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Larvicidal Properties of *Datura Stramonium* (Jimson Weed) and *Nicotiana Tabaccum* (Tobacco) Extracts against the Larvae of (*Anopheles* and *Culex*) Mosquitoes

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Abstract

*Extracts of the leaf of *Nicotiana tabaccum* (Tobacco) (L) in the family Solanaceae and the root of *Datura Stramonium* (Jimson weed) in the family Solanaceae, were prepared from plant materials collected within Ekiti State, Nigeria. With *Datura stramonium* extract treatment, there was less than 50% mortality of larvae on culicine species for the first 24hours, at 100% concentration, there was 100% death rate. On Anopheline species, there was more than 70% mortality rate and 100% concentration recording 90% mortality rate. This work demonstrates the potency of *Nicotiana tabaccum* and *Datura stramonium* extracts in the control of mosquito larvae. The*

highest potency was recorded in Tobacco and on Anopheline larvae which also is a main malaria vector. There was high correlation between the two plant extracts on Anopheline larvae (0.93 and 0.68) at the hours of 24 and 48 but at the hour of 72, there was low correlation (0.41).

Key words: Extracts, *Datura stramonium*, *Nicotiana tabacum*, *Culex*, *Anopheles* mosquito.

Introduction

Mosquitoes constitute a major public menace as vectors of serious human diseases (El Hag *et al*, 1999). The use of different parts of locally available plants and their various products in the control of mosquitoes has been well established (Adams *et al*, 2005). Most of the widely used vector interruption methods are synthetic insecticide-based. These synthetic insecticides do not only affect the non-target population, but also constantly increase resistance to the vector (Redwane *et al*, 2002).

Datura is a genus of 12-15 species of vespertine flowering plants belonging to the family Solanaceae. Their exact natural distribution is uncertain due to extensive cultivation and naturalization throughout the temperate and tropical regions of the globe (Mendes and Carlini, 2006).

Datura stramonium also known as Jimson weed, is a herbaceous plant. It is an annual plant which can reach 91cm in height. It is generally irregularly branched and resembles a shrub. The leaves are alternate and each leaf is toothed shallowly and irregularly lobed and foul smelling. The flowers have five regular parts and are up to 15cm long. They are white and sometimes violet. The long delicate trumpet shaped flowers are attractive and fragrant. They open in the evening to attract nocturnal insects. The thorny capsule contains many small 0.38cm seeds. They are dark brown with pitted surface and a flattened kidney shape. Their habitats include open areas and waste places.

This plant is extremely toxic, all parts are potentially poisonous. Most parts of the plants contain atropine, scopolamine and hyoscyamine. The plant has well known and proven properties which include being anti-spasmodic and anti-asthmatic. It is also used to treat parkinson's disease (CDC, 2006).

Nicotiana tabacum is also a spermatophyte and from solanaceae family. It is related to many other plants which include vegetables, weeds and poisonous herbs like potatoes, eggplant and tomatoes.

Nicotiana tabaccum plant is an annual herb that ranges from 9 to 12cm tall. The leaves are elliptic in shape; flowers grow in clusters and white to light red in colour. The crop can take between 2-5 months before it is ready to be harvested. It is quite sensitive to temperature, air and ground humidity (Moore *et al*, 2002).

Nicotiana tabaccum, also known as Tobacco is made up of thousands of components, the main ones being Nicotine, tar and carbon monoxide. Nicotine is the addictive agent in Tobacco and also extremely toxic. The most valuable part of the plant used is Nicotine, which is found in all parts except the seed. The concentration of nicotine increases with the age of the plant. A mature plant has about 64% nicotine in leaves, 18% in stem, 13% in root and 5% in flowers. The chemical structure of nicotine consists of pyridine and pyrrodine ring. It is slowly becomes brown after it is exposed to light or air. Soluble in water, alcohol, chloroform, kerosene and some fixed oils (Mittai *et al*, 2003).

The Nicotine in the tobacco can be used as an effective insecticide as it is completely biogradable (Philipson, 2001).

Materials and Methods

Extracts of the leaf of *Nicotiana tabaccum* (Tobacco) and root of *Datura stramonium* (Jimson weed) were prepared from plant material collected within Ekiti State. To prepare the extracts, the leaves of Tobacco were plucked from the parent plants and sun dried. It was later grounded to powder using mortal and pestle and sieved manually. Similarly, for *Datura stramonium*, the roots were collected, dried indoor (without sun), so that the sun would not reduce its potency. It was therefore grounded into powdery form and sieved.

Twenty grams of each grounded part were placed in separate conical flasks; 100ml of Dichlorinated tap water was added and mixed vigorously. The mixture was kept for 24hours. After which, the mixture was filtered using fine muslin cloth and the final volume adjusted to 100ml. Serial dilutions of 20.0, 40.0, 60.0, 80.0 and 100.0% were prepared using this stock solution and Dichlorinated tap water as control.

Ten larvae of the early fourth instance were placed in a Petri-dish containing the graded solution and kept in the laboratory. The effects of the extracts were monitored by counting the number of dead larvae for 24hours, 48hours and 72hours. Pupa and adult emergence were observed including the control

(0%) during the 24hours, 48hours and 72hours. The data obtained were assessed using simple percentage (%) and simple correlation coefficient.

Results and Discussion

The effects of the various aqueous extracts of *Datura stramonium* and *Nicotiana tabacum* on the mortality of Culicine and Anopheline species larvae are presented in Tables 1-4. with *Datura stramonium* extract treatment, there was less than 50% mortality of larvae on Culicine species for the first 24hours, but at 100%, there was 100% death rate. On Anopheline species, there was more than 70% mortality rate with 100% concentration recording 90% mortality rate, both 20% and 60% killed more than 50% of the larvae (Table 2).

In table 3, the effect of Tobacco leaf recorded the highest mortality rate with 80 and 100% concentrations having 100% death rate. By 72hours, all tested concentrations of both the leaf and root extracts of Tobacco and Jimson's weed killed 100% of the tested larvae population.

The control (0%) showed no larval mortality on any of the days. A gradient of increasing mortality with increasing concentration was observed in all treatments. This work demonstrates the potency of *Nicotiana tabacum* and *Datura stramonium* extracts in the control of mosquito larvae. The highest potency was recorded from Tobacco and on Anopheline larvae which also is the main malaria vector.

Earlier studies have shown that *Datura Stramonium* plants contain atropine, scopolamine and hyoscyamine, which are toxic, hallucinogenic and produces delirium and possibly death. Also, Tobacco plants contain Nicotine, tar and carbon monoxide (CO), where Heart and Circulatory disease have been linked with these substances (CDC, 2006).

Conclusively, from the results obtained, both extracts of *Datura Stramonium* and *Nicotiana tabacum* have high larvicidal properties and can be used as environmentally-friendly and sustainable insecticides to control mosquito (Bishnu *et al*, 2005). Also, the deficiency of dissolved oxygen in water due to active presence of the chemical components of these plants cannot be ignored as also reported by Farid *et al* (2002).

From the results of the simple correlation coefficient, Table 5 shows that there was high correlation between the two plant extracts on Culicine larvae for the first 24hours (0.61), for 48hours very weak correlation (0.02) and

negative correlation for 72hours (-0.50). Also, Table 6, shows that on the hours of 24 and 48, there was high correlation between the two plant extracts on Anopheline larvae (0.93 and 0.68), but at 72hours, there was low correlation (0.41).

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Table 1: Mortality rate of *Culex* mosquito larvae from different concentrations of aqueous extracts of root of *Datura stramonium*

Mortality Rate

Concentration (%)	24 Hours	48 Hours	72 Hours
Control 0.0	0 (0.0)	0 (0.0)	0 (0.0)
20.0	3 (30.0)	5 (50.0)	2 (20.0)
40.0	3 (30.0)	6 (60.0)	1 (10.0)
60.0	3 (30.0)	6 (60.0)	1 (10.0)
80.0	4 (40.0)	6 (60.0)	0 (0.0)
100.0	10 (100.0)	0 (0.0)	0 (0.0)

Table 2: Mortality rate of *Anopheles* mosquito larvae from different concentrations of aqueous extracts of root of *Datura Stramonium*

Mortality Rate

Concentration (%)	24 Hours	48 Hours	72 Hours
Control 0.0	0 (0.0)	0 (0.0)	0 (0.0)
20.0	5 (50.0)	3 (30.0)	2 (20.0)
40.0	5 (50.0)	3 (30.0)	1 (10.0)
60.0	6 (60.0)	3 (30.0)	1 (10.0)
80.0	7 (70.0)	2 (20.0)	1 (10.0)
100.0	9 (90.0)	1 (10.0)	0 (0.0)

Table 3: Mortality rate of *Culex* mosquito larvae from different concentrations of aqueous extracts of leaf of Tobacco (*Nicotiana tabaccum*)

Mortality Rate

Concentration (%)	24 Hours	48 Hours	72 Hours
Control 0.0	0 (0.0)	0 (0.0)	0 (0.0)
20.0	8 (80.0)	2 (20.0)	0 (0.0)
40.0	9 (90.0)	1 (10.0)	0 (0.0)
60.0	9 (90.0)	1 (10.0)	0 (0.0)
80.0	9 (90.0)	1 (10.0)	0 (0.0)
100.0	10(100.0)	0 (0.0)	0 (0.0)

Table 4: Mortality rate of *Anopheles* mosquito larvae from different concentrations of aqueous extracts of leaf of Tobacco (*Nicotiana tabaccum*)

Mortality Rate

Concentration (%)	24 Hours	48 Hours	72 Hours
Control 0.0	0 (0.0)	0 (0.0)	0 (0.0)
20.0	6 (60.0)	4 (40.0)	0 (0.0)
40.0	8 (80.0)	2 (20.0)	0 (0.0)
60.0	9 (90.0)	1 (10.0)	0 (0.0)
80.0	10(100.0)	0 (0.0)	0 (0.0)
100.0	10(100.0)	0 (0.0)	0 (0.0)

Table 5: Simple correlation coefficient result on the effect of root of *Datura stramonium* and leaf of *Nicotiana tabaccum* on Culicine larvae.

	D	N	DN	R
24 Hours	58	78	41	0.61
48 Hours	44.85	1.71	1.57	0.02
72 Hours	3.42	0.86	-0.85	-0.50

Table 5: Simple correlation coefficient result on the effect of root of *Datura stramonium* and leaf of *Nicotiana tabaccum* on Anopheline larvae.

	D	N	DN	R
24 Hours	50.85	79.71	59.58	0.93
48 Hours	12	8.86	0.7	0.68
72 Hours	3.42	0.85	0.28	0.41

- D - represents *Datura stramonium*
- N - represents *Nicotiana tabaccum*
- R - represents Simple Correlation Coefficient.