and Bacteriological Properties of Spring Water from Manamtam Salt Spring, Manamtam, Bambang, Nueva Vizcaya

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Abstract

There is little to no knowledge about the existence – much less of the properties – of Manamtam Salt Spring. Due to the aforementioned reason, the spring cannot be fully utilized. In this study, it was hypothesised that there is no significant difference in the absorbance level of the salt obtained from the Salt Spring and a laboratory grade salt as exhibited by the UV Vis Spectroscopy. The bacteriological and physicochemical properties were also determined. The methodology used in the preliminary assessment of the salt content is through UV vis Spectroscopy. For the physicochemical properties, electrometric method, filtration method, HANNA Kit, PASCO PASSport water analysis kit. The tests revealed that the water is slightly acidic; nitrite and ammonia are absent in all sites; there is a high amount of Suspended sediments; DO levels are within the acceptable levels except Site B; electrical conductivity showed that there is a high amount of minerals, and salinity revealed that the water is mesaline. UV Vis Spectrophotometer showed that there is no colored material in the water and characterization of the salt sample revealed that there is a significant difference in the peak absorbance level of the salt samples and the positive control, NaCl, that may indicate that the salt content of the spring water may not have the same chemical attributes compared to the positive control. Multiple Tube Fermentation Technique revealed that six of nine water samples failed in Total Coliform, Fecal Coliform and HPC test for July and eight out of nine failed for August. Overall results are alarming because some locals use the salt derived from these sources in household use. Considering that the salt spring is not protected, it is deemed important that community is educated on the proper care of the spring and the LGU to do periodic monitoring to prevent contamination from agricultural sectors.

Keywords: salt, spring water

Anitun Tabu: Automated Microweather Station

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Abstract

Weather forecasting is essential for people due to its roles—to mitigate the possible hazards, to adapt the people, and to prepare the community—in monitoring conditions within the atmosphere. Furthermore, due to the inevitable changes of weather condition that need to be forecasted, the quantity of automatic weather stations is oddly distributed and infrequent to provide information over the entire Philippine archipelago, according to Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) last 2017. Anitun Tabu: Automated Microweather Station is fabricated to mitigate, adapt, and prepare the community for contemporary weather conditions. This instrument aims to provide real-time information that is beneficial in both urban and rural areas. The device was equipped with various sensors that can measure weather parameters such as air pressure, air temperature, wind speed, relative humidity, wind direction, rain amount, UV index, and river water level. An Arduino Software IDE v1.8.3 was used as a software-programming tool. Calibration measurements made by Anitun Tabu are relatively similar to the capacity made by PAGASA using Percentage Error Analysis. At 5% level of significance, the median of weather parameters—air pressure, air temperature, humidity and wind speed—obtained by standard PAGASA devices are not statistically significantly different to the median of measurements made by the fabricated device. This study showed that Anitun Tabu is a low cost and portable weather station, which is advantageous in both urban and rural areas. Moreover, it is accurate as the commercially available automated weather stations in transmitting weather updates for disaster mitigation.

Keywords: automated microweather station, anitun tabu

The Feasibility of *Corchorus capsularis* L. Cellulose as Reinforcement in the Production of Bio-plastic

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Abstract

Plastic has been a useful and versatile material with a variety of use but takes hundreds of years to breakdown. Plastics are made of non-renewable resources such as petroleum that causes air, water, and land pollution. Using white jute cellulose as reinforcement in producing bio-plastic, we tested the hypothesis that the bio-plastic can be a potential packaging material for lightweight products. The bio-plastic was a mixture of water, glycerin, cornstarch, vinegar and white jute fibre. The mixture was mixed at 70°C for 90 minutes. It was placed in a glass mould and sun-dried. The samples were observed for biodegradability and tested for tensile strength. The data was analysed using One-Way ANOVA. Among the three samples tested, the bio-plastic with white jute fibres measured tensile strength of 2.92 N, the bio-plastic without white jute fibres had 2.19N, and the HDPE plastic had 1.96 N ($F_{\text{calc}} = 2.60$, $F_{\text{tab}} = 5.79$ $p < 0.05$, $DF_b = 2$, $DF_w = 5$). The biodegradability test indicated that the bio-plastic samples showed signs of decomposition. Moulds were present on the bio-plastic samples but not on the HDPE plastic. This study showed that the bio-plastic with white jute fibres could be an appropriate alternative material for packaging lightweight products. The biodegradability of the bio-plastic with white jute fibres signified it could be an alternative packaging material that is environmentally friendly. To improve the bio-plastic material produced in this study, further research should be conducted to find the best formulation of the ratio among the raw materials.

Keywords: cellulose, bio-plastic, reinforcement

Mycosynthesis of Silver Nanoparticles from the Morphologically Characterized Endophytic Fungi Isolated from “Sampa-Sampalukan” (*Phyllanthus niruri* Linn.) and their Antibacterial Property: A Preliminary Study

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Abstract

I had the opportunity to be an observer during the National Science and Technology Fair (NSTF) 2017. Most of the studies dwelled on nanoparticles, but silver was proven best as antibacterial and antimicrobial agents. Therefore, it helped in the improvement of my proposal to prove the antibacterial property of the endophytic fungi of *Phyllanthus niruri* Linn. (*P. niruri*) which is an active antibacterial agent and came up with a study that aims to synthesise silver nanoparticles from the endophytic fungi isolated from the roots, stem and leaves of *P. niruri* and to test their antibacterial property. There were five isolated endophytic fungi. Morphological characterisation revealed that these endophytic fungi are different from one another. These fungi were utilised in the synthesis of silver nanoparticles. The silver nanoparticles were further evaluated for its antibacterial activity against *E. coli* and *S. aureus*. Descriptive and inferential statistics were used in the study. Analysis of Variance (ANOVA) was used to test for significant differences. The mycosynthesis of silver nanoparticles were characterised using UV-Vis absorption spectroscopy from 200-460 nm which revealed the synthesis of silver nanoparticles. At 220 nm, S1 has a 1.397 mean peak absorbance. L3 has a 1.556 peak mean absorbance. S5 has a 1.058 peak mean absorbance. L4 has a 0.936 mean peak absorbance, and R5 has a 1.291 mean peak absorbance. The silver nanoparticles showed inactive antibacterial activity against *E. coli* and *S. aureus*. The result suggested that the endophytic fungi derived from *P. niruri* offers eco-friendly production of silver nanoparticles but have ineffective antibacterial activity.

Keywords: silver, endophytic fungi

Efficacy of Granular Activated Charcoal and Rice Husk Ash in the Treatment of Agrochemical Runoff

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Abstract

The widespread use of pesticides for agricultural and non-agricultural purposes has resulted in the presence of their residues in surface and groundwater resources. This agrochemical water causes a problem in raising crops and ecological damage. In this study, rice husk ash and granular activated charcoal were used to filter water with agrochemicals. The charcoal was granulated using mortar and pestle. Rice husk ash and granular activated charcoal were heated to increase its adsorptive power. After combining, the researchers arranged it into the filter. The agrochemical water was filtered, and change in its acidity was analysed. The initial acidity of the agrochemical water was 5. Before every treatment, the researchers heated the rice husk ash and granular activated charcoal first. For the first treatment, the pH level indicated was 5.75. Then for the second treatment, the pH level indicated was 6.25 and for the final treatment of the agrochemical water the pH level indicated was 6.75. Results showed that the agrochemical wastewater had dropped 1.75-pH level. Therefore, the more the time's water was filtered, the more the chemicals on it were reduced as evident by the decreased in its acidity. The researchers found out that the combination of granular activated charcoal and rice husk ash can be a treatment for agrochemical runoff.

Keywords: charcoal, risk husk, agrochemical runoff

Aqua Filtro: The Efficacy of Banana Peels (*Musa Balbisiana*), Malunggay Seeds (*Moringa Oleifera*), Aloe Vera Extract (*Aloe Barbadensis*) and White Sand In Eliminating E. Coli. From Gray Waters

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Abstract

Due to water pollution, people especially who are not well off often used unhealthy water resulting in the acquisition of health problems like certain cancers including, rectal, colon, and bladder cancer. To help prevent and solve this problem, Banana peels, Malunggay seeds, Aloe vera extract and white sand were used to eliminate the *E. coli* present in grey waters. Banana peels were minced into smaller pieces while moringa seeds were crushed. Aloe vera was extracted and placed above the sand that acted as an absorbent. Gray water was filtered and treated using these materials. Samples of treated water and grey were gently rubbed against the surface of the Agar and Maconkey plates. Lastly, the plates were incubated for 24 hours within 37 degree Celsius and then bacterial growth was observed. Before, there were 100,000 colonies of *Escherichia coli* present in the Gray Water. After the filtration process using Aqua Filtro, there was no bacterial growth observed. The results were the same after filtering the grey water thrice and four times. This study showed that AquaFiltro successfully eliminated *E. coli* present in grey waters. This could significantly contribute and served as a basis in innovating water purification stages that could completely turn polluted water into a healthy one.

Keywords: aqua filtro, aloe vera extract, white sand

The ability of Lemon Grass (*Cymbopogon citratus*) Extract to Degrade Polystyrene Foam

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Abstract

Polystyrene foam is a widely-used, petroleum-based plastic. It is considered to be non-biodegradable and is resistant to photolysis. Due to its lightweight, large amounts of Polystyrene foam float and accumulate along coastlines and canals. This study aimed to degrade Polystyrene with the use of Lemon Grass (*Cymbopogon citratus*) extract. Previous studies have already proved the degrading factor of a monoterpene called d-limonene on Polystyrene foam. This research has experimented on the ability of Lemon Grass to produce the said monoterpene through steam distillation. As the distilling process ended, Polystyrene foam samples measuring 1 x 1 x 1 cm were set in amber bottles containing the extracts obtained. The samples fizzed and later on were completely degraded. The researchers then tested the different extraneous factors that may hinder the degrading ability of the extracts and the results of the said tests showed that the health and state of Lemon Grass interfered with its ability to degrade Polystyrene foam. Results of the statistical analysis (independent t-test) support the research hypothesis that the extracts acquired from the stalks of the Lemon Grass will degrade the Polystyrene foam samples in a faster rate as compared to the extracts acquired from the leaves as the stalks contain more of the active constituent, d-limonene. The results presented in this study offer knowledge about the sole purpose of Lemon Grass itself, regarding adding to possible solutions to the waste management of Polystyrene foam.

Keywords: lemongrass, degrade polystyrene foam

Umbrella Tree (*Terminalia cattapa linn*) kernels as Potential Fuel Briquette

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Abstract

The source of the household's fuels is fossil fuel. Production of fuel from organic sources could alleviate this dependency on fossil fuel. This study was conducted to determine how Umbrella tree seeds can be utilised beneficially. The kernel of the umbrella tree seeds was found to contain high levels of unsaturated fatty acids, especially oleic, linoleic, and palmitic acid where according to an experimental study where the three main compounds in the high-acid oil-biodiesel. Umbrella Tree Seeds were pounded to obtain the kernels. The kernels were rounded and manually shaped into fuel briquettes, which were sundried for three days. The product was tested by using it to boil 200 ml water in a beaker. The heat Intensity and the odour of the smoke were observed. The briquettes were easy to ignite and the 200ml water ml water boiled within 15 minutes the odor of the smoke generated from burning briquettes is similar to the odor of burned firewood, which is acceptable. This study showed that briquettes from umbrella tree seed kernels have the potential to be utilised in the production of fuel briquettes. Further study should be conducted to determine the longevity of the generated heat and the possible commercialisation so that it could be used as a possible source of household fuel.

Keywords: umbrella tree, fuel briquette

Production of Dispenser to Filter Rainwater

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Abstract

The study entitled Production of Dispenser to Filter Rainwater was conducted at Tagaytay City Science National High School from October to December 2017. The main objective of this study is to produce effective filtered water using a dispenser made out of cheap materials. This study sought to make effective filtered water, especially for drinking. The physical attributes that the filtered water should have are clarity and odour. With the outcome of the study, the researchers recommend the use of the dispenser for other purposes except drinking since it was not subjected for DOST lab testing. It was proven to be effective regarding its clarity and odour. A big container was used as the dispenser. Wood was used as the divider. Small plastic containers were used as the container for the filtering materials. Fifty grams of sand was placed on the bottom, above the sand was cheesecloth, and above it was pebbles. The researchers made a hole at the bottom part of the container where a small water pipe was positioned. A water pipe was connected to the second container and portable activated charcoal where the rainwater will pass through. The heating device went to the other hole of the dispenser and fixed to the lowest part so when the filtered rainwater gets to the bottom; the device will just be plugged in. A rectangular glass was placed in front so that the process inside can be seen. The filtered rainwater has been collected after dispensing.

Keywords: dispenser, filter rainwater

The Potential of Equus Ferus Caballus Feces as an Alternative Component in Brick Making

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Abstract

Horse manure may not be the appealing thing we can see, but it may help agricultural and rural areas by producing brick out of it. These wastes people think are just plainly used for nourishing the soil would also benefit its consumers since the product's main purpose is to be used as building material. The manures are known to give off many negative effects on the environment. As these animal wastes are left, massive bacteria are soon to thrive. As a response to this problem, the researchers tend to lessen the bacteria that forms from it. The horse manure, cement, sand, and charcoal are all mixed in a plastic container. Then the mixture was moulded in a wooden container and placed under the sun. After the brick mixture was solidified, the researchers gathered information about the product's durability through a durability test, wherein the commercialised and the manure brick were thrown at a certain distance from the ground. The brick made out of horse manure and the commercial ones both provided resistance against external force. This study showed that *Equus Ferus Caballus Feces* is effective and can be an alternative component in brick making. It might not be as good as the commercial one, but it could be a stepping-stone to improve the potential of horse manure.

Keywords: brick making, *Equusferuscaballusfaeces*

Evaluation of Allelopathic Impact of *Samanea saman* (Acasia), *Swietenia mahogani* (Mahogany), *Azadirachta indica* (Neem) Leaves in Seed Germination of (*Oryza sativa*) Rice

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Abstract

Seed priming is important for rapid, uniform germination, and the emergence of seeds. Since rice is the staple food for most Filipinos, seed tolerance, which is one of the properties of rice when it comes to its accumulation might be a crucial problem in the Philippines. Thus, I investigated the effect of *Samanea saman*(Acasia), *Swietenia mahogani*(Mahogany), and *Azadirachta indica*(Neem) leaves in allelopathic impact in *Oryza sativa* (Rice) seeds regarding seeds germination, the speed of germination, and vigour index. Seven setups with varying concentrations were employed. Botanical leaves were identified, verified, and authenticated through taxon sampling. Twenty-five rice seeds with three replications were dipped in seven prepared treatments. Each crude botanical extracts were tested for qualitative phytochemical screening. Results showed that there was a significant difference among the seven setups regarding seeds germination, the speed of germination, and vigour index within 72 hours (p-level of 0.0014; p-level of 0.0169; p-level of 0.0014). It was revealed that the inoculation of the rice seeds with *Samanea saman* significantly increased rice seed germination rate, vigour index, and speed of germination. Results showed that the selected botanicals are dose-dependent which means that the higher the concentration, the greater its effect on its: seeds germinated, the speed of germination, and vigour index. Phytochemical constituents present in the three botanicals are found to be alkaloids, coumarin, flavonoids, phenols, saponins and quinone. This study served its purpose for effective biological agents to enhance rice seed quality, which will increase crop yield planted particularly in the tropical regions.

Keywords: seed priming, rice, allelopathic, mahogani

Teratogenic Effects of Newly Domesticated *Lentinus strigosus*, *BIL1324* on Zebrafish (*Danio rerio*) Embryos

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Abstract

Lentinus strigosus, *BIL1324* or locally known as *Kabuteng Balbon*, is a naturally occurring, wood-rotting mushroom found on fallen logs. With the aim to assess its potential as a source of a toxic compound to find 'nutraceutical' that could help in developing natural anticancer drugs, this study highlighted the teratogenic effects of newly domesticated *L. strigosus*, *BIL1324* on zebrafish (*Danio rerio*) as an animal model. Its functional components obtained through hot water extraction exhibited teratogenic effects on zebrafish embryos. The mushroom extract significantly lessens the hatchability of zebrafish eggs at 0.5% and higher concentrations. Embryos exposed at 0.5% -3% concentrations significantly showed developmental delay. Non-detachment of the tail bud, lack of eye bud at segmentation phase, and bend out the shape of the body of zebrafish at pharyngula period after 48 hours of exposure to mushroom extract and were recorded as growth-delay endpoints. The delayed development resulted to coagulation of embryos at earlier phase (3% treatment concentration) as developmental apical points impede the breakage of chorion before hatchability. It also found that the mushroom extract is dose and time-dependent. The results indicate that *L. strigosus*, *BIL1324* contains bioactive components that induced teratogenic effects on zebrafish embryos.

Keywords: embryos, teratogenic

Utilization of Decocted Garlic Clove (*Allium sativum*) in Inducing Sedation and Anesthesia in *Oreochromis niloticus*: A Potential Substitute to Tricaine Methanesulfonate (MS-222)

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Abstract

MS-222 is a popular anaesthetic agent used in aquatic species, and is intended for the temporary immobilisation of fish, amphibians, and other aquatic cold-blooded animals. It has long been recognised as a valuable tool for the proper handling of these animals during manual spawning (fish stripping), weighing, measuring, marking, surgical operations, transport, photography, and research. This study assessed the effect of the garlic clove (*Allium sativum*) in inducing sedation and anaesthesia in *Oreochromis niloticus* and evaluated if it has potential as a substitute to tricaine methanesulfonate (MS-222). The result shows that garlic clove was capable of causing sedation and anaesthesia in Nile tilapia before tagging. In utilising 80g/L bathe concentrations, the time of sedation effects ranges from 3 to 4 minutes. However, using 100g/L bathe concentration, the time of sedation effects ranges from 2 to 3 minutes. Statistically stated, that 3 treatments were significantly different with each other. These indicate that the 3 treatments have different effects. Moreover, all experimental fishes were successfully tagged using floy tag. *Allium sativum* also gives a quick recovery time compared to the tricaine methanesulfonate. Still, MS-222 has the best effect in causing sedation and anaesthesia to the Nile tilapia. On the other hand, regarding availability, garlic clove is convenient and inexpensive than MS-222, which is available only in foreign countries and is costly.

Keywords: sedation, anaesthesia, floy tag, *Allium sativum*, *Oreochromis niloticus*, tricaine methanesulfonate, MS-222, anaesthetic agent

Analysis of the Functional Properties and Proximate Composition of Banana Exocarp as a Primary Constituent of Flour-Based Food Products

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Abstract

Bananas are highly consumed in the Philippines, thus creating an issue of enormous disposal of peels since it represents about 40% of total weight of the fresh fruit (Anhwange et al., 2008). This study aimed to explore the possibility of Banana exocarp as a functional ingredient in the food industry. Mature ripe banana exocarp was collected and washed with water. To reduce enzymic browning, peels were dipped in 0.5% (w/v) citric acid solution, drained and dried in an oven. The dried of banana exocarp was grounded and sieved to obtained uniform sizes. Powdered banana peels were analysed for its functional properties, proximate composition and general acceptability regarding taste and texture. Proximate analysis of BEF revealed an ash of 11.2, which supported its dark colour. Moisture of 7.6 was suitable for storage. BEF protein of 6.1 falls under “softer flour”. It also obtained a fat of 7.7, which contribute significantly to the energy requirement for humans, good flavour enhancers and promotes fat-soluble vitamin absorption. Functional properties of BEF had a bulk a density of 0.97 g/m³, least gelation concentration of 12%, water absorption capacity of 269%, oil absorption capacity of 180% and had an emulsifying capacity of 38.50%. Evaluation of the taste and texture of the BEF-based product revealed that it is comparable with the commercially available product. These results validated that banana exocarp flour provides other opportunities in the food industry as substitute flour, offers products that are nutritionally comparable with its counterpart and provides additional income due to its high commercial potential.

Keywords: functional properties, banana, flour-based food products

Phenolic Compounds Derived from Ripe Carabao Mango (*Mangifera Indica L.*) Peels as a Reducing Agent in the Retrogradation and Lipid Oxidation of Normal Rice (*Oryza Sativa L.*) Flour

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Abstract

Previous studies have proven that the application of natural antioxidants in native starch had shown an increase in the health benefits and nutritional value. In addition, it strongly improves the retrogradation and starch qualities. The effectivity of phenolic compounds derived from ripe Carabao mango peels as a reducing agent in the retrogradation and lipid oxidation of normal rice flour was determined in this study. Set-ups A, B, and C were incorporated with 5g, 15g and 25g of ripe Carabao mango peel powder (RCMPP). Set-up C reduced the retrogradation and lipid oxidation of normal rice flour the most. Normal rice flour with and without the application of RCMPP was compared regarding total phenolic content, viscosity, and antioxidant activity. Results of the viscosity test, 16.6239 cP, 12.8437 cP, and 10.3002 cP for set-ups A, B, and C showed that the normal rice flour incorporated with RCMPP obtained a lower retrogradation rate. In line with testing the antioxidant activity of the normal rice flour, the application of RCMPP increased the phenolic content of the normal rice flour resulting to the increase in the acid value of the mixture, thus causing a decrease in the lipid oxidation of normal rice flour. The significance level was statistically treated using the one way ANOVA and Post Hoc Test (Tukey HSD). Data obtained from the tests showed that Set-ups A, B, and C were equally significant regarding acid value and viscosity test while Set-up C was the most effective regarding the total phenolic content.

Keywords: carabao mango, retrogradation, lipid oxidation

Phytochemical Compositions and Antioxidant Activity of Papait (*Mollugo oppositifolia* Linn.) As Source of Natural Tea

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Abstract

Papait (*Mollugo oppositifolia* Linn.) is one of the most important indigenous vegetables in Guimba, Nueva Ecija. This study was conducted to investigate the phytochemical components and antioxidant activity of *M. oppositifolia* as a source of natural tea. Ethanolic extraction was carried out to obtain the bioactive chemical components. Its phytochemicals were screened using spot test in the TLC method whereas the antioxidant properties were determined using 2, 2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay. Phytochemical screening revealed that *M. oppositifolia* plant contained essential oils, triterpenes, sterols, phenols, fatty acid, anthraquinones, coumarins, thrones, tannins, flavonoids and alkaloids. However, the three plant parts exhibited radical scavenging activities. The ethanolic extract of stem showed the highest scavenging activity of 27.42%, followed by the extract of the roots with 26.89%. The leaves extract had the lowest activity (10.32%). Based on these results, *M. oppositifolia* plant can be considered a nutraceutical vegetable, which can play an important role in product development such as safe, natural tea.

Keywords: antioxidant, papait

ENGINEERING PROJECTS

GSM Operated Circuit Breaker with Fire Sensor

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Abstract

In the Philippines, fire is one of the most potent disasters man has ever encountered. One major cause of this is the overloading and overheating of circuit breakers. Circuit breakers and fuses are not guaranteed to prevent short-circuit fires such that fire incidents that razed residential premises, buildings, and institution are considerably causing massive damage to properties and loss of lives. The researchers utilised a prototype circuit breaker to be operated using the Global System for Mobile (GSM) Communication Shield Module with fire sensor, a device that controls the electricity flow through text messages and can notify the user about the device's status. It also comes with built-in fire sensors to automatically break the circuit and alert the user whenever fire is present. It is operated by texting the GSM Communication Shield Module the duration of how long the user wants to run the electricity in the circuit. The device is mainly composed of the Arduino® Uno Board, a GSM Communication Shield Module, and a relay. The researchers also created a code to run the device. Connections were secured in a rectangular box. The device was also tapped in a prototype circuit. A survey was conducted to determine users' acceptability on the device and to test the device's functionality. The device got an overall rating of 4.5275 on its acceptability, and 4.87 on the functionality. This study showed that the device is highly acceptable and functional; thus, the device can help reduce fire incidents and conserve energy.

Keywords: GSM, Circuit breaker, fire sensor

Rechargeable Solar Power Bank

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Abstract

The study entitled 'Rechargeable Solar Power Bank' was conducted at Tagaytay City Science National High School from June 2017 to February 2018. This study aimed to make a portable power bank that can be charged using both solar energy and electrical energy. In this study, the researchers used an experimental research design, a collection of research designs, which use manipulation and controlled testing to understand casual processes. Generally, one or more variables are manipulated to determine their effect on a dependent variable. The type of experimental research the researchers had chosen is single group design wherein an experiment where the researchers manipulate one variable, and control/ randomises the rest of the variables. In making the product, the researchers used a solar panel, converter, rechargeable AAA batteries, old foundation case, electrical wires and some scrap materials from an old lamp. The researchers first made the power bank and then attached the solar panel. Several students from Grade VII- SPJ tested the product, and 91% of them were satisfied. Some of the comments and recommendations were: conduct more studies about converting solar energy to electricity; improve the structure of the power bank; and make the product applicable for all types of gadgets. The researchers can conclude that: the power bank is very helpful to everyone especially for students; the product can be charged using solar energy and electricity; and it can only charge android phones. They also discovered that the product could also be charged using a light source such as a flashlight, fluorescent light, etc.

Keywords: solar, power bank

C.O.M.P.A.C.T. Charging Of Mobile Phones Activated thru Conducting Thermoelectricity

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Abstract

Mobile phone charging any time in any place," that is the goal of C.O.M.P.A.C.T., a thermo-electric conducting device that can directly convert heat into electricity. It applies the Peltier and Seebeck Effect on a thermoelectric cooler Peltier plate wherein a temperature gradient (hot on one side, cold on the other) can produce electricity. Within this, the researchers tested the device's effectiveness, charging time, and feasibility as a source of electricity by using five subject phones (brand includes Cherry Mobile, Samsung, Oppo, Huawei, and Blackberry). Two data gathering methods were utilized- first was an observation of C.O.M.P.A.C.T.'s charging the subject phones with their charging time compared to phone charging using their own original charger plugged in a two-hole socket (control set-up), considering the source of heat and its distance (lit medium candle, 12 inches away), phone condition (0% mAh, 50% brightness, disabled Data, WIFI, etc.), and number of TEC plates used (2) was constant; second was a questionnaire for rating in terms of scopes. Observation shows that C.O.M.P.A.C.T. can fully charge the subject phones from 0% to 100% for 3 hours and 6 minutes on average, slower than the control set-up by 20 minutes. Meanwhile, 127 respondents reacted strongly agree (mean of 3.59 in 4-rating scale) for being effective, time-efficient, and feasible as a source of electricity. Hence, C.O.M.P.A.C.T. was an effective device to fully charge different phones with 3 hours and 6-minute average time. More studies are encouraged to find relationships between variables affecting the effectiveness and charging speed of the device.

Keywords: COMPACT, mobile phones, conducting thermoelectricity

Production of Edible Water Container

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Abstract

The research entitled “Production of Edible Water Container” was conducted at Tagaytay City Science National High School. The purpose of this study is to produce an edible water container that can be an alternative to plastic bottles. The researchers tried to formulate the process of making edible water container using calcium chloride and sodium alginate as a component in doing so. Furthermore, this study will focus on the production of edible water container which would help lessen, if not discontinue, the use of plastic waste in the community which would then lead in reducing of our carbon footprint. The researchers discovered that if the edible water containers become a worldwide project, it might help reduce the use of plastic water bottles. The edible water containers can help revolutionise the water-on-the-go market like in marathons. The edible water containers have a gelatinous outer layer and a liquid inside; the outer layer of the edible water container is purely edible and has no taste. Sodium alginate and calcium chloride are purely edible, sodium alginate came from extracted brown algae and used in food industries. Calcium Chloride is used in food industries as a preservative in canned goods; it is also used as a salt substitute. The research was conducted at Tagaytay City Science National High School from June 2017 to February 2018. As aforementioned, it aims to lessen the carbon footprint left by the people in the community using reducing the use of plastic waste. The product was tested and is proven to be safe to eat and is purely edible.

Keywords: edible, water container

Feasibility of Hard Fibers from Sansevieria Trifasciata (Snake Plant) as Fabric

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Abstract

The extraction of natural fibres from plants and their uses for the production of fabrics and other woven or constructed textile materials has played a major role in textile development today. Thus, I investigated the potential of snake plant to produce natural fibre as a fabric, which would be acceptable in terms of its moisture regain, absorbency, crimp frequency, and linear density. Dried fibres from snake plant were subjected for fibre extraction using fibre-decorticating machine. The extracted fibres were then washed thoroughly and was wrung to remove excess liquids and other residues. The fibres were then sun-dried and were combed to remove any residues. The fibres had been chemo-mechanically softened, and were later spun using a spinning machine. The yarn was weaved using the weaving machine, and the fabric was then tested for moisture regain, absorbency, crimp frequency, and a linear density of ten replications. Results showed that fibres from *Sansevieria trifasciata* have no crimps with a recorded mean average of 0.1 crimps per fibre and 0.483 grams per cubic meter in linear density. Moisture regains of 8.5% and a mean average of 40.8 seconds was recorded for the absorbency respectively. This study indicated that *Sansevieria trifasciata* (Snake plant) is capable of producing fabric out of its hard fibres. It also proves that the soft and tough nature of the natural fibres can never be equated to the hard and coarse nature of the human-made nylon fibre especially when they are handled in tying or knotting of any type.

Keywords: fibres, snake plant

Design and Development of Automated Bin for Efficient Solid Waste Management

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Abstract

Solid waste is a major issue that is rapidly increasing and incorporating software into trash can offers innovation in the segregation of plastic bottles and tin cans. Software Development Life Cycle (SDLC) programming language was used in this study to segregate plastic bottles and tin cans in their proper chamber. The programming language was encoded in Arduino microcontroller. A solar charger controller, a power supply controller and main controller were assembled. The three controllers were then enclosed in a wooden frame. A rotary type conveyor was built inside the frame where the light dependent resistors and laser pointers were attached, and a solar panel was placed on top of the wooden frame. The product was tested in terms of percentage accuracy, response time, time to discharge the battery and general acceptability. Results revealed that the percentage accuracy of the product were 93%, 93% and 100% respectively which can be attributed to the programming language used. The response time of the sensor in tin cans was 0.67 seconds, which is less than the response time in transparent and coloured bottles, which are 0.74 seconds and 0.85 seconds respectively. The average discharging time of the battery was 65.2 hours, which denotes that the bin can be used for a long period. Generally, users of the automated bin were very satisfied with the functionality and appearance of the product. This study proved that the design and development of automated bin provide innovation to solid waste management for a greener environment.

Keywords: SDLC, automated bin, solid waste management

Acclimatizing the Wireless Local Area Network Home Automation in the City of General Trias, Cavite

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Abstract

Humans are so engrossed with innovation and technology that they often forget the most important things that include deactivating home appliances resulting in over-consumption of energy, fire accidents, and climate change. The researcher tested the hypothesis that a prototype will be capable of controlling home power simply through Wireless Fidelity using a laptop. The Arduino-based set-up was programmed and constructed to test the capability of controlling home appliances by the aid of the prototype. In testing the system, an experimental group was implemented with the prototype wherein the comparison between the energy consumption with the control group was observed. This also validated the use of various appliances up to 100 meters depending on the connection's strength. Aside from the survey and interview conducted among forty respondents from four Barangays in the City of General Trias, Cavite, the capability and reliability of the prototype in home automation using a Four-Point Likert Scale was also assessed and rated. The data were analysed using a t-test, ($\alpha = 0.05$, $N = 5$, d.f. 4) for a two-tailed test. Since computed $t = 12.823$ is higher than $t_{\text{critical}} = \pm 2.776$, it is within the rejection region. Therefore, the system is essential in decreasing energy consumption through activating or deactivating variety of home appliances. The prototype was proven highly acceptable in terms of feasibility, energy efficiency, structural stability, speed, and engineering concept. With this innovation, it manipulated appliances and allowed people to easily and conveniently connect device using Wi-Fi.

Keywords: wireless local area network, automation

Life Saver Bag

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Abstract

The Philippines is "the most exposed country to tropical storms" according to a Time Magazine article in 2013. When the Super Typhoon Yolanda struck the Philippines, the estimated death toll was above 10,000 in Tacloban alone. This made Yolanda the deadliest natural disaster in the Philippines' history. Based on the assessment of disaster-related mortality post in Tacloban City, the cause of death for all cases was drowning in 100 cases. This led the researcher developed a bag that will aid people during emergencies, the Lifesaver Bag. The researcher gathered the materials. The bag has a large pocket at the back, where the Styrofoam was inserted. Pockets outside the bag, contains first aid kit and survival tools in the first pocket, sanitation/personal hygiene supplies in the second pocket, and the third pocket was left empty, for personal items of the person wearing the bag. The researcher conducted a survey to test the functionality, technicality and safety of the lifesaver bag when in use. The researcher asked thirty randomly selected respondents to wear the bag while in a pool or a large water body. Floating determines whether the lifesaver bag works properly. Results showed that the Life Saver Bag has Exceeded the Standards and are Highly Acceptable with the mean score of 4.56 (± 0.34) for functionality, 4.63 (± 0.36) for technicality, 4.73 (± 0.19) for safety, with an overall evaluation of 4.64 (± 0.08) The researcher concludes that lifesaver bag can save lives and can be used in times of emergency because of its added features.

Keywords: saver bag, life, tropical storms

Stem of Banana (*Musa acuminata*) Plant used to make woven mat infused with citronella (*Cymbopogon citratus*) extract

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Abstract

This study aims to reuse and recycle the stem of a dead banana (*Musa acuminata*) plant to fabricate an environmental-friendly, durable and heat-resistant woven mat. This study also aims to equip and coat the said mat with citronella (*Cymbopogon citratus*) to repel mosquitoes and to avoid diseases that are carried by them. The finely stripped sun air dried banana stem was soaked in citronella oil which was extracted by placing 80% ethyl alcohol in a jar and 4 ounces of citronella leaves for twenty-four hours with frequent agitation. The strips of the dried banana stem are then sun-dried before weaving. After the weaving process, the edges are sealed using soft leather in the process called piping. Testing surfaced after the process piping. The mat's durability was then tested using three types of wedges: cutter, scissors and knife. These wedges were slid across the mat and on its edges. The results show that the mat is durable enough to resist cuts coming from the wedges but when extra force is exerted the mat may be damaged. The citronella's scent was also tested and showed that the scent might last up to one week. It is concluded that the mat is indeed durable but may also not resist greater force. The citronella extract is also effective, but it needs to be infused again after a week to maintain the scent. This shows that the materials used may still be improved.

Keywords: banana, woven mat

Take a Pic Security Bag (TAPS Bag)

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Abstract

Stealing is rampant everywhere. This made the researcher to create an innovation that would intimidate the act of stealing. The researcher used cellular phone and LDR to capture pictures of the culprit. The T.A.P.S. Bag operates when the culprit opens the bag, and the light hits the LDR (Light Dependent Resistor), the LDR activates the Relay and triggers the Bluetooth Shutter to shut the camera shutter of the cellphone, which is set on multiple shots to take many pictures of the culprit at different angles and different parts of his face. The cellphone then immediately captures the pictures of the culprit. The cellular phone is synchronised to the Google photos account of the owner for a quick transfer of culprit's images when connected to data or Wi-Fi. The researcher conducted a survey to test the functionality, technicality and safety of the lifesaver bag when in use. The researcher asked thirty randomly selected respondents to wear the bag while in a pool or a large water body. Floating determines whether the lifesaver bag works properly. Results showed that the TAPS Bag has Met the Standards and are Acceptable with the mean score of 4.35 (± 0.30) for functionality, 4.37 (± 0.31) for technicality, 4.29 (± 0.14) for safety, with an overall evaluation of 4.34 (± 0.05). The researcher concludes that TAPS Bag effectively and reliably intimidates the action of stealing personal items such as money, phones, laptops and other important things from bags thus providing good security in keeping one's belongings safe.

Keywords: TAPS, security bag

Fabrication of Cement Tiles using Mussel (*Perna viridis*) Shells as an Aggregate

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Abstract

Substandard cement tiles offered in the market compromise the well-being of its consumers and even the community. Mussel shells took part in the increasing amount of solid waste in our environment. This study fabricated an efficient type of cement tile that utilised pulverised mussel shells as an aggregate proved beneficial not only for consumers but also its manufacturers. The experimental variables comprised of cement tile A, B, and C consisted of 40g, 50g, and 60g of pulverised mussel shells and the controlled variable were the commercially available cement tiles. The set-ups were mixed with Portland cement, sand, and water and allotted with 7 days of curing time. Percent water absorption, impact strength, and compressive strength tests were the assessments conducted upon the fabricated and commercially available cement tiles. In the Percent Water Absorption test, the fabricated tiles were more efficient than the commercial set-up particularly tile A having 1.53%. In Impact Strength Test, both tiles A and B have the same aptitude having 43.33 and 45.00 as mean value respectively as those commercially available ones. In Compressive Strength Test, only tile A having 31.43 as the mean value was as efficient as the commercial tile. Microscopic Structure Test was also conducted using a microscope (with a magnification of 10x) which served as a qualitative description of the cement tiles. One tail T-test and One-way ANOVA Test were the statistical tools used in the study. To summarise the results, it was shown that cement tile A, which contains 40 g of Mussel shells performs better than the commercial cement tile. This stated the utilisation of pulverised mussel shell; enhanced the percentage of water absorption, strength, and structure of cement tiles. The successful fabrication of an efficient cement tile using pulverised mussel shells as an aggregate guaranteed the safety of everyone and relieved the problem of the increasing amount of solid waste present in our environment.

Keywords: cement tiles, mussel

***Eichhornia crassipes* (Water hyacinth) Infused with HDPE as high-density Fiber Board**

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Abstract

Wastes in land and water are the common problems of people nowadays. One of which is the pollutants from the mainland that go to the bodies of water. Polluted bodies of water made a good habitat for *Eichhornia crassipes* (Water hyacinth). It is a free-floating plant with an explosive growth rate. It reproduces quickly in polluted bodies of water thus depleting the water of dissolved oxygen, which in turn suffocates fish. Another is the containers of ice cream, which is thrown inland everywhere. What happens to this waste? Due to the arising problems in waste disposal, the researcher made a fibreboard from water hyacinth and HDPE (found in plastic containers). The said materials were used in making the fiberboard. Fiber Board was tested using drop test and tensile strength. Drop test was conducted with varying heights (5m, 10m, and 15 m). Tensile Strength was tested by putting weights (5 kg, 10 kg and 15 kg) on top of the fiberboard. Results showed that the fiberboard was able to withstand the drop test and tensile strength test. The researcher concluded that fiberboard made from water hyacinth and HDPE is a good alternative for commercial fibre board sold in the market.

Keywords: HDPE, water hyacinth, fiberboard

The Effectiveness of the Bio-Wax Extract from Taro (*Colocasia esculenta*) in Waterproofing Paper

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Abstract

A paper plays an important role in our daily life as students. Paper is used in writing our lecture and doing projects. For most students, keeping lectures safe from being wet during rainy seasons and unavoidable circumstances is a struggle. It makes students feel disappointed once it gets wet especially during submission of the notebook, project, and other academic requirements that made use of paper. Based on researches, the hydrophobicity of taro is due to the bio-wax on its surface and can be extracted; the researchers thought that the bio-wax could be used as a coating to paper to make it waterproof as well. Our study determined the effectiveness of the Bio-Wax Extract from Taro in waterproofing paper. It showed the behaviour of the droplet of water once placed on the surface of the coated and the non-coated paper. In addition, the percentage of absorption ability to water of the coated and the non-coated paper was compared. The bio-wax causing the hydrophobicity of Taro was extracted by immersing 375 grams of taro leaves to chloroform and separated the solution using cheesecloth. Then, we extracted the bio-wax from the solution with the use of a rotary evaporator. After the procedure, we used the bio-wax extract from taro as a coating to a paper. We cut the papers, coated by the extract and the non-coated papers and measured the masses. Then, we submerge the papers to water and measure their masses again. The statistical result revealed that the ability of the coated paper to absorb water decreases compared to the non-coated paper. Also, we dropped water on the surface of the papers, the drops of water on the non-coated paper was absorbed while the drops of water on the coated paper with taro shaped into a sphere just like when water was dropped on the surface of a taro leaf. As per Water Absorption ASTM D570, Water absorption is expressed as an increase in weight percent. Percent Water Absorption = $[(\text{Wet weight} - \text{Dry weight}) / \text{Dry weight}] \times 100$. The percentage of absorption of the non-coated paper is 70.58% while that of the paper with taro is 18.27% only. The result of the study showed the effectiveness of the bio-wax extract from taro in waterproofing paper. Further experiments will provide strong evidence of the effectiveness of the bio-wax extract from taro in waterproofing paper.

Keywords: bio-wax, taro, waterproofing

Escaping Mr Dalton's University: A Knowledge Enhancing Game in Chemistry 8

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Abstract

The grade 8 students of CNSHS described Chemistry as the hardest branch of Science since it deals with topics like elements (symbol, source, and deficiency condition) that were not familiar to them. This research aimed to create a mobile game that can enhance the knowledge of grade 8 students in Chemistry. The game engine Cocos Creator was used in which C++ was utilised as the programming language. Xcode was used for coding the program and AdobePhotoshop CS5 for the graphical representation of the game. One hundred twelve students were identified as respondents using the Slovin's formula. A pre-test of Chemistry 8 was given to the respondents. The respondents were divided into two groups using a stratified random sampling technique in which half were given a copy of the mobile game while half were not. Post-Test was given after one month. Data were collected and analysed using one-tailed and two-tailed z-tests. Using one-tailed z-test, it was revealed that the post-test scores of students who played the game significantly increased compared to their pre-test scores, obtaining a z-value of 6.2198, which was higher than the Z-critical value of 1.6449. Meanwhile, a computed z-value of 2.5270, higher than the Z-critical value of 1.9600, was obtained using two-tailed z-test, which revealed that the post-test scores of students who played the game were significantly higher than the post-test scores of those who did not. The study showed that the integration of this application game could enhance the knowledge of grade 8 students in Chemistry.

Keywords: knowledge enhancement, game

Integrated Fire Monitoring System in Governor Ferrer Memorial National High School – Main

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Abstract

Nowadays, cases of fire accidents are abruptly increasing in different places due to rapid oxidation that produces a chain reaction. Some of its causes are laboratory experiments, electric malfunction, and incorrect use of hazardous chemicals. Using the prototype, the hypothesis was tested if the Arduino-based monitoring system is efficient, fast, and reliable in input readings. Programmed components are controlled through Arduino Uno board which was prepared including the flame sensor, a Sim800L module for SMS transmittal, LCD 2x16 as a display screen, and buzzer for the auditory impact in alerting the people within the vicinity. Schematic diagram was assembled using Fritzing Software based on the given wiring setup. Codes were then compiled and uploaded from Arduino IDE and Arduino Uno which controlled the components. In testing the LCD and SMS from Sim800L, the fire was neared from the flame sensor. Through the use of systematic data collection approach which is the testing method, the researchers assessed the possible time variation through differentials in phone signals and the viability of the integrated fire monitoring system. Data were analysed using a Five-Point Likert Scales showing an Overall Mean of 4.60 interpreted as “Highly Acceptable” and computed a t-test value of 12.823. This study showed the efficiency of the fire monitoring system on input readings from the flame sensor and temperature level calculation in fast and reliable SMS transmission. Thus, utilisation of Arduino Uno could alleviate the destructive effects of fire hazards especially on the school premises and the community near the area.

Keywords: fire monitoring system, risk management

Limited Slip Tire Wrench for Wheels

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Abstract

The car is not a symbol of luxurious anymore; it is used to do the daily job and to move things to a greater distance. Since cars are one of the most used vehicles, its external parts are usually worn out, such as the tires which are a vital component of a vehicle. However, not all drivers know the basic knowledge of tire replacement procedure. Thus, to avoid time wasting and a lot of energy used to change the tire, a special tool is designed and fabricated to allow driver or mechanic to remove wheel nuts at once with little energy consumption. Differential carrier's gears and extension socket were removed and welded. After the welded gears and extension sockets were polished, the gears were placed and positioned inside the differential carrier. A 22mm socket wrench was connected to the front extension socket. Meanwhile, in creating the base of the product, a two 43cm flat bars were cut and welded to the 60cm flat bar. A 6.4x.5 inches rectangular hole was drilled in each 43cm flat bars. The differential carrier and flat bar were connected by screws and nuts. The experimental product was tested for ten trails and then compared to the traditional way of removing and installing wheel nuts of a car vehicle. Results revealed that there is a significant difference in the time spent on removing and installing wheel nuts between the experimental product and the traditional way. Thus, the experimental product can be a substantial innovative invention for the global car maintenance system.

Keywords: wheels, tire wrench

Manufacturing of Pili Nut (*Canarium ovatum*) Shells and Polyurethane (PUR) Adhesive as an Alternative Particleboard.

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Abstract

Particle board has been made to serve as a replacement to wood panels. It has disadvantages like its inability to withstand heavy weights and its high absorption of moisture and water. Addressing this problem, particle board is produced from pili nut (*Canarium ovatum*) shells with polyurethane adhesive as the binder. Each sample represents a ratio: 90% pili nutshells: 10% polyurethane adhesive, 85% pili nutshells:15% polyurethane adhesive, 80% pili nutshells:20% polyurethane adhesive, and 75% pili nutshells:25% polyurethane adhesive. The pili nut shells were ground using a plastic crusher. The coarse and fine pili nut shells were separated. The particle board is made by mixing the polyurethane adhesive with the coarse and fine pili nut shells, stacking the layers of coarse and fine pili nut shells, and placing them in a mechanical press to add pressure. The particle boards are tested for their Moisture Content, Thickness Swelling and Water Absorption, Screw Withdrawal Test, and Modulus of Rupture. These properties will be compared to the Philippine National Standard Specifications. All samples failed the Modulus of Rupture property (PNSS >7.54). They all passed the tests for Thickness Swelling (PNSS <20), Water Absorption (PNSS <40), and Moisture Content (PNSS <20). Only the samples with the ratio 75:25 and 85:15 passed the test for Screw Withdrawal (PNSS >30). The particle board samples with the ratios 85:15 and 75:25 yield the best results, as they passed all 5 properties. They are qualified to be an alternative to the standard particle board.

Keywords: pili nut, particle board

Influence of Natural Fiber on the Fresh and Hardened Properties of Self-Compacting Concrete

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Abstract

Self-compacting concrete (SCC) is a flowing concrete mixture that can consolidate under its weight. The fresh and hardened properties of self-compacting concrete were determined upon the addition of different volume fractions of agricultural plant fibres. A preliminary test on the aggregates was done. The aggregates were mixed until a uniform consistency was attained. Different percentages of CN and RS fibres were added on the mix design and moulded in a cylindrical moulder. The concrete was dried for 48 hours and cured for 7 and 28 days. Filling ability was tested using slump flow and T_{500} test. Passing ability was tested using J-ring while segregation resistance was tested using V-funnel and T_{5min} . Hardened SCC with plant fibres was tested for its compressive strength. The slump flow results revealed that the SCC with 0.05% and 0.10% CN fibres met the standard specification and guidelines. SCC with CN fibres added and RS with 0.05% and 0.10% had the acceptable passing ability. The results of V-funnel test of the negative control and the SCC with 0.05% and 0.10% CN fibres confirmed to the standard requirement. 0.05% of CN fibres and 0.10% RS fibres added had the most satisfactory result regarding compressive strength. This study proved that the addition of CN and RS fibres significantly affect the fresh properties of the SCC by decreasing the slump flow, increasing the passing ability and segregation resistance. Meanwhile, optimum compressive strength was established when 0.05% CN fibre and 0.10% RS fibre was added to SCC.

Keywords: natural fibre, self-compacting concrete

Agricultural Biomass as Biomaterial Resources for Sustainable Development of Green Construction Materials

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Abstract

In the Philippines, agricultural biomass is an environmental concern. Thus, we investigated the possibility of utilising agricultural biomass lignocellulosic plant fibre (LPF) in the development of green reinforced composites for concrete masonry blocks (CMB) and determined the compressive strength of CMB concerning its number of curing days. Four setups had been made with varying concentrations of 0%, 5%, 10%, and 15% LPF. Batch formulations for each setup were prepared by the ratio (cement: sand: rice husk ash:LPF). Three samples per mixture were tested for mechanical testing regarding its compressive strength under different crushing loads after 7, 14, and 21 curing days. Arithmetic Mean had been applied to analyze the differences in the observed results of the experimentation. The highest compressive strength of the CMB was obtained after 21 curing days with the mean values of 4.63 MPa, 4.31 MPa, 4.66 MPa, 4.77 MPa, 4.90 MPa for rice husk and 4.64 MPa, 4.31 MPa, 4.78 MPa, 4.88 MPa, and 4.99 MPa respectively for coconut fibre. Results of this study showed that the addition of LPF and the number of curing days affects the compressive strengths of the CMB. However, the addition of the LPF to the CMB should be of the same percentage of the rice husk ash as a partial replacement for sand. It was observed that rice husk ash could only be used as a supplement for cement and sand to some extent since the rice husk ash is permissible only to 15% replacement of sand aggregate.

Keywords: agricultural biomass, biomaterial, green construction

Coffee Battery

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Abstract

The continuous production of more than 200,000 tons of coffee waste annually is a great dilemma as the demand for coffee arises per year around the world. Utilizing used coffee grounds, the researchers tested the hypothesis that coffee waste can be an alternative material in making a battery. Used coffee grounds were gathered from coffee shops and dried naturally. Unused batteries were opened, and the coffee grounds were combined with the battery mixture inside the shell. The battery shells were closed tightly. The voltage of each sample was determined, and the capacity of the batteries was tested on LED lights. A voltmeter was used to analyse data. Compared to batteries with a lesser amount of used coffee grounds (at least $\frac{1}{2}$ to 1 tsp of used coffee grounds), a greater amount of used coffee grounds (at least $1\frac{1}{2}$ to $3\frac{1}{2}$ tsp of used coffee grounds) produced a higher voltage. A lesser quantity of used coffee grounds recorded an average of 0.98 volts. A greater quantity of used coffee grounds recorded an average of 1.16 volts. The LED lights were also lit up. This study showed that there is an effect when used coffee grounds were mixed inside a battery and can be an alternative material in making batteries. The recorded average amount of voltage among the batteries is 1.16 volts, suggesting a potential in the use of coffee waste in making batteries. Further experiments will clarify the durability of the coffee batteries using it in different battery-operated materials.

Keywords: coffee battery, ground coffee

Composite Utility Backpack

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Abstract

A school backpack plays a vital role in every student's life. This led us to produce a school backpack that has a built-in study table that allows students to maximise opportunities for learning and has composite functions that can be useful and beneficial for their studies. We constructed 3 prototypes table made up of cardboard (prototype 1), flyboard (prototype 2), and fibreglass (prototype 3), to test the hypothesis that prototype 3 is both lightweight, durable and cheap, compared to other 2 prototypes. Mass, durability, cost and design are the following variables we considered in designing the backpack. We sought the help of a professional sewer in constructing the prototype. The backpack was placed on a weighing scale to determine its mass, then a 3 kilograms load (a laptop and 3 books) were placed on top of the table to test its durability. All the costs of used materials together with the labour of the one who helped in the making was all summed up to compute its cost. Based on the results, the backpack with a table made up of fibreglass and aluminium (prototype 3) is lesser in mass than prototype 2 (with a table made up of wood) and more durable than prototype 1 (with a table made up of card board). When it comes to its cost, it is also cheaper than that of the ones in the market that students usually use but offers a lot more features. This study showed that prototype 3 is lesser in mass and much durable because it is firm and stable despite the loads that were placed in it as compared to other prototypes. It is also cheaper as compared to the ones in the market than is commonly used by the students. When it comes to the design, the bag is also designed just like the backpacks that students usually have for it is fashionable.

Keywords: backpack, built-in study table

Shake Alarm Device

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Abstract

In the Philippines, the highest magnitude recorded in the year 2017 was 7.2 occurred at Sarangani, Davao Occidental that caused damages to properties and injuries to several people. This situation led the researchers to create the Shake Alarm Device that will lessen the casualties and injuries by automatically alarming when a magnitude 4 and above occurs; we tested the hypothesis that the Shake Alarm Device is efficient in terms of sensing intensities such as 4 to 12. After creating the device, tests were conducted in the Earthquake simulator of Philippines Institute of Volcanology and Seismology (PHIVOLCS) by getting the reaction time in different Intensities in three trials and its average to evaluate the efficiency of the device. The results showed that the reaction time is inversely proportional to the intensity level with an overall average of 0.57 seconds, and an efficiency level of 45.83%. It is also showed that the device does not react to intensities 1-3 based on the trials on the Earthquake simulator. By the results in relation with the hypothesis, the researchers came up with the following conclusions: The gathered data from the shake alarm device is efficient regarding sensing intensities ranging from a minimum of 4 and maximum of 12. The Shake Alarm Device has an efficiency of 45.83% and has an average reaction time of 0.57 seconds.

Keywords: shake alarm, device

SegreTRASH: An Arduino-based Segregating Trash Bin

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Abstract

Waste segregation is the process by which waste is separated into different elements. Lack of segregation is one of the major issues in our society since it has lots of negative effects both to human and environment. The main objective of this device is to study the efficiency of SegreTRASH in terms of 1) accuracy of the sensors in detecting motion, and 2) testing if the reaction time of the system is below five seconds, and the success rate of identifying wet and dry wastes. The process of constructing the SegreTRASH was divided into three stages: gathering and wiring the hardware of the project, such as the sensors and servo motor, programming of the microcontroller and statistical hypothesis testing. The microcontroller received digital data from the sensors by wiring the Moisture Sensor and FC-51 Infrared Sensor to analog pin 0 or A0 and analog pin 1 or A1 respectively. The servo motor was controlled with pin 9 or D9. All sensors and modules were powered from the 5V pin of the microcontroller and modules were connected with a common ground or GND. The primary source of energy of the project could be a power bank or could be plugged into a power outlet. With the use of Arduino® Mega 2560™ Microcontroller, sensors such as Moisture Sensor, Infrared Distance Sensor, and a servo motor, the device will be able to segregate trash according to their moisture as wet or dry. The z-score of response time has a mean of 5.91 seconds and a standard deviation of 0.13 in 30 trials. Therefore, the transmission of data is below six-second buffer and is considered steadfast. The SegreTrash classified 25 out of 30 trials correctly. With this, it can be stated that the efficiency of identifying CORRECTLY is at 83.33%. The z-score of infrared detection has a mean of 2.86 meters and a standard deviation of 0.1 meter in 30 trials which were acceptable and proves that sensor is functional. Therefore, SegreTRASH: An Arduino-based Segregating Trash Bin is efficient in terms of segregating wastes in terms of the success rate of identifying wet and dry wastes, and also reliable in terms of response time and also accuracy or sensitivity of the infrared/distance sensor.

Keywords: waste segregation, trash bin

The Selectrixx Device Converting Sound Energy into Electrical Energy

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Abstract

Electricity is one of the most important blessings that science has given to mankind. This topic was chosen, and the goal is for utilising the noise pollution in a city material is the thing to be used in converting sound energy into electrical energy. Specifically, this study would like to answer the following questions: (a) How much energy can the Selectrixx device produce? (b) Does the Selectrixx Device can produce nine voltage to support the street lights? (c) Does the size of oscillators (flat bars) affect the amount of energy gathered in terms of voltage? Flat plastic bars were placed between two metal bricks and thicker metal brick above the metal brick. The screws in the holes were placed and screwed using wrench/plier. Two medium-sized piezoelectric chips were pasted in the flat plastic bar. The end of the copper wire of piezoelectric chips was peeled off and, using soldering iron; this was connected to the circuit board along with full bridge rectifier and wire was put on it and connected to another circuit board with battery/cables. Electrical tape was put on open wirings to avoid short circuit. The circuit board was pasted to the metal brick and using soldering iron, the battery/other cables were attached to the circuit boards. The statistics used are the Mann Whitney-U Test with significance level 0.05 both in energy gathered, energy gathered when two variables are compared and if it can supply electricity for the streetlights. The critical value for energy gathered is 2.79 and for energy gathered when two variables are compared is 2.79 and for the last hypothesis as well. The computed value for energy gathered is -1.983 and for the energy gathered when two variables are compared is -33.511 and the critical value for the last hypothesis is 30. Based on the experimentations and results, the researchers, therefore, concluded that the Selectrixx device is an effective source of energy and the size of the oscillator affects the amount of energy gathered (in terms of a volt), but it cannot supply the energy that is needed for the street lights.

Keywords: selectrixx, sound energy, electrical energy

Modified Shopping Cart and Checkout System

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Abstract

Shopping nowadays is one of the routine activities that people do; this is where they buy their essential needs such as food, clothes, and other goods. However, one of the common problems that is existing throughout not only locally but also internationally is the unsatisfactory shopping experience encountered by the customers; this includes the time selecting your desired product, the long line at the checkout lane and unpleasant experiences regarding the product information and the atmosphere in the establishment itself. This study aimed to create a computer program that can enhance and give ease to customers shopping experience by providing a check out system to be utilised by the customers and incorporating it into a shopping cart. The product was created by coding a program designed for the modified checkout system using the programming language C++ and was then incorporated into the shopping cart along with a scanner and display. The created product shows the significant result in reducing the time spent on shopping specifically the time spent in waiting in line and the time spent on selecting products. These results are based on the comparison of the weighted mean of the time spent in selecting products and time spent waiting in line. With these results, it shows that the shopping experience of the customers would be more convenient with the new modified cart than the traditional one.

Keywords: shopping cart, the checkout system

Mosquito Larvae Inhibitor

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Abstract

Mosquitoes continue to bring innumerable cases of diseases which pose a great threat to people's overall health and lives. People resort to fogging and other methods targeting the adult mosquitoes neglecting the larvae which can turn into mosquitoes. Moreover, these methods are also linked to environment and health negative effects. With this, researches had been utilising plants to produce natural larvicides which target larvae resulting in long-term solutions (Ynion,2013).

To combat the said problem, this research study aimed to produce a prototype device that will provide a solution with the continuously increasing population of mosquitoes through robotics. Programmed by Arduino, this device will disrupt mosquito breeding site to prevent possible occurrence of reproduction processes. Construction of prototype device included two types: hardware robot-making and coding of the program module. Using Arduino Mega as the microcontroller, five (5) sensors (moisture, flow rate, pH, the temperature for water detection, and a light sensor for path detection) and motors for pumping larvicide, the hardware part was built. For the coding of a program module, Arduino Genuino 1.8.1 software was used. After ten (10) trials, the results showed an over-all accuracy of 98.33%: a) 100% accuracy in the movement using line tracing method b) 100% accuracy in the effectiveness of sensors and motors c) 95% accuracy in the movement of the arm. Thus, it can be concluded the great potential of this prototype as a way of searching for solutions against the fast reproduction rate of mosquitoes to provide a safer and mosquito-borne diseases-free environment for people.

Keywords: mosquito larvae, an inhibitor

HSE (Hydro and Solar Energy) Hybrid Mobile Charging Station

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Abstract

The number of smartphone users in the Philippines was estimated at 30.4 million in 2017 and was expected to rise by 40 percent in the year 2021, causing an increase in electricity consumption. This study aimed to create a charging station that could charge android mobile phones using water and solar energy as sources of electricity. Rivets, screws, and allen screws were used to connect each rectangular acrylic plastic sheet to the aluminium angle bars, forming a 240 cm x 60 cm rectangular body. Two tanks were placed on the upper and lower parts of the station. A pipe was placed to connect the upper tank and the crossflow turbine. Another pipe was placed between the crossflow turbine and vortex turbine. One light sensor was put at the top of the station while one ultrasonic sensor was placed on top of each tank for the detection of the buoyant device. Three LEGO Mindstorms NXT brains were used to collect data from the sensors and control the activities of LED bulbs, motor and buzzer. A water pump was installed to transfer water from lower to upper tank manually. The charging station showed 100% functionality in charging android mobile phones and charging batteries using water and solar energy. All the NXT brains were able to receive data from the sensors and were able to give instructions to actuators correctly with 100% accuracy. It was concluded that the HSE Hybrid Mobile Charging Station could charge android mobile phones using water and solar energy.

Keywords: HSE, hybrid mobile charging station

SMARTONOMOUS BOT: Unmanned Flying Robot

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Abstract

To give aid and a helping hand during military activities or calamities is the aim of SMARTONOMOUS BOT, an unmanned flying robot that can transport medicinal kits, hover, share data and even record smartly. It applies the law of Physics and requires angular momentum. The movement is like multiplying the angular velocity by the moment of inertia to attain a balance and stable flight. The researchers assembled the 450mm frame, Arducopter module is installed. Soldering the electric speed module in the power distribution module was also done. Electric Speed Controller Cables and servo cables were manually attached while I2C Navigation board were added to make use of the GPS. Microcomputer, camera and any other navigating tools. The device was programmed with python and c++. A data gathering process was utilised in which the researchers tested the abilities and features of the device. Mainly, the ability of the robot to carry medicinal kits weighing 480g to 1.5k was evaluated. After that, sub testing of minor functions was also done such as; Auto mode and Manual Mode, Basic Drone Features, GPS Waypoint Navigation, Live Stream Video FPV, Face Recognition, Fully Automatic Flight, IoT DataLogger and analyser, Telemetry, and object avoidance. Observation shows that SMARTONOMOUS BOT can carry 1.5k weight without having 50% lower flight stability, 88% accurate in object avoidance while 94% in face recognition. In conclusion, SMARTONOMOUS has the potential to be a military technology in lending aids during activities.

Keywords: BOT, SMARTONOMOUS, flying robot

Improved Mini Vacuum out of Recycled Materials

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Abstract

This research entitled "*Improved Mini Vacuum out of Recycled Materials*" is important for those who cannot afford expensive vacuums. This product aims to produce a mini vacuum that is more convenient and more affordable. The researchers decided to conduct this study to help the society and to lessen the expenses of the people who want to buy mini vacuums. This product also aims to lessen the number of plastic bottles being thrown at the rivers or any canals. The researchers want to make everyone's imagination wider and make them more creative. Also, they want everyone's home to be clean and more organised. The study also includes the recycling of plastic bottles, tin cans, and hose. These materials will help the researchers make the mini vacuum. These materials can be found on scrapyards, and it can be in the backyard and everyone's home. This product can be used by means of batteries or electric socket in your house. The researchers don't need to buy expensive materials to conduct the study. Instead, they will be using recycled materials to make the product cheaper and easier to buy. The researchers want to contribute to our country. This contribution can help a lot of people that can't afford to buy expensive vacuums.

Keywords: mini vacuum, recycled materials

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