

EFFICACY OF ATIS (*ANNONA squamosa*) AND LEMONGRASS (*CYMBOPOGON citratus*) LEAVES AS LIQUID MOSQUITO REPELLENT

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Abstract

This study sought to determine the efficacy of atis (*Annona squamosa*) and lemongrass (*Cymbopogon stratus*) leaves and sensory evaluation of atis and lemongrass leaves by ten (10) CHMT faculty members and ten (10) CTE students majoring in Science at Laguna State Polytechnic University and ten (10) housewives of Barangay Bagumbayan Lynnvill Division, Santa Cruz, Laguna and considered the result as a basis for acceptability of atis and lemongrass leaves as mosquito repellent. In particular, it described the methods of preparing atis and lemongrass and their level of acceptability as to sensory qualities such as appearance, aroma, color, and solubility. It also ascertained the significant difference between the level of acceptability of atis and lemongrass based on the sensory qualities as rated by the three sets of respondents as to faculty, students, and housewives. Using the experimental research method, a series of evaluation and taste tests using scorecards were distributed to three groups of randomly selected respondents. Mean, standard deviation, and t-tests were also used to analyze the statistical data gathered in the study. It was revealed that atis and lemongrass leaves as mosquito liquid repellent have a highly acceptable appearance, aroma, color, and solubility. Further, there is a significant difference in the level of acceptability between the students and faculty members, but there is no significant difference between the students and housewives. Thus, a new product was developed and evaluated as highly acceptable in all its parameters. The atis and lemongrass leaves as mosquito liquid repellent were accepted and assessed by housewives, faculty, and students who must enhance their creativity to create products that serve as a great reservoir for insect-causing diseases.

Keywords: atis, lemon grass leaves, mosquito repellent, appearance, atis and lemons extract

1. Introduction

The current economic situation in the Philippines nowadays brought about by the pandemic, COVID-19 was greatly affected. Most of the working force lost their jobs, which resulted in an imbalance of supply and demand; people increased their needs, but supply was scarce. In the past, most Filipinos usually take their meals three to five times a day including snacks, but due to the pandemic, they lessened their meals to cope with their way of living. This may result in malnutrition. Government and private sectors create a way to

solve problems in malnutrition; few of them know that many nutritious and even foods can prevent diseases such as cassava, atis, and lemongrass, especially the leaves

Physicians and health experts agree that nutrition and free from diseases should be more of a priority for the Filipino family (Dedrick, 2017).

With increasing awareness of the potential health risks associated with chemical repellents- such as skin irritation, respiratory issues, or allergic reactions – natural alternatives are gaining popularity. Conventional repellents often contain chemicals like DEET, which although effective, can be harmful if used frequently, especially for children or individuals with sensitive skin. As a result, more people are turning to plant-based solutions that are both safe and effective.

Atis leaves (*Annona squamosa*), part of the custard apple family, contain compounds such as acetogenins alkaloids, and essential oils known to have insect-repelling and insecticidal effects. These active ingredients interfere with the respiratory and nervous systems of the mosquitoes, deterring them from biting.

In traditional medicine, Atis leaves have been used to treat various ailments, but their insecticidal properties have made them particularly useful as natural pest control.

When formulated into a liquid repellent, the leaf extracts can provide long-lasting protection without the harmful effects associated with synthetic repellents. The process of making a liquid repellent from Atis leaves involves extracting the active components through simple methods such as boiling, steeping, or cold extraction using oils and other compounds from the leaves, which are then combined with a carrier like water, alcohol, or oil to create the final repellent solution. This liquid can be applied directly to the skin or used as a spray in the home or outdoor areas.

On the other hand, lemongrass (*Cymbopogon citratus*) is a well-known plant in natural remedies and traditional medicine, famous for its refreshing citrus aroma and health benefits. beyond its culinary uses, lemongrass is highly effective as a natural mosquito repellent due to its high content of citronella oil – an essential oil widely used in commercial insect repellents. Citronella works by masking scents that attract mosquitoes, thus keeping them at bay.

With increasing concerns about the potential side effects of chemical repellents. Such as skin irritation or toxicity with long-term use, natural alternatives like lemongrass have become more popular. Lemongrass-based repellents offer a safer, eco-friendly, and effective way to protect against mosquitoes, especially in tropical or warm regions where mosquito-borne diseases are prevalent. Lemongrass is prized for its insect-repellent properties due to its high levels of citronella, geraniol, and limonene, which are highly effective at repelling mosquitoes. These natural compounds disrupt the mosquitoes' ability to detect the carbon dioxide and other chemicals humans emit, making it difficult for them to find and bite you.

This research is conducted to make a new product as atis and lemongrass leaves extract a healthy and effective insect repellent aside from being cheap and readily available in the surroundings. It may also help the Filipino people that even in the poor way of living in the Philippines, they can have an effective insect repellent for everyday and can earn money as small businesses as well. In addition, this atis and lemongrass leaf extract is not only an effective mosquito insect repellent but also provides a pleasant, refreshing scent, making it ideal for everyday use.

2. Methodology

The experimental method of research was used in the study to determine the acceptability of Atis and Lemongrass as liquid mosquito repellent on their sensory qualities as appearance, aroma, color and solubility, as rated by the respondents. The researchers use atis and lemongrass leaf extract as a liquid repellent to protect against mosquitoes that are present in the community and use them as an alternative natural insect repellent to prevent mosquito bites and other insects. The method of preparation is the following: the first step

is the collection of good quality atis and lemongrass leaves. Washing the leaves using water to remove foreign objects is the next step. It is followed by chopping the leaves into fine pieces. Followed by mixing all the ingredients of atis and lemongrass leaves repellent together. Then, grind the atis and lemongrass stalks with olive oil and virgin coconut oil. After grinding, extract atis and lemongrass leaves. Strain the pounded lemongrass stalks to separate any solid matter and place the extract in a broiler pan. Let it simmer for about an hour. Let It cool. Lastly, sift the citrus and spice-scented oil through mashing to remove all the fibrous bits, put it in a resealable plastic bottle, and label it is indicating the name and information of the product.

Preparation of Samples and Processing of Atis and Lemongrass Leaves as Liquid Mosquito Repellent

The raw ingredients of Atis and Lemongrass leaves were obtained from Bagumbayan and Bubukal Santa Cruz, Laguna. After this, it was processed into liquid mosquito repellent and was tested among the households of Barangay Bagumbayan and Barangay Bubukal Santa Cruz, Laguna.

Chemical Analysis

Insect repellent properties (compound composition) were done at the National Institute of Molecular Biology and Biotechnology, University of the Philippines Los Banos Laguna.

Sensory Evaluation

From the total population of Barangay Bagumbayan and Bubukal Santa Cruz, Laguna, the selected 5% of males and females that include parents, children, and teenagers that sensory characteristics of atis and lemongrass leaves extract as liquid mosquito repellent using 9-point Hedonic scale.

3. Results and Discussion

The gathered data from 60 respondents in Barangay Bagumbayan and Bubukal Santa Cruz, Laguna who evaluated the atis and lemongrass leaves extract insect mosquito repellent, who are the respondents of this study. It shows the results, analysis and interpretation of data.

The mean level of acceptability of Atis and Lemongrass Leaves as Liquid Mosquito Repellent in terms of :

Table 1. Mean Level of Acceptability of Atis and Lemongrass Leaves as Liquid Mosquito Repellent as Rated by Parents in Different Sensory Qualities

Sensory Qualities	Weighted Mean	Verbal Interpretation
Appearance		
1.The atis and lemongrass is appealing in terms of appearance	4.5	Highly Acceptable
2. The product is attractive in terms of appearance	4.5	Highly Acceptable
3. The product has unique appearance	4.40	Highly Acceptable
Average mean	4.47	Highly Acceptable
Aroma		
1. The Atis and Lemongrass Leaves insect repellent has satisfying fragrance	4.40	Highly Acceptable
2. The product is relaxing in		

terms of its aroma	4.60	
Average Mean		Highly Acceptable
Color		
1. The color of the product provide freshness of the ingredients	4.49	Highly Acceptable
2. The color of the product is appealing to the user	4.60	Highly Acceptable
Average Mean		
Solubility		
1. The extracted atis and lemongrass leaves is soluble in water	4.50	Highly Acceptable
2. No sediments had been seen in the dissolved extracted product.	4.53	Highly Acceptable
Average mean		
Overall Average Mean	3.90	Acceptabl3
	3.60	Acceptable
	3.75	Acceptable
	4.31	Highly Acceptable

Legend:

Numerical Rating	Interpretation
4.20 – 5.00	Highly Acceptable
3.40 – 4.19	Moderately Acceptable
2.60 – 3.39	Acceptable
1.80 – 2.59	Fairly Acceptable
1.00 – 1.79	Not Acceptable

The table shows that the respondents strongly agreed that atis and lemongrass as liquid mosquito repellent is highly acceptable of all the sensory qualities as appearance, aroma, color and solubility with the overall mean of 4.31 and verbally interpreted as Highly Acceptable as rated by the parents.

Table 2. Mean Level of Acceptability of Atis and Lemongrass Leaves as Liquid Mosquito Repellent as Rated by Children in Different Sensory Qualities

Sensory Qualities	Weighted Mean	Verbal Interpretation
Appearance		
1.The appearance of the product is Is clear and looks smooth.	4.60	Highly Acceptable
2. The pleasant- looking product Is attractive and user-friendly	4.40	Highly Acceptable
Average Mean	4.50	Highly
Acceptable		
Aroma		

1.The finish product has certain smell which 4.40 Is not off due to proper procedure of Production.			Highly Acceptable
2. The product has a pleasant odor.	4.20		Highly A acceptable
Average Mean	4.30		Highly Acceptable
Color			
1.The color is clear and presentable.	3.78		Acceptable
2. The color of the product is appropriate in it	3.67		Acceptable
Average Mean.		3.73	Acceptable
Solubility			
1.The extracted leaves remain safe in the skin. without causing irritation	4.20.		Highly Acceptable
2.The product ensures the active compounds are properly dissolved and effective	3.90		Acceptable
Average Mean		4.05	Moderately
Acceptable			
	Overall Mean	4.15	Moderately
Acceptable			

Legend:

Numerical Rating	Interpretation
4.20 – 5.00	Highly Acceptable
3.40 – 4.19	Moderately Acceptable
2.60 – 3.39.	Acceptable
1.80 – 2.59	Fairly Acceptable
1.00 – 1.79	Not Acceptable

The table shows the mean level of acceptability of Atis and Lemongrass Leaves as Liquid Mosquito as rated by the children of Barangay Bagumbayan and Bubukal based on the different sensory qualities such as appearance, aroma, color, and solubility. The table also shows the mean and the verbal interpretation. This shows that appearance, aroma, color, and solubility were accepted as reflected by the average mean of 4.50, 4.30, 3.73, and 4.05 with an overall mean of 4.15 respectively.

The table proves that the mean level of Acceptability of Atis and Lemongrass Leaves as Liquid Mosquito Repellent as rated by the children based on the different sensory qualities such as appearance, aroma, color, and solubility were moderately acceptable.

Table 3. Mean Level of Acceptability of Atis and Lemongrass Leaves as Liquid Mosquitos Repellent as Rated by the Teenager in Different Sensory Qualities

Sensory Qualities	Weighted Mean	Verbal Interpretation
Appearance		
1. The atis and lemongrass leaves are attractive in terms of appearance	4.20	Highly Acceptable
2.The product has a stable, consistent	4.00	Moderately Acceptable

appearance and indicates good formulation.

Average mean	4.10	Moderately
Acceptable		

Aroma

1.The dominant scent determines its appeal and effectiveness	3.90	Moderately Acceptable
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2. The product is tolerable for people with sensitivities to strong smell.	3.90	Moderately Acceptable
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Average Mean	3.90	Moderately
Acceptable		

Color

1.The color of the product has transparent appearance	4.80	Highly Acceptable
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2.The product affects user comfort to apply regularly	4.30	Highly Acceptable
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Average Mean	4.55	Highly Acceptable
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Solubility

1.The finished product is skin friendly	4.00	Moderately
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2.The finished product is more convenient to use	4.00	Moderately Acceptable
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Average Mean	4.00	Moderately
Acceptable		

Overall Average Mean	4.14	Moderately
Acceptable		

Legend:

Numerical Rating	Interpretation
4.20 – 5.00	Highly Acceptable
3.40 – 4.19	Moderately Acceptable
2.60 – 3.39	Acceptable
1.80 – 2.59	Fairly Acceptable
1.00 – 1.79	Not Acceptable

The table shows the mean level of acceptability of Atis and Lemongrass Leaves as Liquid Mosquito Repellent as rated by the teenager based on the different sensory qualities such as appearance, aroma, color, and solubility. The table also shows the finished product's mean and verbal interpretation. It also indicates that the product's appearance, aroma, color, and solubility were Moderately Acceptable as reflected by the computed mean of 4.10, 3.9, 4.55, and 4.00 respectively. A composition that has insect-repellent properties is made from cold processed extracted oils and an antioxidant, particularly from a combination of lemongrass and atis leaves can be made also into lotion, cream, or sprays for application to mammals and vegetation or it can also be formed into polymeric sheets which in turn can be formed into various useful articles, such as animal collars, garbage bag or planting materials. According to Ditzen et.al 2018 the world's most widely used topical insect repellent, with broad effectiveness against insects.

Table 4. Significant Difference Between the Parents and the children on the Acceptability

of Atis and Lemongrass as Liquid Mosquito Repellent

Type of Respondents	Mean	Mean Difference	Computed t-value	Critical t-value	Verbal Interpretation
Parents	4.31	0.16	1.980	2.045	Not Significant
children	4.15				

P<.05

The table revealed the significant difference between the parents and the children on the acceptability of atis and lemongrass as liquid mosquito repellent which shows the type of respondents, average mean, mean difference, computed t-value, critical t-value, and verbal interpretation. The table shows the significant difference between the parents and the children on the acceptability of atis and lemongrass as liquid mosquito repellent. It can be seen from the table that parents have a greater mean which is 4.31 than the children. it also resulted in a t-value is 1.980 which is less than the critical value of 2.045 at a 0.05 level of significance and verbally interpreted as “not significant”

Table 5. Significant Difference Between the Parents and the Teenagers on the Acceptability of Atis and Lemongrass as Liquid Mosquito Repellent

Type of Respondents	Mean	Mean Difference	Computed t-value	Critical t-value	Verbal Interpretation
Parents	4.31	17	1.980	2.045	Not Significant
Teenager	4.14				

P<.05

The table revealed the significant difference between the parents and the teenagers on the acceptability of Atis and lemongrass as liquid mosquito repellent, which shows the type of respondents, average mean, mean difference, computed t-value, critical t-value, and verbal interpretation. It can be seen from the table that the parents have a greater mean, which was 4.31, while the teenager's result is 4.14. it also resulted in the t-value being 1.980, which was less than the critical value of 2.045 at a 0.05 level of significance and verbally interpreted as ‘not significant’.

Table 6. Significant Difference Between the teenagers and the children on the Acceptability of Atis and Lemongrass as Liquid Mosquito Repellent

Type of Respondents	Mean	Mean Difference	Computed t-value	Critical t-value	Verbal Interpretation
Teenager	4.14	0.10	1.980	2.045	Not Significant
children	4.15				

P<.05

Table 6 revealed the significant difference between the teenagers and the children on the acceptability of atis and lemongrass as liquid mosquito repellent, which shows the type of respondents, mean, mean difference, computed t-value, critical t-value, and verbal interpretation. This also shows the significant difference between teenagers and children on the acceptability of atis and lemongrass as liquid mosquito repellent. It can be seen from the table that children have a greater mean, which is 4.15, than teenagers. It also resulted that the t-value is 1.980 which is less than the critical value of 2.045 at 0.05 level of significance and verbally interpreted as “not significant”.

4. Conclusion and Recommendations

The Atis and Lemongrass Leaves as Liquid Mosquito Repellent as rated by the respondents of Barangay Bagumbayan and Barangay Bubukal, including the parents, teenagers, and children on different sensory qualities such as appearance, aroma, color, and solubility, were Highly Accepted and had not a significant difference on the acceptability by the respondents. The atis and lemongrass leaves liquid mosquito repellent are effective against mosquito bites.

After careful analysis of the data obtained, the following recommendations are highly suggested.

Further research and development should be conducted to improve its solubility due to the sediments seen in the dissolved liquid mosquito repellent, and storage and the shelf life of the finished product may also be considered in developing the finished product. For greater effectiveness, extract properly tends to have stronger mosquito-repellent properties. Adding a few drops of natural essential oils like citronella or eucalyptus to enhance the repellent effect without overpowering the scent of lemongrass. Consider also adding a natural emulsifier, such as witch hazel, to create a more stable and uniform liquid. Also, dispose of any leftover plant material responsibly by composting.

Reference:

Exploring natural alternatives for mosquito repellents, ingredients like atis and lemongrass have gained attention due to their insect-repellent properties. Various studies and expert recommendations highlight the effectiveness of these plants. Here are the references used in the studies.

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