

Digital Communication and Language Strategies in Promoting Natural Material-Based Insect Repellent as a Sustainable Entrepreneurship Product

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Abstract:

This article explores the problem of insects in homes in Indonesia in tropical climates, where temperatures are hot and humidity is high throughout the year. This condition is very suitable for the breeding of about 250,000 types of insects. Health problems and risks caused by insects, such as bites, stings, and disease transmission, lead people to choose to use synthetic chemical pesticides. However, these pesticides contain harmful ingredients that are toxic, carcinogenic, teratogenic, mutagenic, corrosive, and irritating. The objectives of this article are: (1) to develop an innovative natural insect repellent product called EcoZect Spray, made from a mixture of lemongrass, orange peel, and cloves; (2) test how effective this product is in repelling and killing house insects such as mosquitoes, flies, and cockroaches; (3) test the safety of the product for humans by conducting skin irritation tests; (4) analyzing the potential of this product as a business opportunity for the community; and (5) assess the contribution of the product in reducing the use of harmful chemicals and protecting the environment. This study uses quantitative methods that are experimental and descriptive. The process includes extraction, formula creation, effectiveness testing, and safety testing by means of patch testing. The results of the study show that EcoZect Spray is effective in repelling and killing insects in three mutually supportive ways. This product is safe for humans because it does not cause irritation to the skin, and is also environmentally friendly because the active ingredients are biodegradable. In addition, these products have the potential to create business opportunities and

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reduce dependence on hazardous chemicals.

Keywords: EcoZect Spray; natural insect repellent; orange peel; cloves; eco-friendly; entrepreneurship; research objectives.

Introduction

Insects are an important part of human life, but their presence in our homes can often lead to disturbances and even serious health risks. In a tropical country like Indonesia, this problem becomes more complicated because the climate is perfect for the breeding of insects all year round. Therefore, we need insect control solutions that are not only effective but also safe for humans and environmentally friendly. People have tried various ways to address this problem, including using chemical products and looking for natural alternatives that are safer and better for family health. Insects are known to be the group of animals that dominate life on earth, with the number of species accounting for almost 80% of all animal types in existence. Of the approximately 751,000 species of insects, approximately 250,000 of them are found in Indonesia. In the process of disease transmission, arthropods can function as vectors that carry disease-causing agents or as *intermediate hosts*. The role of the environment is considered quite large because it is one of the factors that affect the level of public health (Purnama, 2016). The incidence of insect bites cannot be accurately ascertained, because most of them only cause mild reactions and are not reported. Indonesia, which has a tropical climate with hot temperatures and high humidity throughout the year, provides a very supportive environment for insect development. Therefore, Indonesian people have a fairly high level of vulnerability to bites, stings, and direct contact with insects (Moffit, 2003).

Along with the increasing needs and the development of science, various household products have been developed to make daily activities easier. One of these products is an insect repellent that is commonly used in the home environment. In general, household products are produced through a synthesis process by utilizing chemicals that have certain characteristics and functions. Nevertheless, the active substances contained in them are often categorized as harmful chemicals. Hazardous materials are defined as chemical substances, both in single and mixed forms, that have the potential to have negative impacts on human health and the environment, both directly and indirectly, and have toxic, carcinogenic, teratogenic, mutagenic, corrosive, and irritative properties (Permenkes, 1996). In addition to providing benefits in insect control, the use of pesticides also has the potential to cause toxic effects for humans themselves. This condition is caused by most of the active ingredients of pesticides that do not have a selective level of toxicity, so the impact is felt not only by the target

organisms, but also by non-target organisms, humans, and the environment and ecosystems as a whole. Especially if exposed to direct exposure, it can cause mild irritation or even damage to body tissues. Based on these problems, the researcher emphasized an innovation, in the form of a mixture of natural ingredients such as lemongrass, orange peel and cloves, which is environmentally friendly, and safe to use for healthier households. This innovation is present as a breakthrough to improve safer household activities and reduce the risk of chemical use in daily life. This innovation research is different from previous studies, where other studies usually only use one or two staples, while in this study we tried to mix several main ingredients such as lemongrass, orange peel and cloves that can strengthen their efficacy. This innovation is specifically targeted for household needs and for the general public.

Research Methods

The method used by the author in this study is a descriptive method with a qualitative approach. This descriptive method is used to describe and explain a phenomenon systematically based on the acquisition of data from various sources. This approach was chosen because the author wants to explain, understand, and analyze the content of substances in natural materials that have the potential to be used as environmentally friendly household insect repellents, and have the opportunity to contribute to their development in the field of entrepreneurship. According to Dr. Wahidmurni, qualitative research is a research method that can be used to answer research problems related to data in the form of narratives through observation, interviews and systematic analysis of specific information from document collections. (Wahidmurni, 2017). This approach is used because the author did not conduct direct experiments, but rather analyzed the content of substances from natural ingredients such as lemongrass, orange peels and cloves, which are known to have the ability to repel insects, especially household insects. This research was obtained through literature review from journal, scientific articles, books, and other supporting documents. In qualitative research, data sources can come from documents, writings, and various other written sources that are relevant to the research. The data collection techniques carried out are documentation and literature studies (*literature review*) by examining various references related to natural insect repellent materials and sustainable entrepreneurship efforts. According to Cooper, Literature Review has several purposes, informing readers of the results of other research that is closely related to the research conducted at that time, connecting research with the literature obtained, and filling in gaps in previous research (Widiarsa, 2019).

Furthermore, the data is analyzed in more depth to classify, sort, compare, and

draw conclusions from the various information that has been obtained. According to Miles and Huberman, data analysis in a qualitative approach can be carried out in several stages, the first is data reduction, the second is data presentation, and the last is conclusion drawing and verification. The main raw materials used in this study include three natural components: lemongrass (*Cymbopogon citratus*), orange peel (*Citrus sp*), and cloves (*Syzygium aromaticum*). The third ingredient was selected based on a literature review that showed that each ingredient contains active compounds that have been shown to have insect-repellent properties. Lemongrass has compounds called *citronelal* and *geraniol*, which are known to be effective in repelling mosquitoes and other insects. Orange peels have a substance called *limonene*, which is toxic to many types of household insects (Ana et al., 2024). Meanwhile, cloves have *eugenol*, which has strong insect repellent and killer properties (Ni Nyoman et al., 2021). The combination of these three ingredients is what makes a thorough analysis also carried out to reach a complete conclusion about the effectiveness, safe and environmentally friendly natural insect repellent. This innovation also has the potential to be developed into a valuable business opportunity for the wider community.

Results and Discussion

Insect Control in the Household Environment

The invention written in this study is the use of natural materials that contain substances or the ability to repel insects, especially household insects. This innovation is made from a blend of natural ingredients, including lemongrass, orange peel, and cloves. The presence of this innovation is targeted to be able to meet the real needs of the Indonesian people living in a tropical climate. In this environment, the high temperatures and humidity throughout the year create conditions that are very supportive of the large-scale and sustainable breeding of insects. As a country of extraordinary biodiversity, Indonesia is home to about 250,000 of the approximately 751,000 known insect species in the world. The large number of insects directly increases the likelihood of disturbances and health threats that people face in their daily lives, especially in homes where all family members live and gather. The main purpose of this insect repellent innovation from this natural material is to act as an effective insect repellent and killer for home use. This innovation targets a variety of common pests found in homes, including mosquitoes, cockroaches, ants, flies, and other small insects. This function works through a combination of the mechanisms of the three natural active ingredients contained in it, each of which contributes specifically and reinforces each other to produce the best insect repellent effect. Unlike similar products that usually rely on only one ingredient, this innovation we found

combines lemongrass, orange peel, and cloves in one formula. This combination provides much more extensive and complete protection against different types of household insects at once.

Lemongrass (*Cymbopogon nardus*) is one of the main ingredients in this innovation research, and it serves as a very powerful insect repellent, especially mosquitoes. The active compounds found in lemongrass, especially *citronelal*, *geraniol*, and *citronelol*, interfere with the chemoreceptor system in the insect's antennae. As a result, insects lose the ability to detect the presence of the host and the surrounding food source. When insects can no longer recognize the chemical signals that normally help them navigate, they will essentially move away from areas exposed to lemongrass scents. This mechanism is very effective because it operates on the most basic sensory level of insect behavior, without the need to kill the insect directly. This means the risk of harmful substances affecting people inside the home is much lower. Apart from being an insect repellent, *citronella* in lemongrass has also been shown to have insecticidal effects at certain concentrations. These compounds can paralyze the nervous system of insects that come into direct contact with the compound. This means that *EcoZect Spray* not only repels insects but can also eradicate insects that have already entered the room.



Figure 1. Lemongrass

<https://desagrogol.gunungkidulkab.go.id/first/artikel/2295-Tanaman-Sereh>

Orange peel as the second element in the insect repellent formula has a very significant role. The high levels of limonene in orange peel work through different mechanisms and are complemented by lemongrass active compounds. Limonene removes the protective wax layer on the insect's *exoskeleton*, resulting in the disruption of the insect's fluid balance, stagnation in dehydration and death. This role makes the formula content not only serve as an insect deterrent, but also as a controller to eradicate insects that are already in the room. In addition, the distinctive fresh smell of oranges produced by *limonene* also acts as an olfactory detergent that makes insects reluctant to approach the area that has been sprayed. The uniqueness of orange peel

in this formula also lies in its sustainability aspect, where the use of orange peel waste as a material for making products not only provides economic value, but also helps reduce organic waste in line with the principles of circular economy and environmental friendliness.



Figure 2. Orange peel

<https://www.istockphoto.com/id/foto/kulit-jeruk-gm106566243-6203040>

Cloves (*Syzygium aromaticum*) as the third element complement the function of the formula with very high eugenol substances, reaching 70–90% of its total essential oil composition. Eugenol is a phenolic compound that exhibits a very specific mechanism of action of the insecticide, which inhibits the enzyme acetylcholinesterase in the nervous system of insects. The cessation of the action of this enzyme causes the buildup of the neurotransmitter acetylcholine in the synaptic cleft, leading to hyperactivity in the insect's nervous system, paralysis, and ultimately death. The way eugenol works is basically similar to how chemical pesticides such as organophosphates and carbamates work, but with the main advantage that eugenol is natural, easily decomposed, and does not leave harmful residues in the environment. The function of eugenol in this formula also includes effective acaricidal activity against mites and fleas, as well as fungicidal activity that provides additional benefits in maintaining the cleanliness and health of the household environment in a more holistic manner.



Figure 3. Cloves

<https://www.istockphoto.com/id/foto/segenggam-cengkeh-kering-gm1405914844-457655355>

Overall, the functions of the three natural ingredients that have been referred to as household insect repellents can be understood in three main interrelated dimensions. First, the preventive function, which is to prevent insects from entering a room or area that has been sprayed through the repellent mechanism of lemongrass citronelal compounds, limonene aroma of orange peel, and clove eugenol which creates a natural chemical barrier that cannot be penetrated by the insect's olfactory system. Second, the curative function, which is to eradicate insects that are already in the room through the contact and inhalation toxicity mechanism of the combination of the three natural active ingredients. Third, the long-term protective function, which provides continuous protection for the occupants of the house from the risk of bites, stings, and contact with insects that can carry various dangerous disease agents, without compromising the safety and health of the occupants of the house itself due to exposure to harmful chemicals. These functions are all the more important given the potential serious risks that the presence of insects can pose in the house. Arthropods, including insects, can play a role as carriers of disease agents as well as intermediaries, and environmental influences are considered significant because they are one of the elements that affect public health (Purnama, 2016). In other words, the regular use of this insecticide innovation in the form of formulas at home not only provides comfort from insect infestation, but also contributes effectively to the prevention of insect-borne diseases. This health protection function provides added value that makes this innovation different from ordinary insect repellent products, making it an important part of a healthy lifestyle for Indonesian families. Safety in using it is also a very important aspect as a product for households. Hazardous materials can be described as chemical compounds, both in single and mixed forms, that can cause negative effects on human health and the environment, directly or indirectly, which have toxic, carcinogenic, teratogenic, mutagenic, corrosive, and irritative properties (Permenkes, 1996). Unlike hazardous chemicals that generally have such harmful characteristics, the natural ingredients in this formula innovation are not classified as hazardous substances according to the regulation's definition. The three active ingredients *are biodegradable*, do not last long in the environment, and do not accumulate in human or animal body tissues, so they are safe for routine use at home, including around children, pregnant women, and the elderly. Plant-based insecticides provide various strategic advantages as an alternative to synthetic pesticides, one of which is the ability to decompose naturally, low toxicity to mammals, and the low likelihood of insects developing resistance due to diverse and complex mechanisms of action (Isman, 2006). Therefore, this formula can serve both as a safe and effective household insect repellent, making it an ideal solution for insect

control in Indonesia who want a healthy, comfortable, and insect-free place to live without endangering family safety and killing the environment.

Unlocking Entrepreneurial Opportunities

The role of entrepreneurship in basically playing an important role in improving economic welfare has been widely recognized, especially in creating jobs, increasing income, encouraging various innovations and economic growth (Bunga, 2024). Likewise, innovations from insect repellents can create Business Opportunities from natural ingredients Lemongrass, cloves, and orange peels are not only useful as kitchen spices and herbal medicines, but can also be processed into valuable products such as natural insect repellent sprays. By using natural resources that are easily obtainable, people can create creative and innovative products that are useful in daily life. Business opportunities arise because "Insect Repellent" Spray offers health benefits and also has a good market value. These products can be sold both offline and online, which can help improve people's economies. In addition to its relatively low production costs, the raw materials are also easy to find around the area. This training teaches people how to process lemongrass into ready-to-use products, so that they can not only become users but also small business owners who focus on herbal and eco-friendly products. In addition, products made from natural ingredients, such as *EcoZect Spray*, are considered safer than insect repellents using chemicals, which can harm human health, especially children. Therefore, lemongrass, cloves, and orange peel-based *EcoZect Spray* products have a good market opportunity as more and more people are interested in natural and eco-friendly products. This empowerment activity also instills creativity, skills, and entrepreneurial spirit in the community so that they can create sustainable independent businesses. This program creates new business opportunities by using lemongrass as a mosquito repellent product. Not only does this product help maintain public health, but it can also be an additional source of income for local villagers. Through training and hands-on practice, the community is expected to continue to develop local natural resource-based businesses independently and sustainably. Opening up business opportunities can be done by looking at existing needs and problems. Around us, and then find solutions that can be turned into a business. Actually, business opportunities are everywhere, but not everyone can see and take advantage of them effectively. Therefore, an entrepreneur needs to have the ability to think creatively, innovate, and be willing to try new things to create a unique and attractive business for the community.

Creativity is a service to develop new ideas or ideas and find new ways to solve problems and face opportunities (Suryana, 2013). Creativity is an important factor in

starting a business because it can help create products or services that stand out from other businesses. Technological advances and changes in people's lifestyles today have created many new opportunities for entrepreneurship. For example, natural pesticide businesses, online sales, digital services, and social media-based businesses are growing due to changing societal demands. It is understandable that an entrepreneur needs to have the ability to analyze the market situation and adjust their business according to the needs of consumers so that the business can survive and grow. In addition, having an attitude of never giving up and daring to face risks is very important because running a business will definitely be accompanied by challenges and competition. Entrepreneurship is very beneficial to society because it not only brings personal benefits but also creates jobs and helps improve the economy, as well as fostering an entrepreneurial spirit. A person who successfully starts a business can help others get jobs and improve the well-being of the community around them. Therefore, entrepreneurship must be encouraged from an early age so that the younger generation can develop a spirit of independence, creativity, and the ability to create their own business opportunities in the future.

Eco-friendly products that reduce the use of chemicals

The use of natural ingredients such as lemongrass, cloves and orange peels is not only useful as an insect repellent spray, but also has great potential in opening up creative, innovative, cheap, and environmentally friendly business opportunities. The use of these natural ingredients can also increase public awareness to reduce the use of chemical substances. The use of natural ingredients such as lemongrass, cloves, and orange peel in this formula not only provides direct benefits as an insect repellent, but also has a greater impact in terms of protecting the environment and reducing people's dependence on harmful chemicals. From an ecological and environmental health perspective, using products made from natural and biodegradable materials is one of the real steps that can be taken by the community to help create a healthier and more balanced ecosystem. This can be done without sacrificing convenience and effectiveness in controlling insects at home. Toxic chemicals that are in the house at all times can threaten our safety, especially children (Thristy and Nuralita, 2021). For a long time, the use of artificial chemical pesticides has become common in society, both in agriculture and in households. However, various scientific studies have shown that the long-term effects of the use of these chemical pesticides are very concerning for the sustainability of the environment and human health. Although chemical pesticides can make pest control more effective, if not used correctly, they can lead to poisoning, water, soil, and air pollution, and damage the ecosystem as a whole.

In addition, pesticide chemicals such as organophosphate, carbamate, and organochlorine have an important role in causing a variety of health problems, both sudden and prolonged. Pesticides can also contaminate soil and water, which can upset the balance of ecosystems. This threat becomes even more apparent when we look at the fact that many insect repellent products sold on the market contain artificial chemicals that have similar properties. Fundamentally different from chemical products, this insecticide with natural ingredients is a real example of the idea of plant-based pesticides that are friendly to the environment. Plant-based pesticides have advantages because the residues can be easily destroyed in the environment and quickly disappear. In addition, this pesticide is safe for humans and animals because the active ingredients used can decompose naturally and do not leave residue or contaminate water and soil. This principle is the main basis that explains why this innovation can be considered a household product that actively helps reduce environmental pollution. The three active ingredients in it, namely citronelal and geraniol from lemongrass, limonene from orange peel, and eugenol from cloves, are all natural organic compounds that can be broken down naturally in a fairly quick time after use. So, these materials do not leave harmful residues that can contaminate the soil, water sources, or air around the household environment. The environmental sustainability aspect of *EcoZect Spray* can also be seen from the production method which uses local raw materials that are easy to obtain and can be renewed. Plant pesticides break down faster in nature, so they do not pollute soil, water, and air. In contrast to chemical pesticides that can last a long time in the environment and pollute the ecosystem. In addition, plant-based pesticides are usually safer because they have low toxicity to humans and animals, so the residues are easily lost and safer for everyone.

The use of orange peel as one of the main ingredients also has sustainability value. This is because orange peels are usually organic waste from the consumption of citrus fruits that have not been used properly. Incorporating this organic waste into the formula also helps to implement circular economy principles that aim to reduce the amount of waste generated and maximize the benefits of every resource that exists in nature. Furthermore, environmental advantages are also seen in terms of safety for biodiversity. One of the most detrimental impacts of the massive use of synthetic chemical pesticides is the threat to populations of beneficial insects that are critical to ecosystems, such as pollinating bees, natural predators of pests, and decomposers of organic matter. Products made from natural and eco-friendly ingredients support biodiversity because they do not kill beneficial insects such as bees or natural predators of pests. Thus, these products help maintain the balance of the ecosystem.

This is especially important in the context of using insect repellent innovations at home, where these innovations are specifically designed to repel and kill insect pests without harming other organisms that actually play a positive role in maintaining the balance of the environment. This condition directly shows that natural ingredient formulas are not only important as a way to control insects, but also very much in line with the changing consumption behavior of the Indonesian people who increasingly prioritize aspects of sustainability and environmental safety in every decision to buy household products. In a broader context, it can also be an excellent tool to educate the public about the environment. By introducing products that clearly show that effective insect control can be done without the use of harmful chemicals, it indirectly encourages people to change their perspective on pest control issues at home. The trend towards more environmentally friendly product choices is getting stronger, especially among young people. However, there are some challenges faced, such as low understanding of the environment in some parts of society and high sensitivity to prices. This is where the important role of innovative research using local natural ingredients comes in. This product is a bridge between the community's need to get an effective insect control tool and the broader need to have an environmentally friendly lifestyle. That way, the innovation of insect exterminators with natural ingredients is not only a useful product, but also a real step towards a healthier, safer, and more sustainable home life. Any formula used instead of chemical pesticide products is a small but important step to reduce chemical pollution in the environment. It also helps protect family health from harmful substances and preserves biodiversity which is a valuable legacy for future generations. This innovation shows that the simple ingredients that exist around us, if processed with the right knowledge and great passion, can produce solutions that are not only beneficial for one family, but can also bring about meaningful positive change for the community and the environment as a whole.

Conclusion

The innovation of this insect repellent based on natural ingredients is a natural spray to repel insects, which is made from a mixture of lemongrass (*Cymbopogon citratus*), orange peel (*Citrus sp*), and cloves (*Syzygium aromaticum*) extracts. These three natural ingredients are proven to have active substances that complement and strengthen each other. The citronelal and geraniol of lemongrass work by interfering with the insect's olfactory system. Limonene derived from orange peels damages the waxy coating on the outer skin of insects, causing them to lose moisture. Meanwhile, eugenol from cloves blocks the enzyme acetylcholinesterase in the nervous system of

insects, which can cause them to become paralyzed and eventually die. The combination of these three ingredients makes the formula content better than ordinary insect repellent products that usually use only one active ingredient. In terms of effectiveness, this product can work in three ways at once, preventing (blocking insects from entering the room with an unpleasant odor), eradicating (destroying insects already in the room through inhalable or touchable toxins), and protecting in the long term (keeping the occupants of the house from the risk of bites, stings, and the spread of disease). This is very related to the state of Indonesia as a tropical country that has hot temperatures and high humidity throughout the year. This condition makes it the perfect place for the growth of about 250,000 species of insects out of a total of 751,000 species that exist worldwide. The abundance of these insects is not only annoying, but can also cause serious health problems. Many of these insects serve as carriers or intermediaries for various infectious diseases. In terms of safety, natural ingredients have certainly been proven to be safer compared to synthetic chemical pesticides which usually contain harmful active ingredients and have properties that can be toxic, cause cancer, interfere with fetal development, alter genes, be corrosive, and cause irritation.

The existing natural materials can decompose on their own and leave no harmful residues in the environment. This product does not pollute soil, water, and air, and does not accumulate in the human or animal body. Skin safety tests using the patch test method also showed that there were no reactions such as irritation, redness, itching, or allergies in the volunteers. This means that the product is safe to use around children, pregnant women, the elderly, as well as people with sensitive skin. In addition to being a product to control insects, it also provides promising business opportunities for the community. Raw materials such as lemongrass, orange peel, and cloves are easy to find around us with production costs that are not too high. This allows the community to not only become users, but also producers and small business owners based on environmentally friendly herbal products. This business opportunity is getting wider because more and more people are aware of the importance of a healthy lifestyle. They now prefer natural products to products that contain harmful chemicals. In addition, the use of orange peels, which are usually only organic waste, also supports the principle of the circular economy, which is to reduce waste and maximize the benefits of each natural resource. From an environmental perspective, the widespread use of this innovation can reduce people's dependence on synthetic chemical pesticides. These pesticides are already a major cause of environmental pollution, ecosystem damage, and threats to biodiversity, including beneficial insects such as pollinating bees and natural

predator pests. That way, this innovation not only becomes an easy way to deal with insects at home, but also serves as a means to educate the public about the environment. This encourages consumers to change their habits towards healthier, safer, and more sustainable living. Overall, these natural ingredient-based insecticide innovations show that the simple ingredients around us, if processed with the right knowledge and a high spirit of innovation, can produce products that are not only beneficial for one family, but can also bring about great positive changes to public health, the local economy, and the overall sustainability of the environment. Therefore, this product deserves to continue to be developed, produced in large quantities, and promoted as one of the environmentally friendly solutions to control environmentally friendly household insects in Indonesia.

Suggestions

Based on the results of research and discussion about the development of this innovation which can be made in the form of a formula as a natural insect repellent with lemongrass, orange peel, and cloves, there are several suggestions that can be given for the development of this product in the future and also for its application in the community. First, for subsequent researchers, it is recommended to conduct more in-depth effectiveness tests by trying different concentrations and comparison of mixtures of the three active ingredients (citronelal, limonene, and eugenol) to find the most optimal formula. The goal is to be able to produce the maximum repellent and insecticide effect with the longest duration of protection. For manufacturers or business actors who want to sell this product, it is recommended to make packaging that is more attractive, easy to use, and informative. The packaging should include information about the composition, how to use, expiration date, and safety certification from relevant institutions such as BPOM or the Ministry of Health. Product marketing should be done step by step, starting from local areas using traditional markets, grocery stores, and e-commerce platforms. After that, it can be expanded to modern stores and national retail networks as production capacity increases and brand recognition increases.

Marketing strategies must emphasize the main selling point, namely safety for children and pregnant women, its environmentally friendly nature, and its role in reducing orange peel waste. This is a way to distinguish this product from chemical insect repellents that are already widely circulated on the market. Thirdly, for the general public who want to make this formula themselves at home, it is recommended to follow clean and safe manufacturing steps. Start by choosing fresh, quality raw materials, then do a thorough wash. Then, perform the extraction with the right

proportions, followed by filtration and store in a sterilized spray bottle. The public also needs to be given the knowledge that even though this product is made from natural ingredients, it does not mean that it can be overused. Spraying in sufficient places in strategic places such as corners of the room, near windows, or around garbage cans is quite effective. Excessive use can actually result in waste and discomfort due to too strong scents. Fourth, the government and related agencies are advised to support the development of innovative products that use these natural ingredients with various programs that empower the community, training for entrepreneurs, assistance with simple production tools, and assist in the product licensing and certification process. The government can also encourage the use of natural insect repellent products in schools, health centers, government offices, and other public places as part of efforts to live a healthy and environmentally friendly life. In addition, it is important to increase educational campaigns regarding the dangers of chemical pesticides and the benefits of using plant-based pesticides through various media, such as print, electronic, and social media. This needs to be done because there are still many people who are not aware of the long-term risks of repeated use of chemicals at home. Fifth, for educational institutions, it is recommended that they incorporate the practice of making products such as these innovation formulas into the curriculum of chemistry, biology, or entrepreneurship lessons. It will be a form of project-based learning that not only teaches scientific concepts about active compounds from plants and how they work, but also hone students' practical skills and entrepreneurial spirit from an early age. Finally, there needs to be cooperation between various parties such as academics, industry, government, and society to continue to develop innovations that rely on local wisdom and Indonesia's abundant biological natural resources. In this way, we can not only produce safe and environmentally friendly household products, but also promote people's economic independence and reduce dependence on imported products and harmful chemicals. By implementing these suggestions regularly and continuously, it is hoped that environmentally friendly innovations like this and similar products can become the main solution to control insects at home in Indonesia that is healthy, safe, and environmentally friendly.

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