



## Insecticide Production from Orange Peel Oil

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**Abstract:** This paper is aimed at explaining the production of a natural insecticide from natural extracts (orange peel oil and pepper), which are known for their insecticidal repellent properties. The extracts were obtained by extraction using benzene ether and water as solvents. A mixture of 50ml of orange peel, benzene ether oil, and 20ml of dried pepper water extract gave an active insecticide formulation (weight composition) which was determined to be very effective during the test on cockroaches, ants, mosquitoes, and spiders. The formulation obtained was in a liquid form and can be applied using sprays. The long-term effect and the modes of action of the formulation on the insects are not within the scope of this work. The formulation, however, is nontoxic to human health en inhaled but under normal conditions, the effects of ingestion or contact with the skin were not investigated.

**Key words:** Benzene Ether, Orange Peel, Limonene, Citrus Aurantiumdulcis, Citrus  
Aurantiumrisso and Citrus Maxima

### 1.1Introduction

The scourge of malaria and other infectious diseases caused by mosquitoes and other insects alike can be very devastating. More than one million people die from malaria yearly and the majority of them are in Africa, particularly in Nigeria (WHO 2009). The effect on health and by extension the economy can be better imagined due to the fact that it kills the majority of the productive population. Malaria would be the focus of the research work because it has become a global health problem; moreover, it has reached an epidemic level. The work of scientists and researchers of the world health organization has therefore been able to develop a vaccine that completely eradicates the scourge as the parasites have developed resistance to drugs. It is therefore thought of the focus should be shifted from cure to prevention. This prevention can come in two forms. The first involves the prevention by cleaning the environment. The second involves the use of insecticides and treated nets which reduce deaths, especially among children. While we wait for the vaccines to be developed, the production of the insecticides can be from waste materials. The insecticides presently available in the market are too expensive, ineffective, and at times inaccessible because they are imported. This research, therefore,

hopes to lower the prices by producing them locally from waste materials. The effectiveness would however be determined by the end user. The benefit of this research is enormous to society.

### 1.2 Aims and Objectives

This research seeks to investigate the possible use of orange peel in the production of insecticides. The work also tries to show in a limited manner the sustainability of orange as an alternative crop in the production of insecticides.

The specific objective is, therefore:

- To use the orange peel oil in the production of the insecticide.

### 1.3 Research Statement of Problem

Health and environmental concerns, the scarcity of insecticides, and other pest repellents the people all over the world especially in Africa are driving all research institutes to go locally with the aid of trees and plant herbs in the production of these insecticides. Orange peel could be readily available with its large oil content not put into any economic use as a result this research would explore the possibility of using the vast oil content of this fruit as a feedstock in the production of limonene. In other words, orange peel oil which could be obtained easily could be economically used in the production of insecticides to cut down costs and prevent malaria disease.

### 2.3 List of Materials

**Table 1: List of materials used**

S/N	MATERIALS	BOTANICAL NAME	SOURCE
1	ORANGE	CITRUS AURANTIUM RISSO	MAIDUGURI
2	PEPPER	CAPSICUM FRUTESCENT	MAIDUGURI

### 3.1 Methodology

Method used for the extraction of the oil. Decoating, drying and grinding. A soxlet extractor was used for solvent extraction of the oil. The solvent (benzene ether) was removed from the extract by distillation and the residual oil component was collected and used for the analytical work. A 5 liter capacity soxlet extractor was used in the extraction of the oil from the ground seeds, 200g ( $w_1$ ) of the ground seeds were packed in a whatman filter paper and inserted in to the soxlet extractor; they together weigh ( $w_2$ )  $40^0\text{ C}$   $60^0\text{ C}$  benzene ether (BDH analar grade) was used as the extracting solvent. The period of continuous extraction was 16hrs. at the end of the period, the solvent was recovered by simple distillation and the residuol oil was oven dried

at 100<sup>0</sup> C. The oil was then transferred to desiccators; weight ( $w_3$ ) and allowed to cool, before being weighed. The drying, cooling and weighing was repeated until a constant dry weight was obtained (three cycles of treatment), to within 0.01g. The extracted oil sample was in a well-sealed dark brown coloured glass bottle and kept for analytical test.

### 3.2 Insecticide formulation

#### Potency Testing of Extracts

Before the formulation of the insecticides, drops of the extract was tested on insects such as ants, cockroach, weevil and mosquitoes to measure how long each extract takes to have effect on the target insect.

### 3.3 Derivation of formulation

20ml of the orange peel extract, and 20ml of the pepper extract were mixed in a glass container and tested for optimum concentration.

## 4.1 Results and Discussion

After conducting some tests on the effectiveness of the formulation on quite a number of insects, the results obtained were discussed briefly as to why the formulation has immediate effect on some insects and slow effect on some other insects.

## 4.2 Results

Table 2: Target insect and Extraction Results

s/n	Target insect	Extract (oil)	Qty (ml drop)	Results
1	Mosquito	Orange peel	2	Repelled 30 secs
2	Ant	Orange peel	3	Repelled 43 secs
3	Spider	Orange peel	3	Repelled 33 secs
4	Cockroach	Orange peel	10	Repelled 4 mins
5	Mosquito	Pepper	2	Repelled 50 secs
6	Spider	Pepper	4	Repelled 11 mins 43 secs
7	Ant	Pepper	1	Repelled 1 secs
8	Cockroach	Pepper	4	Repelled 3 mins

Table 3: Effects of the formulation (insecticide) on selected insects

Insect	Repellency	Killing
Mosquito	High	After 50 secs
Fly	High	After 40 secs
Ant	High	After 17 secs
Cockroach	High	After 3 mins
Spider	High	After 1 mins

#### **4.3 Discussion of Results**

The results presented in table above showed all the sample insects repelled by the formulation of the orange peel oil and pepper, but variations occurred in terms of the interval of time it takes for a given insect to be knocked out. The variations may be explained by the fact that the individual extracts had different repelling capacities. That is probably why some of the insects like spiders and cockroaches which are resistant to some chemical insecticides, took longer time to succumb to the formulation. The content of pepper is very active and may affect some of the insects. Ants are very vulnerable to the formulation that is why it took them a shorter time to die in contact with it, while it took the cockroach and spider a longer time to die in contact with it. Another benefit of the formulation is that the odor of the orange peel oil gives the treated room a perfumed smell besides its insecticidal property to overcome the odor of the pepper.

#### **Conclusion**

The formulation obtained by mixing 50 ml of orange peel (benzene ether) oil extract with 20 ml of pepper which gave an active natural insecticide with a killing property provided by pepper, while the repelling property provided by the orange peel oil. The cockroach resisted longer with 180 seconds while the fly resisted less with 30 seconds only. The formulation is non-toxic to humans when inhaled and raw materials can be obtained with ease in our environment.

#### **Recommendation**

Just as mentioned earlier, the focus of this research work was on the formulation of a natural insecticide which will compete with current chemical insecticides but the long term effect has not been investigated, therefore a further study is suggested to find out if there are any drawbacks from the formulation for necessary adjustment.

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