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PROSIDING KERTAS PENYELIDIKAN

KOLOKIUM PNS SIRI 1

21 MEI 2019

PENGENALAN

Kolokium PNS adalah program pembentangan kertas penyelidikan. Kolokium ini adalah satu wadah untuk membudayakan penyelidikan dan inovasi dalam kalangan pensyarah.

Program ini merupakan salah satu platform bagi para pendidik membentangkan hasil penyelidikan mereka untuk diketengahkan bagi tujuan pembanguan organisasi.

Semoga dengan adanya program ini dapat membantu kita semua menuju kearah kecemerlangan secara kretif demi memangkin bersama pembangunan pendidikan TVET di Politeknik Malaysia.

TENTATIF PROGRAM

Masa	Aktiviti
8:30PG	Pendaftaran peserta program Taklimat peserta kolokium Persediaan peserta kolokium
9:00PG	SESI PEMBENTANGAN PENYELIDIKAN
1:30PTG	Majlis Perasmian Penutup Ulasan panel penilai Penyampaian sijil
2:00PTG	Sesi Bergambar Majlis Bersurai

KATA ALUAN KETUA PUSAT PENYELIDIKAN DAN INOVASI

بسم الله الرحمن الرحيم

السلام عليكم ورحمة الله وبركاته dan Salam Sejahtera,

Alhamdulillah dan merafak kesyukuran ke hadrat Allah S.W.T, serta selawat dan salam ke atas Baginda Nabi Muhammad s.a.w., ahli keluarga dan para sahabat Baginda sekalian.

Umum mengetahui bahawa, Pusat Penyelidikan dan Inovasi (PPI) adalah sebuah pusat yang sentiasa merancang, membimbing dan memandu usaha pembudayaan penyelidikan dan inovasi dalam kalangan akademia dan pelajar di Politeknik Nilai (PNS). Usaha ini adalah seiring dengan hasrat dan dasar kerajaan yang sentiasa menggalakan budaya penyelidikan yang lestari sentiasa berjalan bagi memberi manfaat kepada individu, institusi, komuniti dan negara.

Bertitik tolak dalam menyahut hasrat kerajaan, maka PPI, PNS sentiasa berusaha melaksanakan pembudayaan penyedlidikan melalui penganjuran KOLOKIUM PNS Siri 1 bagi memberi ruang dan peluang kepada para akademia di PNS sendiri berkongsi segala hasil dapatan penyelidikan dan inovasi yang dilaksanakan. Hal ini secara langsung membuka ruang percambahan ilmu yang mempraktikkan pengetahuan yang digarap secara emperikal dan ia bersifat holistik. Holistik ini dapat dilihat dengan suatu perancangan yang rapi dijalankan oleh PPI bermula dengan usaha perkongsian ilmiah melalui bengkel-bengkel penyelidikan yang merangkumi tentang penghasilan sebuah kajian yang berkualiti sehinggalah kepada peringkat pembentangan hasil dapatan serta dibukukan ke dalam prosiding yang mampu disebar luas sebagai bacaan yang baik khas kepada warga PNS dan secara umum kepada semua penyelidik di Malaysia.

Syabas dan terima kasih kepada pihak pengurusan PNS yang sentiasa mendukung dan menyokong segala usaha yang dibuat oleh pihak PPI, para pegawai di PPI sendiri yang begitu komited dalam menganjurkan segala perbengkelan dan seminar ini. Juga kepada para akedemia yang turut aktif dalam menjalankan dan membentang hasil penyelidikan dan inovasi PNS sama ada sebagai penyelidik dan pembentang. Tidak dilupakan juga kepada semua pihak yang bekerjasama menjayakan penganjuran KOLOKIUM PNS Siri 1 ini. Semoga segala jasa anda semua diberikan kebaikan dan mendapat redha serta kasih sayang Allah swt.

Bersama memartabatkan penyelidikan dan inovasi untuk semua.

Ts. Dr. Mohd Ridhuan Bin Mohd Jamil
Ketua Pusat Pusat Penyelidikan &
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EVALUATION OF CREAM INCORPORATED WITH *Acalypha indica* EXTRACT

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Abstract

Acalypha indica is a plant that can be found mainly in Malaysia, Sri Lanka, India, and many other countries which contains a lot of benefits to treat various diseases especially skin diseases. *Acalypha indica* possess hepatoprotective, anti-inflammatory, antibacterial and also wound healing properties. The study is carried out to develop a cream incorporated with *Acalypha indica* leaves extracts that can inhibit the growth of microorganisms that present on the surface of the skin that cause infections. The plants were extracted using two solvents which are ethanol and aqueous with four different concentrations of 50mg/ml, 100mg/ml, 150mg/ml and 200mg/ml. The plant sample were dried, ground, extracted and analyzed. The antimicrobial activity of the extract was determined by using Disk Diffusion Test. The concentration with greater inhibition was chosen to incorporate into the basic cream formulation. Concentration of 200mg/ml ethanol extract showed the greater inhibition toward gram positive bacteria with 6.43 ± 0.513mm while the smallest inhibition of 2.33 ± 1.155mm for 50mg/ml of aqueous extract. The cream with 200mg/ml of ethanol extracts gives pH 5.68 which suitable for skin application. As conclusion, the extract of *Acalypha indica* shows the potential of antimicrobial activity and can be a promising organic substance to be incorporated as an antiseptic cream.

Keywords: *Acalypha indica*, antimicrobial, antiseptic

Introduction

The *Acalypha indica* is also known as Indian acalyphal is a plant that can be found in Malaysia, Sri Lanka, India, and many other countries. It has been reported to be used in Sri Lankan and India as indigenous medicine to treat bronchial asthma, constipation, skin disorders, snake bites and many more (Jagatheeswari, 2013). The juice of *Acalypha indica* is added to oil or lime and used to treat a variety of skin disorders. The antibacterial property of the plant can be used against human pathogens causing nosocomial infection (Saranraj, 2011). According to Griffith (1998), four bacterial and fungal strains can be inhibited using water, ethanol and chloroform extracts of *Acalypha indica* with disc diffusion method. Skin diseases are caused by several factors such as poor hygiene, overcrowding, malnourishment, non-availability of potable water, high temperature and humidity. Antibiotics, steroids and sulfonamides are drugs used to treat skin diseases. These drugs are difficult to reached people in local population besides adverse effects such as sensitizing dermatitis which are far more troublesome. Indigenous medicinal plants have been a readily available source of drugs and almost 50% new drugs have been patterned for it phytochemicals. This is aligning with a guideline by World Health Organization (WHO) in 1997 stated that effective locally available plants can be used as substitute for drugs. Pretorius (2003) has stated that the increasing of antibiotic resistant strains pathogen led to the emergence of new multi-resistant bacterial strains. Consequently, this had led to the search for more effective antimicrobial agents among materials of plant origin, with the aim of discovering potentially useful active ingredients that can serve as source and template for the synthesis of new antimicrobial drugs. Plants are important sources of potentially useful constituents for the development of new therapeutic agents because most of them are safe with little side effects (Handali, 2011).

The main objective of this study is to determine the antibacterial activity of *Acalypha indica* leaves extracts and to evaluate its ability to incorporate into cream.

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Literature Review

The *Acalypha indica* has several common names. It is also known such as Kucing Galak, Cika Mas or Indian acalyphal. It is a plant that can be found in open and dry area. A. indica also can be found abundantly in residential area in peninsular Malaysia. It has been reported to be used in Sri Lankan and India as indigenous medicine to treat bronchial asthma, constipation, skin disorders, snake bites and many more (Jagatheeswari, 2013). Different parts of the plant which are leaves, stems, and roots are used in various preparations to treat different diseases (Hrckov, 2013). Several chemical and biological investigations have been carried out on this plant. The juice of *Acalypha indica* is added to oil or lime and used to treat a variety of skin disorders. *Acalypha indica* are emetic, expectorant, laxative antiparasiticide, ground with common salt or quicklime or lime juice applied externally on scabies. *Acalypha indica* plant also commonly used to treat diuretic, anti-helminthic and for respiratory problems such as bronchitis, asthma and pneumonia. Its root is used as laxative and leaves for scabies and other cutaneous diseases (Somchit, 2010). The antimicrobial activity of water, ethanol and chloroform extracts of *Acalypha indica* have been earlier reported against four bacterial and fungal strains using the disc diffusion method (Griffith, 1998).

Antiseptic creams, also known as antibiotic or first-aid creams, are sold over the counter. They contain either streptomycin or penicillin antibiotics capable of killing bacteria that cause infections. Antiseptic cream are disinfecting agents with sufficiently low toxicity for host cells that they can be used directly on skin, mucous membranes or wounds. It is also used in the treatment of skin infections, prevention of infections in wounds (Fredericks, 2017).

Materials and Methods

Plant materials
Acalypha indica leaves were collected around Ipoh, Perak.

Reagents, chemicals and apparatus
Ethanol was obtained from Sigma Aldrich Co. St. Louis, USA. Vitamin E oil, beeswax, coconut oil and essential oil were purchased from local supplier. Drying oven (Thermo Fischer), rotary shaker (Thomas-Scientific) and electronic balance (Shimadzu).

Preparation of crude extracts
Acalypha Indica was washed thoroughly to remove any debris from the leaves and dried using drying oven at 60ºC for 72 hours. The dried plants were ground off to powdered it and kept in the air-tight container at room temperature for further analysis.

Methods of extraction
Extractions were carried out using two different solvents which are ethanol and distilled water. 60g of the powder was mixed with 240ml of solvents in a 250ml conical flask. The mixture was shaken for 24 hours at 37ºC in a shaker set to a speed of 150 r.p.m. After shaking, the solutions were filtered through Whitman's No.1 filter paper before the filtrates were subjected to centrifuge using a centrifugation at 5,000 r.p.m. for 15 minutes at room temperature. The extracts were preserved aseptically in a brown bottle and were stored in the chiller at 3-4 °C until further use.

Bacteria preparation
A target area on 20 respondents hand was chosen to swab (minimum of 10 cm^2). The standard area was recorded. The targeted area was pre-mark on the surface to be wiped with ethanol. The sterile swab stick was wiped the pre-marked targeted area from left to right using an even pressure and it was continued until the whole surface has been wiped. Used swabs were inoculated into the nutrient broth for bacterial growth. The bacterial culture was incubated at 37°C for 24-48 hours in an incubator. Gram staining method was performed to determine the classification of the bacteria.

Antibacterial activity of *Acalypha indica* leaves extract
Acalypha indica leaves extract was diluted into four different concentrations (50mg/ml, 100 mg/ml, 150 mg/ml and 200 mg/ml repesctively). The plates were prepared with 20ml of sterile Muller Hilton agar. The plate was inoculated with prepared hand swabbing culture by using a proper aseptic technique. After that, four discs containing 10µl each of different concentration of *Acalypha indica* extract were placed onto the plate agar surface. The surface of the agar was let to dry up by slightly open the petri dish lid for about 3-5 minutes. Then, the plates were incubated at 37°C for 24-48 hours. The Zone of Inhibition (ZOI) was observed after incubation time. The diameter of the inhibition zone was measured in millimeter (mm). The observation was recorded as 0 mm if the extractions do not inhibit any inhibition zone. Concentration that exhibit greater diameter of ZOI was chosen to be used in the production of the antiseptic cream.

Production of cream
150ml of distilled water and 75ml of glycerin were measured in a heat-proof glass. 37.5ml of coconut oil and 12.5g of beeswax was weighed in a different container before both containers were set into hot water baths and heat up at 70°C. Water phase was poured into oil phase and blended with hand blender for 3 minutes. The emulsion was allowed to cool down to between 40°C until 50°C before adding 25ml of the best concentration of *Acalypha indica.* Then, it was blended for additional 3 minutes to ensure it mixed well. The cream was poured into a clean, sterilized container and allows for cooling before capping.
3.8 Determination of pH
One gram of the antiseptic cream was dispersed in 25ml of deionized water, and the pH was determined using a pH meter. Measurements were done in triplicate reading.

Result and Discussion

Extraction yield
Table 1 shows the percentage of dried leaves after drying process. Total percentage of dry weight basis is 62.2%.

Table 1: Percentage of dried sample for *Acalypha indica* leaves

Sample	Wet weight (g)	Dry weight (g)	% of weight
Acalypha indica leaves	397.49	150.06	62.2

The percentage of extract from two different solvents was shown in table 2. The highest yield obtained from aqueous extraction with 84.6% compared to ethanol extraction with 79.4%.

Table 2: Percentage of extraction yield for *Acalypha indica* leaves

Sample	Extraction yield (%)	
	Ethanol	Aqueous
Acalypha indica crude extract	84.6	79.4

Yield (%) = (volume of filtrate / total initial volume) x 100

Antibacterial activity of *Acalypha indica* leaves extract

Table 3 shows the Zone of Inhibition (ZOI) of *A. indica* extract towards gram positive bacteria from four different concentrations. Basically both of the solvent showed almost similar Zone of Inhibition towards gram positive bacteria. Greater ZOI shows from 200 mg/ml concentration of ethanol extract with 6.43 ± 0.513 mm than 5.67 ± 2.309 mm of aqueous extract. It is shows that aqueous (polar) and ethanol (semipolar) extract revealed more potent antibacterial activity than the non-polar extract (Somchit et al., 2010). In comparison between ethanol and aqueous extraction, ethanol extracts exhibit greater inhibition than aqueous. Since ethanol is an organic solvent, Lima-Filo et al (2002) suggested that it gives a better ability to extract compounds for antibacterial activities compared to water based extraction. The phenol and tannins compound contains in *A. indica* responsible for the antibacterial activity of the extract.

Table 3: Zone of inhibition (ZOI) of *A. indica* leaves extract toward gram positive bacteria

Solvent	Concentration (mg/ml)			
	50	100	150	200
Ethanol	3.33 ± 2.082	5.43 ± 0.513	6.00 ± 0.000	6.43 ± 0.513
Aqueous	2.33 ± 1.155	4.67 ± 2.309	5.67 ± 2.309	5.67 ± 2.309

Antibacterial activity of cream incorporated with *Acalypha indica* extract

Diameter of Zone of Inhibition (ZOI) for cream incorporated with *A. indica* extract is shown in table 4.3. The ethanol extract of 200 mg/ml is chosen to incorporate into the cream as it exhibit greater ZOI. The diameter shows 4.00 ± 0.000 mm compared to 4.50 ± 0.707 mm from amoxicillin as positive treatment. Hence, *A. indica* extracts still able of to inhibit growth of gram positive even after being incorporated into the cream formulation.

Table 4.3: Zone of inhibition (ZOI) of cream incorporated with *A. indica* extract

Sample	Zone of Inhibition (mm)
Cream incorporated with 200 mg/ml of *A. indica* extract	4.00 ± 0.000
Amoxicilin	4.50 ± 0.707

pH of the cream incorporated with *Acalypha indica* extract

Table 4 shows the pH of the cream before and after incorporated with *A. indica* extract. The pH of basic cream is 6.47 meanwhile pH of the cream incorporated with the extract is 5.68. According to Ali (2013), normal human skin is between pH 4 to 6. It suggested that any product that needs to be applying on the skin must have the pH in range of 4 to 5. Hence the incorporation of the extract into the cream does provide a good pH that will not cause any harm to human skin.

Table 4: pH of the cream

Sample	pH
Basic cream	6.47
Cream incorporated with *A. indica* leaves extract	5.68

Conclusion

As a conclusion, leaves extract of *Acalypha indica* has shown a potential as antibacterial incorporated into cream. Ethanol extract with 200mg/ml concentration showed greater inhibition towards gram positive bacteria with 6.43 ± 0.513mm than 5.67±2.309mm of aqueous extract. The incorporation of the extract into cream formulation shows inhibition of 4.00±0.000mm close with inhibition by Amoxicilin with 4.50±0.707mm. pH cream incorporated with *A. indica* extract of 5.68 will not cause skin irritation when being apply on skin. Overall, the extract of A. indica has a potential and can be a promising organic substance to be incorporated into cream as antiseptic cream.

References

1. Ali, S.M. and Yosipovitch, G. 2013. Skin pH: from basic science to basic skin care. *Acto dermato-venereologica*, 261-269.
2. Fredericks, J. 2017. Uses of Antiseptic Cream. *Livestrong.com*. Retrieved from https://www.livestrong.com/article/149422-uses-of-antiseptic-cream/
3. Govindarajan, M. 2008. Antibacterial activity if Acalypha indica . *Eur Rev Med Pharmacol Sci*, 229-302.
4. Griffith, W. 1998. Vitamins, Herbs, Minerals and Supplements. *The Complete Guide (Fisher Books USA)*, 217-226.
5. Handali S, H. H. 2011. Formulation and evaluation of an antibacterial cream from Oxalis corniculata aqueous extract. *Jundishapur J Microbial* , 255-260.
6. Hrckov, G. 2013. Nematocidal activity of plants. *Pharmacological potential of selected natural compounds in the Control of Parasitic diseases*, 43.
7. Jagatheeswari, D. D. 2013. An Important Medicinal Plant; A Review Of Its Important Traditional Uses, And Pharmacological Properties. *Int. J. Bot*, 19-22.
8. Lima-Filo, J.V.M., Carvola, A.F.F.U., Freitas, S.M. 2002. Antibacterial activity of extract of six macro algae from the North eastern Brazilian Coast. *Brazilian Journal of Microbiology*, 33: 311-313
9. Pretorius JC, M. S. 2003. Growth inhibition of plant pathogenic bacteria and fungi by extracts from selected South African plant species. *South African Journal of Botany*, 188-192.
10. Saranraj, T. M. 2011. Antibacterial Activity of Various Solvent Extracts of the Indian Herbal Plant *Acalypha indica* against Human Pathogens Causing Nosocomial Infection. *International Journal of Pharmaceutical and Biological Archives*, 1473-1478.
11. Somchit, M. N., Abdul Rashid, R., Abdullah, A., Zuraini, A., Zakaria, Z.A., Sulaiman, M. R., Arifah, A.K., and Mutalib, A.R. 2010. In vitro antimicrobial activity of leaves of *Acalypha indica* Linn. (Euphorbiaceae). *African Journal of Microbiology Research*, 4(20): 2133-2136.

Thediarycases - E-commerce website for Frontend and Backend

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Abstract

In today's fast-changing business environment, it's extremely important to be able to respond to client needs in the most effective and timely manner. The business-to-consumer aspect of electronic commerce (e-commerce) is the most visible business use of the World Wide Web. The primary goal of an e-commerce site is to sell goods and services online. This project deals with developing an e-commerce website for online shopping. This project covered to area which is Frontend (user side) and Backend (admin side) for ecommerce site. Front end page, visitors can see the publicly available features such as browse products, view details of products (Size, Color and Cost), and view other static contents of site. Registered User can view all publicly available features and in addition to this they can purchase the products by adding them into shopping cart. Backend (admin side) can manage product, customers, orders and others). This is a project with the objective to develop a basic website where consumer is provided with a shopping cart application and also to know about the technologies used to develop such an application.

Keywords : ecommerce site, Ecommerce project, frontend, backend

Introduction

Online shopping is the process whereby consumers directly buy goods or services from a seller in real-time, without an intermediary service, over the Internet. It is a form of electronic commerce. This project is an attempt to provide the advantages of online shopping to customers of a real shop. It helps buying the products in the shop anywhere through internet. According https://www.export.gov, Malaysia has high rates of ecommerce usage. Malaysia boasts 15.3 million online shoppers (50 percent of the population) and 62 percent of mobile users their devices to shop online. Top 3 most purchased categories of products are Fashion & Beauty, Electronics and Sports & Hobbies. Malaysian e-commerce market is growing fast. It is growing both in terms of scale and scope: sales volumes and numbers of online shoppers as well as in terms of categories of products being bought online. According https://aseanup.com/top-e-commerce-sites-malaysia/, Shopee is the top ecommerce website in Malaysia has 20,900,000 monthly traffic. Objective this project is to provide an online shopping of products for IPhone cover hand phone for customer and admin site to manage the online website.

Literature Review

E-commerce usually refers to the trade in global business activities, the Internet environment based on browser/server application mode, achieving consumer on-line shopping, on-line transactions between merchants and on-line electronic payment and a variety of business activities. (Marshall Brain, 2000). In order to develop this project , a number of Technologies will applied server and client side scripting techniques, implementation technologies such as Hypertext Pre-processor (PHP), Hypertext Mark-up Language (HTML), Cascading Style Sheets (CSS) and java scripts. MySQL is used to create a database. In order to design the

graphic student should create using Adobe Photoshop. Project online shopping system valuable information and practical knowledge on several topics like designing web pages using HTML &CSS, usage of responsive templates, designing of android applications, and management of database using Mysql. The entire system is secured. Also the project helped us understanding about the development phases of a project and software development life cycle. (Shibin Chittil et. al 2014). The system is implemented using a 3-tier approach, with a backend MySQL database, a middle tier apache server and a web browser as the front end client. In order to develop online shopping application use HTML, CSS, JAVA Script, server side scripting language PHP and relational database MySQL. This is a project with the objective to develop a basic website where consumer is provided with a shopping cart application and also to know about the technologies used to develop such an application. (Md. Mehadi Hasan 2016). The 'Online Shopping' is designed to provide a web based application that would make searching, viewing and selection of a product easier. The search engine provides an easy and convenient way to search for products where a user can Search for a product interactively and the search engine would refine the products available based on the user's input. The user can then view the complete specification of each product. They can also view the product reviews and also write their own reviews. (Chaitanya Reddy Mittapelli , 2008)

Methodology
This project used system development life cycle (SDLC) process. The System Development Life Cycle is methodology for understanding business objectives of a system and designing an appropriate solution. Five major steps involve are:
1. Analysis/planning Phase
   During this phase, a plan is developed that documents the approach to be used. It includes a discussion of methods, tools, tasks, resources, project schedules, and user input, Personnel assignments, costs, project schedule, and target dates are established. A Project Management Plan is created using Gantt chart
2. Design Phase
   Design Phase is the third phase of the SDLC and it involves the actual creation and design of a ecommerce. Thediarycases used
        a) Data Flow Diagram (DFD) to maps out the flow of information for any process or system. That describes the flow of information requests and responses for a ecommerce site.. Who is going to use the system? How will they use the system? What data should be input into the system? What data should be output by the system?
        b) Entity Relationship Diagram (ERD) to design using shows the relationships of entity sets stored in a database
        c) Site map is a visual or textually organized model of a Web site's content that allows the users to navigate through the site to find the information they are looking
        d) Wireframe a page schematic or screen blueprint, is a visual guide that represents the skeletal framework of a website. Wireframes are created for the purpose of arranging elements to best accomplish a particular purpose,
3. Development phase
In this phase, this project start writing program code in the suitable programming language and developing error-free executable programs efficiently. Thediarycases using:
   • Hypertext Preprocessor (PHP) to interaction between the browser and the server
   • Hyper Text Markup Language (HTML) to create website
   • Cascading Style Sheets (CSS) to style of an HTML document. It can control the layout of multiple web pages all at once

- Javascripts for the interaction with backend servers.
- MySQL for creating the database for ecommerce site
- Adobe Photoshop to creating graphic for ecommerce website

Testing phase
This project testing in localhost using server XAMMP 1.7.4

Implementation
This project using https://www.000webhost.com to store (a website or other data) on a server or other computer so that it can be accessed over the Internet.

Result and Discussion
User interface (UI) is everything designed into an information device with which a person may interact. This can include display screens, keyboards, a mouse and the appearance of a desktop. It is also the way through which a user interacts with an application or a website. Thediarycases have two type user interface are user site and admin site.

User site
User site for Thediarycases contain main page, user sign up, user login, catalog, order process, FAQ and about us.

    a. Main page
       The Home Screen will consist of screen were one can browse through the products at website
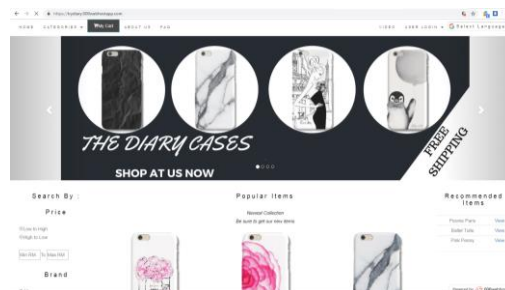
Fig 1 : User interface for Catalogue

b. Order Process
   Order process is the work of dealing with orders
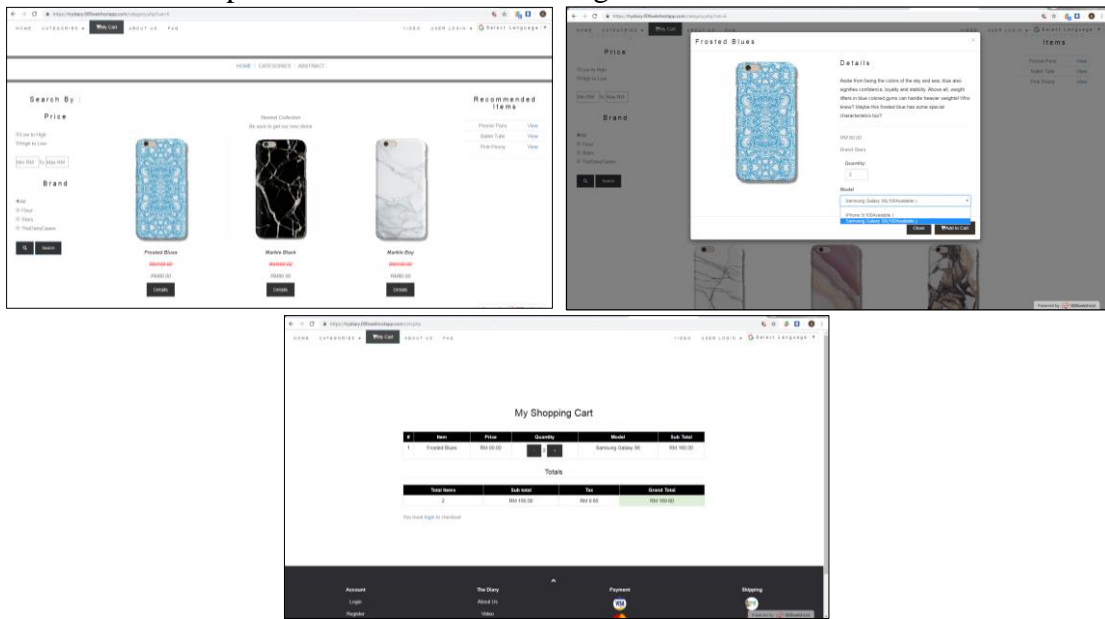
Fig 2: User interface for Order process shopping online

c. About Us
   "About Us" page that accurately describe about the company and its operations.
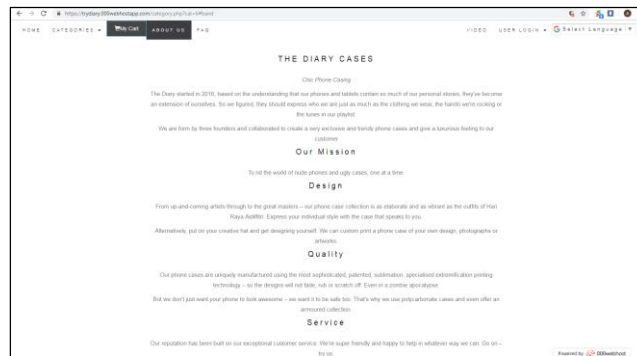

Fig 3: User interface for About Us

d. Frequently Asked Questions (FAQ)
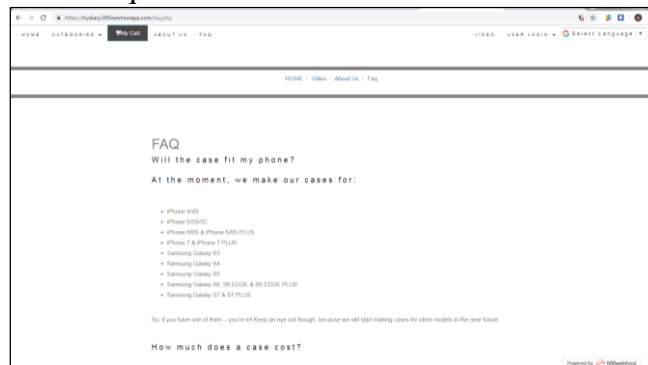   FAQ section on the online stores, where the customer can look up answers to the most common questions.

Fig 4: User interface for Frequently Asked Questions

e. User login and registration

User Login : This section allows User to enter the website by adding login details created during registration. Registration: This section allows New Users to create new registration account on the Site
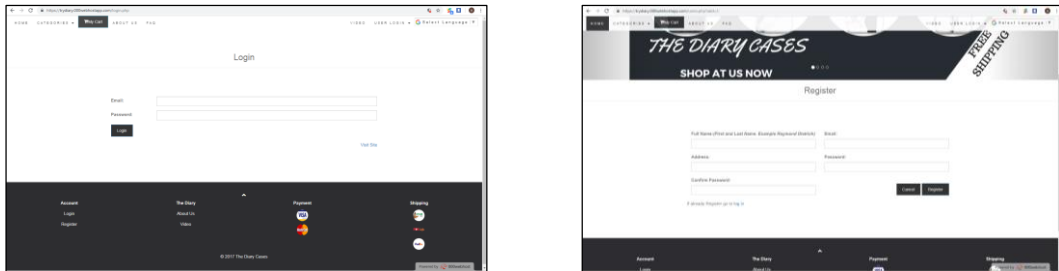
Fig 5: User interface for user login and registration

Backend

Back end data-entry system to allow staff to securely update information to the database and website. Back end for Thediarycases contain customer management, product management and order management.

a. Order management

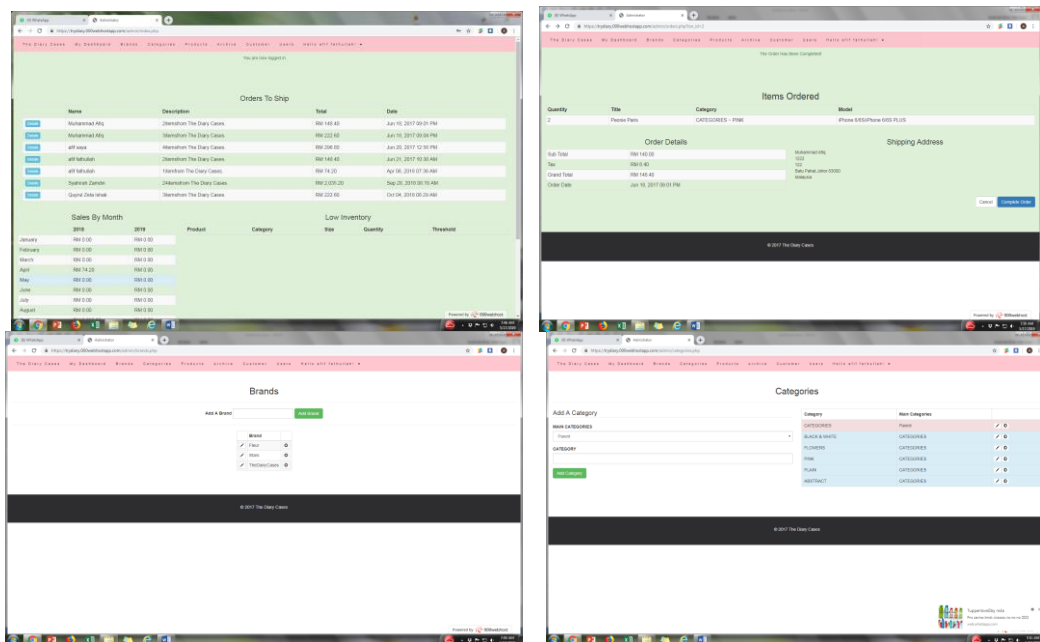Customer ordered products, status and delivery information is stored in this table

Fig 6: User interface for order management

b. Product Management

Product management is a process that focuses on bringing a new product to market or developing an existing one. It starts with an idea of a product that a customer will interact with and ends with the evaluation of the product's success. Product management unites business, product development, marketing, and sales.
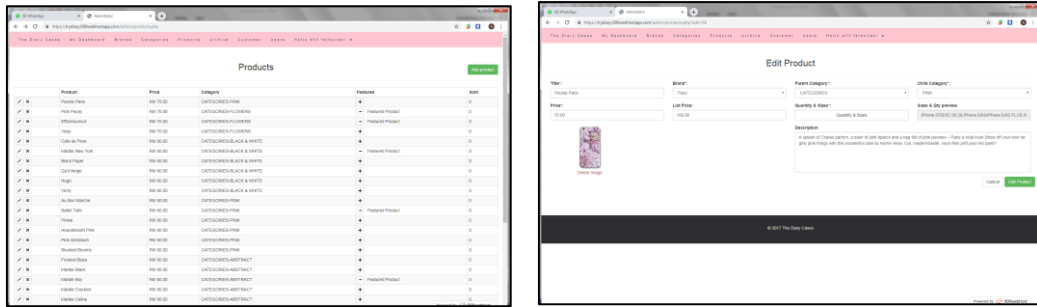
Fig 6: User interface for product management

c. Customer Management
   Customer management is of collecting data about your customers
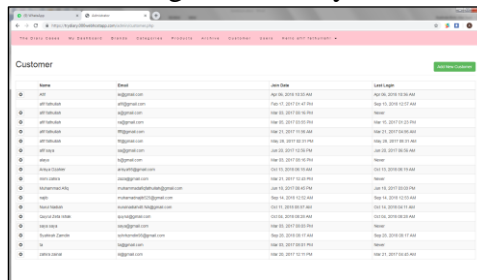

Fig 6: User interface for customer management

Discussion

Purpose of this project to know ability of the student to apply all the IT skills and business knowledge acquired in expressing creativity, analyzing and producing designs, writing programs, making verification, and documenting a project assignment in areas of e-commerce. This is a project with the objective to develop a ecommerce website, which is covered two (2) area are Frontend and Backend.

The frontend is the ecommerce website for consumer is content log in/ log out, customer registration, product catalog, shopping cart, campaign and feedback. Front end also have static website for general information such as information about company, site map, shipping method and cost information, payment gateway information and others. The backend is for management to monitor all the activities at frontend such as customer's management, product management, general management and order management. In order to access the ecommerce frontend and backend as below

Table 1 : Information to access Thediarycases e-commerce site

Ecommerce Site	URL	Username	Password
Frontend	https://trydiary.000webhostapp.com	-	-
Backend	https://trydiary.000webhostapp.com/admin	afif@gmail.com	password

Advantages of this project
1. The student can
   a. developed more ecommerce platform for others user like WIX, Easy Store
   b. developed ecommerce to companies that need specials an ecommerce system
2. Small and Medium Enterprise (SME) can use this project to join ecommerce world

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Conclusion

This project helped to gain valuable information and practical knowledge on several topics like designing web pages using HTML & CSS, usage of responsive templates, designing of ecommerce , and management of database using MySQL .Purpose of this project to know ability of the student to apply all the IT skills and business knowledge acquired in expressing creativity, analyzing and producing designs, writing programs, making verification, and documenting a project assignment in areas of e-commerce. This project can be used to Small and Medium Enterprise (SME) to join ecommerce world.

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References

Chaitanya Reddy Mittapelli. (2008). *Online Shopping*. Retrieve from https://core.ac.uk

Jie Zhang. (2010). *Development of E-Commerce Web Application Using WAMP*. Retrieve
        from http://sdsu-dspace.calstate.edu/bitstream/handle/10211.10/640/Zhang_Jie.pdf

Marshall Brain. *How e-commerce works*. Retrieve from https://money.howstuffworks.com

Md. Mehadi Hasan. (2016) . *Web Based Application For Online Shopping*. Retrieve from
        http://dspace.ewubd.edu

Shibin Chittil ,Nidheesh Chittil , Rishikese M R.(2014). *Online Shopping Sytem*. Retrieve
        from http://dspace.cusat.ac.in

Top 10 e-commerce sites in Malaysia 2019. Retrieve form https://aseanup.com

Malaysia – eCommerce. Retrieve form https://www.export.gov

Removal of Dye in Textile Industry Using Caffeinated Waste

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Abstract

Growing concern about environmental issues has prompted the textile industry to investigate appropriate and environmentally friendly treatment technologies. Waste aqueous effluent containing color compounds causes serious environmental problems. The use of low-cost and ecofriendly adsorbents has been investigated as an ideal alternative to the current expensive methods of removing dyes from wastewater. The ability of tea and coffee waste to remove dye in wastewater was studied in order to provide a low-cost adsorbent.

Keywords: textile wastewater, adsorption, decolourisation, low-cost adsorbents.

Introduction

Synthetic dyes are used extensively in many industries included dye houses, paper printers and textile dyers. A significant proportion of synthetic dyes are lost annually to waste streams during textile processing, which eventually enters the environment. Textile dyes have synthetic origin and complex aromatic molecular structures that make them difficult to biodegrade when discharged in the ecosystem. Some of dyes are carcinogenic and mutagenic. Dye being one of the important recalcitrant, persist for long distances in flowing water, retards photosynthetic activity, inhibit the growth of aquatic biota by blocking out sunlight and utilizing dissolved oxygen and also damage the aesthetic nature of the environment (Raghuvanshi et al., 2004). As such dyeing wastes need to be treated before discharge into the environment (Robinson et al., 2002).

There are several methods for dye removals such as adsorption, oxidation-ozonation, coagulation, coagulation flocculation and biological methods (Raghuvanshi et al., 2004). Adsorption is one of the best conventional waste water treatment methods compared to other treatment methods such as coagulation, flocculation (Panswed and Wongchaisuwan, 1986), reverse osmosis, ozonation (Muthukumar and Selvakumar, 2004), electrochemical techniques (Alinasafi et al., 2005) and fungal decolorisation. Activated carbon is the most popular and widely used adsorbent because of high adsorption efficiency for the organic compound. But the commercially available activated carbon is very expensive and has problems of regeneration. An adsorption system using activated carbon is perhaps the most widely used adsorbent for the removal of many organic contaminants, which are biologically resistant. But activated carbon is expensive and also has problems associated with regeneration, which has necessitated the search for alternate adsorbents. In this study, the caffeinated waste were used as an adsorbent to remove three dyes malachite green, methylene blue and methyl red, from aqueous solution. Effective parameters such as adsorbent dosage, contact time and pH test were conducted to evaluate the adsorption capacity of caffeinated waste.

Literature Review

Dyes may be defined as substances that, when applied to a substrate provides color by a process that alters, at least temporarily, any crystal structure of the colored substances (Kirk, 2004). Such substances with considerable coloring capacity are widely employed in the textile, pharmaceutical, food, cosmetics, plastics, photographic and paper industries (Carneiro, Nogueira &Zanoni, 2007). In the textile industry,

up to 200,000 tons of these dyes are lost to effluents every year during the dyeing and finishing operations, due to the inefficiency of the dyeing process (Ogugbue & Sawidis, 2011). The textile industry consumes a substantial amount of water in its manufacturing processes used mainly in the dyeing and finishing operations of the plants. The wastewater from textile plants is classified as the most polluting of all the industrial sectors, considering the volume generated as well as the effluent composition (Şen, & Demirer, 2003). In addition, the increased demand for textile products and the proportional increase in their production, and the use of synthetic dyes have together contributed to dye wastewater becoming one of the substantial sources of severe pollution problems in current times. Textile wastewaters are characterized by extreme fluctuations in many parameters such as chemical oxygen demand (COD), biochemical oxygen demand (BOD), pH, color and salinity. The composition of the wastewater will depend on the different organic-based compounds, chemicals and dyes used in the dry and wet-processing steps (Ogugbue & Sawidis, 2011). Recalcitrant organic, colored, toxicant, surfactant and chlorinated compounds and salts are the main pollutants in textile effluents (Mansour, et. al., 2012). In addition, the effects caused by other pollutants in textile wastewater, and the presence of very small amounts of dyes (<1 mg/L for some dyes) in the water, which are nevertheless highly visible, seriously affects the aesthetic quality and transparency of water bodies such as lakes, rivers and others, leading to damage to the aquatic environment (Wijetunga, Li, & Jian, 2010).

Many physicochemical methods have been tested but only that of adsorption is considered to be superior to other techniques. This is attributed to its low cost, easy availability, simplicity of de- sign, high efficiency, ease of operation, biodegradability, and ability to treat dyes in more concentrated form (Sanghi & Bhattacharya, 2002; Meshko, Markovska, Mincheva, & Rodrigues, 2001; Mckay, 2007). An adsorption system using activated carbon is perhaps the most widely used adsorbent for the removal of many organic contaminants, which are biologically resistant. But activated carbon is expensive and also has problems associated with regeneration, which has necessitated the search for alternate adsorbents. Some low cost adsorbents such as fly ash, coal, peat (Low, Lee and Heng, 1994). The use of a bio-adsorbent such as rice husk (Churchley, 1994), banana pith (Namasivayam, Prabha and Kumutha, 1998) wheat straw, baggase, sawdust (Low, Lee and Heng, 1994; Churchley, 1994) have been found to be highly effective, cheap and ecofriendly. McKay and Alexander (McKay, Porter and Prasad, 1999) investigated the adsorption of basic dyes onto silica and although adsorption capacities observed were high, silica is much more expensive adsorbent than the materials used in this study. Khattri et al., reported that sawdust basically contains lignin and cellulose and the surface of sawdust in contact with water is negatively charged. Basic effluent is ionized in solution to give cations and this will undergo attraction approaching the anionic sawdust structure. The suitability of different kinds of low cost materials to remove dye colours, the reaction involved and factors governing the sorption is not fully understood.

Materials and Methods

Preparation of Adsorbents
The coffee waste was obtained from Starbucks located around Negeri Sembilan and the tea waste was collected from Lawang Cafe, Politeknik Nilai. Both wastes were washed several times with boiled distilled water to remove any adhering dirt and color. The wastes was then 10 dried in the oven at 60ºC for 48 hours, ground and sieved to obtain a finely powdered. The powder was stored in airtight container for future usage.

Preparation of Standard Solution
Methylene Blue, Methyl Red and Malachite Green is very common in textile industries. Stock solution for Methylene Blue, Methyl Red and Malachite Green were prepared by dissolving 0.1g weighed quantity of the dye in 1L distilled water. Then, the desired amount of solutions were took from the mother solution for further use. pH was adjusted by adding 0.1M Sodium Hydroxide (NaOH) solution

and 1M Hydrochloric Acid (HCl) solution. Batch adsorption study in was used to study the effects amount of adsorbent, pH values, the contact time between adsorbate and adsorbent.

pH Test

25 ml of sample wastewater was taken from the stock solution. pH ranged (1-10) was adjusted by adding 0.1M Sodium Hydroxide (NaOH) solution and 1M Hydrochloric Acid (HCl) solution. A fixed amount of adsorbent, 1.5 gram with the ratio of 1:1, 0.75 gram of tea waste and 0.75 gram of coffee waste was then added to the sample. This experiment was carried out at room temperature. The solutions were then placed in an orbital shaker operating at 90 RPM for proper adsorption. The conical flask containing reaction mixture were kept under undisturbed for 2 hours for settlement of precipitation formed. Then the adsorbents were separated from the sample by using filter paper. The absorbance was measured for supernatant solution using UV-Spectrophotometer. The final concentration of dye was estimated with the help of these absorbance data. The amount of adsorption at equilibrium time, qe (mg/g) was calculated using equation:

$$qe = (Co - Ce)\ V\ W$$

Where, C0 for the liquid-phase concentrations of dye at initial (mg/L); Ce, for the liquid-phase concentrations of dye at equilibrium (mg/L); V represents the volume of the solution, (L); W =mass of dry adsorbent used, (g). The test was then repeated to the other two ratios, 3:2 and 7:3.

Dye-adsorbent contact time 25 ml of sample wastewater was taken from the stock solution. A fixed amount of adsorbent, 1.5 gram with the ratio of 1:1, 0.75 gram of tea waste and 0.75 gram of coffee waste was then added to the sample. This experiment was carried out at room temperature. The solutions were then placed in an orbital shaker operating at 90 RPM for proper adsorption. The conical flask containing reaction mixture were kept at different time intervals which are (30, 60, 90, 120, 150 and 180 minutes). Then the adsorbents were separated from the sample by using filter paper. The absorbance was measured for supernatant solution using UV-Spectrophotometer. The final concentration of dye was estimated with the help of these absorbance data. The amount of adsorption at equilibrium time, qe (mg/g) was calculated using equation:

$$qe = (Co - Ce)\ V\ W$$

Where, C0 for the liquid-phase concentrations of dye at initial (mg/L); Ce, for the liquid-phase concentrations of dye at equilibrium (mg/L); V represents the volume of the solution, (L); W =mass of dry adsorbent used, (g). The test was then repeated to the other two ratios, 3:2 and 7:3.

Dosage of adsorbent

25 ml of sample wastewater was taken from the stock solution. A range from 0.5 gram to 3.0 gram of adsorbent with the ratio of 1:1, was added to the sample. This test was carried out at room temperature. The solutions were then placed in an orbital shaker operating at 90 RPM for proper adsorption. The conical flask containing reaction mixture were kept under undisturbed for 2 hours for settlement for precipitation formed. Then the adsorbents were separated from the sample by using filter paper. The absorbance was measured for supernatant solution using UV-Spectrophotometer. The final concentration of dye was estimated with the help of these absorbance data. The amount of adsorption at equilibrium time, qe (mg/g) was calculated using equation:

$$qe = (Co - Ce)\ V\ W$$

Where, C0 for the liquid-phase concentrations of dye at initial (mg/L); Ce, for the liquid-phase

concentrations of dye at equilibrium (mg/L); V represents the volume of the solution, (L); W =mass of dry adsorbent used, (g). The test was then repeated to the other two ratios, 3:2 and 7:3.

Analysis Method

Analysis of dye adsorption

The absorbance was measured using supernatant solution using UV-Spectrophotometer with the wavelength for Methylene blue at 470nm, Methyl Red at 660nm and Malachite Green at 520nm. The final concentration of dye was estimated with the help of these absorbance data.

Result and Discussion

Effects of adsorbent dose

Effect of adsorbent dose on removal of dye was studied by varying the dose of adsorbent (0.5-3g) in the test solution while keeping the initial dye concentration (0.1mg/L), room temperature at pH (7). Experiments were carried out at contact time equal (120 min). Three different formulations were used in order to find the best mixture between coffee and tea waste. As shown in Fig.1 (a), Fig.1 (b), and Fig.1 (c) the percent of adsorption increased with increasing adsorbents doses. The increase in the percent removal of dyes with the increase in adsorbent dose is due to the availability of larger surfaces area with more active functional groups. This phenomenon can be also explained, based on the fact that at lower adsorbent dose the adsorbate (dye) is more easily accessible and because of this, removal per unit weight of adsorbent is higher (Raghuvanshi et al., 2005). Plots show a decrease in dye concentration at a faster rate as the adsorbent mass is increased. Increasing in dosage of adsorbent gave the greater removal at all levels of the adsorbent dose until it reach equilibrium percentage removal rate at 2.5g of adsorbent dosage. From the results obtained, F1 have the greatest percentage in dye removals which are 98% for methylene blue, 97% for Malachite green and 95% for Methyl red. The percent removal of dyes for F1, F2 and F3 decrease at dosage 3g. The subsequent slow rise in the curves is due to adsorption and intra-particle diffusion taking place simultaneously with the dominance of adsorption. With a rise in adsorbent dose there is a less commensurate increase in adsorption resulting from lower adsorptive capacity utilization of adsorbent (Singh, et. al., 2001). This phenomenon can be also explained, based on the fact that at lower adsorbent dose the adsorbate (dye) is more easily accessible and because of this, removal per unit weight of adsorbent is higher. With rise in adsorbent dose, there is less commensurate increase in adsorption, resulting from many sites remaining unsaturated during the adsorption (Jain et al., 2003).
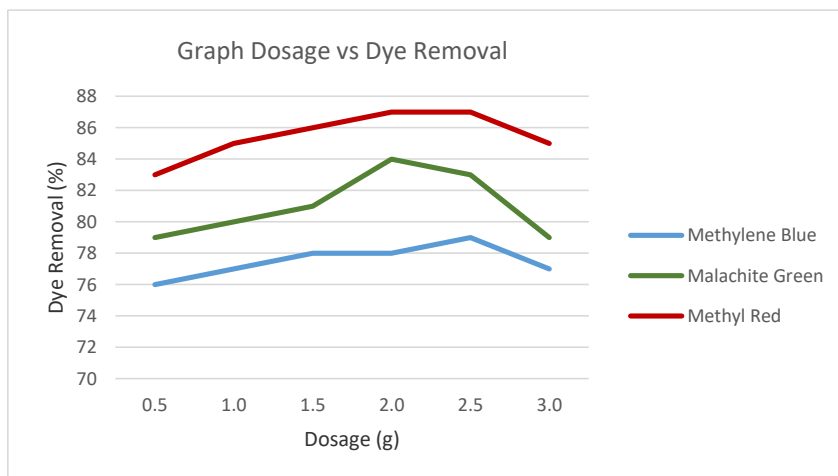

Fig. 1 (a). Effects of absorbent dosage on dye absorption for formulation 1:1.
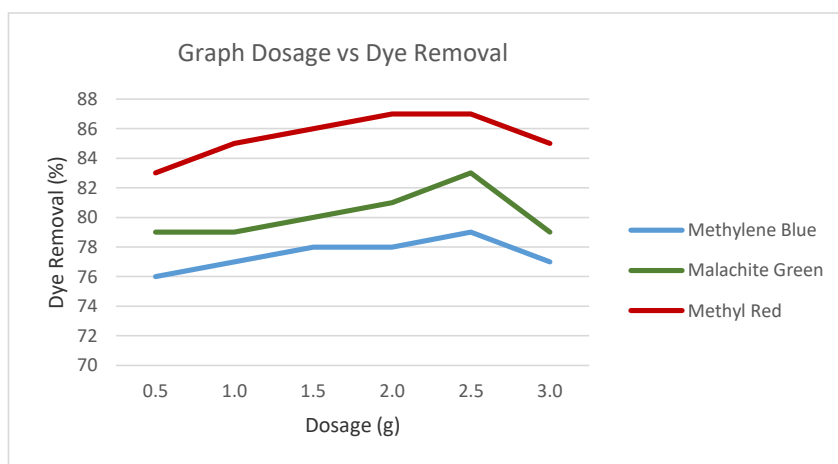
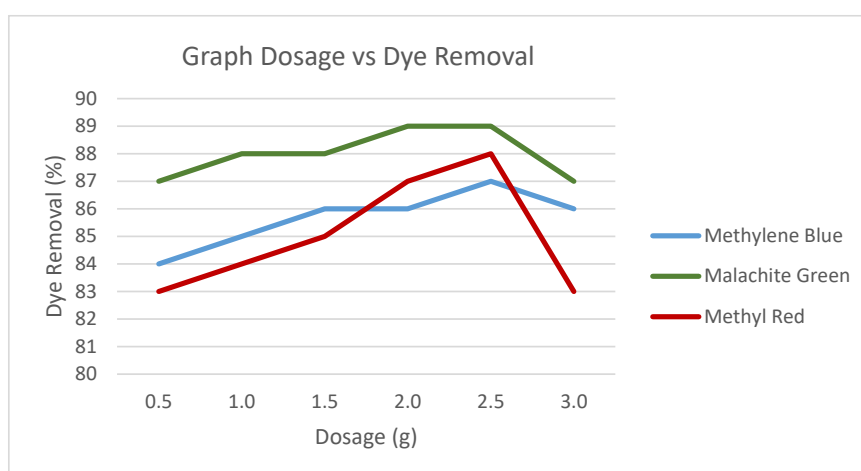Fig. 1 (b). Effects of absorbent dosage on dye absorption for formulation 3:2.

Fig. 1 (c). Effects of absorbent dosage on dye absorption for formulation 7:3.

Effects of pH

The effect of pH on the adsorption methylene blue, malachite green and methyl red by all absorbent shown in Fig. 2 (a), Fig. 2 (b) and Fig. 2 (c). The maximum dye adsorption occurs at pH 10 for F1, F2 and F3.The pH test were conducted to determine the effect of pH of adsorbent on dye removal. pH ranged 1 to 10 which was adjusted by adding 0.1M Sodium Hydroxide (NaOH) solution and 1M Hydrochloric Acid (HCl) solution were tested in the pH test for three color dyes. The digital pH meter was the equipment that was used to measure the pH value on dye removal. The reading from the UV Spectrophotometer for pH test were triplicated to get the average of the final absorbance. The best pH on dye removal was recorded and tabulated. From the data, pH 10 is the best pH for the three ratios which are (1:1, 3:2 and 7:3) on dye removal for all three color dyes. pH is a measure of acidity (pH<7) or basicity (pH>7) of an aqueous solution. The pH factor is very important in the adsorption process especially for dye adsorption. The solution pH is an important parameter in the adsorption process as it may affect the surface charge of adsorbent and the ionization degree of the dye. The pH of a medium will control the magnitude of electrostatic charges which are imparted by the ionized dye molecules. As a result, the rate of adsorption will vary with the pH of an aqueous medium (Onal, 2006).
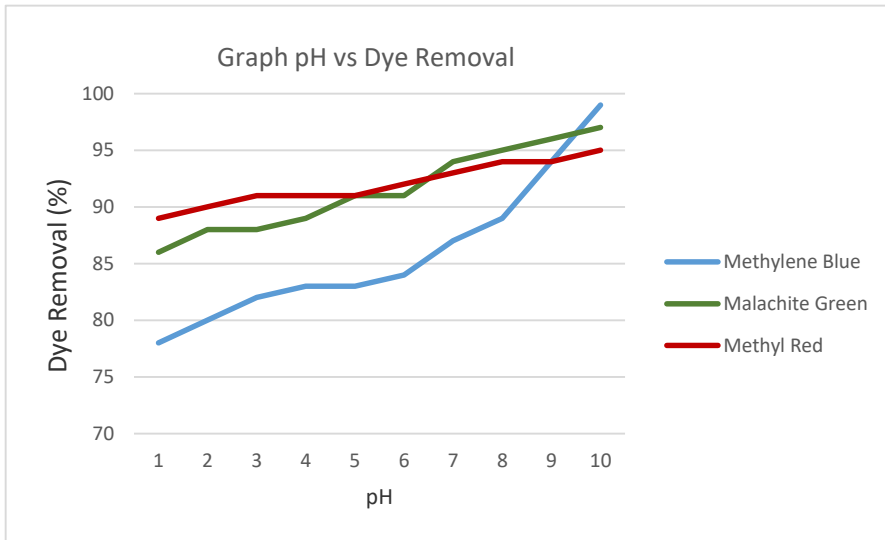
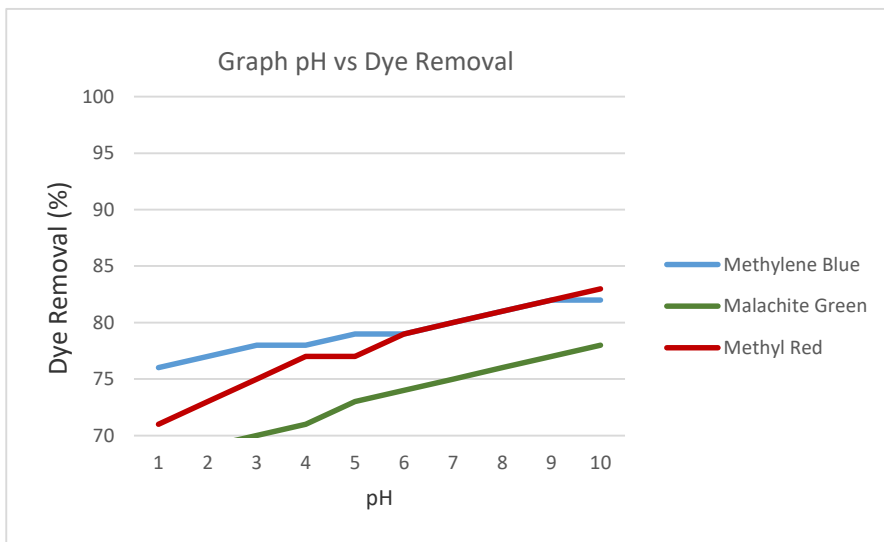Fig. 2 (a). Effects of pH on dye absorption for formulation 1:1.

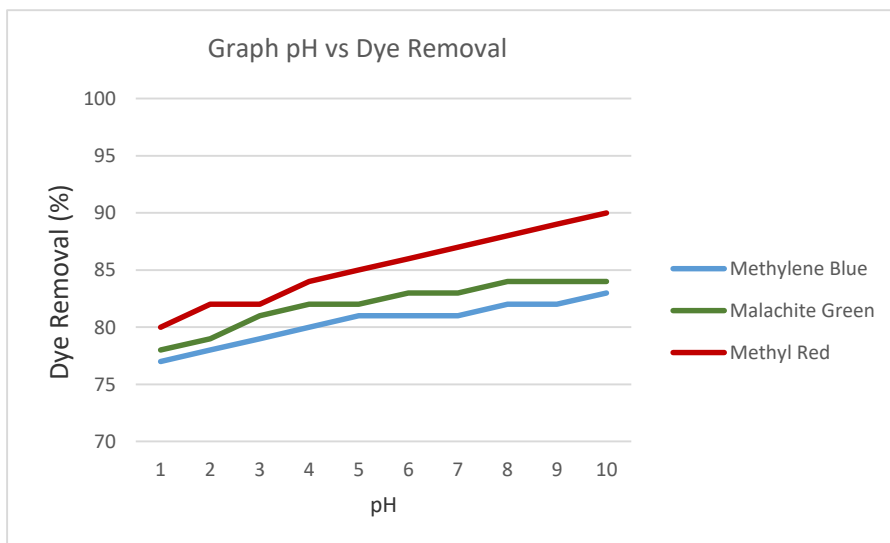Fig. 2 (b). Effects of pH on dye absorption for formulation 3:2.

Fig. 2 (c). Effects of pH on dye absorption for formulation 7:3.

Effects of contact time

The effect of contact time on adsorption of dye can be carried out by preparing adsorbent adsorbate solution with fixed adsorbent dose and initial dye concentration for different time intervals and shaken until equilibrium. Generally the rate of removal of dye increases with an increase in contact time to a certain extent. Further increase in contact time does not increase the uptake due to deposition of dyes on the available adsorption site on adsorbent material (Ansari and Mosayebzadeh 2010). At this point, the amount of the dye desorbing from the adsorbent is in a state of dynamic equilibrium with the amount of the dye being adsorbed onto the adsorbent. The time required to attain this state of equilibrium is termed the equilibrium time, and the amount of dye adsorbed at the equilibrium time reflects the maximum adsorption capacity of the adsorbent under those operating conditions (Bello et al. 2010). As per the test, the best removal occurs at the 90 minute for each ratio where it removes 80% to 87% of dyes.
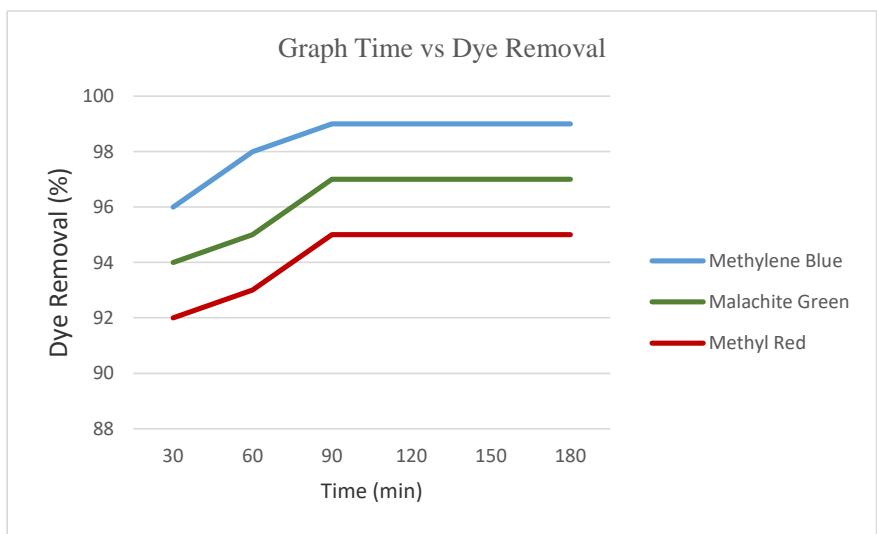

Fig. 3 (a). Effects of contact time on dye absorption for formulation 1:1.
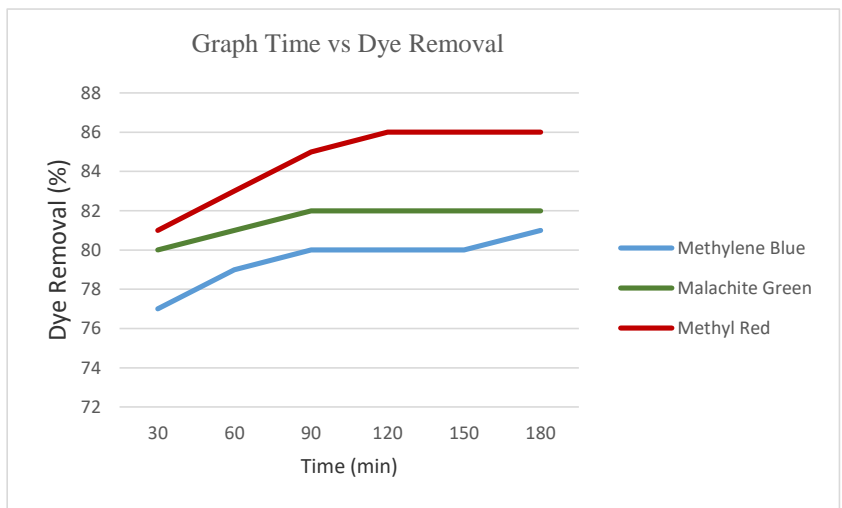

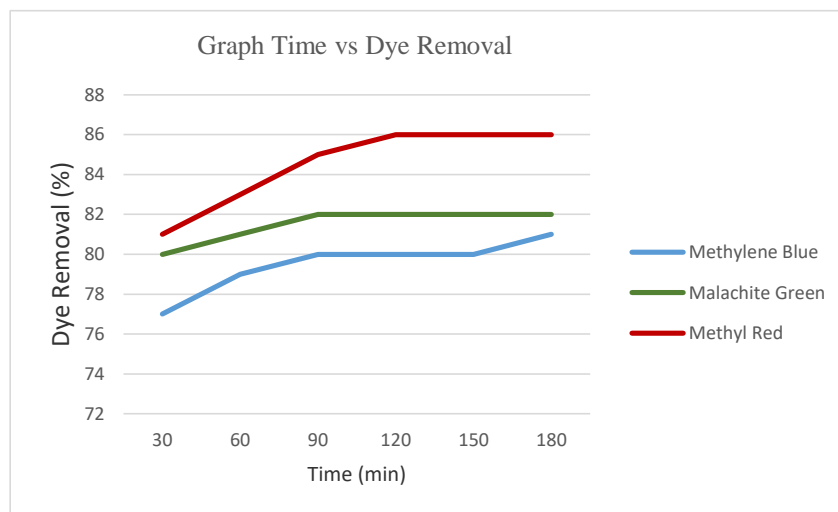Fig. 3 (b). Effects of contact time on dye absorption for formulation 3:2.

Fig. 3 (c). Effects of contact time on dye absorption for formulation 7:3.

Conclusion

The adsorbent of tea and coffee waste had been prepared. The ideal ratio of the combination of the waste also had been determined which is 1:1 ratio. The dosage, contact time and also pH test also had been conducted. The best dosage will be 2.5 gram, contact time will be 90 minutes and pH 10 is the optimum pH as it was determined. These will be supervised by rotating the adsorbents and the sample with the speed of 90 RPM.

Acknowledgement

References

Alinasafi, A., M. Khemis, M.N. Pons and J.P. Lecleric, 2005. Electro-coagulation of reactive textile dyes and textile waste water. Chem. Eng. Process J., 44(4): 461470.

Carneiro, P., Nogueira, R., & Zanoni, M. (2007). Homogeneous photodegradation of C.I. Reactive Blue 4 using a photo-Fenton process under artificial and solar irradiation. Dyes and Pigments, 74(1), 127-132. doi:10.1016/j.dyepig.2006.01.022

Churchley, J. (1994). Removal of Dye waste Colour From Sew Age Effluent – The Use of A Full Scale Ozone Plant. Water Science and Technology, 30(3), pp.275-284.

El-Geundi, M. S. (1997). Adsorbents for Industrial Pollution Control. Adsorption Science & Technology, 15(10), 777-787. doi:10.1177/026361749701501004

Jain AK, G. V. (2003). A comparative assessment of adsorbents prepared from industrial wastes for the removal of cationic dye. J Indian Chem Soc 80, 267-270.

Khattri, S. and Singh, M. (2019). Adsorption of basic dyes from aqueous solution by natural adsorbent. Indian Jounal of Chemical Technology, 6, pp.112-116.

Low, K., Lee, C. and Heng, L. (1994). Sorption of basic dyes byHydrilla verticillata. Environmental Technology, 15(2), pp.115-124.

Lustig, M., & Hill, W. E. (1967). The .mu.-oxo-difluorophosphines (CF3)2C(OPF2)I, (CF3)-2C(OPF2)Br, and (CF3)2C(OPF2)H. Inorganic Chemistry, 6(8), 1448-1450. doi:10.1021/ic50054a003

Mansour, H. B., Houas, I., Montassar, F., Ghedira, K., Barillier, D., Mosrati, R., & Chekir-Ghedira, L. (2012). Alteration of in vitro and acute in vivo toxicity of textile dyeing wastewater after chemical and biological remediation. Environmental Science and Pollution Research, 19(7), 2634-2643. doi:10.1007/s11356-012-0802-7

McKay, G., Porter, J. and Prasad, G. (1999). Water, Air, and Soil Pollution, 114(3/4), pp.423-438.

Meshko, V., Markovska, L., Mincheva, M., & Rodrigues, A. (2001). Adsorption of basic dyes on granular acivated carbon and natural zeolite. Water Research, 35(14), 3357-3366. doi:10.1016/s0043-1354(01)00056-2

Namasivayam, C., Prabha, D. and Kumutha, M. (1998). Removal of direct red and acid brilliant blue by adsorption on to banana pith. Bioresource Technology, 64(1), pp.77-79.

Ogugbue, C. J., & Sawidis, T. (2011). Bioremediation and Detoxification of Synthetic Wastewater Containing Triarylmethane Dyes by Aeromonas hydrophila Isolated from Industrial Effluent. Biotechnology Research International, 2011, 1-11. doi:10.4061/2011/967925

Raghuvanshi, S.P., R. Singh and C.P. Kaushik,(2004). Kinetics study of methylene blue dye bioadsorption on baggase. Applied Ecology and Environmental Research, 2(2): 35-34.

Robinson, T., B. Chandran and P. Nigam, 2002. Removal of dyes from asynthetic textile dye effluent by biosorption on apple pomace and wheat straw. Water Research, 36(11): 2824-2830

Şen, S., & Demirer, G. (2003). Anaerobic treatment of real textile wastewater with a fluidized bed reactor. Water Research, 37(8), 1868-1878. doi:10.1016/s0043-1354(02)00577-8

Singh, R.P., Singh, Y., Gupta, N., Gautam, A., Singh, A., Suman, R. and Kulshrestha, R.R., (2001). Removal of Cr (VI) from wastewater using activated carbon, flyash, rice husk and sawdust, Proc. X National Symposium on Envt., Bhabha Atomic Research Centre, Mumbai, pp. 143–147.

Raghuvanshi, S., Singh, R., Kaushik, C. and Raghav, A. (2005). Removal of textile basic dye from aqueous solutions using sawdust as bio-adsorbent. International Journal of Environmental Studies, 62(3), pp.329-339.

Kirk, O. (2004). Encyclopedia of Chemical Technology, v. 7, 5th Edition. Wiley-Inter- science: US

Mckay, G. (2007). Adsorption of dyestuffs from aqueous solutions with activated carbon I: Equilibrium and batch contact-time studies. Journal of Chemical Technology and Biotechnology, 32(7-12), 759-772. doi:10.1002/jctb.5030320712

Muthukumar, M. and N. Selvakumar, 2004. Studies on the effect of inorganic Salts on decolouration of acid dye effluents by ozonation . Dyes and Pigments, 62(3): 221228.

Panswed, T. and S. Wongchaisuwan, 1986. Mechanisms of Dye waste water colour removal by magnesium carbonate-hydrated basic. Water Sci. Technol., 18(3): 139-144.

Sanghi, R., & Bhattacharya, B. (2002). Review on decolorisation of aqueous dye solutions by low cost adsorbents. Coloration Technology, 118(5), 256-269. doi:10.1111/j.1478-4408.2002.tb00109.x

S. P. Raghuvanshi, Renu, S., C.P. Kaushik and A.K. Raghav (2005). Removal of textile basic dye from aqueoussolutions using sawdust as bio-adsorbent. *International Journal of Environmental Studies*, Vol. 62, No. 3, 329–339

Wijetunga, S., Li, X., & Jian, C. (2010). Effect of organic load on decolourization of textile wastewater containing acid dyes in upflow anaerobic sludge blanket reactor. *Journal of Hazardous Materials,177*(1-3), 792-798. doi:10.1016/j.jhazmat.2009.12.103

THE STUDY OF COSMETIC PRODUCTS USING BIOPOLYMER CELLULOSE BEADS

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Abstract

Plastic microbeads are produced in a wide range of consumer products from personal care products to abrasives and paints. The synthetic polymers do not biodegrade and their persistence in aquatic environments and of ingestion by marine organisms leading to potential dietary exposure for shellfish consumers. Cellulose is abundant renewable resource on earth will become the main chemical resource in the future. In addition to being prepared from a renewable resource, cellulose beads have the added benefit of being degraded by current wastewater treatment plants, so avoiding accumulation in aquatic ecosystems. The small size of synthetic microbeads allows them to elude removal in wastewater treatment plant. The synthetic microbeads in the cosmetics are often made of polyethylene / polypropylene which derived from plastics and take hundreds of years to break down in the environment. This study intends to use cellulose from plants sources, as a renewable source of raw material to make the biodegradable microbeads. The processes involved the preparation of cellulose solution and turn it into microbeads, making the body lotion with the addition of vitamin E and the analysis of the product. From the results obtained indicates that the pH of the product is suitable for the human skin due to the neutral pH range between 4.5 to 7.0. For the stability of the microbeads using centrifugation test, 60% of the cellulose solution is not easily breakdown compare to other concentration. The product is proven to be suitable by the results of patch test which gives negative effects to all the respondents. The biopolymer cellulose microbeads were successfully produced using natural derivatives. The body lotion produced is suitable to be used for the human skin. Thus, it is proven that cellulose microbeads are a good alternative to replace the synthetic microbeads commercially.

Keywords: Cellulose, Microbeads, Body Lotion

INTRODUCTION

Plastic microbeads are produced at scale for use in a wide range of consumer products from personal care products to abrasives and paints (Song, et al., 2014). The small size of the microbeads used in the range of sub-100 μm to ca. 500 μm for these personal care product application allows them to elude removal in wastewater treatment plant (Murphy, Ewin, Carbonnier & Quinn, 2016). The synthetic polymers employed do not biodegrade and there is strong evidence of their persistence in aquatic environments and of ingestion by marine organisms leading to potential dietary exposure for shellfish consumers (Van Cauwenberghe & Janssen, 2014). It was estimated that in the USA as many as 8 trillion microbeads are transferred into aquatic habitats daily (Rochman, et al 2015). This evidence, combined with increased public awareness of the issue (The Guardian, 2017) has led to the passing of legislation banning microbeads, notably in the USA (U.S. Congress, 2015) with the UK expected to follow suit by October 2017 (Hirst & Bennet 2015). While many producers of personal care products have responded by phasing out plastic microparticles in their products, replacements do not always offer the same performance characteristics as plastic microbeads. In addition to the personal care product applications highlighted, plastic microbeads are used in significant quantities as abrasives and polymeric fillers which have the potential to result in significant release to the environment. Microbeads used in the cosmetics industry are often

made of polyethylene or polypropylene, which are cheap and easy to make. However, these polymers are derived from plastics and they take hundreds of years to break down in the environment.

The distinction between microbeads and microplastics is important, but the problem they cause is ultimately the same. It is estimated that between 15 and 51 trillion microplastic particles have accumulated in the ocean, with Europe alone flushing between 80,000 and 219,000 tons of microplastics into the sea each year (Klemm, Heublein, Fink & Bohn, 2005). More than 280 marine species are known to ingest microplastics, a number that is only going to grow. And the damage they cause is becoming increasingly clear. Their size, their surface area and the sheer number of them makes microbeads a huge problem once they make it into marine ecosystems.

Cellulose is a biopolymer material, the most abundant renewable resource on earth will become the main chemical resource in the future (Eichhorn, Young, & Davies, 2005; Schurz, 1999). It is a valuable source of energy, renewable, biodegradable and bio-compatible which produced from natural resources up to 1 trillion tonnes per year (Zhang 2005). Cellulose is hydrophilic in nature and tends to absorb a high proportion of water due to the large number of hydroxyl groups. The great amount of intermolecular hydrogen bonds in cellulose chains can be broken and modified for various purposes (Luo & Zhang 2010a; Ruan, 2004; Zhang, 2005). The hydroxyl groups in cellulose are the main focus in the modification of cellulose to be used in the formation of regenerated cellulose materials (Chen 2006; Yang, 2001). Moreover, numerous new functional materials from cellulose are being developed over a broad range of application because of the increasing demand for environmentally friendly and biocompatible products (Klemm, Heublein, Fink, & Bohn, 2005). In addition to being prepared from a renewable resource, cellulose beads have the added benefit of being degraded by current wastewater treatment plants, so avoiding accumulation in aquatic ecosystems (Pérez, Muñoz-Dorado, De La Rubia & Martínez, 2002).

MATERIALS AND METHODS

Preparation of Cellulose Solution

Materials

Hydroxyethyl Cellulose were obtained at Finn Chemical Sdn Bhd. Vitamin E Acetate, Sunflower Oil and Beeswax were obtained at Finn Chemical Sdn. Bhd. Span 80 were obtained at SI Labshop. Coconut Oil and Rosewater were obtained at TESCO supermarket. Methanol, Acetone and n-hexane were obtained at Laboratory at Nilai Polytechnic.

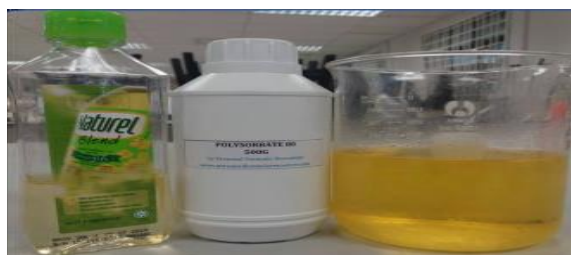Figure 2.1: Prepared Cellulose Solution

Figure 2.2: Prepared Sunflower Oil-Span 80 Solution

1g of Hydroxyethyl Cellulose will dissolved in 20ml of solvent (1:9 (v/v) Methanol:Acetone). Vitamin E (20g) dispersed in the hydroxyethyl cellulose solution to give a final concentration of 1mg/ml such shown in Figure 2.1. The mixture mixed well and slowly emulsify into 100ml of sunflower oil that contain 1ml of Span 80 as an emulsifier such shown in Figure 2.2. The whole system will continuously be stirred at 2000rpm for 5 hours at room temperature. Acetone and methanol will completely remove by evaporation. The beads will separate from the solution by filtration. The filtered beads that formed will wash three times with 50ml of n-hexane to remove the residual sunflower oil and then collect, dry at room temperature overnight and stored in a desiccator. (AAPs PharmSci:Tech, vol.10, No 4, December 2009).

Preparation of the Lotion
20ml of coconut oil and 4g of beeswax transferred into respective beakers. All ingredients have to heat, to about 50°C. Direct heating is not recommended and use water bath instead. Be careful with the hot water or surfaces. Melt the content of beaker using the water bath. Swirl or stir the content until the beeswax melts. Do not pour or spill any of the small beakers content into the water bath. Remove beaker that contain coconut oil from the water bath. Warm the beeswax. Once both contents had been warmed, pour the melted beeswax into beaker that contains coconut oil. Immediately, stir the mixture continuously. We notice that the mixture texture as we stir. Then few drops of pure rosewater added to the mixture (Chitumbo, K.; Brown, W. J. Polym. Sci., Part C: Polym. Symp. 1971).

pH Test of the Cellulose Solution

Materials
The pH meter and pH paper were obtained at the Bioprocess Technology Laboratory.

Method
The pH meter were calibrated using standard buffer solution. 5g of the product were weighed in 100 ml of beaker and were dissolved in 45 ml of distilled water dispersed the cellulose solution in it. The pH of the product were measured by using the pH meter and pH paper. The pH measurement of the product were triplicated (Keshwar et al., 2016).

pH Test of The Lotion

Materials
The pH meter and pH paper were obtained at the Bioprocess Technology Laboratory.
Method
The pH meter was calibrated using standard buffer solution. 5g of the product were weighed in 100 ml of beaker and were dissolved in 45 ml of distilled water dispersed the lotion in it. The pH of the product was measured by using the pH meter and pH paper. The pH measurement of the product was triplicated (Keshwar et al., 2016).

Centrifuge Test

Materials
Cellulose solution and sunflower oil-Span 80 solution

Method
4 different concentrations (20%, 40%, 60%, and 80%) of cellulose solution were prepared. The beads were produced by using 20%, 40%, 60%, and 80% of cellulose solution. The beads were centrifuged in 400rpm under room temperature (DeLa et al., 2015).

Viscosity Test
Materials
Dettol were obtained at the Bioprocess Technology Laboratory and Lotion.

Method
The skin was cleaned by using Dettol. 2 drops of lotion were applied on the skin. Feel the texture of the lotion while apply on the skin. The result was based on the concentration of the beeswax and the physical state.

Patch Test

Materials
Dettol were obtained at the Bioprocess Technology Laboratory and Lotion that contain biopolymer cellulose beads.

Method
The skin was cleaned by using Dettol. 2 drops of lotion which contains cellulose beads was applied on the skin. Then cover the lotion by sterile cotton. This test undergoes by survey. 30 Polytechnic Nilai students take part in this survey. The result was obtained based on the effectiveness of lotion towards skin allergic, burning, irritation, redness and stinging. Positive result shows the presents of skin allergic, burning, irritation, redness and stinging. Negative result shows there are no any skin allergic, burning, irritation, redness and stinging.

RESULT
pH Testing

Cellulose solution (%)	Cellulose solution (pH)	Lotion (pH)
20%		
40%	6.33	5.5
60%		
80%		

Table 3.1: pH test for cellulose solution in different concentration and lotion

The pH of human skin normally ranges from 4.5 to 7.0 and 5.5 is considered as an average pH of human skin. This shows the cellulose solution and lotion is safe for skin usage.

Centrifugation Testing

Cellulose solution (%)	The stability of the beads
20%	Easily breakdown
40%	Easily breakdown
60%	Stable
80%	Too hard

Table 3.2 : Centrifuge test for cellulose beads

At 60% of the cellulose solution no breakdown of cellulose beads were seen which kept in the centrifuge compare to other concentration. So that, the beads were produced at the concentration of 60%.

Patch Testing

Effectiveness of lotion	Results
Allergic	Negative
Burning	Negative
Irritation	Negative
Redness	Negative
Stinging	Negative

Table 3.3 : Patch result for lotion

All the results for the effectiveness showed negative which indicate that the lotion was not harmful to skin.

Viscosity Testing

Amount of beeswax for 150ml of coconut oil	Texture of the lotion
16g	Too liquid
32g	liquid
64g	Smooth and silky
128g	Solidify

Table 3.4 : Viscosity test for the lotion

Based on the results, it showed that 64g of beeswax was suitable for 150ml of virgin coconut oil to make lotion.

DISCUSSIONS

pH Testing
The pH of human skin normally range from 4.5 to 7.0 and 5.5 is considered as an average pH of human skin. The pH level of the skin refers to how acidic or alkaline it is. On a scale of 1-14, with 1 being the most acidic to 14 being the most alkaline, 7 is considered a neutral reading for the skin's pH. Human skin has a thin, protective layer on its surface, referred to as the acid mantle. This acid mantle is made up of sebum (free fatty acids) excreted from the skin's sebaceous glands, which mixes with lactic and amino acids from sweat to create the skin's pH. Therefore, in order for a formulation to possibly gain admission for industrial application, it should have a pH that is close to this range. The pH of cellulose solution in different concentration was 6.33 and the pH for lotion was 5.50 as mentioned in Table 3.1. In general, products with pH above 8 may be irritating to the skin (Frollini & Jacobson, 2006). pH test on

a product must be carried out because increase in pH causes an increase in dehydrate effect, irritability and propioni bacterial count. Changes in the pH are reported to play a role in the pathogenesis of some skin disease (Tarun, Susan, Suria, Susan & Criton, 2014).

Centrifugation Testing

Centrifugation test result for the cellulose beads were given in Table 3.2 and evaluated based on the stability of the beads to breakdown. At 60% of the cellulose solution, no breakdown of cellulose beads were seen which kept in the centrifuge compare to other concentration. Thus, the beads were produced at the concentration of 60%. It can be concluded that the beads were stable under the centrifugation testing.

Centrifugation can be used for solid-liquid separation provided the solids are heavier than the liquid. Centrifuge can also be used to separate a heavy phase, and two lighter liquid phases, with one of the lighter phases being lighter than the other. As discussed, solids can be lighter than liquid and separation is by flotation of the dispersed solid phase. One of the several possible applications is to classify crystals of different size range, with the finer submicron sizes leaving with the light phase and retaining only the larger sizes in the separated heavy phase. In this study, the product that produced which is cellulose beads was undergoes the centrifugation test in order to determine the degree of confidence in the long-term shelf life. Based on the result, the cellulose beads does not break in the distilled water that added in the centrifuge tube at the concentration of 60%. This shows that formulation of the products is stable and it has long-term shelf life.

Patch Testing

Patch test result for the lotion were shown in Table 3.3 and evaluated based on the effectiveness of the lotion. The patch test was carried out for 24 hours on a human skin. During the test, respondents should avoid bathing and activities that cause heavy sweating. The patches were removed after 24 hours and irritated skin at the patch site may indicate an allergy. All the results for the effectiveness showed negative results which indicate that the lotion was not harmful to skin.

Patch testing is generally done to see whether a particular substance is causing allergic skin irritation. Patch tests can detect delayed allergic reactions, which can take several days to develop. During a patch test, the skin may be exposed to 20 to 30 extracts of substances that can cause contact dermatitis. These can include latex, medications, fragrances, preservatives, hair dyes, metals and resins. A positive skin test means that the person may be allergic to a particular substance. Bigger wheals usually indicate a greater degree of sensitivity. A negative skin test means that the person probably are not allergic to a particular allergen. Based on the result of this study, all the results were negative which mean it is not allergic to skin and other particular allergen.

Viscosity Testing

Viscosity test was carried out to measure the texture of the lotion and the result was shown in Table 3.4. The test is done to determine how much of beeswax needed for 150ml of virgin coconut oil so that the lotion can be smooth and silky. Based on the results, it showed that 64g of beeswax was suitable for 150ml of virgin coconut oil.

Viscosity is often referred to as the thickness of a fluid, where water has a low viscosity and honey has a high viscosity. There are two methods to determine the viscosity of a material, kinematic and dynamic, and both can be determined under controlled temperature. One important purpose of viscosity determination is to determine the dilute solutions of polymers. For most polymers, there is a relationship between average molar mass and the relative increase of viscosity in dilute solution.

CONCLUSION

As a conclusion to the findings, it indicates that the biopolymer antioxidant cellulose beads are suitable for human usage and for the skin. This biopolymer cellulose beads were successfully made from natural derivatives which is less harmful for organisms and marine life. It can be prove that it is not harmful to human skin. Synthetic plastic beads are not suitable for human usage and skin because plastic takes many decades to break down and leading to widespread accumulation in the natural environment. Firstly, the cellulose beads were prepared at the concentration of 60% cellulose solution. Then it was undergoes the centrifugation test and the beads were stable at the concentration of 60%. Secondly, lotion was successfully prepared using virgin coconut oil. 64g of beeswax was used for 150 ml of coconut oil to prepared smooth and silky lotion. Next, in the result for patch test all the results obtained were negative which means it is not harmful to the skin. The pH for the both product were found to be in range of 4.0-6.0 which is good for skin pH. Furthermore, when the samples were kept for 7 days, it was found that no changes in colour and the texture of the products.

REFERENCES

Eichhorn, S. J., Young, R. J., & Davies, G. R. (2005). Modeling Crystal and Molecular Deformation in Regenerated Cellulose Fibers. Biomacromolecules, 6, 507.

Klemm, D., Heublein, B., Fink, H., & Bohn, A. (2005). Cellulose: Fascinating Biopolymer and Sustainable Raw Material. Angewandate Chemie International Edition, 44, 3358.

Napper, I. E.; Bakir, A.; Rowland, S. J.; Thompson, R. C. Characterisation, Quantity and Sorptive Properties of Microplastics Extracted from Cosmetics Mar. Pollut. Bull. 2015, 99 (1–2) 178– 185.

Pérez, J.; Muñoz-Dorado, J.; Dela Rubia, T.; Martínez, J. Biodegradation and Biological Treatments of Cellulose, Hemicellulose and Lignin: An Overview Int. Microbiol. 2002, 5 (2) 53– 63.

Song, Y. K.; Hong, S. H.; Jang, M.; Kang, J. H.; Kwon, O. Y.; Han, G. M.; Shim, W. J. Large Accumulation of Micro-Sized Synthetic Polymer Particles In The Sea Surface Microlayer Environ. Sci. Technol. 2014, 48 (16)9014– 9021.

Van Cauwenberghe, L.; Janssen, C. R. Microplastics In Bivalves Cultured for Human Consumption Environ. Pollut. 2014, 193, 65– 70.

Zhang, Q. L.; Shi, F.; Wang, P.; Lin, D. Q.; Yao, S. J. Preparation Of Cellulose Adsorbents With Ionic Liquid And Pore Expansion For Chromatographic Applications J. Appl. Polym. Sci. 2014, 131 (7) 1– 8.

KAJIAN PENGGUNAAN BAHAN BUANGAN SISA PERTANIAN TERHADAP PEMBUATAN PRODUK LANSKAP SIMEN FERRO

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Abstrak

Simen ferro merupakan salah satu elemen landskap kejur daripada gabungan simen, pasir, air dan rangka besi. Kajian ini adalah bertujuan lebih kepada pembuatan produk landskap iaitu menggunakan teknik simen ferro dengan menggunakan bahan buangan pertanian bagi mencapai konsep pembuatan produk secara lestari. Metodologi simen ferro telah dijalankan ini menggunakan gabungan simen dan bahan buangan sisa pertanian seperti sekam padi bakar dan sabut kelapa bagi menggantikan pasir dalam pembuatan produk simen ferro. Hasil dapatan kajian menunjukkan bahan buangan sisa pertanian seperti sekam padi dan sabut dapat digunakan sebagai produk landskap Simen Ferro. Penggunaan bahan buangan sisa pertanian semula jadi ini menghasilkan inovasi produk simen ferro lebih ringan, mesra alam, mudah selenggara dan mudah alih berbanding produk lanskap simen ferro menggunakan pasir. Kesimpulan kajian ini dapat mengubah persepsi pengguna terhadap produk lanskap simen ferro bukan lagi di anggap sebagai objek berat dan pegun tetapi boleh diinovasikan menjadi lebih lestari, mudah alih dan mesra alam.

Kata Kunci: Simen ferro, sisa pertanian , lanskap, lestari

PENGENALAN

Industri lanskap di Malaysia banyak menggunakan simen ferro sebagai sebagai eleman tambahan dalam penghasilan sebuah taman lanskap. Kebanyakan produk lanskap berasaskan teknik Simen Ferro adalah seperti kerusi, meja, arca, papan tanda, taman mini, pemijak kaki, kolam air dan sebagainya. Minat dan kecenderungan kepada eleman kecantikan hiasan halaman rumah dan gaya hidup yang gemar kepada landskap semula jadi menyebabkan industri produk simen ferro di negara ini masih mendapat permintaan tinggi oleh pengguna.

Simen Ferro merupakan satu elemen landskap kejur yang terdiri dari struktur binaan yang terdiri daripada campuran air, simen dan pasir. Campuran ini yang dilepa nipis pada jejaring dawai keluli yang dibentuk mengikut kehendak. Simen ferro adalah sejenis produk landskap yang berdinding nipis dan diperbuat daripada konkrit dan biasanya terdiri daripada simen bersama bersama lapisan jaringan dawai kecil sebagai pengukuhan dan pembentukan (ACI, 1997). Roberto Gargiani, (2016) menyatakan nama simen ferro ini diberikan oleh Profesor Pier Luigi Nervi dari Itali yang merujuk kepada gabungan bahan mortar simen dengan

lapisan dawai dan besi (ferus). Samsida Samsudin, (2012) menyatakan teknik simen Ferro mula diperkenalkan di Malaysia pada tahun 1979 bermula di Universiti Pertanian Malaysia (UPM).

Peningkatan industri nurseri lanskap yang menjual produk lanskap simen ferro menjadi titik tolak penghasilan satu produk baru dalam pembuatan produk lanskap simen ferro. Selain itu, produk yang dihasilkan mampu menjana pendapatan di samping menjimatkan kos pengeluaran serta membantu usaha dalam pemuliharaan alam sekitar.

Kebanyakan produk lanskap simen ferro yang dihasilkan adalah jenis campuran simen dan pasir. Campuran ini menyebabkan produk yang dihasilkan adalah berat. Ini menyebabkan tanggapan pengguna yang mengatakan produk lanskap simen ferro adalah produk lanskap yang berat, sukar dijadikan produk mudah alih dan rumit untuk diselenggara.

Masalah kekurangan bahan asas semin ferro iaitu pasir juga menjadi penghalang kepada industri landskap. Ini kerana buat masa ini penghasilan semin ferro lebih tertumpu kepada penggunaan pasir sebagai bahan asas utama. Kesan dari masalah ini kajian mortar simen dengan menggunakan bahan buangan sisa pertanian sekam padi dan sabut kelapa diperkenalkan sebagai usaha untuk menggantikan penggunaan pasir dalam pembuatan simen ferro.

Penggunaan bahan sisa pertanian ini juga mampu melestarikan alam sekitar. Ini dapat mengurangkan aktiviti pengorekan pasir sungai untuk tujuan komersil. Pengorekan pasir sungai yang berleluasa sama ada secara halal mahupun haram akan merosakkan ekosistem alam sekitar. Sikap masyarakat yang kurang peduli kepada alam sekitar juga turut menyumbang kepada permasalahan ini.

Kajian ini bertujuan untuk menghasilkan produk lanskap simen ferro menggunakan bahan buangan sisa pertanian semula jadi seperti sekam padi dan sabut kelapa sebagai bahan gantian pasir. Selain itu .Untuk membuktikan produk lanskap simen ferro menggunakan bahan buangan sisa pertanian semula jadi lebih ringan berbanding produk lanskap simen ferro menggunakan.

KAJIAN LITERATUR

Gram 1983 menyatakan simen diperkukuh gentian mortar semula jadi atau produk konkrit yang menggunakan gentian seperti sabut kelapa, sisa organik, hampas tebu, buluh dan sebagainya telah dihasilkan dan diuji di lebih 40 negara. Kajian Barros 2013 pula menyatakan kelebihan menggunakan rumpai laut semula jadi sebagai bahan polimer tambahan menghasilkan mortar simen yang menunjukkan prestasi sangat baik dari segi mekanisme ikatan, kekuatan, dan ketahanan untuk mencapai kelestarian. Ini menunjukkan penggunaan bahan semula jadi selain pasir dalam pembuatan mortar simen seperti sabut kelapa dan sekam padi boleh digunakan serta menepati syarat produk yang bersifat lestari terhadap alam sekitar.

Berdasarkan kajian yang dijalankan oleh A.M Waliuddin, dan S.F.S. Rafeeqi, (1994) mengenai konkrit dengan simen ferro parameter yang digunakan untuk mengkaji kesesuaian konkrit dengan simen ferro adalah dengan nisbah campuran simen dan pasir (1: 1.5, 1:2, 1:3) dan kaedah lepaan (melepa lapisan mortar pada dawai mesh). Nisbah air untuk bancuhan simen yang menggunakan adalah di antara 0.55-0.60. Kesesuaian penghasilan mortar simen menggunakan bahan semula jadi boleh dilakukan berdasarkan nisbah campuran simen.

PERMASALAHAN KAJIAN

Kebanyakan produk lanskap Simen Ferro yang dihasilkan adalah jenis campuran simen dan pasir. Produk tersebut yang dihasilkan adalah berat kerana campuran simen dan pasir. Ini menyebabkan tanggapan pengguna yang mengatakan produk lanskap Simen Ferro adalah produk lanskap yang berat, sukar dijadikan produk mudah alih dan rumit untuk diselenggara.

Disamping itu, penggunaan pasir dalam pembuatan mortar simen sering digunakan sebagai asas pembuatan Simen Ferro. Masalah kekurangan pasir sungai yang menjadi penghalang kepada industri lanskap. Inovasi mortar simen dengan menggunakan bahan semula jadi alternatif seperti sabut kelapa dan tanah organik diperkenalkan sebagai usaha untuk menggantikan penggunaan pasir dalam pembuatan Simen Ferro.

Malah penggunaan bahan semula jadi alternatif juga mampu melestarikan alam sekitar. Pengorekan pasir sungai yang berleluasa sama ada secara halal mahupun haram akan merosakkan ekosistem alam sekitar. Sikap masyarakat yang kurang peduli kepada alam sekitar juga turut menyumbang kepada permasalahan ini.

OBJEKTIF KAJIAN

i.   Untuk menghasilkan produk lanskap Simen Ferro menggunakan bahan semula jadi alternatif seperti sabut kelapa dan tanah organik sebagai bahan lestari.

ii.   Untuk membuktikan produk lanskap Simen Ferro menggunakan bahan semula jadi alternatif lebih ringan berbanding produk lanskap Simen Ferro menggunakan pasir.

METODOLOGI KAJIAN

Prosedur Dan Langkah Kerja

Kajian ini dijalankan dengan menghasilkan produk lanskap simen ferro yang direka bentuk pasu bunga menyerupai potongan log kayu yang dipotong. Sampel produk lanskap simen ferro yang dihasilkan merangkumi 3 jenis iaitu:
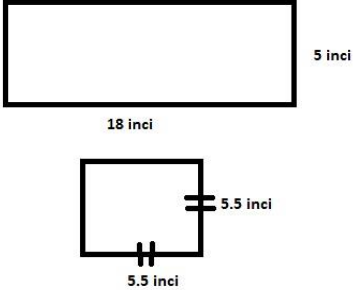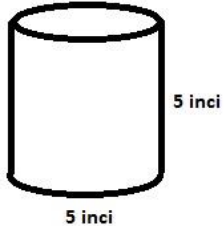
i.   Produk lanskap simen ferro dengan konvensional pasir.
ii.   Produk lanskap simen ferro dengan sisa pertanian sekam padi.
iii. Produk lanskap simen ferro dengan sia pertanian sabut kelapa.

Bahan dan peralatan yang diperlukan untuk menghasilkan produk lanskap simen ferro.
i.   Bahan untuk mortar simen:
      - Simen portland
      - Pasir sungai
      - Sabut Kelapa (hancur)
      - Sekam padi (dibakar)

ii.   Bahan untuk rangka produk Simen Ferro:
      - Dawai BRC ½ x ½
      - Dawai mesh
      - Dawai pengikat

iii. Bahan untuk kemasan dan kecantikkan:
      - Cat untuk hiasan dalaman warna hitam, coklat, kuning dan merah.
      - Cat jenis 'clear' atau cat kilat.

Prosedur dan langkah kerja untuk menghasilkan produk lanskap simen ferro

Jadual 1 : Langkah Kerja

Bil	Langkah Kerja	Gambar Rajah
1.	<u>Memotong dawai untuk rangka</u> - Rangka produk simen ferro haruslah dibentuk terlebih dahulu dengan memotong dawai BRC ½ x ½ dan dawai mesh dengan ukuran 18 inci panjang dan 5 inci lebar seperti gambar rajah untuk bahagian dinding. - Manakala untuk bahagian penutup pula ukuran petak segiempat tepat 5.5inci x 5.5inci.	
2.	<u>Membina rangka dawai</u> - Seterusnya lenturkan rangka dawai BRC ½ x ½ menjadi bulat dan ikatkan dengan dawai pengikat untuk menjadi lapisan pertama bersama penutup. - Selepas itu, lenturkan rangka dawai mesh sebagai lapisan kedua diikat bersama dengan lapisan pertama.	
3.	<u>Kerja menyimen dan melepa</u> - Produk pertama: Nisbah campuran simen, pasir dan air dibancuh berdasarkan nisbah 1 : 2 : 0.7. Selepas dibancuh lepa simen pada bahagian luar rangka dawai dan biarkan sehingga keras dalam tempoh 2-3 jam. - Produk kedua dan ketiga: nisbah campuran simen dengan bahan buangan sisa pertanian semulajadi ditentukan dengan mencampur sedikit demi sedikit sehingga mendapat campuran yang sekata.	
4.	<u>Kerja kemasan dan mengecat</u> Sebelum mengecat, lorekan pada luaran perlu dilakukan untuk menampak kesan ukiran bentuk kayu. Tambahan simen dilakukan untuk kemasan. Kerja mengecat dilakukan: - Warna coklat dan hitam untuk kulit kayu - Warna kuning, coklat dan merah untuk bahagian kayu yang dipotong - Warna cat kilat untuk kemasan terakhir	

Produk lanskap yang telah siap akan dijemur sehingga kering

DAPATAN DAN ANALISIS KAJIAN
Berdasarkan keputusan kajian, produk lanskap simen ferro yang menggunakan sekam padi

dan sabut kelapa menunjukkan keputusan positif. Hasil dapatan kajian memperlihatkan penggunaaan bahan sisa pertanian ini berjaya menghasilkan produk yang lebih ringan. Selain itu penggunaan pasir juga dapat dikurangkan dengan terhasilnya keputusan ini. Data analisis ditunjukkan dalam jadual 2.

Jadual 2 : Data Produk Lanskap Simen Ferro

DATA BANCUHAN	Simenferro + Pasir	Simenferro + Sekam padi	Simenferro + Sabut Kelapa
Simen	½ kg	½ kg	½ kg
Bahan semulajadi	1 kg pasir	200 g	150 g
Air	350 ml	300 ml	300 ml
Nisbah Simen + Bahan semula jadi + air	1 : 2 : 0.7	1 : 0.4 : 0.6	1 : 0.3 : 0.6
Berat bahan selepas bancuhan	1.85 kg	1.05 kg	0.95 kg
Berat produk selepas siap dibentuk	1.4 kg	0.7 kg	0.68 kg
Kemasan Simen	225 g simen + 100 ml air	225 g simen + 100 ml air	225 g simen + 100 ml air
Berat sebenar produk selepas kemasan	1.475 kg	0.75 kg	0.735 kg

KESIMPULAN
Kesimpulan kajian ini menunjukkan penggunaan bahan sisa pertanian seperti sekam padi dan sabut kelapa sesuai digunakan dalam penghasilan produk lanskap simen ferro. Kedua-dua bahan tersebut sesuai kerana berat produk yang dihasilkan tidak mempunyai begitu banyak perbezaan. Di samping itu, penggunaan bahan semulajadi alternatif tersebut mudah dibentuk dan mudah dilepa berbanding penggunaan bahan berasaskan pasir dalam mortar simen. Produk juga menjadi lebih ringan dan mudah untuk dibawa serta dijadikan sebagai produk pasu bunga dengan berkesan. Keseluruhan kajian ini dapat mengubah persepsi pengguna terhadap produk lanskap simen ferro bukan lagi di anggap sebagai objek berat dan pegun tetapi boleh diinovasikan menjadi lebih lestari, mudah alih dan mesra alam.

RUJUKAN
ACI Committee 307, (1997) "Standard Practice For The Design And Contruction ff Cast In Place Reinforced Concrete Chimneys (ACI 307-98)," American Concrete Institute, Farminton Hiils, MI, 1998, 32 pp. Also ACI Manual of Concrete Practice.
Barros, FCN., da Silva, DC., Sombra, VG., Maciel, JC, Feitosa, JPA., Freitas, ALP., de Paula, RCM. 2013. Structural characterization of polysaccharide obtained from red Seaweed Gracilaria caudata (J Agardh), Short communication, Carbohydrate Polymers 92, pp. 598– 603.
Gram, H. E. (1983). "Methods of reducing tendency towards embrittlement in sisal fiber concrete," Nordic Concrete Research, 5, 62-71.
Samsida Samsudin, (2014). Reinforced concrete construction. Terbitan Universiti Putra Malaysia Institutional Repository.
Waliuddin A.M and Rafeeqi S.F.A. (1994) Study of the behaviour of plain concrete confined with ferrocement. Journal of Ferrocement, 24 (2): 139-151.

KAJIAN TENTANG KEBOLEHGUNAAN PENGGUNAAN 'SMART SQUARE RULER' DALAM PEMBELAJARAN: SATU KAJIAN DI POLITEKNIK NILAI

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Abstrak

Pada masa kini, industri amat bergantung penuh terhadap penggunaan tenaga kerja manusia yang berkemahiran tinggi. Bagi memenuhi permintaan industri di dalam bidang Hortikultur Landskap, Jabatan Pengajian Politeknik Malaysia telah mencari insiatif dengan menawarkan kursus teras DYL 3012 Planting Design untuk Diploma Hortikultur Lansdkap. Kursus ini membina kemahiran melukis dalam bidang lukisan senibina landskap yang lebih profesional. Ia juga dapat mengukuhkan lagi pengetahuan asas lukisan serta membolehkan pelajar mempraktikkan pengetahuan sedia ada kepada situasi sebenar dalam alam pekerjaan kelak (Jabatan Pengajian Politeknik Malaysia, 2011). Satu inovasi telah dicipta oleh pensyarah Jabatan Agroteknologi & Bio-industri bagi memudahkan pelajar mempraktikkan asas lukisan senibina landskap. Inovasi tersebut adalah 'Smart Square Ruler' iaitu hasil gabungan daripada tiga jenis alatan melukis (pembaris, pembaris sesiku segitiga dan protractor). Penyelidikan ini adalah bertujuan untuk meninjau keberkesanan penggunaan 'Smart Square Ruler' di dalam pembelajaran, khususnya bagi kursus DYL 3012 Planting Design. Kepelbagaian ciri 'Smart Square Ruler' ternyata membawa impak yang positif dari aspek kemudahan penggunaan, aspek penjimatan masa dan aspek rekabentuk. Penggunaan Smart Square Ruler' dapat menarik minat pelajar terhadap proses pembelajaran dan sekaligus meningkatkan kemahiran pelajar melukis reka bentuk landskap dalam memenuhi kehendak industri di dalam bidang Hortikultur Landskap.

Kata Kunci: Smart Square Ruler, Hortikultur Landskap, inovasi

PENGENALAN

Jabatan Pengajian Politeknik dan Kolej Komuniti Malaysia memainkan peranan penting dalam mereka bentuk kaedah pengajaran dan pembelajaran yang efisien bagi menghasilkan pasaran sumber guna tenaga yang berkemahiran. Ini kerana keupayaan industri amat bergantung penuh terhadap penggunaan tenaga kerja manusia yang berkemahiran tinggi, berketerampilan, mampu bekerja secara berkumpulan dan mempunyai kemahiran visualisasi yang baik (Muhyiddin, 2010). Di dalam Pelan Pembangunan Pendidikan Malaysia 2015-2025 (Pengajian Tinggi), Kementerian Pendidikan memperkemaskan sistem pendidikan di peringkat pengajian tinggi bagi meningkatkan kemahiran pelajar untuk memenuhi keperluan industri (Kementerian Pendidikan Malaysia, 2015). Oleh itu, Jabatan Pengajian Politeknik dan Kolej Komuniti Malaysia telah menawarkan Diploma Hortikultur Landskap bagi memenuhi keperluan industri di dalam bidang hortikultur landskap.

Diploma Hortikultur Landskap (DLH) di Politeknik Nilai dibentuk untuk menyediakan graduan yang berpengetahuan serta mempunyai kemahiran melalui pengalaman pendidikan bersepadu dalam bidang sains hortikultur dan senibina landskap. Objektif program ini adalah untuk memberi pendidikan serta pengetahuan hortikultur landskap pada peringkat separa professional bagi memenuhi keperluan industri dalam sektor awam mahupun swasta. Program ini juga dapat melengkapkan para graduan dengan pengetahuan dan kemahiran mereka bentuk landskap. Pelajar perlu membuat pelan landskap yang memerlukan kemahiran melukis secara

manual mahupun mekatronik. Struktur program Diploma Hortikultur Landskap ada menawarkan beberapa kursus yang melibatkan pelan landskap iaitu kursus DYL 3012 Planting Design. Salah satu matlamat kurikulum mata pelajaran DYL3012 Planting Design yang dibina adalah untuk memperkembangkan kemahiran melukis serta pelajar dapat mengaplikasikan pengetahuan melukis tersebut (Jabatan Pengajian Politeknik Malaysia, 2011). Selain itu, ia bertujuan mengukuhkan lagi pengetahuan asas lukisan serta membolehkan pelajar mempraktikkan pengetahuan sedia ada kepada situasi sebenar dalam alam pekerjaan (Jabatan Pengajian Politeknik Malaysia, 2011).

Alatan konvensional untuk melukis lukisan geometri di dalam pelan landskap terlampau banyak dan menyukarkan pelajar serta mengambil masa yang agak lama untuk menyiapkan sesuatu reka bentuk. Pelajar perlu bawa 3 jenis alatan melukis iaitu pembaris, pembaris sesiku segitiga dan protraktor. Oleh itu pelajar sering tertinggal salah satu pembaris dan lambat menyiapkan tugasan yang diberi kerana penggunaan pembaris yang banyak. Berpandukan hal tersebut, pensyarah Jabatan Agroteknologi & Bio-industri, Politeknik Nilai telah mencipta satu inovasi bagi membantu pelajar membuat visualisasi pada konsep melukis dengan cara yang cepat dan cekap. 'Smart Square Ruler' (SQR) adalah satu inovasi hasil daripada gabungan beberapa jenis pembaris (pembaris, pembaris sesiku segitiga, protractor) yang sering digunakan pelajar di dalam melukis pelan landskap. 'Smart Square Ruler' merupakan alat pengukur serba guna yang berkonsepkan pelbagai fungsi dan sangat mudah digunakan. Penggunaan alat ini boleh diaplikasikan dalam pelbagai cara seperti mengukur pelan lukisan, menentukan skala lukisan atau melakar pelbagai bentuk lukisan pelan landskap.

Kajian ini juga sebenarnya ingin memperlihatkan bagaimana penggunaan 'Smart Square Ruler' memainkan peranannya, khususnya di dalam pengajaran dan pembelajaran DYL3012 Planting Design yang sememangnya merupakan kursus wajib bagi pelajar DLH di Politeknik Nilai. Dengan adanya 'Smart Square Ruler' pelajar dapat mempercepatkan masa melukis semasa proses pengajaran dan pembelajaran kerana ia mudah dikendalikan. Objektif kajian ini adalah untuk:

1. Untuk mengetahui tahap keberkesanan pelajar tentang penggunaan 'Smart Square Ruler' dalam pembelajaran DYL3012 Planting Design.

2. Untuk mengetahui persepsi pelajar perbandingan penggunaan 'Smart Square Ruler' dengan alatan melukis konvesional sedia ada iaitu pembaris, pembaris sesiku segitiga dan protraktor.

TINJAUAN LITERATUR
Terdapat beberapa kajian menunjukkan bertapa pentingnya kemahiran pelajar dalam memenuhi kehendak majikan. Majikan lebih cenderung kepada pekerja yang mampu menampilkan kombinasi kemahiran teknikal, kemahiran kendiri dan kemahiran hubungan antara manusia (Abd Hair, Azizi & Rahmah, 2003; Laporan Eksekutif Graduan Politeknik, 2008). Ciri-ciri ini amat diperlukan dalam semua sektor pekerjaan di Malaysia. Sadegh, Ali & Davood, 2012 menyatakan tenaga kerja yang berpendidikan dan berkemahiran lebih mendapat perhatian di kebanyakan negara sebagai sumber utama menjana ekonomi Oleh sebab itu, pendidik bertanggungjawab memikirkan medium pembelajaran yang relevan dengan objektif Kementerian Pendidikan Malaysia.

DYL3012 Planting Design, kursus yang ditawarkan bagi pelajar DLH menggabungkan lukisan geometri dengan pelan tumbuhan landskap. Kursus ini membina kemahiran melukis dalam bidang lukisan senibina landskap yang lebih profesional. Selain itu juga, visualisasi diperlukan bagi membantu pelajar mendapat gambaran awal sebelum menterjemahkan dalam

bentuk lukisan (Widad & Hatta, 2001). Kajian-kajian lepas mendapati bahawa visualisasi bukan sahaja kritikal untuk bidang kejuruteraan tetapi mereka telah mengenalpasti lebih 80 bidang kerjaya lain yang memerlukan kemahiran visualisasi untuk berjaya (Baartmans &Sorby, 2003). Bidang sains seperti kimia, perubatan, matematik, kejuruteraan, perniagaan, komputer sains, psikologi, seni, arkitek, teknologi dan sebagainya (Robichaux, 2004) memerlukan penggunaan grafik untuk memudahkan kefahaman konsep bidang-bidang tersebut. Di samping itu, menurut Hatta (2001), pelajar perlu mengaplikasikan segala kefahaman dan pengetahuan yang dipelajari kepada bentuk lukisan atau geometri dalam matapelajaran lukisan.

   Walaubagaimanapun, hasil kajian oleh Ruhizan M. Yasin., atl, (2012) menyatakan bahawa pelajar mengambil masa yang lama untuk melukis geometri serta guru mengalami masalah bahan bantu mengajar yang kurang, Jadi, 'Smart square ruler' merupakan alat bagi membantu pelajar dalam pengajaran dan pembelajaran yang berasaskan kepada lukisan bagi memperoleh teknik melukis dengan cepat dan mudah. Hal ini berbeza daripada kaedah konvensional yang agak lambat kerana banyak pembaris digunakan bagi melukis sesuatu reka bentuk.

3.0   METODOLOGI

Kajian ini merupakan satu kajian diskriptif dengan pendekatan kuantitatif. Kaedah kajian yang digunakan adalah kaedah tinjauan kerana kaedah ini dapat merangkumi skop kajian yang luas (Wiersma, 2000). Instrumen kajian terdiri daripada borang kaji selidik yang mempunyai dua bahagian. Bahagian A adalah untuk mengetahui maklumat demografi respondens manakala Bahagian B untuk penilaian bahan inovasi 'Smart square ruler' (SQR). Di dalam Bahagian B terdapat tiga aspek yang dinilai iaitu aspek kemudahan penggunaan SQR, aspek penjimatan masa dan aspek rekabentuk.

        Pelajar juga diuji dengan kognitif dimana pelajar perlu membuat latihan interaktif dengan menggunakan alatan konvensional (pembaris, pembaris sesiku segitiga, protractor) dan 'Smart square ruler'. Catatan masa dicatat semasa menggunakan alatan konvensional dan alatan inovasi 'Smart square ruler'. Setiap item dianalisis menggunakan analisis diskriptif dimana setiap data dikumpulkan mengikut aspek dan dipersembahkan dalam bentuk jadual kekerapan dan carta kolum terkumpul. Sampel kajian ini melibatkan 22 orang pelajar DYL3012 Planting Design. Jadual 1 menunjukkan perkelasan likert 5 skala yang digunakan dalam soal selidik.

Jadual 1 : Jadual perkelasan likert 5 skala

Likert	Perkelasan
1	Setuju
2	Tidak setuju
3	Kurang setuju
4	Setuju
5	Sangat setuju

HASIL DAPATAN DAN PERBINCANGAN

Profil demografi responden

Jadual 2 menunjukkan ringkasan analisis latar belakang pelajar yang terlibat. Keputusan analisis menunjukkan 64% pelajar adalah terdiri daripada perempuan manakala 36% pelajar adalah lelaki. Semua pelajar terdiri daripada pelajar semester tiga Diploma Hortikultur Landskap. Merujuk pada jadual 2, purata peringkat umur pelajar yang terlibat dalam kajian ini

adalah daripada lungkungan 20-22 tahun (82%). Terdapat 2 pelajar yang berumur dalam lingkungan 23-25 tahun (18%)

Jadual 2 : Jadual perbandingan demografi daripada tinjauan responden

Ciri	Kekerapan (n=22)	Peratus (%)
Gender		
Lelaki	8	36
Perempuan	14	64
Umur (tahun)		
17-19	0	0
20-22	18	82
23-25	4	18

Penggunaan SQR : Kemudahan

Jadual 3, menunjukkan seramai 14 pelajar sangat bersetuju dengan pergunaan SQR dapat memudahkan pelajar untuk membuat pelan landskap. Penggunaan alatan yang bersesuaian adalah amat penting dalam proses mereka bentuk landskap.

Jadual 3 : Jadual kekerapan membuat pelan landskap
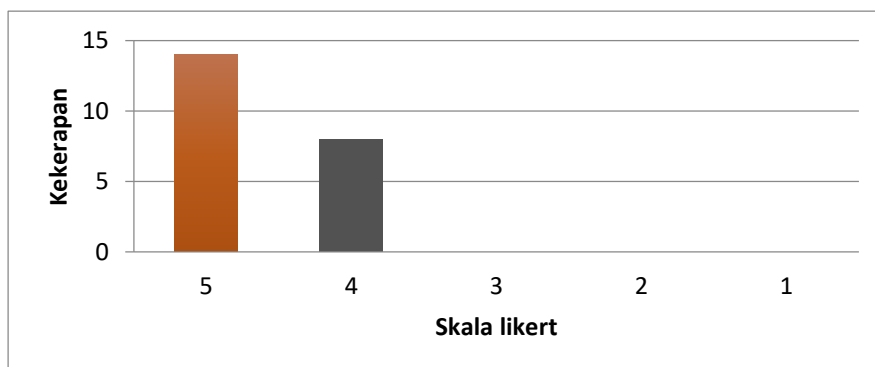
Selain daripada memudahkan pelajar membuat pelan landskap, SQR juga mempunyai ciri yang ringan dan mudah dibawa. Seramai 18 orang pelajar sangat bersetuju dengan kenyataan ini. Dengan ciri-ciri mudah dibawa ia akan dapat mengurangkan keberangkalian pelajar tidak membawa alatan ke kelas. Justeru itu, pensyarah dapat mengajar dengan lebih efisen sekali gus dapat merealisasikan kehendak insdutri pada masa kini.

Jadual 4 : Jadual kekerapan kemudahan membawa alatan SQR

Penggunaan SQR : Menjimatkan masa

Jadual 5 menunjukkan seramai 14 pelajar sangat bersetuju bahawa SQR mempercepatkan kerja-kerja melukis dijalankan. Kenyataan ini juga dapat dibuktikan daripada latihan interaktif yang telah dijalankan. Jadual 6 menunjukkan purata masa untuk melukis gambahrajah dengan menggunakan alatan konvensional adalah selama 954 saat atau 15 minit 9 saat. Walau bagaimanapun untuk melukis gambar rajah dengan penggunaan SQR ternyata menjimatkan masa kerana masa yang dicatat kan hanyalah 626 saat atau 10 minit 43 saat. Sebanyak 5 minit dapat dijimatkan dengan adanya alat inovasi ini. Purata bagi seorang pelajar hanyalah 56 saat saat untuk menyiapkan satu gambar rajah yang diberi.

Jadual 5 : Jadual kekerapan masa
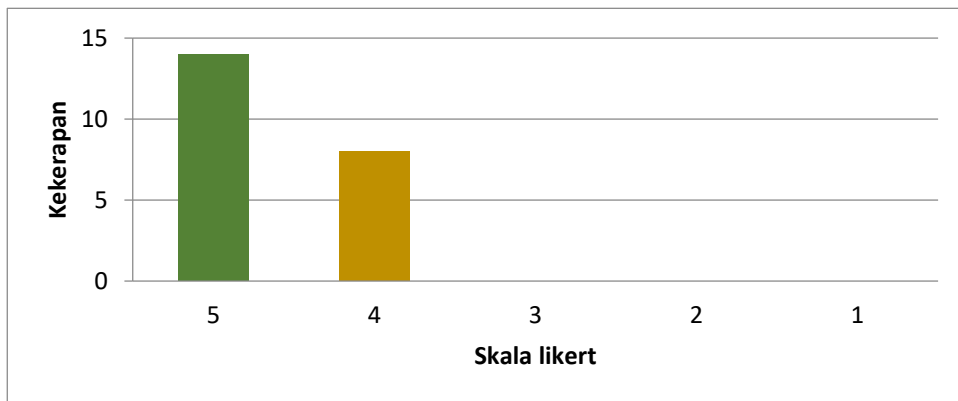
Jadual 6 : Carta penggunaan masa melukis satu gambar rajah
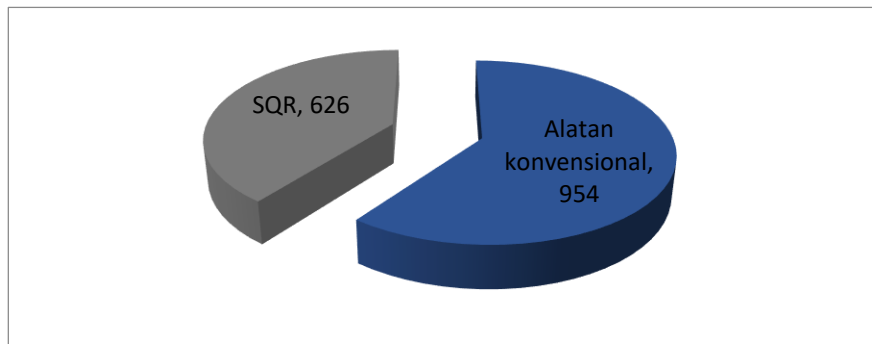
Penggunaan SQR : Reka bentuk

Berdasarkan Jadual 7, menunjukkan 20 pelajar sangat bersetuju yang SQR mempunyai ciri-reka bentuk yang ringkas dan menarik. Ini menetapi dengan kehendak pelajar pada masa kini. Dengan reka bentuk SQR ini, ia dapat menarik minat pelajar untuk melukis pelan dengan lebih jelas dan kemas. 18 orang pelajar (rujuk Jadual 8) memilih sangat bersetuju SQR menarik minat mereka untuk melukis di dalam kursus DYL 3012 Planting Design. Justeru itu, pelajar sangat bersetuju bahawa SQR dapat menambah kemahiran mereka dalam menentukan ukuran pelan landskap.

Jadual 7 : Jadual kekerapan bagi reka bentuk
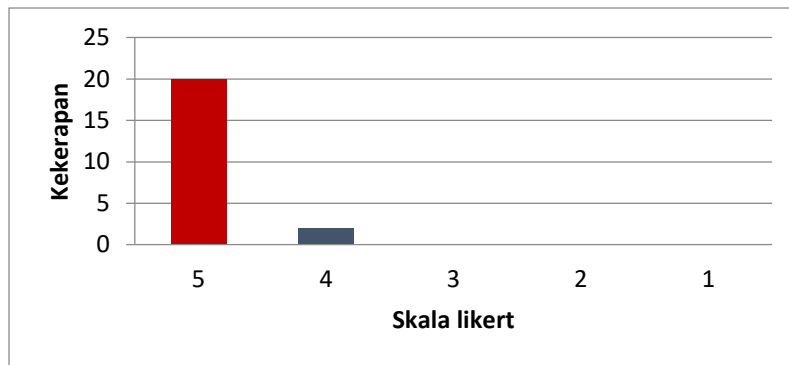
Jadual 8 : Jadual kekerapan minat pelajar
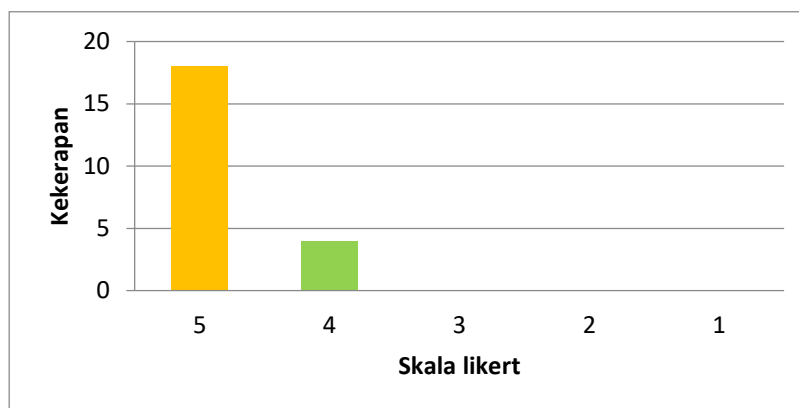
KESIMPULAN

Secara keseluruhan, penggunaan alatan inovasi 'Smart Square Ruler' terbukti memberi kesan yang baik semasa sesi pembelajaran DYL3012 Planting design. Melalui kaji selidik dan latihan interaktif yang dijalankan majority pelajar sangat bersetuju 'Smart Square Ruler' memberi kemudahan yang pelbagai cara untuk mereka. Antara kemudahan yang boleh didapati semasa menggunakan 'Smart Square Ruler' adalah memudahkan kerja mereka bentuk landskap, memudahkan pelajar membawa alatan kerana ianya ringan dan ringkas. 'Smart Square Ruler' juga dapat membantu pelajar menjimatkan masa mereka melukis kerana 'Smart Square Ruler' adalah gabungan daripada tiga jenis pembaris.

Alatan melukis konvensional tidak lagi relevan digunakan jika dibandingkan dengan alatan inovasi 'Smart Square Ruler'. Kepelbagaian ciri 'Smart Square Ruler' ternyata membawa impak yang positif ke atas diri pelajar terutama semasa sesi pembelajaran diadakan. Hal ini dapat menarik minat pelajar terhadap proses pembelajaran dan sekaligus pelajar akan memberikan tumpuan sepenuhnya terhadap sesuatu topik yang akan mereka pelajari.

Diharapkan, dengan adanya penggunaan inovasi 'Smart Square Ruler', ianya dapat membantu pelajar dan pensyarah untuk merealisasikan Pelan Pembangunan Pendidikan Malaysia 2015-2025 (Pengajian Tinggi), dimana Kementerian Pendidikan berhasrat memperkemaskan sistem pendidikan bagi meningkatkan kemahiran pelajar untuk memenuhi keperluan industri (Kementerian Pendidikan Malaysia, 2015).

RUJUKAN

Abd Hair Awang, Azimi Hamzah & Rahmah Ismail (2003). Penguasaan Kemahiran Bolehkerja di Kalangan Pelatih ILP dan IKM. Prosiding Persidangan Kebangsaan, 25-46. Universiti Kebangsaan Malaysia, Bangi, 12-13 September 2003.

Baartmans, B. dan Sorby, S. (2003). Introduction To 3D Spatial Visualization: An Active Approach. USA: Thomson Delmar Learning.

Hatta Ismail. (2001). *Kefahaman Instrumental Dan Kefahaman Relasional Pelajaran Dalam Topik Lukisan Orthigrafik Dan Pandangan Keratan*. Universiti Teknologi Malaysia: Tesis Sarjana.

Jabatan Pengajian Politeknik Malaysia (2011). Silibus Mata Pelajaran Lukisan Kejuruteraan. Putrajaya: Jabatan Politeknik Malaysia.

Kementerian Pendidikan Malaysia (2015). Ringkasan Eksekutif Pelan Pembangunan Pendidikan Malaysia 2015-2025 (Pendidikan Tinggi). Di akses pada 28 September 2015 dari www.ptsb.edu.my.

Laporan Eksekutif Graduan Politeknik (2008). Jabatan Pengajian Politeknik dan Kolej Komuniti. Kuala Lumpur: Kementerian Pengajian Tinggi Malaysia.

Muhyiddin Mohd Yassin (2010). Tranformasi Politeknik. Putrajaya International Convention Centre. 25 Februari 2010.

Robichaux, R. R. (2004). Predictors of Spatial Visualization: Structural Equations Modeling Test of Background Variables[Electronic version]. Journal of Integrative Psychology. Dicapai pada 26 Ogos 2004, dari http://www.integrativepsychology. org/articles/vol2_article3.htm

Ruhizan M. Yasin , Ramlee Mustapha , Asnul Dahar Minghat , Kamaruzaman Jusoff , Azaman Ishar and Shafie Shamsudin (2012), Pelaksanaan Pengajaran Dan Pembelajaran Mata Pelajaran Lukisan Kejuruteraan Di Sekolah Menengah, Universiti Kebangsaan Malaysia, Bangi

Sadegh, M. A., Ali, M. & Davood, M. (2012). The Entrepreneurship of Ardabil Technical and Vocational Centers Trainees. American Journal of Scientific Research. 53. 80-85.

Widad Othman & Hatta Ismail (2001). Aplikasi Konsep Dan Kaedah Lukisan Kejuruteraan DalamMatematik Oleh Guru-Guru Matematik Di Sekolah Menengah Teknik Seluruh Negeri Kelantan. Jurnal Teknologi. 35. 1-10.

Wiersma, W. (2000). Research Methods In Education: An Introduction. 7th ed. Boston: Allyn & Bacon.

TVET 4.0 – Pemerkasaan Sains Data dalam kalangan pensyarah. Satu tinjauan: Kesedaran Sains Data Dalam Kalangan Pensyarah Politeknik Nilai

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ABSTRAK

Kajian tinjauan ini dijalankan dalam kalangan pensyarah Politeknik Nilai. Tujuan utama kajian ini adalah untuk mengetahui tahap kemahiran pensyarah dalam bidang berkaitan sains data, kesediaan pensyarah untuk mengajar dalam bidang sains data dan kolerasi antara tahap kemahiran dan kesediaan pensyarah untuk mengajar dalam bidang sains data. Data kuantitatif dikumpul melalui borang soal selidik yang dimuatnaik melalui aplikasi KoboToolBox. Seramai 64 orang responden yang telah memberi respond. Analisis kuantitatif menggunakan aplikasi WEKA digunakan dalam kajian ini. Data yang diperoleh dimasukkan di dalam aplikasi Excell kemudian dianalisis di dalam WEKA. Di dalam perisian WEKA, semua data yang diperolehi telah melalui proses pembersihan data seperti Replace Missing Value, Convert From Nominal To Numeric dan Find Outliers Dan Extreme Values (IQR). Bagi mengenal pasti kolerasi dan nilai terperinci data outliers dan extreme value, data telah dimasukkan ke dalam R-Commander. Hasil kajian menunjukkan para pensyarah mempunyai kemahiran yang rendah dalam bidang berkaitan dengan sains data. Para pensyarah juga tidak bersedia untuk mengajar di dalam bidang sains data. Selain itu tidak terdapat kolerasi di antara pembolehubah kemahiran dan kesediaan pensyarah.

Kata kunci – sains data; pensyarah; TVET 4.0;

PENGENALAN

Amanat Ketua Pengarah Politeknik dan Kolej Komuniti pada tahun 2018 menjelaskan bahwa TVET 4,0 merupakan salah satu agenda penting bagi dalam menentukan haluan pendidikan tinggi negara. Beliau menekankan konsep Pendidikan Tinggi 4.0 yang mengaitkan ilmu, industri dan insan bagi menangani cabaran-cabaran terutamanya dalam era revolusi industri baharu.

Di dalam amanat itu ada menyentuh Kerangka Kerja TVET 4.0 (TVET framework) dibangunkan bagi menyahut cabaran dan merebut peluang ekoran perkembangan teknologi digital yang mempengaruhi pasaran pekerjaan terutamanya dalam segmen "high-skills/ high pay". Selari dengan Lonjakan 4, Pelan Pembangunan Pendidikan Malaysia (Pendidikan Tinggi), TVET 4.0 bermatlamat menghasilkan graduan TVET berkualiti. Ia berteraskan bentuk pengajaran dan pembelajaran baharu; tadbir urus responsif dan mampan; pendekatan penyelidikan gunaan dan inovasi baharu; dan bakat yang didorong teknologi. Di atas segalanya, TVET 4.0 menyediakan generasi pelajar yang membudayakan pembelajaran sepanjang hayat bagi sentiasa relevan dengan keperluan semasa.

Antara agenda yang dirancang di dalam Pelan Strategik Politeknik dan Kolej Komuniti, 2018 – 2025 adalah memastikan graduan TVET berkualiti melalui Redesigning TVET. Konsep Redesigning TVET ialah penambahbaikan proses pengajaran dan pembelajaran seiring pendekatan pembelajaran Abad ke 21 daripada aspek reka bentuk kurikulum, instruksional dan pentaksiran. Selain itu, perancangan untuk meningkatkan bilangan penawaran program hybrid antara disiplin, memperkenalkan modul PSH berkredit, meningkatkan kandungan Internet of Things, data science, virtual and augmented reality, gamification, dan keselamatan siber dalam pengajian serta menambahbaik kaedah dan pendekatan pengajaran melalui CDIO (Conceive-

DesignImplement-Operate), TeCCgogy dan experiential learning. Pendekatan ini disuai padan dalam konsep Teaching and Learning 4.0.

Steve Case, salah satu seorang pelopor INTERNET dan pengasas bersama AOL, berpendapat bahawa terdapat tiga gelombang besar dalam teknologi digital: Gelombang Pertama membina INTERNET. Gelombang Kedua ialah revolusi bergerak dan penciptaan ekonomi berasaskan aplikasi. Sekarang kita berada dalam peralihan ke Gelombang Ketiga. Ini terbukti apabila teknologi digital dan INTERNET meninggalkan infrastruktur tradisional, dan berpindah ke sektor kesihatan, tenaga, pengangkutan dan kewangan yang dikawal selia. Ini merupakan dunia Internet Pelbagai Benda (Internet of Things -IoT) dan Data Raya (Big Data).

Bagi memastikan politeknik dan kolej komuniti dapat menyumbang kepakaran dalam bidang data sains ini, Jabatan Pendidikan Politeknik dan Kolej Komuniti telah mengajurkan program Sijil Professional Sains Data selama 4 bulan di Big Data Center, UTM Skudai. Program ini telah memberi pendedahan kemahiran sains data tahap tinggi kepada 20 pensyarah politeknik dan kolej komuniti di seluruh bagi menyahut keperluan negara untuk menyediakan pakar dalam bidang berkenaan.

Dalam ucapan perasmian di Penganugerahan Sijil Profesional Sains Data pada 28 Februari 2018, Ketua Pengarah JPKK, Profesor Dato Dr Mohd Ismail berkata, bidang sains data kini dilihat antara bidang kepakaran yang diperlukan negara terutama melalui Pendidikan dan Latihan Teknik dan Vokasional (TVET). Beliau juga berhasrat untuk memastikan jumlah pensyarah yang mempunyai kepakaran dalam bidang berkenaan mencukupi di kedua-dua institusi berkenaan,

Selari dengan hasrat Ketua Pengarah dan keperluan TVET 4.0, tahap kesedaran dan kesediaan pensyarah politeknik dari aspek pengetahuan dan kemahiran berkaitan sains data perlu ditingkatkan bagi memperkasakan TVET 4.0. Selain itu bilangan pensyarah yang pakar dalam bidang sains data juga perlu ditambah. Kajian tinjauan ini dilakukan bagi mengenalpasti kesediaan pensyarah Politeknik Nilai dalam sama-sama menjayakan keperluan TVET 4.0.

OBJEKTIF KAJIAN
1. Mengenalpasti tahap kemahiran pensyarah dalam bidang berkaitan dengan sains data
2. Mengenalpasti tahap kesediaan pensyarah mengajar dalam bidang sains data.
3. Mengenalpasti korelasi antara kemahiran dan kesediaan mengajar dalam bidang data sains.

KAJIAN LITERATUR

Definisi sains data
Sains data adalah satu konsep di mana menyatukan pelbagai bidang seperti bidang statistik, matematik, sainis komputer, sains maklumat, analisis data, pembelajaran mesin (*machine learning*) dan kaedah yang berkaitan untuk menganalisis data dan membolehkan sesuatu keputusan diambil. *At a high level, data science is a set of fundamental principles that support and guide the principled extraction of information and knowledge from data. Possibly the most closely related concept to data science is data mining—the actual extraction of knowledge from data via technologies that incorporate these principles (Foster Provost and Tom Fawcett, 2013).* Ledakan gelombang ketiga era digital masa kini telah menjadikan bidang Sains Data terus berkembang penggunaannya di dalam bidang seperti Kecerdasan Buatan (AI), Pembelajaran Mesin, dan Internet Pelbagai Benda (IoT). Sains data digunakan untuk memilih dan menyediakan sejumlah data untuk diproses dan dianalisis. Sains data memerlukan Teknologi Data Raya *(big data)* yang mampu mengumpulkan data yang sangat banyak dari berbagai sumber. *Big Data Analytics* pula merujuk kepada data yang diambil dan dianalisis sebelum sebarang kesimpulan dibuat. Hasil data yang telah dianalisis boleh digunakan untuk

merancang atau menyelesaikan sebarang masalah yang timbul. Di dalam bidang perniagaan, data yang ada boleh memberi petunjuk kepada trend dunia perniagaan masa kini dan boleh membuat jangkaan perancangan penambaikan perniagaan pada masa hadapan. Oleh itu teknologi Data Raya telah mula diterapkan ke bidang lain, seperti perubatan, kejuruteraan, dan sains sosial.

Kepentingan mengenai sains data mula mendapat perhatian apabila wujudnya aliran dan hala tuju industri yang dipacu oleh perkembangan teknologi dunia antaranya menerusi media sosial, perubahan peralatan, analisa data dan pengkomputeran awam yang menyediakan pelbagai data penting untuk menyelesaikan masalah selain turut dapat meramal kemungkinan yang berlaku pada masa hadapan. Sebenarnya, sejarah awal sains data dapat dikesan selama lebih dari lima puluh tahun yang lalu dan digunakan sebagai pengganti sains komputer pada tahun 1960 oleh Peter Naur.

Kepentingan sains data

Bidang sains data telah mula berkembang dengan pesat semenjak 10 tahun yang lalu. *In the past ten years, Data Science has quietly grown to include businesses and organizations world-wide. It is now being used by governments, geneticists, engineers, and even astronomers. Technically, this includes machine translation, robotics, speech recognition, the digital economy, and search engines. In terms of research areas, Data Science has expanded to include the biological sciences, health care, medical informatics, the humanities, and social sciences. Data Science now influences economics, governments, and business and finance.* (Kaufmann, Alain. 2017). Oleh kerana bidang-bidang ini sentiasa berkembang, bidang sains data juga berlaku perkembangan yang sama. Perkembangan teknologi seperti telefon pintar dan komputer riba yang menjadi sebahagian daripada sistem pendidikan, sains data dapat membantu mewujudkan peluang yang lebih baik untuk membantu pelajar belajar dan meningkatkan pengetahuan mereka secara konstruktif. Selain itu dalam bidang perniagaan, Sains data dapat membantu menaghasilkan analisa data membolehkan sesuatu perniagaan menghasilkan perkhidmatan yang lebih baik, merancang jumlah pengeluaran dan menjangkakan keuntungan.

Bidang lain yang mendapat manfaat adalah bidang perubatan. Menurut Pengarah Bahagian Bakat, Perbadanan Pembangunan Multimedia (MDeC), Muhammad Imran Kunalan Abdullah, pelbagai data yang dikumpul dan diperolehi, memberi peluang kepada pihak berkaitan untuk membuat kesimpulan atau menjangkakan perkara yang boleh berlaku. Semua maklumat yang diperoleh itu, membolehkan pihak berkaitan mengambil tindakan sewajarnya atau merangka perancangan berikutnya bagi memastikan sesuatu isu ditangani dengan lebih berkesan atau langkah berjaga-jaga diambil supaya keadaan tidak menjadi lebih buruk. Sebagai contoh, wabak denggi yang semakin meningkat. Kementerian Kesihatan mempunyai data. Langkah seterusnya ialah bagaimana untuk menterjemahkan data itu dan selepas dianalisa, apa pula tindakan untuk mengelakkan atau sekurang-kurangnya mengurangkan kes denggi. Pengumpulan dan penganalisaan data perlu melalui proses yang tersusun menggunakan kaedah atau peralatan khusus melihat kepada maklumat serta hasil diharapkan. Kebanyakan data sudah terkumpul dan hanya perlu dibawa ke satu tahap lagi supaya dapat dimanfaatkan. Data yang dianalisa boleh memberi manfaat kepada pelbagai pihak yang ingin memanfaatkan maklumat tersebut dan memanipulasi data yang benar-benar sesuai serta memberi manfaat.

Bidang sains data juga telah membantu penghasilan banyak aplikasi yang boleh diterokai oleh pelbagai bidang seperti aplikasi mengesan penipuan, aplikasi penjagaan kesihatan, aplikasi carian Internet, aplikasi pegiklanan, aplikasi cadangan laman web, aplikasi pengesanan suaran, aplikasi perancangan laluan syarikat penerbangan, aplikasi pelbagai permainan dan juga TeknologiRaliti Berperanta (Aaugmented Reality, AR).

Masa depan sains data

Menurut laporan yang telah diterbitkan, *The Quant Crunch: How The Demand For Data Science Skills Is Disrupting The Job Market,* menjelang tahun 2020, jumlah pekerjaan untuk semua profesional data di Amerika Syarikat akan meningkat sebanyak 364,000. Permintaan terbesar pekerjaan Sains Data Dan Analisis (DSA) adalah bidang Kewangan dan Insurans, Perkhidmatan Profesional, dan IT; Ketiga-tiga industri ini menyumbang sebanyak 59%. Dalam industri Kewangan dan Insurans, di mana permintaan pekerjaan DSA menyumbang 19%, Industri Profesional dan industri IT sebanyak 18% dan 17% permintaan.
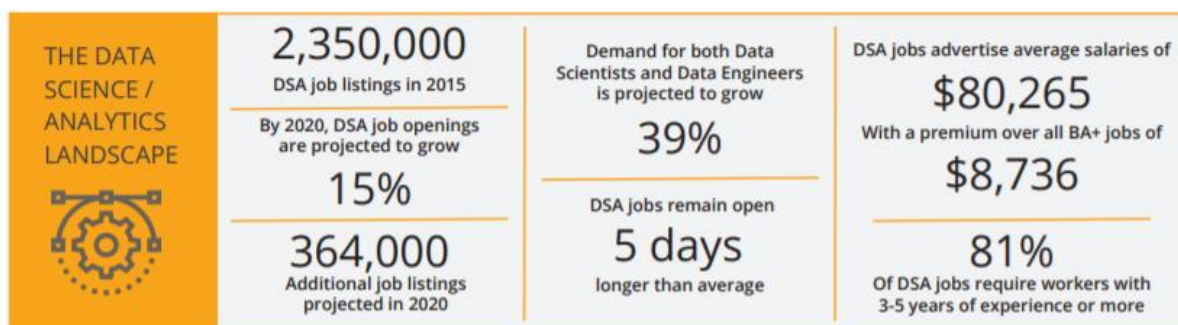
Rajah 1 : Unjuran grafik menunjukkan permintaan kemahiran sains data dan analisis sehingga tahun 2020 di USA

Pekerjaan Sains Data Dan Analisis amat diperlukan pada abad ke-21 ini adalah kerana revolusi ledakan gelombang digital yang ketiga iaitu Internet Pelbagai Benda (Internet of Things -IoT) dan Data Raya (Big Data). Justeru itu, industri dan sektor yang terlibat perlu berkemampuan untuk mengikut gelombang kebanjiran maklumat serta kaedah memanfaatkannya. Industri juga memerlukan modal insan yang mencukupi serta berkemahiran untuk menganalisis data. Menurut Dato' Seri Ahmad Shabery Cheek pada tahun 2016, negara kita masih kekurangan pakar dalam bidang sains data. Malaysia memerlukan 10, 000 Saintis Sains Data Profesional menjelang tahun 2020.

Oleh itu, kepentingan ini telah disedari beberapa badan agensi kerajaan seperti Jabatan Perkhimatan Awan (JPA), Majlis Amanah Rakyat (MARA) dan SKMM telah menyediakan biasiswa bagi melatih rakyat Malaysia dalam bidang sains data di peringkat pengajian sarjana muda, sarjana (*masters*) dan doktor falsafah (PhD). Universiti-universiti di Malaysia juga telah mula menawarkan bidang Sains Data bagi memenuhi permintaan masa kini. Selain itu pihak Malaysia Digital Economy Corporation (MDEC) akan melaksanakan tiga (3) projek berimpak tinggi dalam membangunkan bakat di negara ini. Projek berkenaan adalah penubuhan Institut Data Sains Asia, Institut Data Terbuka Kerajaan dan penubuhan Pusat Inovasi Kecemerlangan bagi melahirkan bakat tempatan dalam bidang sains data di negara ini. Bagi memastikan politeknik dan kolej komuniti dapat menyumbang kepakaran dalam bidang data sains ini, Jabatan Pendidikan Politeknik dan Kolej Komuniti juga telah mengajurkan program Sijil Professional Sains Data selama 4 bulan di Big Data Center, UTM Skudai. Program ini telah memberi pendedahan kemahiran sains data tahap tinggi kepada 20 pensyarah politeknik dan kolej komuniti di seluruh bagi menyahut keperluan negara untuk menyediakan pakar dalam bidang berkenaan

METODOLOGI

Kajian ini menggunakan reka bentuk tinjauan. Kajian ini turut menggunakan kaedah non-probability kerana tujuan kajian bukan untuk digeneralisasikan kepada keseluruhan populasi. Sebaliknya, kajian ini lebih berbentuk kajian deskriptif yang bertujuan memberikan gambaran awal tentang kesedaran bidang sains data dalam kalangan pensyarah. Responden kajian terdiri

daripada staf akademik di semua jabatan Politeknik Nilai iaitu Jabatan Perdagangan, Jabatan Kejuruteraan Mekanikal, Jabatan Agroteknologi dan Bio-Industri, Jabatan Pengajian Am dan Jabatan Matematik, Sains dan Komputer. Seramai 64 orang reponden menjawab soal selidik yang telah dimuatnaik di dalam KoboToolBox. Analisis kuantitatif menggunakan aplikasi WEKA digunakan dalam kajian ini. Data yang diperoleh dimasukkan di dalam aplikasi Excell kemudian dianalisis di dalam WEKA. Di dalam perisian WEKA, semua data yang diperolehi telah melalui proses pembersihan data seperti Replace missing value, convert from nominal to numeric, find outliers dan extreme values (IQR) dan akhir sekali data imbalance. Bagi mengenal pasti korelasi dan nilai terperinci data outliers dan extreme value, data telah dimasukkan ke dalam R-Commander.

HASIL DAPATAN DAN ANALISA

Terdapat 30 soalan keseluruhan di dalam borang soal selidik (Lampiran 1) iaitu

1. About You (6 item)
2. Knowledge About Data Science (8 item)
3. Availability of Data Science facility (6 item)
4. Knowledge and skills (7 item)
5. Readiness (3 item)

Dari keseluruhan soalan, pecahan soalan dibahagikan kepada 4 pembolehubah iaitu knowledge, facilities, skill dan readiness.

Jadual 1 : Reliability – Cronbach's Alpha

Component Factor	Cronbach's Alpha
Knowledge	0.978
Facilities	0.353
Skill	0.952
Readiness	0.716

Jadual 1 menunjukkan hasil analisa Reliability Cronbach's Alpha di mana konstruk Facilities adalah sangat rendah iaitu 0.353, berbanding dengan konstruk lain.
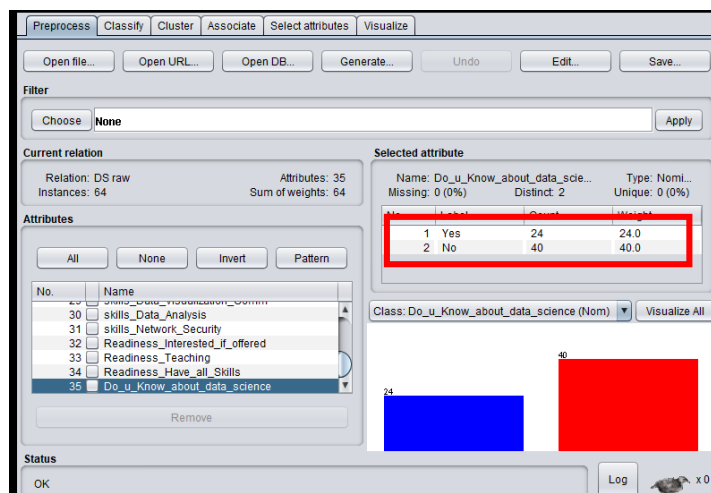
Rajah 2 : Menetapkan class dalam WEKA

Kelas ditetapkan dengan menggunakan soalan "Do you know about data science?". Rajah 1 menunjukkan terdapat 24 yang menjawab YES dan 20 yang menjawab NO.
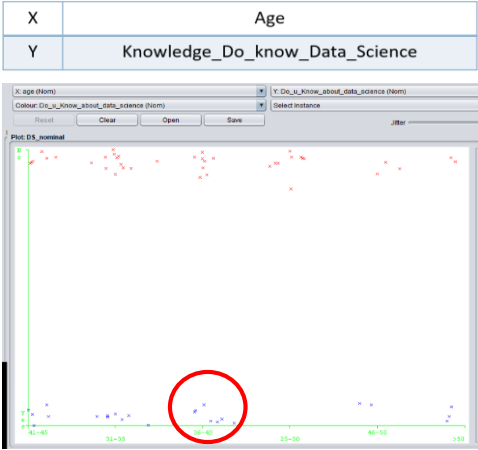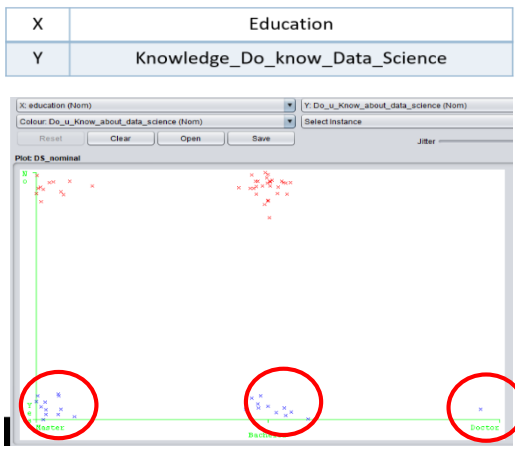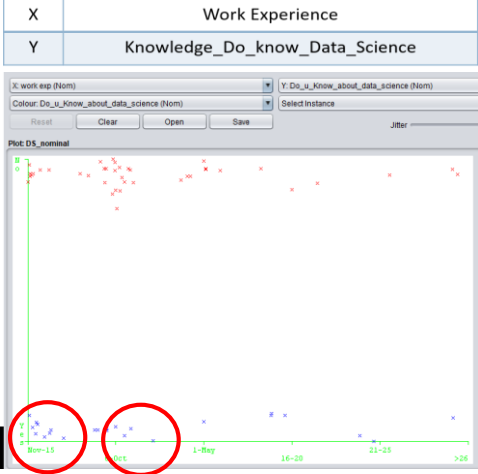
Dapatan dan analisa data melalui WEKA
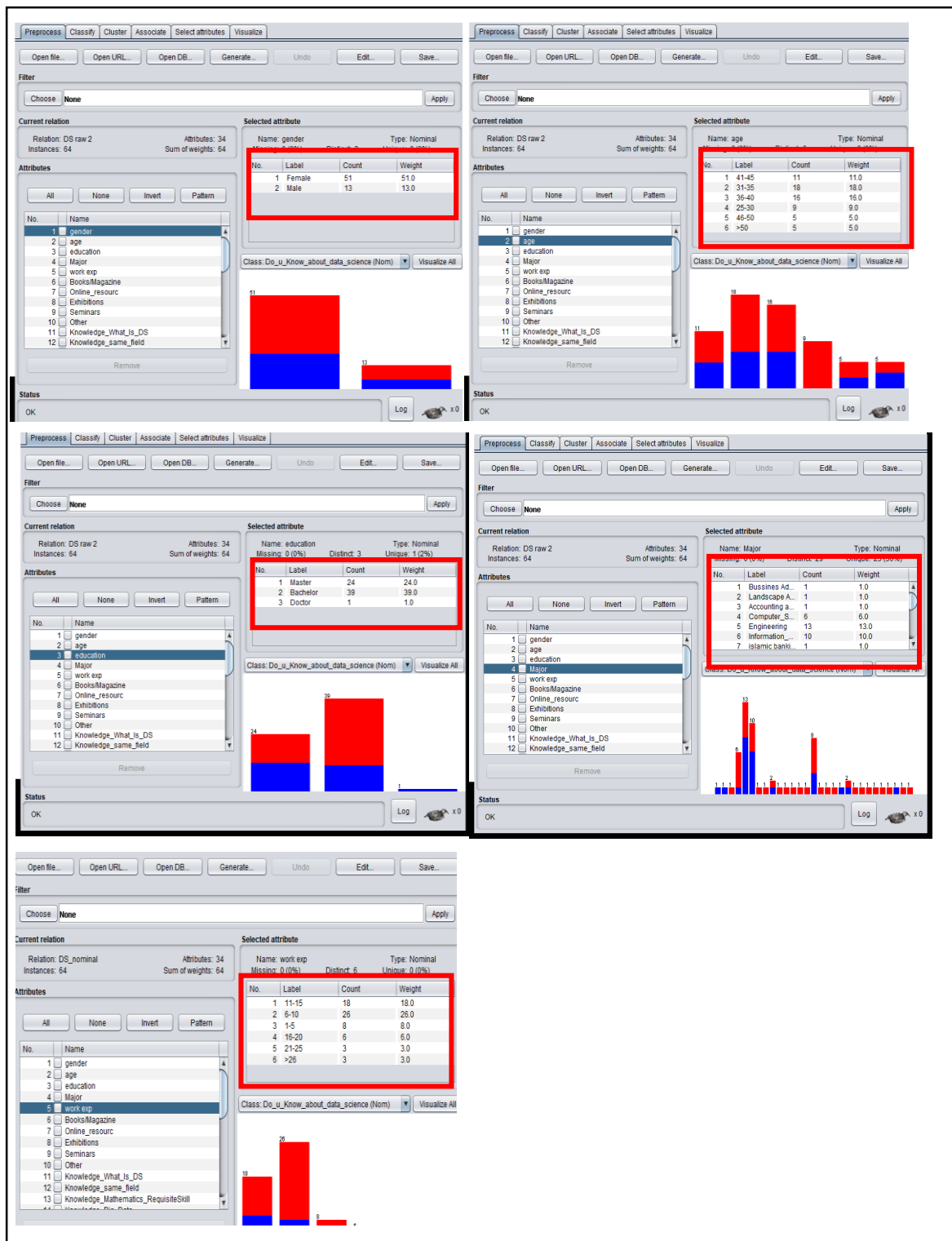
Rajah 3: About You (6 items)

Analisis korelasi

Analisa korelasi dibuat antara item di dalam bahagian About You.

|	
Rajah 4 : Korelasi antara umur dan class	Rajah 5 : Kolerasi antara Pendidikan dan class
Responden dari semua julat umur kecuali julat umur 25-30 tahun mempunyai pengetahuan mengenai sains data.	Bagi tahap Pendidikan, peringkat sarjana muda, sarjana dan doctorate mempunyai pengetahuan mengenai Sains Data
Rajah 6 : Kolerasi antara bidang dan class	Rajah 6 : Kolerasi antara pengalaman bekerja dan class
Responden dari bidang Teknologi Maklumat yang paling banyak yang mempunyai pengetahuan mengenai sains data	Bagi tempoh kerja antara 6-10 tahun dan 11-15 tahun yang banyak mempunyai pengetahuan mengenai Sains Data
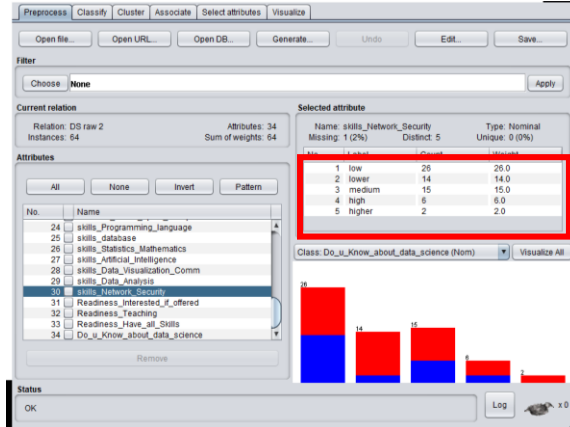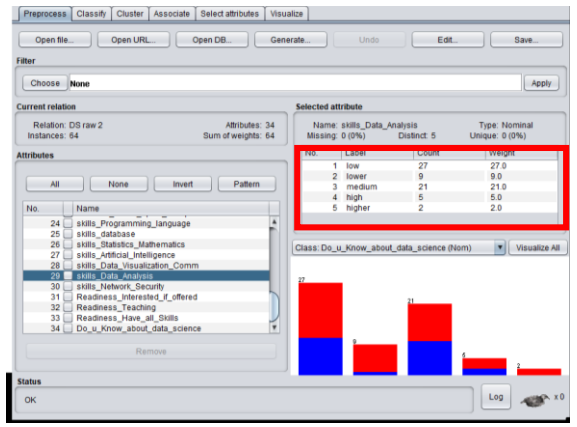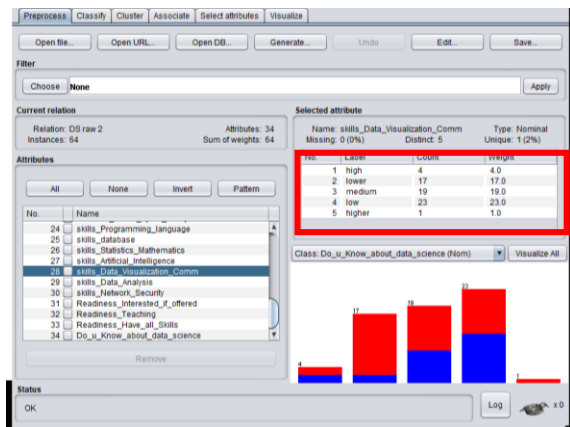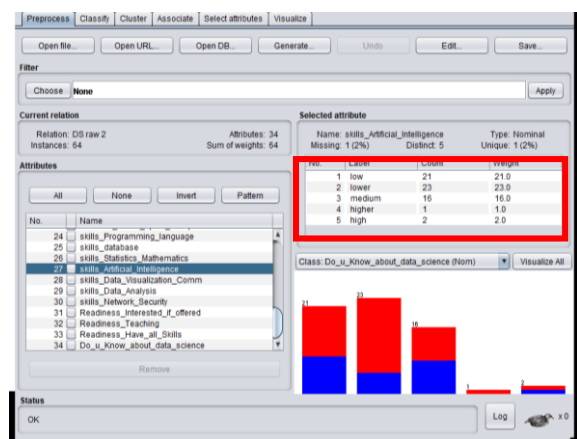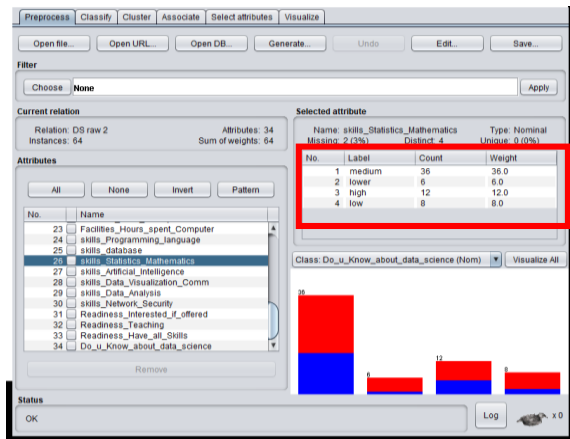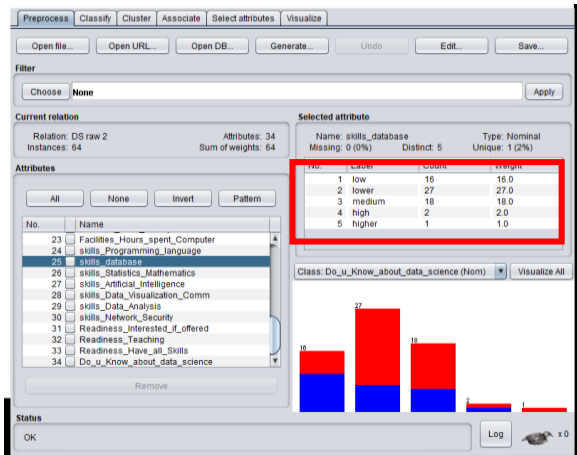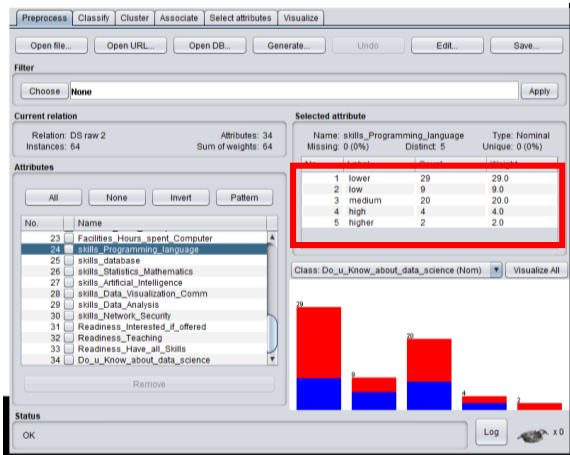
Rajah 7: Skills (7 items)

Jadual 1 : Analisa konstruk skills (7 item)

Pengetahuan dan Kemahiran	Tahap	Peratus
Programming language	Low to lower	59.37
Database and SQL	Low to lower	67.19
Statistics / Mathematics	Medium	56.25
Artificial Intelligent	Low to lower	68.75
Data Visualization & Communication	Low to lower	62.5
Data Analysis	Low to lower	56.25
Network and Security	Low to lower	62.5

Responden yang mempunyai tahap pengetahuan dan kemahiran yang diperlukan bagi mempelajari Sains Data adalah rendah mengikut hasil dapatan dari soal selidik, seperti jadual di atas.
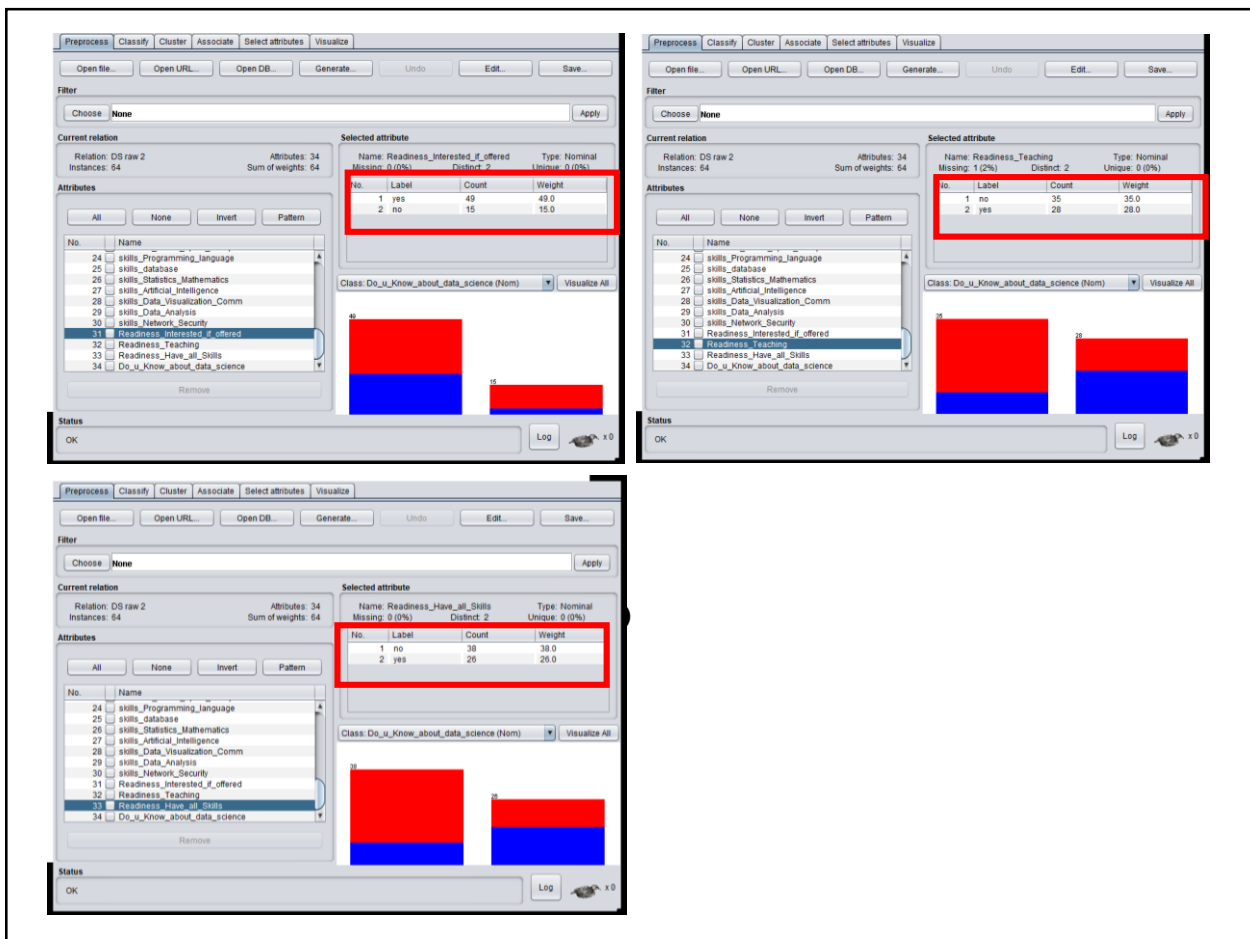

Rajah 8: Readiness (7 items)

| Readiness	YES (%)	NO (%)
I am interested to join the Data Science courses/training if I am being offered.	76.56	23.44
I am able to teach Data Science course with proper training.	45.32	54.68
I have all the pre-requisites knowledge to learn data science	40.63	59.37

Sebanyak 76.56 responden bersetuju untuk mengikuti kursus sains data tetapi tidak bersedia untuk mengajar dan mempunyai pra syarat bagi mempelajari sains data.

R-Commander - Correlation Test – Readiness and Skills
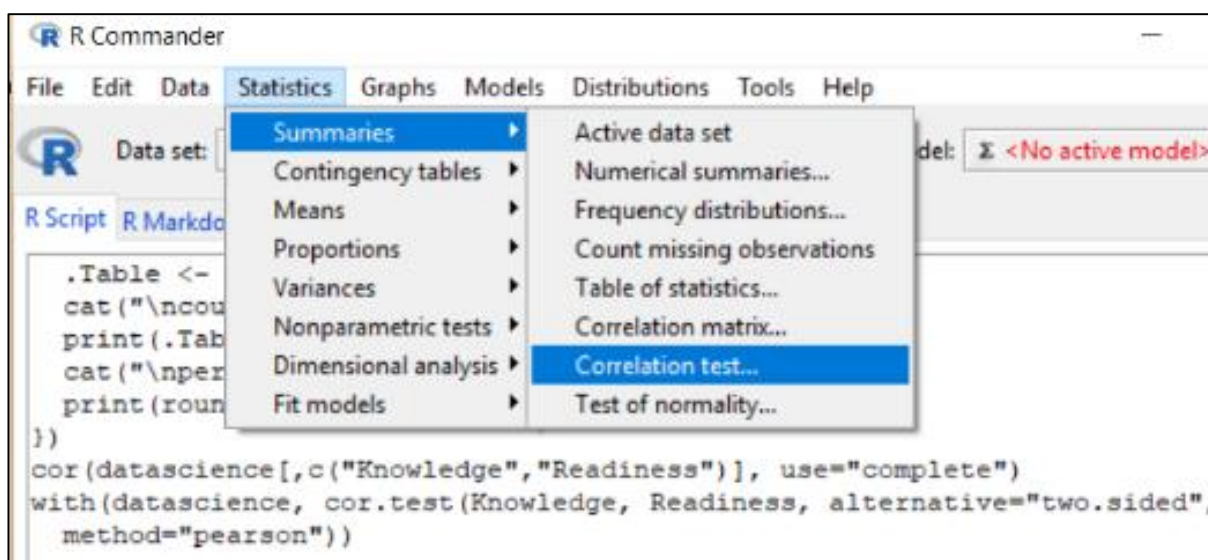
Rajah 9: Proses menguji kolerasi dalam R
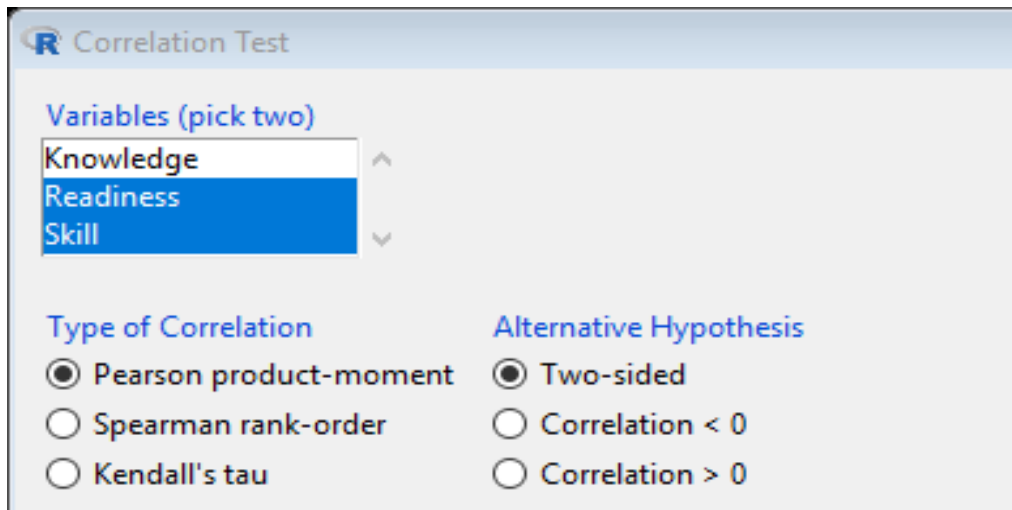
Rajah 10 Proses memilih pembolehubah readiness dan skill

```
Rcmdr>  with(datascience, cor.test(Readiness, Skill, alternative="two.sided",
Rcmdr+    method="pearson"))

        Pearson's product-moment correlation

data:  Readiness and Skill
t = 1.8503, df = 62, p-value = 0.06904
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 -0.01806758  0.44930233
sample estimates:
      cor
0.2287577
```

Rajah 11: Keputusan kolerasi antara pembolehubah **readiness**

Rajah 11 menunjukkan keputusan ujian kolerasi menggunakan Pearson. Terdapat 2 hipotesis iaitu

H_0: Tiada kolerasi di antara Readiness and Skills dalam Sains Data.
H_1: Terdapat kolerasi di antara Readiness and Skills dalam Sains Data

Hasil ujian mendapati nilai p-value = 0.06904. p>0.05, maka hipotesis null tidak ditolak. Tiada kolerasi di antara Readiness and Skills dalam Sains Data. Hubungan antara Readiness and Skills dalam Sains Data adalah positif. Dibuktikan dengan nilai cor = 0.2287577 dan tidak mempunyai hubungan linear.

IMPLIKASI KAJIAN
Kajian ini dapat melihat tahap kemahiran pensyarah di Politeknik Nilai dalam bidang sains data adalah rendah dan mereka belum bersedia untuk mengajar dalam bidang sains data. Beberapa langkah perlu diambil agar dapat memenuhi keperluan TVET 4.0 dan juga Konsep

Redesigning TVET seperti mengadakan program pendedahan kepentingan yang akan diperolehi melalui bidang sains data. Para pensyarah perlu didedahkan kepentingan data dan analisis dalam pelbagai bidang serta kepentingan dalam era ledakan digital. Bidang sains data dapat memenuhi permintaan dengan memberi peluang pekerjaan dalam pelbagai bidang, melahirkan tenaga kerja yang memiliki kemahiran dalam bidang yang menjanjikan peluang lebih luas seiring permintaan pasaran kini.

Pengarah Urusan EMC Malaysia, Cheam Tat Inn berkata, komitmen meningkatkan peluang pekerjaan kepada graduan serta profesional membolehkan tenaga kerja tempatan merebut peluang di pasaran global dan bidang sains data memang menjadi tumpuan kini. Menurut Kajian Transformasi IT EMC, kira-kira 88 peratus perniagaan Malaysia dilaporkan yakin *Big Data* akan menentukan kejayaan mereka dalam industri. Jelaslah industri mula memahami kepentingan tenaga kerja berkemahiran dalam bidang analisis data. Oleh itu, sudah tiba masanya untuk pensyarah Politeknik Nilai perlu bersama-sama untuk menjadi sebahagian tenaga pengajar dalam memenuhi permintaan tenaga kerja berkemahiran bagi memenuhi permintaan semasa dan permintaan itu dijangka akan terus meningkat khususnya mereka yang memiliki kepakaran dalam bidang analisis data serta sains data.

KESIMPULAN & PERBINCANGAN

Bidang sains data dijangka terus berkembang. Politeknik dan Kolej Komuniti perlu bersedia untuk bersama-sama memperkasakan bidang ini bagi terus menerajui TVET negara. Pelbagai program boleh dirancang dan Pelan Strategik Politeknik dan Kolej Komuniti, 2018 – 2025 perlu dijadikan garis panduan dan sandaran untuk terus bergerak ke depan dan memberi sumbangan signifikan kepada negara dan komuniti.

Cadangan bagi kajian pada masa akan datang adalah membuat perbandingan pengetahuan dalam bidang berkaitan dengan bidang sains data. Kolerasi diantara pembolehubah kemahiran dengan pengetahuan dan pembolehubah pengetahuan dan kemahiran. Seterusnya, pengkaji juga boleh menjalankan kajian politeknik lain. Akhir sekali, pengkaji akan datang boleh menggunakan peralatan data sains yang lain di dalam menganalisa datadata tersebut dan membuat perbandingan dengan perisisan SPSS yang kebiasaannya digunakan oleh pengkaji-pengkaji di dalam bidang sains social

PENGHARGAAN

RUJUKAN

Afterschool.my (2016, December 7). 10, 000 Saintis Sains Data Profesional Diperlukan Menjelang 2020!. Retrive 9 May 2019 from the World Wide Web: https://afterschool.my/bm/berita/10-000-saintis-sains-data-profesional-diperlukan-menjelang-2020-dato-seri-ahmad-shabery-cheek-menteri-komunikasi-multimedia

Alain Kaufmann. (2017). *Data Science from Scratch: Practical Guide with Python.* Createspace Independent Publishing Platform.

Amanat Ketua Pengarah Tahun Baru 2018, Y.Bhg. Prof. Dato' Dr. Mohd Ismail Bin Abd Aziz, Ketua Pengarah Jabatan Pendidikan Politeknik Dan Kolej Komuniti Kementerian Pendidikan Tinggi. 12 Januari 2018. Tema Spearheading Tvet.Embracing IR 4.0.

Ashok Srivastava (2017, May 16). The Data Science Revolution: Why It's Changing Every Aspects of Our Lives. Retrieved 15 May 2019, from the World Wide Web: https://www.linkedin.com/pulse/data-science-revolution-why-its-changing-every-our-lives-srivastava

Berita Harian Online. (2014, Ogos 23) Kursus Sains Data Penuhi Keperluan Modal Insan Bidang ICT. Retrieved 15 May 2019, from the World Wide Web:https://www.bharian.com.my/node/2132

Berita Harian Online. (2018, Februari 28). Program Latihan Sains Data Diperluaskan Ke Seluruh Negara. Retrieved 15 May 2019, from the World Wide Web: https://www.bharian.com.my/berita/nasional/2018/02/394057/program-latihan-sains-data-diperluaskan-ke-seluruh-negara

Louis Columbus (2017, May 13) IBM Predicts Demand For Data Scientists Will Soar 28% By 2020. Retrive 9 May 2019 from the World Wide Web:https://www.forbes.com/sites/louiscolumbus/2017/05/13/ibm-predicts-demand-for-data-scientists-will-soar-28-by-2020/#3a2b53c67e3b

Miller Steven And Hughes Debbie, (2017). The Quant Crunch: How The Demand For Data Science Skills Is Disrupting The Job Market. Retrieved 15 May 2019, from the World Wide Web:https://www.ibm.com/analytics/us/en/technology/data-science/quant-crunch.htm

Provost Foster and Fawcett Tom (2013, Feb 13). Data Science and its Relationship to Big Data and Data-Driven Decision Making. Retrive 9 May 2019 from the World Wide Web:https://doi.org/10.1089/big.2013.1508

Upasana (2019, May 13). Top 10 Data Science Application. Retrive 9 May 2019 from the World Wide Web: https://www.edureka.co/blog/data-science-applications/

KAJIAN TERHADAP KERBERKESANAN PENGGUNAAN BATU BATA DAN ARANG SEBAGAI MEDIA TANAMAN BAGI KEADAH AKUAPONIK

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ABSTRAK

Akuaponik adalah suatu kaedah yang menggabungkan sistem akuakultur dan tanaman hidroponik. Pada sistem ini, ikan dan tanaman membesar dalam satu sistem secara integrasi dan simbiosis. Tujuan kajian ini dijalankan bagi mengenalpasti pertumbuhan pokok sayur kailan terhadap kesan penggunaan media tanaman yang berlainan menggunakan bahan alternatif yang berkonsepkan lestari. Sehubungan itu, metodologi kajian yang telah dijalankan dengan menggunakan 3 media tanaman iaitu batu leca (media tanaman akuaponik di pasaran), bahan media tanaman alternatif lestari iaitu batu bata tanah liat terbuang dan media arang. Di samping itu, akuaponik yang dijalankan menggunakan tanaman sayuran kailan dengan tiga jenis media tanaman dan ikan talapia sebagai sumber akuakultur. Hasil dapatan kajian menunjukkan bahan terbuang batu bata tanah liat dan arang dapat digunakan sebagai bahan media alternatif lestari untuk media tanaman akuaponik. Media tanaman batu bata terbuang dan arang ini juga lebih menjimatkan kos media tanaman, mesra alam, mudah alih dan hasilan tanaman yang setara dengan menggunakan media tanaman sedia ada iaitu menggunakan batu leca. Kesimpulan kajian ini dapat menghasilkan teknologi akuaponik yang lebih lestari dan mendidik masyarakat ke arah budaya pertanian sihat secara tidak langsung menjaga alam sekitar.

Kata Kunci: Akuaponik, media tanaman, batu leca, batu bata, arang, bahan altenatif lestari

PENGENALAN

Akuaponik adalah suatu kaedah yang menggabungkan sistem akuakultur dan tanaman hidroponik. Pada sistem ini, ikan dan tanaman membesar dalam satu sistem secara integrasi dan simbiosis (Nelson 2008). Teknologi ini membolehkan kita menternak ikan di dalam tangki bersama-sama sayuran di mana hasil yang bakal diperolehi adalah ikan dan sayur-sayuran. Ikan makan yang sesuai diternak secara ini adalah ikan talapia, sepat, puyu, haruan dan keli. Jenis sayuran yang sesuai adalah jenis sayuran dedaun hijau samada kangkong, sawi, kailan dan sebagainya. Tumbuhan yang terdapat di dalam sistem ini akan menyerap nutrient di dalam air yang terhasil dari sisa najis buangan ikan untuk tumbesaran tumbuhan. Dengan adanya penyerapan nutrient oleh tumbuhan maka air akan menjadi jernih, kualiti air bertambah baik dan ekosistem dalam tangki tersebut akan lebih seimbang dan ikan dapat hidup dengan sihat dan membesar (Diver 2006).

Sistem akuaponik juga dilihat berkesan bagi menyahut cabaran negara dalam menangani krisis bekalan makanan berasaskan sumber akuakultur mahupun sumber tanaman sayuran. Sehubungan dengan itu, mekanisma penggunaan teknologi ini dilihat mesra alam sekitar serta mampu dijalankan oleh masyarakat di rumah samada di bandar mahu pun di luar bandar. Faedahnya kepada masyarakat bukan sekadar membantu mengurangkan kos

perbelanjaan harian malah menambah pendapatan sampingan serta melestarikan kehidupan seluruh alam.

Industri yang menyokong bidang akuakultur ini dilihat semakin berkembang dari tahun ke tahun. Masih ada kekurangan dalam memajukan teknologi ini kerana faktor kekangan untuk mendapatkan bahan keperluan sistem akuaponik yang semakin meningkat setiap masa. Justeru ini menunjukkan terdapat potensi yang sangat baik bagi generasi masa kini menceburi bidang akuakultut khasnya menggunakan teknologi akuaponik dengan lebih meluas di negara ini.

KAJIAN LITERATUR

Akuaponik adalah teknik tanaman yang menggabungkan kaedah hidroponik dan akuakultur. Sisa-sisa buangan oleh ikan diserap oleh tumbuhan sebagai nutrien dan ditapis air untuk mencegah sisa air toksik yang membahayakan haiwan akuatik.(Sebes & Sheetz 2006). Sisa toksik ikan jika tidak ditapis akan menyebabkan penghasilan ammonia yang tinggi yang memberi kesan kepada ikan samada tumbesaran ikan atau jangka hayat ikan akan berkurangan.

Rakocy dan Hargraeves 1993 pula menyatakan akuaponik merupakan sistem gabungan antara dua keadah iaitu akuakultur dan hidroponik. Selain itu sistem ini juga ditanam tanpa menggunakan tanah dengan merujuk kepada tanaman hidroponik tumbuhan dan sayur sayuran. Sistem ini dapat mengurangkan penggunaaan air, meningkat hasil tanaman yang berkualiti dan mengurangkan penggunaan kawasan (Rakocy 1989).

Penggunaan sayuran berdaun hijau seperti sayur kailan juga sangat sesuai untuk akuaponik kerana tumbuhan ini bukan sahaja mempunyai tempoh kematangan yang pendek malah kadar penyerapan nutrient adalah tinggi melalui sistem pengakaran yang mampu menyerap air dengan baik.

Media tanaman seperti penggunaan batu leca dalam akuaponik bertindak sebagai penapisan bio untuk menapis air sisa buangan ikan dan sisa tersebut sebagai baja nutrient kepada tanaman (Rakocy 1984). Di samping itu batu leca merupakan sejenis batu kecil tanah liat juga dipanggil dengan nama *hydroton* atau *hdroball* di pasaran. Kegunaan media jenis ini dipanggil sistem tanaman tanpa penggunaan tanah atau *soilless* dalam akuaponik. Sifat batu leca yang diperbuat dari tanah liat memberi idea baru dengan menggunakan bahan terbuang untuk dikitar semula seperti batu bata sebagai bahan ganti kepada batu leca.

PERMASALAHAN KAJIAN

Kebanyakan media tanaman untuk akuaponik menggunakan batu leca yang sukar untuk diperolehi dipasaran berdekatan. Ini kerana untuk membeli batu leca perlu membuat tempahan dari kedai nurseri berdekatan. Malah ada juga nurseri yang menjual batu leca tetapi jarak yang jauh serta kos pengangkutan yang tidak berbaloi untuk membeli bahan tersebut. Malah penggunaan batu leca sentiasa mendapat permintaan yang tinggi di pasaran di samping harga batu leca yang tinggi dari semasa ke semasa. Justeru penggunaan bahan ganti kepada batu leca amat perlu bagi menjalankan sistem akuaponik dan bahan ganti tersebut perlulah setara kelebihannya dari segi kesan kepada tumbesaran pokok dan ikan ternakan akuaponik.

Faktor isu alam sekitar akibat pembuangan bahan binaan yang tidak terkawal kerana tidak digunakan lagi selepas pembinaan seperti batu bata yang berasaskan tanah liat berpotensi untuk dikitar semula. Kebanyakan syarikat atau kontraktor pembinaan akan membuang lebihan batu bata di tapak pelupusan sampah sehingga mencemarkan alam sekitar. Ini amat merugikan kerana batu bata tersebut boleh dikitar semula sebagai media tanaman terbaik untuk akuaponik. Di samping itu, kos pembelian batu leca mampu dijimatkan tanpa perlu membeli atau mencari bahan tersebut kerana batu bata terbuang boleh di dapati dengan mudah.

OBJEKTIF KAJIAN
   a. Untuk mengenalpasti tumbesaran tanaman sayur kalian dari penggunaan media tanaman yang berlainan menggunakan bahan alternatif yang berkonsepkan lestari.
   b. Untuk membuktikan penggunaan bahan media tanaman alternatif boleh digunakan sebagai pengganti media tanaman sedia ada untuk akuaponik.

METODOLOGI KAJIAN

Rekabentuk Kajian
Kajian ini yang dilakukan dengan menggunakan 3 jenis media tanaman akuaponik. Hasil tanaman akan diuji berdasarkan ketinggian pokok dan bilangan daun.
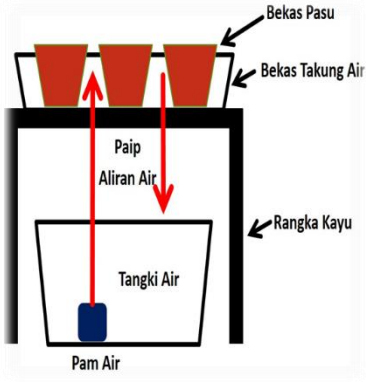Media tanaman A: Batu leca
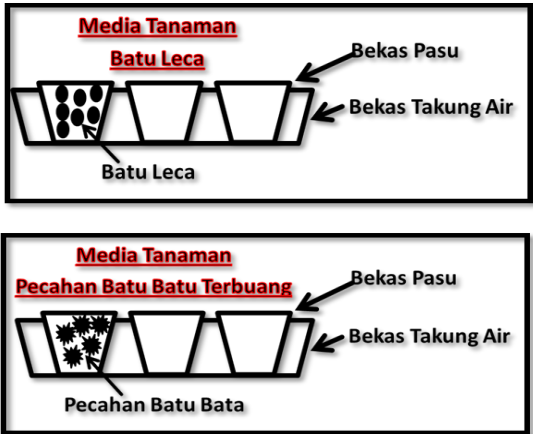Media tanaman B: Batu bata terbuang
Media tanaman C: Arang

Bahan Untuk Penghasilan Sistem Akuaponik
   i. Bahan untuk sistem akuakultur:
      • Tangki air
      • Pam air jenis akuarium
      • Bahan keperluan paip
      • Rangka kayu sokongan untuk media tanaman
   ii. Bahan untuk tanaman:
      • Media tanaman batu leca
      • Media tanaman pecahan batu bata terbuang
      • Media tanman arang
      • Bekas pasu untuk media tanaman dan bekas takung air
      • Benih sayur kailan
   iii. Bahan untuk haiwan akuakultur:
      • 50 ekor anak ikan talapia
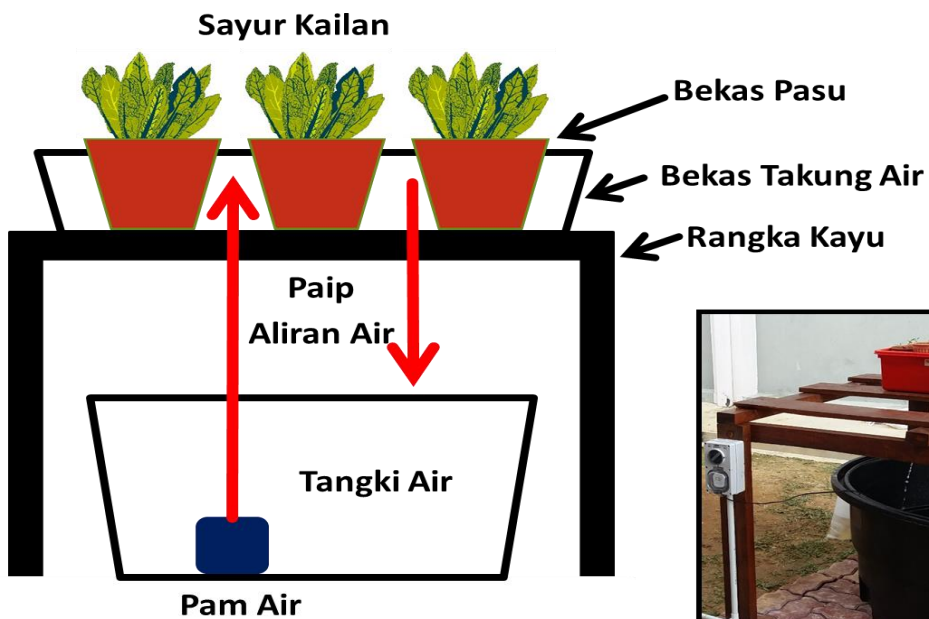   • Makanan ikan jenis palet

Prosedur dan Langkah Kerja Penghasilan Sistem Akuaponik

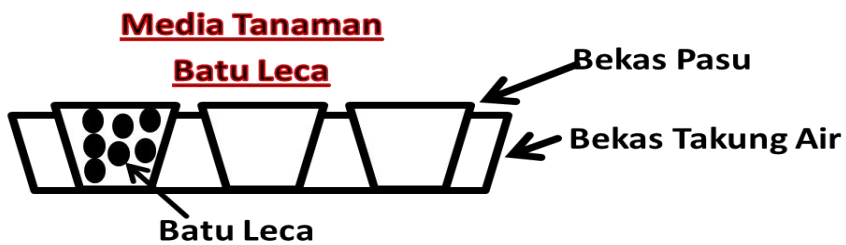| 1.	Memasang Sistem Akuaponik
	   - Sistem ini dipasang dengan menggabungkan rangka kayu sebagai sokongan kepada bekas media tanaman iaitu bekas takung air dan pasu.
	   - Manakala tangki air dipasang dengan paip aliran air keluar masuk bersama dengan pam air akuarium.	

2.	Menyediakan Media Tanaman Sayur
	- Seterusnya media tanaman disediakan dengan menyediakan dua bekas takung air berisi pasu untuk kegunaan akuaponik iatu:
	  i. Media tanaman dalam pasu berisi batu leca
	  ii. Media tanaman dalam pasu berisi pecahan batu bata terbuang
	  iii. Media tanaman dalam pasu berisi arang
	- Benih sayur akan disemai dahulu sebelum dipindahkan ke pasu akuaponik.	

3.	Penyediaan Ikan Akuatik - Ikan yang digunakan adalah jenis ikan tilapia kerana sisa buangan ikan yang sesuai untuk tanaman sayuran, tahan lasak serta bernilai komersial untuk akuaponik. - Sebanyak 50 ekor anak ikan yang digunakan untuk 1 tangki air. - Makanan ikan yang digunakan jenis palet diberi 2 kali sehari. - Jangkaan Hasil Ternakan Ikan Talapia = 4-5 bulan	

RAJAH SISTEM AKUAPONIK

Sayur Kailan

Bekas Pasu

Bekas Takung Air

Rangka Kayu

Paip

Aliran Air

Tangki Air

Pam Air

RAJAH MEDIA TANAMAN

Media Tanaman
Batu Leca

Bekas Pasu

Bekas Takung Air

Batu Leca

Batu Leca

Media Tanaman
Pecahan Batu Batu Terbuang

Bekas Pasu

Bekas Takung Air
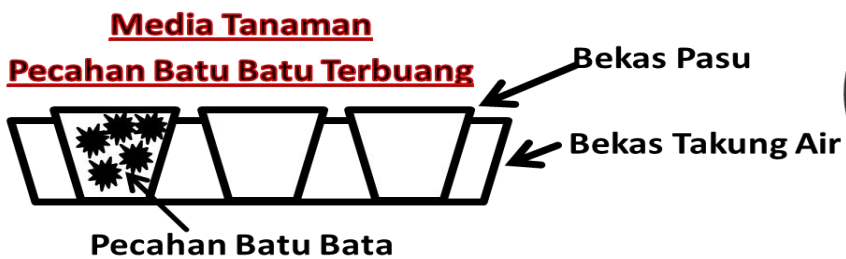
Pecahan Batu Bata

Pecahan Batu Bata

*Muatan satu bekas takung air = 10 pasu kecil

Jadual 1: Carta Gantt Penanaman Sayur Kailan

NO.	AKTIVITI	2016 DIS				2017 JAN				FEB				MAC			
		M1	M2	M3	M4	M1	M2	M3	M4	M1	M2	M3	M4	M1	M2	M3	M4
1.	Menyemai Benih Sayur Kailan				▓												
2.	Memindahkan Anak Sayur Kailan ke Akuaponik					▓											
3.	Tempoh Matang Sayur					TEMPOH MATANG SAYUR UNTUK DITUAI SELAMA 8 MINGGU											
4.	Tuaian Hasil Sayur												▓	▓			

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Jadual 2 : Carta Gantt Kajian

NO.	AKTIVITI / MINGGU	2016				2017											
		DIS				JAN				FEB				MAC			
		M1	M2	M3	M4	M1	M2	M3	M4	M1	M2	M3	M4	M1	M2	M3	M4
1.	Membuat Perancangan Kajian	▓	▓														
2.	Penyediaan Bahan Kajian			▓	▓												
3.	Perlaksaan & Pengumpulan Data Kajian					DATA DIAMBIL MENGIKUT TEMPOH MATANG SAYUR KAILAN SELAMA 8 MINGGU											
4.	Analisis Kajian													▓	▓		
5.	Penulisan Kajian															▓	▓

ANALISIS KAJIAN

Jadual 3 : Graf Ketinggian Pokok Sayur Kailan
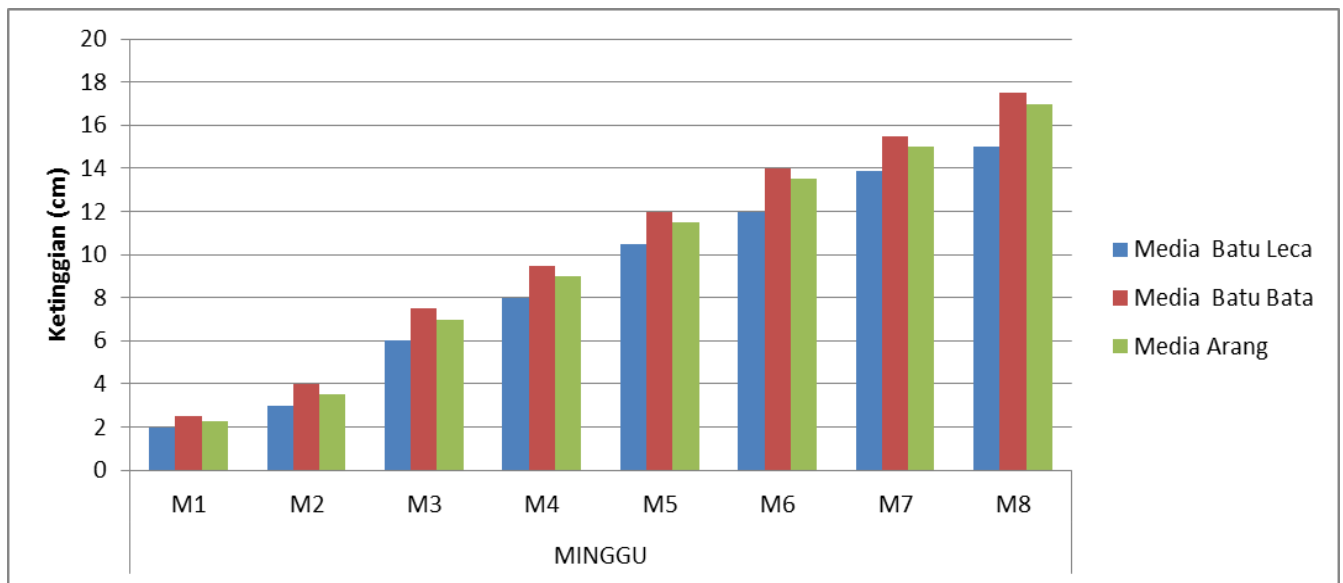
Jadual 4 : Graf Ketinggian Pokok Sayur Kailan

JENIS MEDIA	KETINGGIAN (CM)/ MINGGU							
	M1	M2	M3	M4	M5	M6	M7	M8
Media Batu Leca	2	3	6	8	10.5	12	13.9	15
Media Batu Bata	2.5	4	7.5	9.5	12	14	15.5	17.5
Media Arang	2.3	3.5	7	9	11.5	13.5	15	17

*Data ketinggian diambil berdasarkan purata dari 10 pasu.

Berdasarkan graf ketinggian pokok sayur kailan menunjukkan ketinggian pokok dengan menggunakan media batu bata terbuang meningkat lebih berbanding media batu leca bermula minggu 1 hingga ke minggu 8.

Jadual 5 : Graf Bilangan Daun Sayur Kailan
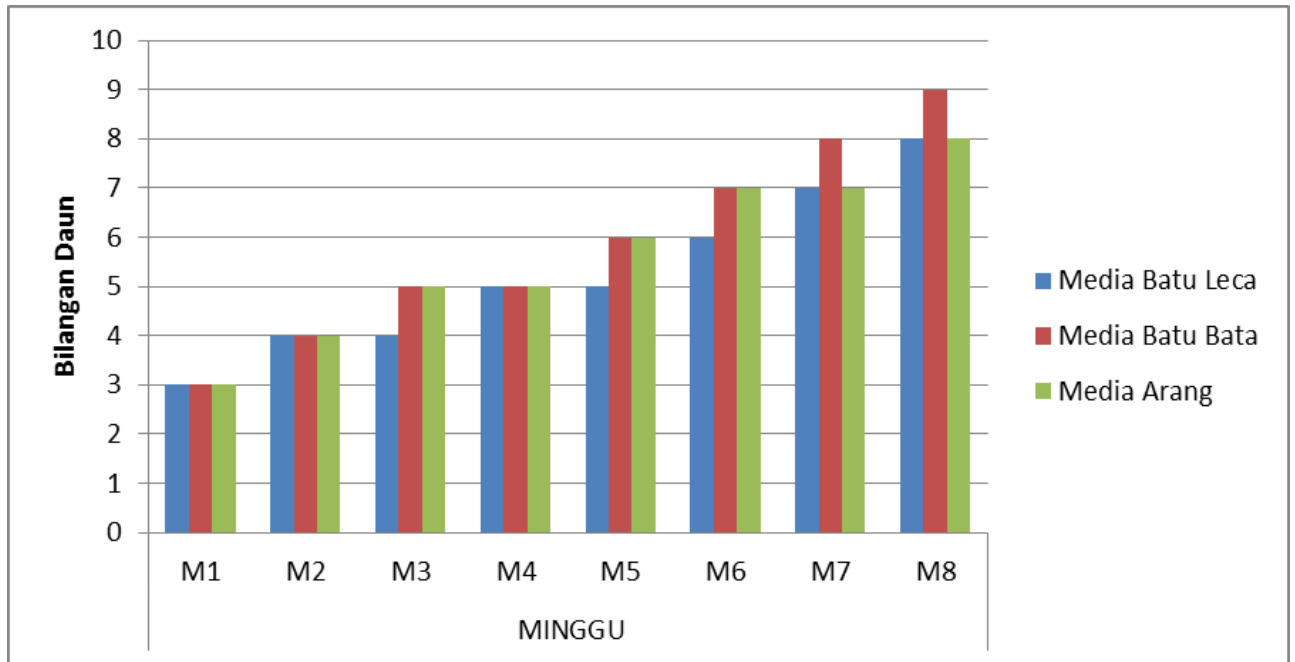
Jadual 6 : Jadual Jumlah Bilangan Daun Sayur Kailan

JENIS MEDIA	BILANGAN DAUN/ MINGGU							
	M1	M2	M3	M4	M5	M6	M7	M8
Media Batu Leca	3	4	4	5	5	6	7	8
Media Batu Bata	3	4	5	5	6	7	8	9
Media Arang	3	4	5	5	6	7	7	8

*Data bilangan daun diambil berdasarkan purata dari 10 pasu.

Berdasarkan graf bilangan daun pokok sayur kailan menunjukkan bilangan daun pokok dengan menggunakan media batu bata terbuang meningkat lebih berbanding media batu leca dan arang bermula minggu 3 hingga ke minggu 8. Selain itu media arang juga menunjukkan hasil positif dimana graf bilangan dan tinggi daun lebih baik dari batu leca.

KESIMPULAN
Kesimpulan kajian ini membuktikan bahawa penggunaan bahan media tanaman altenatif seperti batu bata tanah liat dan arang terbuang dapat digunakan sebagai media tanaman akuaponik. Selain daripada itu penggunaan media juga memperlihatkan hasil dan pertumbuhan lebih cepat. Penggunaan batu bata tanah liat dan arang ini juga dapat mengurangkan kos pelaksanaan sekali yang mana lebih mengutamakan bahan semula jadi . Hasil dapatan dapat dirumuskan penggunaan batu bata tanah liat dan arang sesuai digunakan sebagai menjadi media

tanaman bagi keadah akuaponik. Ini juga turut sama mendidik masyarakat ke arah budaya pertanian sihat secara tidak langsung menjaga alam sekitar dengan mengutamakan bahan semula jadi dalam pelaksanaan kaedah akuponik ini.

RUJUKAN

Diver, S. 2006 Aquaponics- Integration Hydroponic In Aquaculture Of. ATTRA, 1-28.

Mandha. 2010. Teknik Budidaya sayuran Sawi Sendok atau Pakcoy. Yogyakarta: Kanisius.

Nelson 2008, Aquaponics Food Production: Raising fish and plants for food and profit. Montello: Nelson and Pade Inc, Copyright © 2010-2013 Nelson and Pade, Inc. PO Box 761, Montello, WI 53949, USA, ISBN 978-0-9779696-1-6.

Kumar,n.d.; Beria, Garber, Neu, Sebes & Sheetz, 2006. The Vertical Farm Project: Maximally Viable Crop Profile.

Rakocy, J.E., 1984. A Recirculating, Sistem for Tilapia Culture and Vegetable Hydroponics in the Caribbean, Auburn University, Alabama. 30 pp.

Rakocy, J.E., 1989. Hydroponic Lettuce Production In A Recirculating Fish Culture System. Island Perspective 3;5-10.

Rakocy, J.E, dan J.A Hargraeves. 1993. Integration Of Vegetable Hydroponic With Fish Culture : A Review American Society Of Agriculture Engineer, St Josept MI (USA)pp 112-132.

ANJURAN

PUSAT PENYELIDIKAN DAN INOVASI

POLITEKNIK NILAI