Abstract Book

The First Meeting of

Future Scientist School (FSS), Shizuoka University

&

Science Classrooms in University-Affiliated School Project (SCIUS), Thammasat University

7-8th August 2018

Faculty of Science and Technology, Thammasat University

National Science and Technology Development Agency

Princess Chulabhorn Science High School Pathumthani

Program

7 August 2018		
9.00-12.00	Faculty of Science and Technology Visit, Welcome by the Dean, Lab visit, A hands-on activity on 'Thai perfume'	Faculty of Science and Technology
12.00-13.30	Lunch	Faculty of Science and Technology
13.30-16.00	Student Presentations & Poster (Oral presentation 10 min, Q&A 5-10 min)	SCIUS, Faculty of Science and Technology
17.00	Welcome dinner	Faculty of Science and Technology
8 August 2018		
9.00-12.00	National Science and Technology Development Agency Visit, National Biotechnology Center and National Nanotechnology Center Labs visit, JST visit	National Science and Technology Development Agency
12.00-13.00	Lunch	National Science and Technology Development Agency
13.30-17.00	Princess Chulabhorn Science High School Pathumthani Visit, School introduction, Cultural Exchange & Activity	Princess Chulabhorn Science High School Pathumthani

Student Presentations

(13.30-17.00 hrs, Oral presentation 10 min, Q&A 5-10 min**)**

	Title	Presenter
Oral Presentation		
1	Introduction to FSS, Shizuoka, Japan	FSS representative
2	Introduction to SCIUS, SKR&TU, Thailand	SCIUS representative
3	Behavior of pill bugs: preference of light and humidity	Honoka Ikeya
4	Development of Healthy Bubble from Okra	Isara Cholaseuk, Sasisom Ritthiboon, and Sasikarn Aneksitthisin
5	Emergence Behavior of Cicadas in Shizuoka City	Nozomi Takeuchi
6	Development of degradable suture thread from fibroin and biopolymers by electrospinning technique	Patthanit Mongkol, Natnicha Chulapai, and Thanop Ambavat
7	Influence of external pressure on the BZ reaction	Sohta Tatara, and Itsuki Kondo
8	pH measurement of solution from colorimetric detection by using smartphone	Jetnipat Taothong, Thanyachanok Rachavongsuk, and Weeraya Munprasert
Poster presentation		

Behavior of pill bugs: preference of light and humidity

Honoka Ikeya

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Abstract

I have studied the behavior of pill bugs in club activities of Senior High School and the first year of Future Scientists' School (FSS).

First, I examined the speed of pill bugs' movement under the different conditions of illuminance such as 10, 25 and 50 lux. Also, I compared the speed of pill bugs' movement under the different color conditions of light such as red, yellow and blue colors. The results of behavioral experiments showed that pill bugs move faster under the higher illuminance condition than under the lower illuminance condition. Also, it was found that the speed of pill bugs was the fastest under red light, the second fastest under blue light and the slowest under yellow light. From these results, I hypothesized that the negative phototaxis (dark-place preference) of pill bugs was caused by their slower moving and longer staying in dark places.

Second, I analyzed the preference of humidity in pill bugs. I observed the behavior of pill bugs under the alternative humidity conditions by dry and wet filter papers. Pill bugs moved to the wet filter paper not the dry filter paper as soon as they were put on the intermediate area 10 out of 12 tests. Additionally, pill bugs stayed on the wet filter paper longer time than on the dry filter paper. Then, the present results supported the hygrotaxis (wet-place preference) of pill bugs.

At present, I plan to experiment about the behavior of pill bugs under different combinations of color light and humidity.

Keywords: pill bug, preference behavior, illuminance, color, humidity

Emergence Behavior of Cicadas in Shizuoka City

Nozomi Takeuchi

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Abstract

Characteristics of this study are not the examination of the cicada shells but the live cicada larvae. The method made it possible to record accurate the time and the place of appearance under natural environment, and to observe the emergence (imaginal molt) behavior in an indoor experimental environment.

The larvae of cicada were collected in several locations of Shizuoka city on July-August of 2010-2017, and the place/time of collection and species name/sex of cicada were recorded. For the collected larva, the body weight was measured, and the emergence behavior was observed using indoor artificial emergence tables.

From the data of about 3800 samples, it was found that the seasonal times when the larvae of blackish cicada appeared on the ground were earlier than those of large brown cicada, and males appeared earlier than females within the same species. In addition, the appearance times of large brown cicada were concentrated around the sunset time, but the variation in the appearance times of the blackish cicada was larger than that of large brown cicada. These data suggested that the environmental factors such as temperature, illuminance and noise conditions affected the appearance times of larvae, and that the magnitude of the influence differed depending on species and sex.

The data of behavioral experiments made me guess that the timings at which the larvae appeared on the ground and started the emergence were determined in each individual. Further studies are needed to clarify the physiological and ecological mechanisms for the emergence behavior of cicadas.

Keywords: cicada, larvae, emergence behavior, environmental factors

Influence of external pressure on the BZ reaction

Sohta Tatara, and Itsuki Kondo

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Abstract

A BZ (Belousov-Zhabotinsky) reaction is one of the oscillating reaction that repeats oxidation and reduction reactions. The reaction is carried out by mixing of malonic acid, potassium bromate, sulfuric acid, and redox active catalysts such as tris(2,2'-bipyridyl)ruthenium(II) chloride hexahydrate or cerium(IV) nitrate. The reaction process can be monitored by changes of the color and electric potential of the solutions.

During an experiment of the reaction which used the ruthenium catalyst, we found that the amplitude is unexpectedly affected by running an air fan in the laboratory. The finding prompted us to study the influence of the external pressure on the BZ reaction. The study showed that the external pressure remarkably affects the BZ reaction behaviors.

The BZ reaction that used the cerium catalyst showed irregular oscillation at the latter reaction stage under reduced pressure compared to that under the normal pressure (Figure 1) . For the BZ reaction that used the ruthenium catalyst, we found that the reaction continued longer reaction period under reduced pressure compared to that under normal pressure. We would like to describe the unexpected influence of the external pressure on the BZ reaction behaviors in this paper.

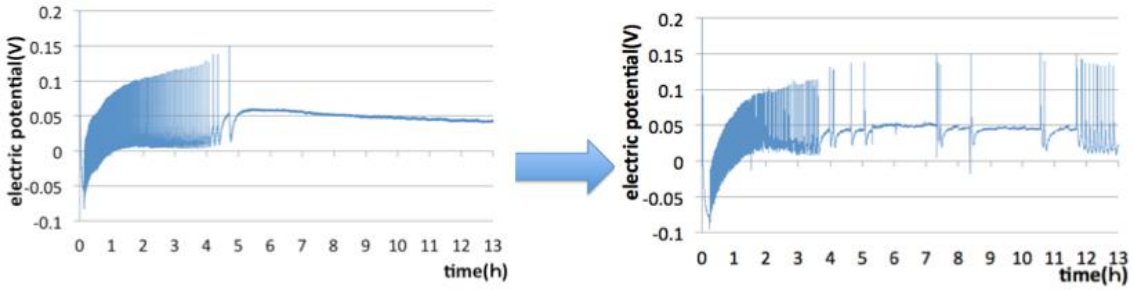

Figure 1. The change of the electric potential of the solution of the BZ reaction which used the cerium catalyst carried out under normal pressure (left) and reduced pressure (right).

Keywords: BZ reaction, external pressure, reaction period

Comparative Study of Zinc Oxide Nanostructure Synthesized by Thermal Oxidation of Zn Coated on Mesh Field

Phichamon Yoorod, Nattaphon Anuniwat, and Chayanon Chinhom

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Abstract

Nowadays, the environmental problem that very close to us is water pollution. This problem is affect to quality of life, economy and tourism in some province. There are several ways to solve this problem and application of photocatalysis is one more alternative. In this case, we choose Zinc Oxide that synthesized by thermal oxidation on mesh for comparative study. That method is not complicated, inexpensive and has high rate of coated. To achieve the objectives, the experiments were divided into 3 parts. Firstly, study of appropriately temperature and time for heated the mesh after Zinc was coated for growth Zinc Oxide nanostructure that has a lot of surface area. Second, structure analysis and the last part, application the mesh. After the mesh was heated at 400°C, 500°C, 600°C, 700°C and 800°C for 1 hour and analysis picture result from scanning electron microscope (SEM). We found that at temperature heated 400°C and 600°C occur too much Zinc Oxide nanostructures per unit area. So we choose 400°C and 600°C for study of appropriately time. We include time conditions as 1 hour, 2 and 4 hours. After the mesh was heated at 600°C for 4 hours occur Zinc Oxide nanowires 1-2 μm. So It is can concluded that if increase heated time, surface area of Zinc Oxide nanostructures will increase too. For application, wastewater treatment should use the mesh was 400°C heated for 2 hours because this mesh has ability to degrade methylene blue 51.2%. The condition that properly use with separation of water and oil is the mesh was 600°C heated for 2 hours because when drop water on mesh water drop suddenly pass through the mesh. All of the result show that each meshes can application to invention in the future.

Keywords: Photocatalysis, Zinc Oxide Nano structure

Conductive Composite of Natural Rubber and Carbon

Warissaporn Wongrattanapipat, Jitjaree Nilliam, and Prouwrawee Budngam

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Abstract

Nowadays, synthetic rubber prices drop, thus many industries use synthetic rubber instead of natural rubber. Due to this situation, natural rubber prices are falling, that seriously affect Thai rubber farmers' income. Most Thai rubber productions export raw or semi-processed rubber, hence we decided to develop conductive composite of natural rubber and carbon. We mixed natural latex with two types of carbon, Carbon Black N660 and Activated Carbon Black N660, dipped with mesh, dried, then studied conductivity property by cyclic voltammetry method. The result showed that composite of natural rubber and Activated Carbon Black N660 had greater conductivity than composite of natural rubber and Carbon Black N660, and they had same tendency of conductivity, slightly increased until 30 phr, then rapidly increased until 40 phr and almost remained stable.

Development of degradable suture thread from fibroin and biopolymers by electrospinning technique

Patthanit Mongkol, Natnicha Chulapai, and Thanop Ambavat

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Abstract

The silk cocoons is important Thai agricultural materials. And it is also the material can be developed to use widely. Therefore, the development of silk cocoons so useful in various fields is important because they add value to agricultural products is more important to the economy. This research focuses on the study about degradation of silk fibroin, which is the protein component of the cocoon. Normally, the rate of decomposition is quite long time. But the interesting features about the compatibility of tissues. It is interesting to develop a material that can be degraded as a guide to develop into soluble suture thread to further exploitation. By studying the protein mixed with biopolymer. And the predicted from properties that may be able to increase the rate of degradation of protein fibroin.

Starting from the study on preparation of silk protein. Cocoon has been eliminated glue silk or sericin then stored separately. Study on extraction methods between the use of autoclave and boiling. Separated fibroin protein was dissolved by solvents from CaCl2 : Ethanol : H2O in ratio of moles 1:2:8. The solution was taken to dialysis to take the salt out and get pure fibroin. Sericin and fibroin have been freeze dried in freeze dryer to get the form of protein powder. The film forming process is mixing fibroin protein and biopolymer with the formic acid. Biopolymer which used in this research include hyaluronic acid, collagen and sericin. Then, a forming technique with casting method. Finally,we get a silk thread that can be studied about physical and degradation properties. Degradation properties was tested by soaking silk in dissolved 1u / ml protease in 0.05 M sodium acetate buffer at 37 ° C for 24 hours. Then, the dry matter content of each film was compared.

The study found that the procedure for the sericin extraction by using autoclave gets better extraction results when compared to the weight of sericin. When measuring the absorbance of proteins, the characteristics of protein remains unchanged. In addition, the use of autoclave has better effect in term of the energy saving. Because heating once time of autoclave provide extraction result more than boiling. The results from FTIR-ATR corresponds to the corresponding bonding of the peaks in the graph. The peaks correspond to the reactants and biopolymers that are mixed. The SEM x1000 of films from four treatments that prepared under the same conditions and using a solvent formic acid. Found that film from mixing fibroin with biopolymers has smooth surface more than film from fibroin only.

This is in line with increased water retention properties or water can absorb in the film structure. That is clearly noticeable by the decreasing of contact angle of fibroin film with biopolymers. And the crystallization of the XRD technique show that these films has long-range order graph pattern or the materials have low crystallinity. The degradation properties tested found the film has a higher percentage of dry weight loss when the film mixed with biopolymers. The highest dry weight loss are the films that fused with hyaluronic acid. This treatment has dry weight loss from degradation of fibroin films about 59.45±1.09%.

Development of Healthy Bubble from Okra

Isara Cholaseuk, Sasisom Ritthiboon, and Sasikarn Aneksitthisin

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Abstract

Okra (*Abelmoschus esculentus*) is Thai local plant and it is all year-round plant. Okra has mucilage that contains soluble fiber, pectin and gum which can cure gastric ulcer and balance body systems, etc. So, we decided to make a product from okra mucilage by using it as main ingredient to make bubbles. Bubbles are made from tapioca flour that have high calories and lack of nutrient. The objectives of this project are reducing the ratio of tapioca flour and producing rich in nutrients bubbles. The first step, find the best recipe to make healthy bubbles, using 50 volunteers' judge from 9-point Hedonic scale. The best recipe is the ratio 44 : 48 : 7 of tapioca flour : water : sugar by mass but it can't form up bubble when we mix tapioca flour, water and okra powder together. So we choose another recipe which has close score to the ratio before, tapioca flour to water in ratio 6 : 5 by mass, boil at 95℃ for 40 minutes and cover on while stop heating for 20 minutes. The second step is to find the best process for extracting okra mucilage. The best process is boiling okra at 80℃ with the ratio 1 : 1 of okra to water by mass for 5 minutes, blend in blender for 1 minute, filter by using straining cloth and spread on the tray. Then, dry in Hot Air Oven at 60℃ for 15 hr. Next, blend in blender to make powder. This process can get more mucilage, long shelf life and easier to prepare. The third step is to make the healthy bubble, using water : tapioca flour : okra powder in ratio 6 : 5 : 1 by mass. After that, we let 50 volunteers do the 9-point Hedonic scale to evaluate for producing healthy bubbles from okra. The best recipe contains 8.33% concentrated okra powder. Our finished product would be dried bubbles for long shelf life, so we boil bubbles at 95℃ for 30 seconds and dry in Hot air oven at 50℃ for 15 hours. Then analyze the chemical and physical performance of healthy bubbles. The chemical performance of bubbles contains carbohydrate, fats, protein, moisture content, ash and gelatinization. And physical performance are spherical and density. The healthy bubble from okra contains 87.56±0.56% carbohydrate, 0.1±0.03% fats, 4.51±0.5% protein, 6.13±0.16% moisture content, 1.71±0.16% ash, 92.77±0.78% of gelatinization, 97.15% spherical and density is 1,650.91 kg/m^3. After analyzing, the healthy bubble from okra contains soluble fiber and more nutrients than other bubbles. Finally, most people accept this healthy bubble from okra.

Keywords : okra, bubble tea, bubbles, calories, nutrients

Efficiency of *Eupatorium odoratum* L. and *Eupatorium adenophorum* Spreng Extracts on Inhibition of Chili Pathogens and Weed Control

Khem-aksorn Nimyen, Rungvigrai Lertsuwan, and Chanyaporn Ruangrot
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Abstract

Weeds are the important pests of agriculture crops that can snatch nutrients and minerals of the plants. They make the plant growth rate decreased. But there are some groups of weeds such as Siam weed and Praxelis that have the Allelopathy effect which can inhibit the growth of plants. So we extracted Siam weed and Praxelis with the organic solvent including Hexane, Dichloromethane, Acetone, Ethyl Acetate and Methanol. Afterwards we brought the extract to test the biological activity. The experiment is divided into 4 steps. First experiment was the extraction and chemical composition analysis by Thin Layer Chromatography (TLC) method. The result showed that Siam weed and Praxelis from each solvent mostly has the same major chemical components but there may also have other different component depending on the different solvent. Second experiment was the weed germination inhibition test. We chose 2 weeds to study. The results showed that the Siam weed extract from Methanol can inhibit the germination of barnyard grass at 500 and 5000 ppm concentrations. The germination percentage was at 67.93% and 79.38% respectively. And also inhibit the length of barnyard grass's root. The barnyard grass's seeds that soaked in the extract of 500 and 5000 ppm concentrations have the root length average at 1.830±0.403 and 1.420±0.035 centimeters respectively and in the distilled water (Negative control) has the average length at 19.650±3.416 centimeters. But the extract cannot inhibit the germination and root's length of sunn hemp. When compared with the distilled water and the Siam weed extract from Dichloromethane has the different result as follow at 5000 ppm concentration can inhibit the germination of barnyard grass 100% but at the 500 ppm concentration has more growth than distilled water 1300% and the extract can inhibit the root's length of sunn hemp when compared with distilled water. The root length at 5,000 ppm was 6.650±0.215 centimeters. While the negative control has the length of 14.600±0.515 centimeters. Third experiment was the weed growth inhibition test. We founded that the barnyard grass soaked in the Siam weed extract from Dichloromethane at 5000 ppm concentration has withered leaves as well as soaked in the Gramoxone (Positive control). In addition we also founded the leaves were changed into yellow leaves. But while in the barnyard grass that soaked in the Siam weed extract from Dichloromethane at the 500 ppm concentration has the best growth and similar result was found in sunn hemp. Fourth experiment was tested with the *Colletotrichum* sp., which is the cause of fungal disease called Anthracnose in chili. Result showed that Siam weed extracted by Dichloromethane at the concentration of 45,000 ppm has the best result with the culture diameter of 3.625±0.075 centimeters. While Mancozeb (Positive Control) has the culture diameter of 4.200±0.050 centimeters. In conclusion, Siam weed extract from Dichloromethane at high concentration can inhibit the germination and the growth of plants, which can be developed to control weeds and inhibit the growth of *Colletotrichum* sp. in chili.

Keywords: Siam weed, Praxelis, *Colletotrichum* sp., Weed control

pH measurement of solution from colorimetric detection by using smartphone

Jetnipat Taothong, Thanyachanok Rachavongsuk, and Weeraya Munprasert

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Abstract

Standard pH meters are expensive and difficult to move. So it is not easy to use outside the laboratory. Also the use of universal indicator solution for pH measurement is still necessary. However, the reading method, using naked eyes observation comparing to the standard color chart, may be inaccurate. Nowadays smartphones play an important role in the various aspects in everyday life and smartphones' performance is close to portable computers. Therefore, we are interested to study the method of using smartphones for pH measurement by monitoring from the color change of pH indicator. The experiment is divided into 2 parts. The first part is to create a calibration equation from the picture of standard color chart (MU test kit- pH 3.0 – 9.0) captured by Lenovo K910L inside the light control room. ImageJ software is used to analyze the picture of standard chart by choosing the region of interest (ROI) with the area of 2,025 pixel2 for each pH values and then create a graph of the relationship of xy color space and pH value. The calibration equation is obtained by surface fitting of the graph. The second part of experiment is to test with the standard buffer solution with known pH value measured by standard pH meter (Denver instrument model ub-10). Three buffers with the pH value of 4.06, 5.60 and 7.10, respectively, are mixed with universal indicator solution in the bottle with the volume of 1.5 ml. The color changes of solution are captured by Lenovo K910L and then xy parameters are calculated. The pH values are determined from the calibration equation and then are compared to the values that are measured by standard pH meter to obtain the error values. The result shows that the error value is about 10% and the correlation (R^2) is 0.893.

Keywords: pH, Colorimetric measurement, Smartphone

Studying and comparison of efficiency adsorption and desorption of carbon that produced from Banana peel and leaf sheaf of banana tree by Gros Michel banana for developing them to fertilizer

Woraporn Pengsook, Khwanjira Pattawanwiwek, and Autthawit Tuamrungroj

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Abstract

Nowadays, Bananas are the fruits which many Thai people consume. People eat both banana and banana product. Banana processing leave component of banana as waste. Then we use banana peel and leaf sheaf of the banana tree to make charcoal by burn at 300 °c in 3 hours. Some charcoal brings to boil with HNO3 8 M in 1 hour and wash it until neutral. Soak the charcoal in KH2PO4 solution 5000 mgP/L in 2 hours for absorbing Phosphorus. Potassium is the complement of the banana peel and leaf sheaf of the banana tree but Potassium in leaf sheaf of the banana tree more than a banana peel. Next step is testing efficiency desorption. The result shows the banana peel charcoal able to absorb and desorb Phosphorus well. The leaf sheath of banana tree charcoal able to absorb and desorb Nitrogen well. Then bring charcoal though processing to make charcoal pellet like fertilizer. This process for easy to use. So the objectives of the study were to reduce banana peel and leaf sheaf of the banana tree in the environment, add the value of banana peel and leaf sheaf of the banana tree, Using in agriculture for avoiding dangerous fertilizer.

Synthesis and characterization of cellulose fiber from water hyacinth and calcite composites by reflux and hydrothermal method for adsorption phosphate

Thitiwat Larndech, Napisa Pattanawadee, and Sukittaya Rungrit

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Abstract

Nowadays Water hyacinth is one of things that cause water pollution in Thailand. So we try to add value of water hyacinth by synthesize the water hyacinth with $CaCO_3$ bio-nanocomposite and then study adsorption phosphate by our composite. In our study, We blend water hyacinth by blender and treat by NaOH with 2% and 4%. Then tested methylene blue adsorption to find the best condition of Water hyacinth's adsorption and used this condition in synthesis bio-nanocomposite. We prepare cellulose solution from water hyacinth by (Jia, Li, Ma, Sun, & Zhu, 2012) method and add $Ca(NO_3)_2 \cdot 4H_2O$ (0.40mol/L) and $Na_2SiO_3 \cdot 9H_2O$ (0.40mol/L) in 10ml of this solution. Then heat at conditions by reflux and hydrothermal method. Characterized this composite by X-ray Powder Diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), Scanning Electron Microscope (SEM) then used condition in study phosphate adsorption. We found that this composite can be prepared by both reflux and hydrothermal method but reflux is better than hydrothermal method. Synthesis of the composite by reflux for 8 hours has the largest crystal of $CaCO_3$ and reflux for a long time for better crystallinity and for 2 hours befit in phosphate adsorption. In study phosphate adsorption, it fit in Langmuir isotherm more than Freundlich isotherm but it is not good as phosphate absorbent.

Keywords: Bio-nanocomposite, Phosphate, water hyacinth

The development of antimicrobial chitosan film for Gros Michel banana

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Abstract

Currently, Gros Michel banana is the economic plant of Thailand. The problem most farmers find after harvest is banana was rotten. General packaging does not help to extend the life. The concept of packaging can extend the life of Gros Michel banana. The main raw material of the packaging is the chitosan film and the kariyat extract. Crude extracted with methanol and ethanol 50% 75% and 95%. Determine the amount of phenolic compounds. Wolfe et al. (2003) investigated microbial activity by MIC, MBC method and disc diffusion by testing with *Bacillus subtilis*, *Staphylococcus aureus*, *Escherichia coli*, *Enterobacter* and the isolate from the rotten banana. Then film forming, check the properties of the film by testing the elasticity and test the shelf life of banana. Using a film coated banana, the banana is coated with crude extract. The experiments showed that the crude extract of EtOH 95% was effective in inhibiting the highest bacteria. The MeOH 50% solvent was the most effective against fungi. Based on the diameter of the clear zone. The effectiveness of bacterial and fungal inhibition varies due to the different morphological characteristics of bacteria and fungi. Then, select the crude extracts with 95% ethanol and crude extract of MeOH 50% in film forming.

The study of Lythracea extract-loaded niosome preparation for transdermal patch

Chaichana Pantan, Thanawin Duangjan, and Benyapa Insawang

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Abstract

Thailand is experiencing problems with patients in chronic non-communicable diseases. Non-communicable diseases (NCDs) and type 2 diabetes are the most common NCDs with the highest rates of death. Type 2 diabetes is caused by decreased sensitivity to the hormone insulin in the membrane. The transport of glucose into the cell is not normal. In this study, the organizer studied the particle niosomes that contained the plant extracts to prepare the transdermal patch. The study was divided into 4 parts. Three types of leaves were macerated, namely, Inthanin, Salao, and Tabak. The two solvents are ethanol and ethyl acetate. To compare the properties of plant extracts, it was used in the preparation of niosomes and in the transdermal patch preparation. Tamarind seeds were incubated for 1, 2, 3 and 4 hours and then extracted with ethanol. The third experiment was to study the surfactant and cholesterol ratio in the preparation of particulate matter. Oom To obtain a smaller and more efficient particle size, maximum retention And experiment 4 is to make the transdermal patch by extraction in the first experiment, polysaccharide extracts from experiment 2 and niosomes were obtained from the third experiment. The results showed that Tabak extracts were extracted with ethanol has the best antioxidant activity. Salao extracts extracted with ethanol contained the total phenolic content and the highest extraction yield, so we used Salao extracted by ethanol in the next experiment. The duration of 2 hours of tamarind seed drying was the time that the polysaccharide extract had the viscosity and the maximum polysaccharide yield. The ratio between span 60 and cholesterol 2: 1 gives the smallest niosomes. And most effective in quarantine. Ratio of niosomes 0.2 and 0.4 percent on total film weight cause of transmission sheet can be formed. This research is just the preparation of the early release tablets. This will be beneficial for the development of type 2 diabetes treatment in the future.

Keywords: polysaccharide, niosomes, transdermal patch

Lists of Japanese Participants

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Accompanying person:

1. Mrs. TAKEUCHI

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