Project

Mosquito repellent patch from citronella essential oil and catnip

by

Miss Priyaporn wongnongwa

Mr. Palathip thongchua

Mr. Sorawit bungankorn

Counsellor

Mr. Chumphon Charisaen

Mr. Suriya Phopiasri

Kalasinpittayasan school

Name Project Mosquito repellent pad from essential oil, citronella and catnip

Name Organiser Miss Priyaporn wongnongwa

Mr. Palathip thongchua Mr. Sorawit bungana

Name Counsellor Mr. Chumphon CharisaenMr. Suriya Phopiasri

Kalasinpittayasan school, Mueang Kalasin District, Kalasin Province

Class level high school

Academic year 2566

Abstract

At present, mosquitoes are carriers of a variety of life-threatening diseases such as malaria.Slow foot disease, encephalitis, Chikunguya fever, dengue fever, etc. In addition, the female mosquito can also lay up to 50-150 eggs at a time and can produce eggs throughout its lifetime. The data between January 1 - 24, 2023, the Kalasin Provincial Public Health Office reported 706 cases of dengue fever patients, accounting for 68.33 cases per hundred thousand people. The disease caused by the outbreak of other types of mosquitoes has stopped spreading. The project committee has surveyed and analysed the various indexes of Kalasipit School. It was found that the HI value of the Aedes mosquitoes has more than 10, the CI value is equal to 0 and the BI value is less than 50. In conclusion that the Kalasin Pittayasan School area is at risk of the risk of the transmission of dengue fever. And the use of moderate types of mosquito repellents today, whether it is a spray type, against type and spots type that the use of these mosquito repellents may contain synthetic chemicals that are toxic to humans if used in excessive quantities and may be dangerous to users. Mosquito repellents from citronella and catnip essential oil are a product that can solve the problem of mosquito repellents and is not harmful to humans as well. By using citronella and catnip to extract essential oils that with excellent insect repellent substances from the experiment, it was found that citronella essential oil and catnip essential oil can repel mosquitoes. By experimenting with a paste that drops of citronella essential oil on the left side of

the net used in the experiment, the volume of 3 drops in 20 minutes, with a mosquito repellent, the number of mosquitoes, the percentage of the total number of 91.67 can repel mosquitoes better than the catnip essential.

Keyword : Mosquito repellent products, Citronella, catnip

Acknowledgments

The science project on mosquito repellent patches from citronella essential oil and cat cannabis can be successfully achieved very well with the courtesy of many people. I would like to thank everyone for their knowledge and thank you for the GLOBE project, the Institute for the Promotion of Teaching and Learning that provides knowledge about the operation and data collection. As well as being supported by the Ministry of Public Health, Kalasin Province that provides information about dengue fever in the process of analysing the risk of dengue outbreak data in Kalasin Pittayasan School.

Thank you to Teacher Chumphon Charisaen and Teacher Suriya Phopiasri for taking advantage of the science laboratory, tools and equipment during research, introducing documents, textbooks and websites used in research and giving advice on solving various problems to complete well.

The organizers hope that this project will benefit the people and those interested in mosquito repellent products. Mosquito patch from citronella essential oil and cat cannabis If there is any mistake, the researcher would like to accept it only.

The organiser

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Lesson 1
Introduction

1.1 The origin and importance of the project

At present, mosquitoes are many living things on the planet, which have more than 3,000 species, especially Thai mosquitoes that can be considered as carriers of serious diseases to life, such as dengue fever caused by Aedes mosquitoes, Malaria caused by Anopheles, Lympphatic filariasis caused by Culex mosquitoes, etc. In addition, the female mosquito can also lay up to 50-150 eggs per time. And can lay eggs throughout its life. therefore, it is not strange that we can meet mosquitoes at any time every day and can be found almost everywhere and still cause a lot of problems for people, such as biting, harassing, etc., which mosquito bites can be infected with various dangerous diseases. to prevent a variety of mosquito species, especially Aedes mosquitoes, which are carriers of dengue fever. the information between January 1 - August 24, 2023, there were 706 reports of dengue patients, representing a disease rate of 68.33 cases per hundred thousand people. As for diseases caused by carriers of other types of mosquitoes, it has stopped spreading for 3 years. (Kalasin Provincial Public Health Office,2566)

How to prevent or get rid of mosquitoes today There is a widespread use of mosquito repellent, whether it is a spray mosquito repellent that mainly uses chemicals. The type of mosquito repellent which inhaling the smoke of the mosquito s may cause dizziness, nausea, cough or feel sore throat. And if inhaled for a long time, it may affect the respiratory system, causing allergies or the risk of lung cancer more than the general public and the type of mosquito repellent. Because this mosquito repellent is used directly on the skin Therefore may cause irritation to the skin Or allergic reactions May cause red rashes, itching or other abnormal symptoms Children under 4 years old should not use mosquito repellents. Because it may cause irritation to the skin.

Herbs that can prevent mosquitoes. The popular is Citronella grass that extracts essential oils from the leaves and residue of citronella grass. There are important

compounds that are active in repelling various insects. And catnip in addition to making cats satisfied, the compounds in the leaves also help to repel mosquitoes and insects naturally. And cats may develop this behavior naturally to protect themselves from infectious diseases that are carried by mosquitoes and insects (Nadia Melo, 2021). The important compound that is active in repel various insects. Is a volatile substance from the catnip plant It is also effective enough to repel mosquitoes. Such research results makes the extract from the catnip plant. To be used as a safe and highly effective insect repellent for humans (Mazao Miyazaki et al., 2021)

The project organiser has seen this problem, so he is interested in exploring the water source within Kalasin Pittayasan School. To study the risk of the outbreak of dengue fever and prepare mosquito repellent products from nature that extracts essential oils from citronella grass and catnip to reduce mosquito infestation and reduce the use of dangerous chemicals by using the properties of citronella and catnip instead of chemicals that are dangerous to humans and easy to use.

1.2 Objective

1.2.1 To study the risk of the outbreak of dengue fever in Kalasin Pittayasan School.

1.2.2 To produce mosquito repellent patches from essential oils from citronella grass and catnip.

1.3 Scope of study

1.3.1 Kalasin Pittayasan School.

1.4 Expected benefits

1.4.1 The risk level of the outbreak of dengue fever in Kalasin Pittayasan School.

1.4.2 Mosquito repellent patch with essential oil from citronella and Catnip.

Lesson 2

Related documents and research

2.1 citronella

2.1.1 Botanical characteristics

citronella is a herbaceous plant. It can be about 6-8 years old. It is a fragrant plant. It grows with sprouting or cracking rhizomes. There is a bush shaped like a house citronella with stems protruding from a short rhizome, cylindrical shape, smooth, smooth surface. The above the ground, can be from 1-2 m high. The leaves are single, long, but thinner than home citronella. The leaves are slender leaves are 1.5-2.6 cm. wide, 60-115 cm long, the tip is slender, pointed, with a sharp, with a sharp, with a rough leaf surface. There is no hair. The inside of the base of the leaf has a long leaf. The leaves are a yellowish greenish-green artificial stem. The leaf is a red or purple, which is different from the citronella with a greenish-white. The flowers are a large, a long bouquet. It is a large, about 100 cm, the below, there are 7-9 lines. The real flower has 1 scale, about 0.3 cm long. There is a clear colour. 3 males and 2 flake petals, the result is a dry fruit. Cylindrical shape, round and There is a terminal at the base

2.1.2 Chemical structure, citronella essential oil

citronella will be extracted essential oils for use in experiments. Aromatic oil (Volatile Oil) is an organic substance that the plant synthesises. Has a unique smell and taste Was created in a special cell cell wall The gland or pipe within the essential oil plant occurs from the secondary metabolism process. (Secondary metabolite) But is a substance that does not act on growth as a substance found in some plants Substrate in the production process of essential oils is a substance derived from the primary metabolism reaction (Primary metabolite) different with enzymes as a catalyst of essential oil production Each type of plant that produces essential oils will synthesise, store and release the smell of volatile oil. Different for citronella Is a plant that creates essential oils from small hair cells (Microhairs) that are in the permanent tissue, abaxial epidermis of the leaves.

2.2 catnip

2.2.1 Botanical characteristics

The trunk looks like a nettle in our home, with soft hair covered all over the stem, the height of the stem is about 50-100 cm. There are soft hairs in general in the stems and leaves. There will be fragrant oil. Volatile that gives a unique smell Which in each type has a different chemical composition, the leaves look like a heart shape. The green leaf plate is wavy. There is a flower as a bouquet at the end of the branch in each bouquet. There are many small flowers. The appearance of the flower is similar to lavender flowers. Full bloom with 5 mm. The flowers are both white, purple, pink, blue or purple, white, covered throughout the inflorescence.

2.2 Chemical structure, catnip essential oil

Nepetalactone and Nepetalactol It is a substance derived from catnip and many other plants in the genus Nepetal They protect these plants from herbivorous insects by repelling insects. They are also produced by many aphids, which are sexual pheromones. Nepetalactones are attractive to cats and nepetal lactone from cat catnip. Can repel mosquitoes to escape far away 10 times better than DEET, which is the main component of mosquito repellents that is commonly sold. Plus, the extraction is easy to extract (Chris Peterson, 2019). Volatile substances from the catnip plant are also effective enough to repel mosquitoes. Especially the female mosquito in the laboratory, they will not come close to the cat that is in contact with the catnip plant including not to bite the arms and hands of researchers who tore the catnip leaves. (Mazao Miyasaki et al., 2021)

2.3 Aedes mosquitoes carry dengue fever

Aedes mosquitoes are one of the insects in Thailand. There are more than 100 types of Aedes mosquitoes, but there are 2 types of dengue fever. There are 2 types of Aedes mosquitoes (Aedes Aegypti) as the main carrier. And the garden mosquito (Aedes Albopictus) is a secondary carrier In the life cycle of Aedes mosquitoes, consisting of 4 phases Including the egg stage, the larvalva stage, the pup stage or the middle age (moot), and the adult stage (mosquito) stage, all 4 stages are different.

Both the shape, characteristics and life of the egg, the egg, the mosquito egg has a bobbin-like shape. When laid out, new, it will be white, then it will change to brown and black within 24 hours. The ball phase, no legs, the chest is larger than the head. The long belly consists of 10 internodes. There is a breathing tube on the 8th chimney. Used in breathing of the breathing of the mosquito is shorter than the mosquito's breathing tube. And there is a group of hair on the breathing tube The tube. The body has no legs. The shape is like a comma (,) There is 1 pair of breathing organs used on the cephalothorax (together with the head). The adult body The body is soft, fragile, divided into 3 parts, clearly separated, namely the head, chest and abdomen. The body is about 4-6 mm long. There are black scales, alternating white according to the body, including the head and chest. 2. There are 3 pairs of legs (6 legs) on the chest. The legs are black and white. On the back leg, the end of the last segment is white. 3. There is a noticeable mouth 1 pair in the chest The appearance of the mouth is clear. There are small scales on the mouth. The appearance of narrow and long scales On the back edge of the mouth, there is a small scale. There is also an organ that acts on balance. (Called 1 pair of halters) is near the mouth 4. It has a very long mouth. The appearance of the mouth is a stabbing style 5. The moustache line consists of 14-15 short internodes at the joints between the internodes with hair. In the surrounding in the male mosquito, these hairs are very long. (Used to receive sound waves caused by moving the mouth of the female mosquito) looks like a feather tassel. In the female mosquito, the hair at the joint between the internodes is shorter and less. Called a yarn moustache, the characteristics of the mosquito moustache are used to classify the sex of mosquitoes easily. House mosquitoes and Aedeges mosquitos have different as In this way

Aedes aegypti

1. Adults, the mouth syllable area is covered with white scales. At the centre of the chest The back will have hard hair and white scales. See each other as a pattern like a harp.

2. The larvae in the eighth segment will have about 8-12 rows of scales on the edge. At the end of the scales are separated into lobes. And in the chest, there are spikes

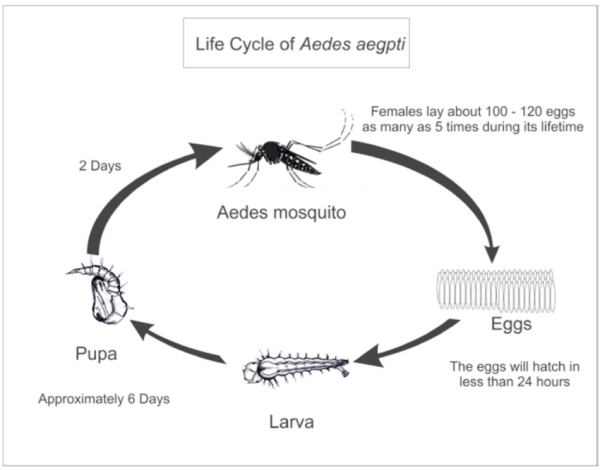
Aedes albopictus

1. The adult has a black scale at the back of the mouth, the chest with a white stripe in the centre.

2. The eighth segment has about 8-12 rows of scales. The tip of the scales at the edge is not split. The chest does not have a spike.

2.4 The life cycle of Aedes mosquitoes

Aedes mosquitoes often lay eggs along the surface of the container slightly above the water level. By laying single bubbles together as a group The female lays about 100 eggs at a time. The mosquito's life cycle will have 4 stages, including the egg stage, the larva stage (larva stage) and the pupa stage (adult stage), which the mosquito will have a life cycle of 9-14 days. The female is about 1-3 months. The male is about 6-7 days old. Each mosquito can lay 3-4 times, 50-300 bubbles per time. The female mosquito at the age of 2-3 days, therefore begins to eat human or animal blood. To bring protein and minerals to use for the growth of the ovaries, the male mosquito will suck nectar to survive. After sucking blood when the egg is fully ripe, the female mosquito will find the right water source for laying eggs. After laying eggs, the female mosquito can suck new blood and lay eggs.



Picture 1 : The life cycle of Aedes mosquitoes

Source : ResearchGate (2021)

2.5 Dengue fever situation in Kalasin Province

Kalasin Provincial Public Health Office has received reports of a total of 115 dengue patients in 15 districts, representing a sick rate of 11.13 per hundred thousand people. There are no reports of deaths. The number of patients with dengue fever classified by gender found more than female, with 386 male patients, 320 female, male to female ratio 1.21: 1, the age group that found the top 3 patients: 10-14 years old, 32.29 percent, followed by the age group of 15-24 years (26.2%) and the age group 5-9 years (22.10%), respectively. The occupation found the top 3 patients: students, 70.68 percent, followed by the administration (12.47%) and hire (7.37%), respectively. Kalasin Province is classified as a yellow province. It is a province that is at risk of outbreak. (Kalasin Provincial Public Health Office, 2566)

2.6 Related documents

2.6.1 Studies on the extraction of essential oils

Kanokwan Preecharat et al. (2004) has worked to study the extraction of essential oils from citronella (Cymbopogon grass) and the killing effect of mosquito larvae. Study of the appropriate conditions for extracting essential oils by using citronella 50.00 grams by conventional distillation method by using steam as an extractor. When using essential oil from citronella trees mixed with 70 percent alcohol at various concentrations, it was found that the higher the concentration, the death rate will be high. And in the concentration of 0.30 and 0.35 in a million parts, the death rate is 100 percent within 30 minutes.

2.6.2 A study on catnip

Mazao Miyazaki et al. (2021) conducted research on cat marijuana and its effects in Insect control, which has two chemicals, nepetalactol and nepetalactone - an eight-shaped molecule - is classified as iridoids, which are produced by plants such as catnip and cat's marijuana to dispel insect attacks. Nepetalactone also occurs to stimulate a series of receptors within the cat's nasal cavity, causing a cascading response that makes it roll quickly in the leaves, demonstrating the cat's intense action,

causing cat's cat's leaves and cannabis. If bruised, it is very bruised enough to release nepetalactone and nepetalactol in sufficient quantities to act as as a mosquito repellent. The team also tested it. Many others are about the effectiveness of various plant extracts and ingredients of iridoids as a Mosquito repellents and the concentration of volatile compounds around the research results in extracts. Catnip plants for use as a safe and highly effective insect repellent for humans.

Lesson 3

How to operate

Study of the risk of the outbreak of dengue fever in Kalasin Pittayasan School and study on mosquito repellent patches from fragrant oil, citronella and catnip he objective is to study the risk conditions in Kalasin Pittayasan School and to produce mosquito repellent patches with essential oils from citronella and catnip as follows:

Part 1 Study the risk of dengue fever outbreak in Kalasin Pittayasan School.

Materials and equipment

1. A cullender to trap the larvae.
2. Permal sample collection bag
3. Digital Microscope

How to study

1. Determine the study point in the survey as follows.
   - 23 pieces of waterlogged containers
   - 15 buildings within the school
   - 109 common water containers
2. Conduct a survey of mosquito larvae according to the method of GLOBE (Institute for the Promotion of Teaching Science: 2009)
3. Classify and count and send the information entered in https://www.globe.gov/globe-data/data-entry
4. Calculate various indices as follows:

$$\text{HI (House Index)} = \frac{\text{Number of houses surveyed found larvae}}{\text{Total number of houses surveyed}} \times 100$$

$$\text{CI (Container Index)} = \frac{\text{Number of containers surveyed found larvae}}{\text{Total number of containers surveyed}} \times 100$$

$$\text{BI (Breteau Index)} = \frac{\text{Number of containers surveyed found larvae}}{\text{Total number of houses surveyed}} \times 100$$

5. Analyse the risk according to the calculated index.

Translation of mosquito larvae index

HI >10 Is a high risk of disease transmission HI < 1 Is a low risk of disease transmission BI >50 Is a high risk of disease transmission BI < 5 Is a low risk of disease transmission CI = 0 Is a low risk of disease transmission

Part 2 Extract essential oil from citronella by steam distillation.

Materials and equipment

1. citronella
2. Heating mentle
3. Equipment for cutting citronella leaves
4. Medicine dropper
5. Essential oil storage
6. Gas lead tube
7. Round-bottom flask
8. Black rubber dot
9. Scales
10. Clevenger
11. Condenser

Experimental method

1. Clean 1 kg of citronella leaves by rinsing the water and then air drying.
2. Cut the citronella leaves into small pieces and blend them.
3. Put the round-bottom flask in about 300.00 mL of distilled water. Cover with a black rubber stopper with two holes. Another hole put the U-shaped gas pipe to heat the round bottom bottle using Heating mentle.
4. Take the citronella leaves weighing 500.00 grams and put them in

a flat-bottomed bottle. Cover with a black rubber stopper with two holes, one connected to the U-shaped gas pipe in the (3) and the other hole connected to the gas pipe. That is closed with a black rubber stopper with another hole and then connected together with the distilled liquid support container (Clevenger), bring the condensers to connect together, connect the water pipe and the water to the condenser.

5. Turn on the heat switch to the round bottom bottle. Observe until the liquid obtained from the distillation drops out regularly. Therefore, it is noticed that the oil that has been extracted has not increased.

6. Turn off the heat switch to the round bottom bottle before the completion of the distillation. 15-20 minutes, when the distillation is finished, separate the essential oil from the water by separating the separation hopper.

7. Weigh another 500.00 grams of citronella leaves to extract again.

8. Weigh the essential oil that you have already taken notes.

9. citronella scented oil that can be extracted in a glass jar.

10. Store essential oils in an opaque container or store them in the refrigerator at 4 degrees Celsius.

Part 3 Extract essential oil from catnip by steam distillation.

Materials and equipment

1. Catnip
2. Heating mentle
3. Equipment for cutting catnileaves
4. Medicine dropper
5. Essential oil storage
6. Gas lead tube
7. Round-bottom flask
8. Black rubber dot
9. Scales
10. Clevenger
11. Condenser

Experimental method

1. Clean 2 kg of catnip leaves by rinsing the water and then air drying.
2. Cut the catnip leaves into small pieces and blend them.
3. Put the round-bottom flask in about 400.00 mL of distilled water. Cover with a black rubber stopper with two holes. Another hole put the U-shaped gas pipe to heat the round bottom bottle using Heating mentle.
4. Take the catnip leaves weighing 1.00 kg and put them in a flat-bottomed bottle. Cover with a black rubber stopper with two holes, one connected to the U-shaped gas pipe in the (3) and the other hole connected to the gas pipe. That is closed with a black rubber stopper with another hole and then connected together with the distilled liquid support container (Clevenger), bring the condensers to connect together, connect the water pipe and the water to the condenser.
5. Turn on the heat switch to the round bottom bottle. Observe until the liquid obtained from the distillation drops out regularly. Therefore, it is noticed that the oil that has been extracted has not increased.
6. Turn off the heat switch to the round bottom bottle before the completion of the distillation. 15-20 minutes, when the distillation is finished, separate the essential oil from the water by separating the separation hopper.
7. Weigh another 1.00 kg of catnip leaves to extract again.
8. Weigh the essential oil that you have already taken notes.
9. catnip scented oil that can be extracted in a glass jar.
10. Store essential oils in an opaque container or store them in the refrigerator at 4 degrees Celsius.

Part 4 Test the effectiveness of the cat's citronella and catnip essential oil patch.

Materials and equipment

1. Aedes mosquito larvae
2. Sweat-absorbing patch
3. Citronella essential oil and catnip extracted
4. Mosquito net size 35x35x60 cm.

Experimental method

1. Install the experimental site from the modification of the net and plant the larvae in the mosquito net in the centre.

2. Take the sweat-absorbing patch and cut it into a square to a size of 3x3.5 cm.

3. Test the effectiveness of the patch that drops the catnip essential oil on the 3x3.5 cm square sweat pad. Volume 1, 2 and 3 drops, respectively, go to the left side of the mosquito net.

4. Test the effectiveness of the patch that drops the catnip essential oil on the 3x3.5 cm square sweat pad. Volume 1, 2 and 3 drops, respectively, go to the left side of the mosquito net.

5. During the test, the number of mosquitoes will be observed and counted in the proximity of the patch and away from the patch in the period of 5, 10, 15 and 20 minutes of the patch that drops both essential oils.

6. Compare the essential oils that drop on the two patches, measuring the appropriate volume and time to use.

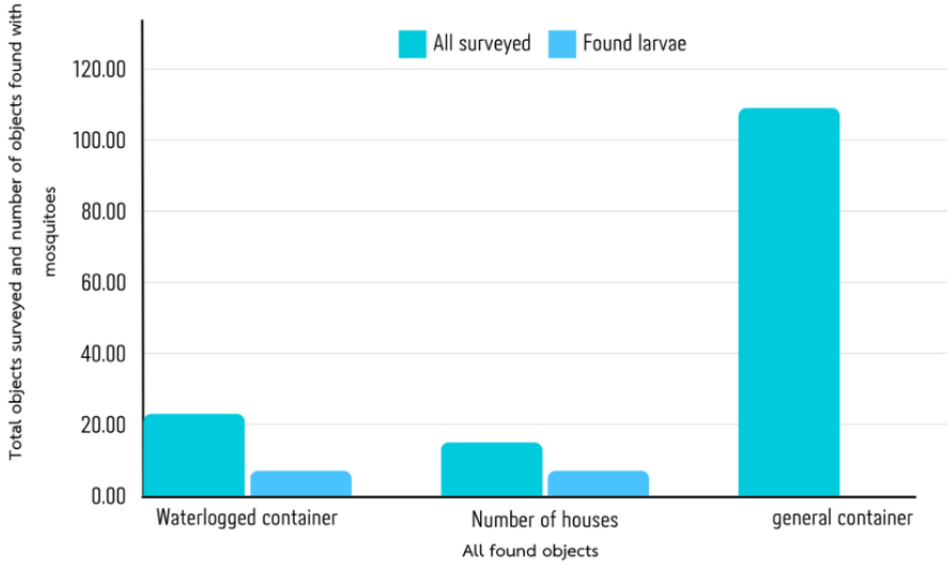
Lesson 4

The results of the experiment

Part 1 Study the risk of dengue fever outbreak in Kalasin Pittayasan School.

Materials and equipment

From the study of surveying larvae in various areas of the school that affects the outbreak of dengue fever Get the results of the following results



Graph 1 : the areas where all mosquito larvae were found

From the graph 1, it was found that the survey of the area where all mosquito larvae were found was found that the total water area was surveyed in Kalasin Pittayasan School, equal to 147 sources, found 17 sources, representing 23 water containers, 7 pieces were found, 15 buildings were found, 7 places, and 109 general containers surveyed, found 0 pieces.

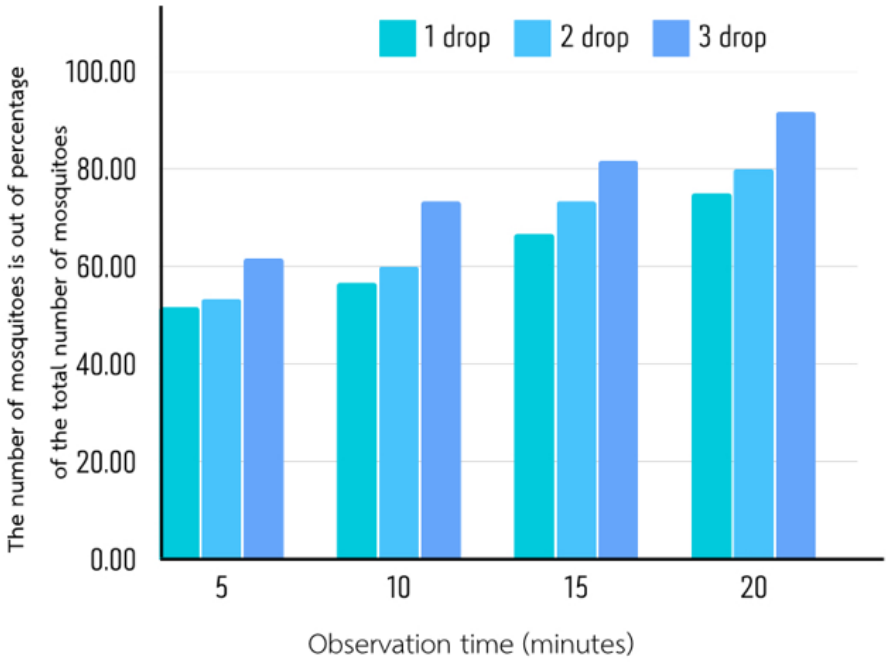
Surveying schools	HI	CI	BI
Kalasinpittayasan school	46.67	0	30.43

Table 1 : Index, risk analysis, transmission of dengue fever, Kalasin Pittayasan School

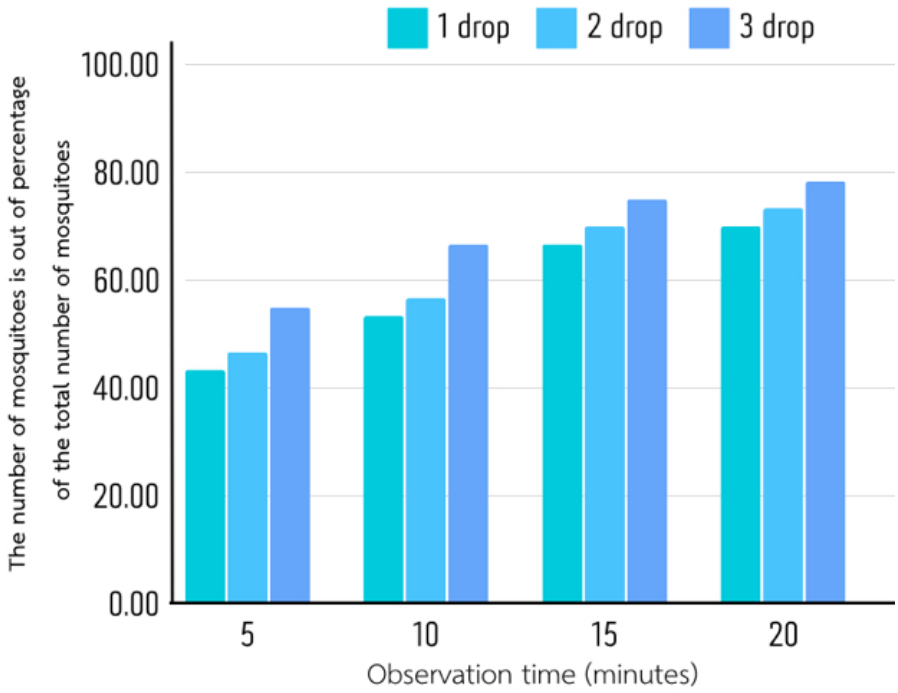
From table 1, it was found that the survey and analysis of various indices of Kalasin Pittayasan School found that the HI value of Aedes mosquitoes is more than 10, the CI value is 0 and the BI value is less than 50. In conclusion that the Kalasin Pittayasan School area is at risk of spreading dengue fever.

Part 2 Test the effectiveness of mosquito repellent pads from citronella essential oil and catnip.

Comparison of the effectiveness of mosquito repellent patches by using citronella essential oil pads and sweat pads, catnip essential oil drops. By experimenting 3 times each in 5, 10, 15 and 20 minutes, the results are as follows:



Graph 2 : Number of mosquitoes that moved away from the citronella essential oil patch, percentage of the total number of mosquitoes, and time



Graph 3 : Number of mosquitoes that moved away from the catnip essential oil patch, percentage of the total number of mosquitoes, and time

From the graphs 1 and 2, it shows that the number of mosquitoes that leave the patch, the percentage in the total number of mosquito patches that drips both types of essential oils. It was found that the best percentage of the citronella essential oil patch is equal to 91.67 percent in 20 minutes and the best percentage of the catnip essential oil patch is 78.33 percent in 20 minutes.

Lesson 5
Summarise and discuss the results of the experiment

5.1 Discuss the results of the experiment

From the study of the risk of dengue fever outbreak in Kalasin Pittayasan School, it was found that the HI value of Aedes mosquitoes has a HI value of more than 10, the CI value is 0 and the BI value is less than 50. In conclusion, the Kalasin Pittayasan School area is at risk of moderate dengue fever.

The use of various types of mosquito repellents today, whether it is a topical type, a spray type and a type of point type, which the use of these mosquito repellents may have synthetic chemicals that are toxic to humans if used in too large quantities and may be dangerous to users. Mosquito repellents from citronella and catnip essential oils is a product that can solve the problem of mosquitoes and is not harmful to humans as well. By using citronella and catnip to extract essential oils that have excellent mosquito-repellent compounds. Use the essential oil by dripping on then stick to any area of the clothes. When the mosquito is close, the stick, the essential oil dropper smell of the mosquito that is close to the mosquito to the stick to the stick. From the stick from the stick from the following experiment, from the experiment, it was found that the pad has amount of citronella essential oil 1, 2 and 3 drops in 5, 10, 15 and 20 minutes, respectively, the number of mosquitoes that leave the patch, the percentage in the total number of mosquitoes in the volume of 1 drop is equal to 51.67, 56.66, 66.67 and 75.00, respectively. The volume of 2 drops is 53.33, 60.00, 73.33 and 80.00, respectively. The volume of 3 drops is equal to 61.67, 73.33, 81.67 and 91.67, respectively. And the patch that drops catnip essential oil, volume 1, 2 and 3 drops in 5, 10, 15 and 20 minutes, respectively, the number of mosquitoes that leave the percentage of the patch in the total number of mosquitoes in the volume of 1 drop is 43.33, 66.67 and 70.00, respectively. The volume of 2 drops is equal to 46.67, 56.67, 70.00 and 73.33, respectively. The volume of 3 drops equal to 55.00, 66.67, 75.00 and 78.33, respectively. When the experiment was concluded that the patch that the essential oil drops can repel mosquitoes the best at the volume of 3 drops in 20 minutes. The number of mosquitos from the percentage of mosquitoes

is equal to 91.67 compared to the patch that drips that drips cat essential oil in the same volume and duration. The number of mosquitoes that leave the percentage of mosquitoes is 78.33 A patch that drips citronella essential oil can repel mosquitoes better than a patch that drips catnip essential oil.

5.2 Summarise the results of the experiment

From the study of the risk of dengue fever outbreaks in Kalasin Pittayasan School, it was found that the survey and analysis of various indexes of Kalasin Pittayasan School found that the HI value of Aededes mosquitoes has a HI value of more than 10, the CI value is 0 and the BI value is less than 50. In conclusion, the Kalasin Pittayasan School area is at moderate risk of spreading dengue fever. Citronella essential oil and catnip essential oil can repel mosquitoes. It can be used by dripping essential oil on the patch for easy use. The patch that drips 3 drops of citronella essential oil in 20 minutes can repel mosquitoes better than the patch that drips the catnip essential oil. In the same volume and duration The patch that drips the catnip essential oil has a percentage of mosquitoes that leave the total number of mosquitoes equal to 78.33 percent. The sweat patch that drips the citronella essential oil has a number of mosquitoes that leave the percentage of the patch in the total number of mosquitoes equal to 91.67 percent, which is the best percentage from the experiment. It shows that the mosquito repellent from citronella essential oil can repel the essential oils mosquitoes better than catnip. And still safe and is also safe and effective in repel mosquitoes well.

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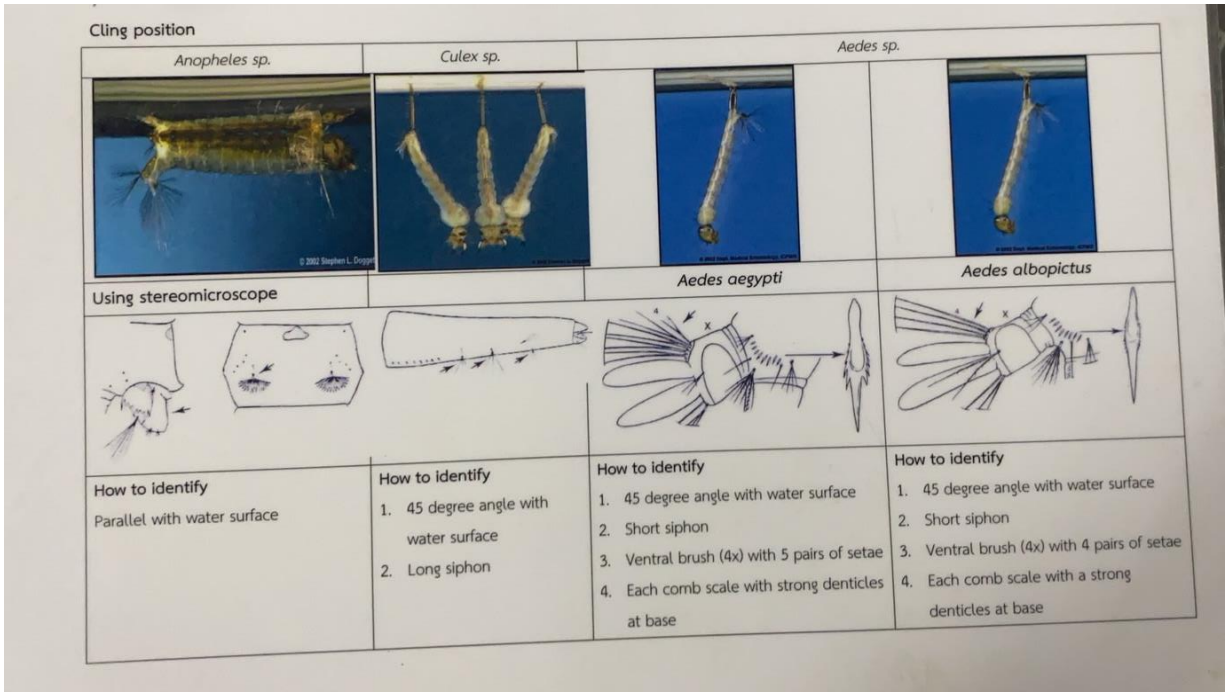
Addenda

The image of the classification of mosquito larvae



Cling position			
Anopheles sp.	*Culex sp.*	*Aedes sp.*	
		Aedes aegypti	*Aedes albopictus*
Using stereomicroscope			
How to identify Parallel with water surface	**How to identify** 1. 45 degree angle with water surface 2. Long siphon	**How to identify** 1. 45 degree angle with water surface 2. Short siphon 3. Ventral brush (4x) with 5 pairs of setae 4. Each comb scale with strong denticles at base	**How to identify** 1. 45 degree angle with water surface 2. Short siphon 3. Ventral brush (4x) with 4 pairs of setae 4. Each comb scale with a strong denticles at base

Source : Institute for the Promotion of Teaching Science and Technology. (2009)

Picture 2 Installation of an essential oil extractor extracted using steam.

Picture 3 Essential oil extractor using steam.

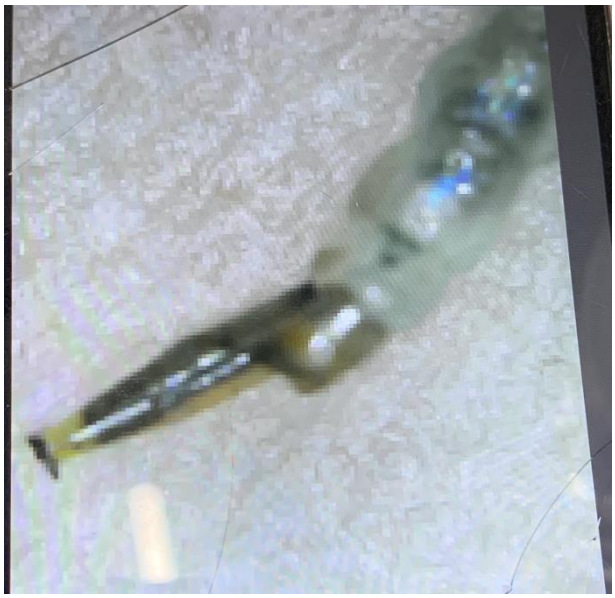
Picture 4 Separate water and essential oils with separate cones.

Picture 5: Lemongrass essential oil, volume 20 ml.

Picture 6 Cat cannabis essential oil, volume 10 millilitres.

Picture 7: Explore the water inside Kalasin Pittayasan School.

Picture 8: Classify the types of larvae by looking at the tail with a Digital Microscope.



Picture 9: The tail of the ball is illuminated with a Digital Microscope.

Picture 10: Install a mosquito net for trial.

Picture 11 Bring the larvae to grow as a mosquito for use in the experiment.

Picture 12 drops of essential oil put on a patch for testing.

Picture 13 Paste a patch that drops essential oil on the left side of the mosquito net.

Table 2 Bugs in the behaviour of mosquitoes

A total of 60 mosquitoes used in the experiment

The type of essential oil that drops into the patch.	Number of drops (drops)	Time (minutes)	The behaviour of mosquitoes		The total number of mosquitoes is a percentage of the number of mosquitoes	
			Approach the patch	Stay away from the patch	Approach the patch	Stay away from the patch
Citronella essential oil	1	5	29	31	48.33	51.67
		10	26	34	43.33	56.66
		15	20	41	33.33	66.67
		20	15	45	25.00	75.00
	2	5	28	32	46.67	53.33
		10	24	36	40.00	60.00
		15	16	44	26.67	73.33
		20	12	48	20.00	80.00
	3	5	23	37	38.33	61.67
		10	16	44	26.67	73.33
		15	11	49	18.33	81.67
		20	5	55	8.33	91.67
Catnip essential oil	1	5	34	26	56.67	43.33
		10	28	32	46.67	53.33
		15	20	40	33.33	66.67
		20	18	42	30.00	70.00
	2	5	32	28	53.33	46.67
		10	26	34	43.33	56.67
		15	18	42	30.00	70.00

		20	16	44	26.67	73.33
	3	5	27	33	45.00	55.00
		10	20	40	33.33	66.67
		15	15	45	25.00	75.00
		20	13	47	21.67	78.33