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PHYTOCHEMICAL SCREENING OF AQUEOUS EXTRACT OF *ICACINA TRICHANTHA* ROOTS AND ITS EFFECT ON MORTALITY OF WOOD TERMITE

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ABSTRACT

Icacina trichantha root tuber was extracted in aqueous medium. The extract was assessed for phytochemical screening and also tested on termites to examine its mortal effects. The phytochemical screening of the plant showed the presence of tannins, saponins, alkaloids and carbohydrates. The original extract was further diluted serially to 25, 20, 15, 10, 5 and 0.00 mg/L concentrations. The termites were introduced into petri dishes smeared with the extract and a touch of the extract on the abdomen and examined for 70 minutes. The mortality of the termites was found to be concentration and time dependent. The result of the phytochemical screening and components observed calls for further examination. Moreover, in the recent quest for more potent and environmental friendly drugs, it will be found useful in drug synthesis and pharmacological studies. The extract can also serve as an alternative termiticide to replace the synthetic ones because of its effectiveness in causing death of termites.

KEY WORDS: *Icacina trichantha,* annins, saponins, alkaloids and carbohydrates.

INTRODUCTION

Naturally herbs and plants have formed the basis of herbal or traditional medicine for the treatment of different illness and diseases all over the world.[1] They are used for curative purposes because of the presence of phytochemical components which have therapeutic importance or value.[2] Phytochemicals are naturally present in plants and have been found to possess defense mechanism and protection against different diseases.[3] According to.[4]

certain diseases have been managed traditionally through the use of plant parts and such diseases include malaria, epilepsy, convulsion, skin diseases, sexually transmitted diseases, diarrhea, etc. Due to the importance of plants in this area (disease treatment), there has aroused special interest in the study of herbs and the subsequent incorporation of herbal medicine into orthodox medicinal plant practice.[5]

Herbs are found to be safe, less toxic, economical (cheap), reliable.[1] and more environmental friendly, since the waste associated with them are biodegradable and have non accumulative health effect. Due to the fact that plant contains different chemical components of importance to humans, they are considered to be a chemical factory of inexhaustable resources.[6] Phytochemicals are classified into primary and secondary compounds.[7] The primary compounds such as chlorophyll, carbohydrates, (sugars), proteins, fats and oil and vitamins are required essentially for daily life maintenance, the secondary components are basically used in the treatment of various diseases and illness in the society.

A vast number of chemical compounds from plant remains untapped and these extracts from plants reservoir can offer many potential uses or alternatives in pest and agricultural management.[8] Various authors have experimented on the use of plant extracts in the management and control of human and animal health protection, agriculture and household pest and have found them to be particularly promising.[9, 10, 11,12] The discovery of these plant based pesticides has led to increased use of plant extracts in place of synthetic pesticides and has also shifted attention to the use of natural products in recent years.[13] According to.[14] Saxena, (1998) products of plant origin have been used to regulate the growth and development of insects, insecticides, repellants and antifeedants. However, these plant products are not completely environmental friendly since they also pose slight negative effect on the environmental species namely the suppression of calling behaviour in insects.[15] toxicity.[16] growth inhibition or retardation.[17] and reduction of fecundity and fertility.[18] among others.

The use of plant extracts as drugs and agricultural and home pesticides may have arisen from their potency in treatment of ailments, destruction or reduction of insect pests and others such as wading off of rodents.

This study was therefore carried out to examine the phytochemical components of aqueous extract of *Icacina trichantha* and its effect on the mortality of termites (O*dontotermes obesus*) a common household wood pest in the Niger Delta area of Nigeria.

MATERIALS AND METHODS

Collection and Preparation of Plant Root

The tubers of the plant, *Icacina trichantha* were dug up at Egbelu-Ogbogoro community in Obio/Akpo Local Government Area of the Rivers State, Nigeria. They were transported to the Chemistry Department Research Laboratory immediately. The tubers were sliced to small sizes and air dried in the laboratory to constant weight. The dried tubers were reduced to powdered form with the aid of a blender and sieved with 2mm mesh. The powder was stored in a clean airtight bottle and kept safe in the laboratory.

Crude Aqueous Extract of *Icacina trichantha* and Preparation of the Extract

Precisely, 100g of the plant was weighed and transferred into a 500ml beaker and 250ml de-ionized water was added and was allowed to stand for twenty four hours. The mixture was filtered with Whatsman filter paper and the filtrate was then used as the stock solution believed to contain the active ingredients from the plant. From the stock, other concentrations were prepared using serial dilution method. The prepared concentrations were 25mg/L, 20mg/L, 15mg/L, 10mg/L and 5mg/L and a control (0.00mg/L). The remaining solution from the stock was refrigerated at 4^{o}C and used for phytochemical screening.

Phytochemical Screening (Test)

The tests for the different phytochemicals were carried out using the prescribed methods as described in.[19]

Test for Tannins

To the solution of the extract, a little amount of ferric chloride ($FeCl_3$) was added and was examined for a precipitate of blue-green or blue-black colour

Test for Saponins

The extract solution was shaken with 5 ml distilled water and heated to boiling point and was observed for frothing formation.

Test for Alkaloids

The extract was warmed and 1% hydrochloric acid was added. The mixture was allowed to stand for two minutes and was filtered. A small amount of dragendorff's reagent was then added. The solution was then observed for a reddish-brown colour with a high turbidity when it was added.

Test for Flavonoids

To the extract, two drops of ammonia (NH_3) was added and observed for colour change.

Test for Carbohydrates

To the extract, few drops of Molisch's reagent and 1 ml of of concentrated tetraoxosulphate (vi) acid (H_2SO_4) by the side and again 5 ml of distilled water was added. The reaction was observed for a red dull violet colour between the two phases.

Test for Steroids

Few drops of concentrated tetraoxosulphate (vi) acid **(**H_2SO_4) was added in drops to the extract and was observed for a colour change.

Test for Cardiac Glucosides

To the extract, glacial acetic acid was added plus 1 drop each of $FeCl_3$ and H_2SO_4 and observed for colour change.

Collection of Termites

The workers of termites (*Odontotermes obesus*) were collected from an anthill within the Ignatius Ajuru University of Education Port Harcourt, main campus with a wide plastic material and transferred into a plastic bucket on a day with a cloudy and cool atmospheric condition to prevent the termites from exposure to the sun. They were transported to the Chemistry Department Research Laboratory immediately.

Experimental Design

The completely randomized design (CRD) was used for the experiment. The experiment was divided into six treatment levels and three replicates.

Exposure of Termites to the Plant Extract

Petri dishes in triplicates for each treatment level were first smeared with the plant extract and **t**en termites were subsequently introduced into petri dishes after which the termites were touched at the abdomen with a glass rod which was dipped into the extract.

Mortality Count and Data Collection

The termites were monitored for changes in movement and mortality. Termites were considered dead when they fail to respond to touch or the prodding of a glass rod and fail to make any form of movement thereafter for thirty seconds. Dead termites were counted after every ten minutes.

RESULTS

The results of the phytochemical screening showed a blue-green colour precipitate indicating the presents of tannins. A frothing formation was also formed after test for saponins, which indicates its presents. Alkaloids were also present because a reddish- brown colour with high turbidity was seen. Red dull violet colour was observed between two phases in the test for carbohydrates indicating its presence (Table 1).

After exposure of the termites to aqueous extract of *Icacina trichantha*, the movement and general behaviour of the termites changed. The termites exhibited wobbling movement and were consistently falling on their backs. This behaviour was more pronounced in the higher concentrations. The rate of movement around the perimeter of the petri dish gradually decreased until they ultimately fell on their backs and die.

No mortality was observed in the control for a period of four days and thereafter was discarded. The mortality of the termites in the *Icacina trichantha* medium were dose (concentration) and time dependent. The concentration of 25 mg/L was able to effect total mortality of all the termites within 50 minutes, while 20 mg/L accomplished the same effect in 70 minutes. At 15, 10 and 5 mg/L, all the termites did not die within the 70 minutes of monitoring, although only few survived (Table 2). The mean mortality of the exposed termites showed that the lower concentration could not effect mortal damage on the termites as fast as the higher concentrations. Also the mortality rates were significantly different ($P< 0.05$) between concentrations at the various time intervals (Table 3). The percentage mortality of the termites in the various concentration solutions are shown in Table 4.

Table 1: Phytochemical components of aqueous extract of *Icacina trichantha.*

Chemical Component	Aqueous Extract
Tannins	+
Saponins	+
Alkaloids	+
Flavonoids	-
Carbohydrates	+
Steroids	-
Cardiac glycosides	-

Key: + = present, - =absent

Table 2: Total mortality of termites (*Odontotermes obesus*) in different concentrations of *Icacina trichantha* after exposure.

Time (minutes)	Concentrations of *Icacina trichantha* (mg/L)				
	25	**20**	**15**	**10**	**5**
10	12	5	2	2	1
20	17	11	7	7	5
30	24	16	12	11	8
40	29	20	16	15	10
50	30	23	20	19	13
60	-	26	24	21	19
70	-	30	28	25	23

Table 3: Mean mortality of termites (*Odontotermes obesus*) in different concentrations of *Icacina trichantha* after exposure.

Time (minutes)	Concentrations of *Icacina trichantha (mg*/L)				
	25	**20**	**15**	**10**	**5**
10	4.00	1.67	0.67	0.67	0.33
20	5.67	3.67	2.33	2.33	1.67
30	8.00	5.33	4.00	3.67	2.67
40	9.67	6.67	5.33	5.00	3.33
50	10.00	7.67	6.67	6.33	4.33
60	-	8.67	8.00	7.00	6.33
70	-	10.00	9.33	8.33	7.67

Table 4: Percentage mortality of termites (*Odontotermes obesus*) in different concentrations of *Icacina trichantha* after exposure.

Time (minutes)	Concentrations of *Icacina trichantha* (mg/L)				
	25	**20**	**15**	**10**	**5**
10	40.0	16.67	6.67	6.67	3.33
20	56.67	36.67	23.33	23.33	16.67
30	80.00	53.33	40.00	36.67	26.67
40	96.67	66.67	53.33	50.00	33.33
50	100.00	76.67	66.67	63.33	43.33
60	-	86.67	80.00	70.00	63.33
70	-	100.00	93.33	83.33	76.67

DISCUSSION

Medicinal plants play active roles in curative and preventive medicine. The manufacture of new drugs to cope with the increasing adversity of diseases and sicknesses can be achieved if medicinal plants are screened to examine their phytochemical components. The screening of plants for phytochemicals has helped in the production of new drugs of therapeutic importance.[3,5] and many more are on the way. The chemical components of plants are related to their medicinal and curative properties. The chemical components observed in this work were tannins, saponins, alkaloids, flavonoids and carbohydrates. The removal of these components from the plant for medicinal use depends on their solubility in the extracting solvent.[1]

The phytochemical screening of Icacina trichantha revealed the presence of tanins, saponins, alkaloids and carbohydrates, while flavonoids, steroids and cardiac glucosides were absent. In a similar study.[20] they observed the presence of alkaloids, reducing sugars, steroids and cardiac glucosides but saponins, tannins, flavonoids and phenols were absent.[21] observed the presence of tannins, oxalates, saponins, phytates, alkaloids, HCN and flavonoids in *Icacina senegalensis*.[22] observed the presence of tannins, saponins, alkaloids and phenols, while flavonoids and cardiac glucosides were absent. The presence of these phytochemicals indicates that the plant is of medicinal and pharmacological importance.[22]

The presence of phytochemicals from the same plant may not exactly be of the same chemical composition due to climatic condition, geographical location and the soil type.

The observed phytochemicals in the plant (*Icacina trichantha*) are of great biological and biochemical importance in the human system. Tannins when taken in excess is found to be harmful to man.[23] Its toxicity originates from its ability to chelate with metals ions rendering them unavailable to the human system. This situation can lead to anaemia especially when the binding metal is iron.[21]

Saponins on the other hand causes reduced cholesterol and protein concentration in the human due to its ability to bind with both cholesterol and protein. This situation in effect affects the red blood cells, since they are rendered unavailable.[24] If this situation continues on the ground of consumption, it will affect the general metabolism since cholesterol and proteins are the building block of the human and animal system. Alkaloids have some medical uses, but despite their medical importance, they are associated with gastrointestinal

and neurological effects in humans.[25] Carbohydrates serve as source of energy which activates body cell to work effectively.

Mortality and behavioural changes of termites associated with plant extracts have been reported in other studies.[8] observed mortality and changes in tunneling behavior of termites exposed to different plant parts.[12] observed that some plant extracts repel termites and also caused mortality and changes in the tunneling behaviour of subterranean termites (*Heteroterms indicola*).[11] observed that plant extract and essential oils killed the workers of termites (*Microcerotermis gabriles*) and that the mortality rate of the termites were concentration and time dependent. In this study, the mortality of the termites were observed to be time and concentration dependent similar to those observed by other authors.[8,11,12] The 100% mortality in 25mg/L recorded in 50 minutes is an indication that the plant *Icicina trichanta* is highly toxic to termites. The toxicity or potency of this plant may have resulted from the active chemical components present in the plant elucidated from phytochemical screening namely benzophenones, alkaloids and flavonoids.[20,21,22] and others ones observed in this study. All the tested concentrations were able to cause over 76% mortality in seventy minutes and this may suggest that the plant can be effectively used as a termiticide or in general possesses insecticidal components readily made available through the aqueous extract.

Insecticidal activity through contact method in this study corroborates the work of.[26,27] when they exposed termites to different concentrations of different plant extracts. Leaf extracts of several plants were found to be effective against insect pests and diseases.[26] The mortality of the termites may have resulted from the biocidal effects of the plants which contains active components.[27] The same author also observed that mortality of insects, for example the termites do not necessarily depend on the concentration of the toxicant but majorly on the active components of the plant extract. The effectiveness of the toxicant in causing mortality of termites after a brief body contact with the extract showed that the active components or compounds may have penetrated into the cuticles or the spiracles to affect the nervous or the digestive systems of the termites.[28]

CONCLUSION

The aqueous extract of *Icacina trichantha* contains some chemical components which can be useful in the design, synthesis and production of drugs. The extract was found to cause

mortality of termites within a short time interval. Therefore it can serve as a potential termiticide for use in homes and offices, since it is environmental friendly.

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