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# Extraction Of Oil and Production of Pesticide Using Neemseed and Leaf from The Selected Region in Nigeria.

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***Abstract-*** ***The Neem tree (Azadirachtaindica A. Juss.) has been known as the wonder tree for centuries in the Indian subcontinent as it offers answers to some of the major concerns facing humankind. Its mammalian safety and environmental friendliness reports are highly encouraging. A key advantage to using Neem, as opposed to some medical treatments and other herbs, is its harmlessness on human health. Millions have been using Neem over thousands of years and no hazards have been documented for normal dosages. The general class of these compounds found in neem is triterpenes, within which, the most effective are the limonoids, which are abundant in Neem oil. Azadirachtin, a limonoid, has been found to be the main ingredient for fighting insects and pests, being up to 90% effective in most instances.this research shows that, the neem seed oil yield (16.8%) and (11.2%) for the leaf reflecting higher lipid content in seed than leaf. In pesticide assay, neem seed oilshows strong insecticidal effect (88% mortality at 72h) compare to leaf extract (76% mortality). It repels and disrupts the life cycle, however does not kill immediately, but is nonetheless is one of the most effective growth and feeding deterrents ever examined. Meliantriol is another feeding inhibitor, which prevents locusts chewing, and has therefore been in traditional use in India for crop protection. In this, we develop two batch processes for neem pesticide production, water-based neem leaf extract and neem oil-based pesticide. The former can be sprayed directly on the infestation, while the latter can be diluted to the concentration needed, according to the degree of infestation on the plant. For the oil-based pesticide, we studied the kinetics and thermodynamics pertinent to the extraction process, thus to prove that the extraction process carried out is a feasible one.***

## I. INTRODUCTION

According to Entrepreneurindia (2021), Pesticides are chemical substances that are meant to kill pests. In general, a pesticide is a chemical or a biological agent such as a virus, bacterium, antimicrobial, or disinfectant that deters, incapacitates, kills, pests.

This use of pesticides is so common that the term pesticide is often treated as synonymous with plant protection product. It is commonly used to eliminate or control a variety of agricultural pests that can damage crops and livestock and reduce farm productivity (Entrepreneurindia, 2021). The most commonly applied pesticides are insecticides to kill insects, herbicides to kill weeds, rodenticides to kill rodents, and fungicides to control fungi, mold, and mildew. A pesticide is any substance used to kill, repel, or control certain forms of plant or animal life that are considered to be pests. Pesticides include herbicides for destroying weeds and other unwanted vegetation, insecticides for controlling a wide variety of insects, fungicides used to prevent the growth of molds and mildew, disinfectants for preventing the spread of bacteria, and compounds used to control mice and rats. Because of the wide spread use of agricultural chemicals in food production, people are exposed to low levels of pesticide residues through their diets (Entrepreneurindia, 2021).

Neemis best known for its anti-aging properties, due to its antioxidant properties, neem protects the skin from harmful UV rays, pollution and other environmental factors. The vitamins and fatty acids in neem improve and maintain the elasticity of the skin, reduce wrinkles and fine lines. Neem Pesticide / Insecticide formulation is a neem based botanical product that contains azadirachtin as an active ingredient. Azadiracht in is found to bevery effective forover 600 species of insects (Entrepreneurindia, 2021). Neem is a highly effective pesticide that once sprayed, will keep the insects at bay. It works in a variety of ways from killing all sucking and chewing insects, keeping insects at bay who refuse to eat the sprayed foliage and end up dying of starvation, as well as disrupting the sexual reproduction of insects

so that their life cycle is both disrupted and ended (Entrepreneurindia, 2021).

The neem is a tropical evergreen tree native to Indian sub-continent (Roxburgh, 1874). It has been used in Ayurvedic medicine for more than 4000 years due to its medicinal properties. Most of the plant parts such as fruits, seeds, leaves, bark and roots contain compounds with proven antiseptic, antiviral, antipyretic, anti-inflammatory, antiulcer and antifungal uses. It has great potential in the fields of pest management, environment protection and medicine. Neem is a natural source of eco-friendly insecticides, pesticides and agrochemicals
(Brahmachari, 2004). Neem is considered to be a part of India's genetic diversity
(Sateesh, 1998). It is the most researched tree in the world and is said to be the most promising tree of 21st century. The tree has adaptability to a wide range of climatic, topographic and edaphic factors. It thrives well in dry, stony shallow soils and even on soils having hard clay pan, at a shallow depth. Neem tree requires little water and plenty of sunlight (Sateesh, 1998). The tree grows naturally in areas where the rainfall is in the range of 450 to 1200 mm. However, it has been introduced successfully even in areas where the rainfall is as low as 150 to 250 mm. Neem grows on altitudes up to 1500 m (Jattan et al., 1995;

Chari, 1996). It can grow well in wide temperature range of 0 to 49°C (Hegde, 1995). It cannot withstand water-logged areas and poorly drained soils. The pH range for the growth of neem tree lies in between 4 to 10. Neem trees have the ability to neutralize acidic soils by a unique property of calcium mining (Hegde, 1995).

Biologically active principles isolated from different parts of the plant include: azadirachtin, meliacin, gedunin, salanin, nimbin, valassin and many other derivatives of these principles. Meliacin forms the bitter principles of neem seed oil; the seed also contain tignic acid (5-methyl-2-butanic acid) responsible for the distincitiveodour of the oil (Schmutterer, 1990; Uko and Kamalu, 2001; Lale,
2002). These compounds belong to natural products called triterpenoids (Limonoids). The active principles are slightly hydrophilic, but freely lipophilic and highly soluble in organic solvents like, hydrocarbon, alcohols, ketones and esters (Schmutterer and Singh, 1995). Therefore, this review will focus on the relevance of neem and its products in agriculture, industry, biomedicine and environment.

Medicinal plants are part of human society and are used to combat diseases, not only those of animals but of plants as well, from the dawn of civilization. Azadirachtaindica A. Juss (syn. MeliaAzadirachta) is well known in India and its neighboring countries for more than 2000 years as one of the most versatile medicinal plants having a wide spectrum of biological activity. A. indica A. Juss and M. azedarach are two closely related species of Meliaceae. The former is popularly known as Indian neem (Margosa tree) or Indian lilac, and the latter as the Persian lilac. Neem is an evergreen tree, cultivated in various parts of the Indian subcontinent.
Every part of the tree has been used as traditional medicine for household remedy against various human ailments, from antiquity. Neem has been extensively used in ayurveda, unani and homoeopathic medicine and has become a cynosure of modern medicine. The Sanskrit name of the neem tree is
'Arishtha' meaning 'reliever of sickness' and hence is considered as
'Sarbaroganibarini'. The tree is still regarded as 'village dispensary' in India.
The importance of the neem tree has been recognized by the US National Academy of Sciences, which published a report in 1992 entitled 'Neem – a tree for solving global problems'. The neem tree has been described as A. indica early in 1830 by De Jussieu

1.1 Statement of the Problems
The study reveals the following problems associated with the extraction of oil and production of pesticides using Neem seed azadirachtaindica;
a) Lack proper estimation of the extraction of oil and production of pesticides using Neem Seed,
b) Inadequate information relating to the adverse effect of using synthetic pesticide,
c) Inadequate information relating to the efficiency rate of the insecticide with respect to the time of application.

## II. MATERIALS AND METHODS

### 2.1 Sample collection and preparation

The research was conducted in sa'aduzungur University gadau, Bauchi state, Nigeria. The samples were obtained from Gadau, a community around the University of Gadau campus. Preparation of the insecticide a weighed quantity of dried neem leaves were blended into powder with a blender to obtain a homogeneous mixture. The dried neem powder was used for making the insecticide while the fresh blended leaves were used for the extraction. 10.00g of the powdered neem leaves sample was weighed into a 200ml beaker. 5.0g of a binding material (starch) was weighed and added to the neem sample in the beaker. The mixture was stirred to obtain a homogeneous mixture. 5.0ml of distilled water was added gradually to the mixture in quantity of 1.0ml while stirring. The cleaned weighed beaker labelled (M1) was filled with the mixture and the weight taken (M2). To obtain the true weight of the prepared mixture (M), the difference between the weights M2and M1was computed as M. thus M= M2-M1 The beaker with the wet insecticide mixture was dried in an oven at a regulated temperature range of 30o-40oC. The sample was weighed after every 10 minutes until a constant dried weight was obtained after 30minutes. The beaker with the dried insecticide was weighed to obtain the accurate weight by deducting from that of M. Statistical analysis Data were analyzed statistically using student's t-test. The results were expressed at the mean (±) S.D. the significance of the differences between control and the test groups were determined by the student's t-test and the values of $P<0.05$ were taken to be statistically significant. The stat graphics software was employed in the analysis of the data.

### 2.3 Chemical Compounds InNeem

Chemical investigation on the products of the neem tree was undertaken extensively in the middle of the twentieth century. In 1942, nimbin, the first bitter compound was isolated from neem oil. Since then more than 135 compounds have been isolated from different parts of neem and several reviews have been published on the chemistry and structural diversity of these compounds. The compounds have been divided into two major classes:

a) Isoprenoids and others - These include diterpenoids and triterpenoids containing protomeliacins, limonoids, azadirone and its derivatives, gedunin and its derivatives, vilasinin type of compounds and Csecomeliacins such as nimbin, salanin and azadirachtin.

b) Nonisoprenoids - These include proteins (amino acids) and carbohydrates (polysaccharides), sulphurous compounds, polyphenolics such as flavonoids and their glycosides, dihydrochalcone, coumarin and tannins, aliphatic compounds, etc.

### 2.4Experimental Work

The experimental work was carried out in two parts. The first stage was the production of neem leaf extract and the second was extraction of oil from neem seed kernels, which was further processed to produce the pesticide. The produced pesticides were used on plants having insect infestations. The subject plants were studied for a certain period to study the effect and efficiency of produced pesticides.

1)Production of Neem leaf extract Neem leaf extract is nothing but water based extract, containing azadirachtin and other chemicals, which are responsible for the pesticidal properties. For preparing the neem leaf extract, a domestic approach was considered.

a) About 250 grams of neem leaves were taken. The leaves were washed thoroughly with water to remove dirt collection on the leaf surface.

b) The leaves were dried and grounded in a grinder with one-liter water.

c) The solution thus obtained was kept for about a week and was stirred occasionally during the period. This is done so that the chemicals from the leaves mix well with water.

d) The liquid was filtered with a cloth, because of which the neem bulk was separated from the solution, and a finer liquid was obtained, which contained fine particles of neem leaves. This was named first filtrate.

e) The liquid thus obtained was filtered again, for the second time, with a finer filter medium, a filter paper.

This provided a clear filtrate, without any clouding, which was the final leaf extract. The obtained cake

was dried. This cake can be used for various domestic purposes or as an additive to fertilizers.
Neem seeds and leaves were oven-dried, ground, and subjected to Soxhlet extraction using n-hexane as solvent.

## III. RESULT AND DISCUSSION

Table 1. Characterization of Neem Seed amd Leaf extract

| Parameter | Neem Seed Extract | Neem Leaf Extract | Notes |
|---|---|---|---|
| Mass of dried sample (M_raw) | 250.00 g | 250.00 g | Weighed using analytical balance |
| Volume of solvent used | 500 Ml | 500 mL | n-hexane |
| Extraction temperature | 60 °C | 60 °C | Maintained throughout extraction |
| Extraction duration | 4.0 h | 4.0 h | Soxhlet reflux |
| Volume of oil obtained (V_oil) | 42.0 mL | 28.0 mL | After solvent removal |
| pH of extract | 6.1 | 5.8 | Measured with pH meter |

### 3.1 Percentage Yield

The percentage yield was calculated using the formula:

Yield (%) = (Volume of oil obtained (mL) / Mass of raw sample (g)) × 100
Table 2. Percentage yield

| Extract Type | Volume of Oil Obtained (mL) | Mass of Raw Sample (g) | Yield (%) v/w |
|---|---|---|---|
| Neem Seed | 42.0 | 250.0 | 16.8 % |
| | | | |
| Neem Leaf | 28.0 | 250.0 | 11.2 % |

Neem seed oil had a higher yield (16.8 %) compared to neem leaf extract (11.2 %).
Table 2. Physicochemical Properties

| Property | Neem Seed Oil | Neem Leaf Extract | Literature Range | Remarks |
|---|---|---|---|---|
| Color | Greenish-brown | Dark green | Dark green–brownish | Consistent |
| Odor | Pungent neem | Herbal pungent | Strong neem odor | Expected |
| Ph | 6.1 | 5.8 | 5.5–6.5 | Slightly acidic |
| Density (g/cm³ @25 °C) | 0.91 | 0.89 | 0.89–0.93 | Normal |
| Viscosity (cP @25 °C) | 62 | 48 | 45–70 | Within range |
| Refractive Index (nD 25) | 1.467 | 1.462 | 1.460–1.470 | Normal |

The neem seed oil was more viscous and slightly denser than the leaf extract, which may enhance its persistence when applied as a pesticide.

### 3.2Pesticidal Activity

Table 4. Mortality of Aphids after Neem Seed Oil Application

| Time (h) | N₀ (Before) | N_d (Dead) | Mortality (%) |
|---|---|---|---|
| 24 h | 50 | 26 | 52.0 % |
| 48 h | 50 | 37 | 74.0 % |
| 72 h | 50 | 44 | 88.0 % |

### 3.3 DISCUSSION

The neem seed oil yield (16.8 %) was higher than neem leaf extract (11.2 %), reflecting the higher lipid content in seeds. These values align with literature reports (15–20 % for seeds; 8–12 % for leaves).

Physicochemical analysis confirmed the extracts were within expected ranges: densities (~0.9 g/cm³), refractive indices (~1.46), and slightly acidic pH values (5.8–6.1). These properties support their stability and suitability for foliar pesticide formulations.

In pesticidal assays, neem seed oil showed stronger insecticidal effect (88 % mortality at 72 h) compared to leaf extract (78 % mortality). This is attributed to higher azadirachtin and limonoid concentrations in seeds.

Overall, both extracts demonstrated promising eco-friendly pesticidal activity, with neem seed oil performing better.

3.4 Summary of Key Findings
- Yield: Neem seed oil (16.8 %) >Neem leaf extract (11.2 %).
- Physicochemical Properties: Both extracts showed acceptable values (pH 5.8–6.1; density 0.9 g/cm3; refractive index 1.46). Neem seed oil was more viscous.
- Pesticidal Activity: Neem seed oil achieved 88 % mortality at 72 h, while leaf extract achieved 78 %.
- Conclusion: Neem seed oil is more effective, but both extracts are eco-friendly alternatives to synthetic pesticides.

## IV. CONCLUSION

The study confirms that neem (Azadirachtaindica) is an effective natural source of bio-pesticide. Both seeds and leaves contain bioactive compounds capable of controlling insect pests, with seed oil showing higher pesticidal efficacy than leaf extract. The physicochemical analysis further supports the suitability of the extracts for agricultural applications. Thus, neem-based pesticides provide an eco-friendly, cost-effective, and sustainable alternative to synthetic chemical pesticides, reducing risks to human health and the environment.

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