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Effects of *Xylopia aethiopia (Dun.)* A. Rich and *Eucalyptus Camalduleusis* Dehn. H *Leaves extracts* on leaf gall bug disease of *Terminalia ivorensis A. Chev.*

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ABSTRACT

Epicerura pulverulenta **(African Moth)is one of the most important defoliator of *Terminalia ivorensis A. Chev.* leading to a great reduction in their production and yield potentials. The constant use of chemicals to control these phyto-pathogens poses potential threats to human health and the environment. A non–chemical control strategy such as the use of botanicals would be a better alternative. Botanicals are readily available, safe, efficacious and eco-friendly. This study was undertaken to investigate the effect of *Eucalyptus camaldulensis Dehn. H*and *Xylopia aethiopia (Dun.) A. Rich* leaf extracts on the leaf gall bug disease of *Terminalia ivorensis*. The fresh leaves of both plants were blended to fine liquid extracts by conventional maceration techniques using distilled water. Prepared concentration (0.5-2.0%) of the extracts were then tested against the development of the leaf gall bug of *Terminalia ivorensis* . Benomyl(3%) was used as insecticidal drug. It was observed that the extract treatments had no significant effect expect for table 5,6,and the control which showed a significant effect.**

INTRODUCTION

Terminalia ivorensis is a bulky forest tree which producesthe timber called Idigbo. It looks like *Terminalia superba* in nature,but it is notable by the dark,blackish and deeply fissured bark. It belongs to family *combretaceae*. In yoruba, it is called "idigbo", in edo it is called "eghoin nekini" and in ijaw it is called "Ubiri" The germination time of the seed varies depending on the climate in Nigeria and parts of Africa. Macgregor (1934) has recorded 2 to 3 weeks,Cooper and Bramwell (1953) 2 to 3 weeks and in Ghana. The timber is used primarily for construction works and utility purposes for which it is available in large bulk for house building, planks, doors and window frames etc. It is easily sawn into planks at the sawmill and it is suitable for plywoods and veneers.The sap expressed from young leaves is applied to cuts and wound in Sierra leone(Burhill., 1972) (and is taken with a bark decoction for enema and gonorrhea and kidney disorders and as an aphrodisiac. However,its cultivation is faced with numeroussetbacks such as attack by pests and diseases in the seedling nursery stage.

Young plantations in cote d'voire and Nigeria have been defoliated by the moth *Epicerura spp*.and by the locust *Zonocertus variegatus,*which may cause considerable decrease of yield. Spraying with insecticides decamethrin and thiocyclam hydrogen oxalate at concentration of 900g and 300g active ingredient per hectare, respectively showed good results, but a virus desease attacking the pests was also identified.The plantations are also attacked by ambrosias beetles of the genus *Doliopygus*. This causes small blackish holes in the wood. Newly planted stumps can be attacked by termites; this can be prevented by treating the base with insecticides. The River Red Gum wood (*Eucalyptus Camaldulensis*) is a tree of the genus *Eucalytus.* It is a plantation specie in many parts of the world,but it is native to Australia,where it is widespread,especially beside inland water courses. (Slee*et al,*2006).The tree produces welcome shade in the extreme temperatures of central Australia and plays an important role in stabilizing river banks.The oils are used as an inhalant with steam and other preparations for relief of colds and influenza symptoms.Because of its refreshing odour and its efficiency in killing bacteria, the oil is also used an antiseptic (Orwa *et al.* 2009}.

*Xylopia aethiopica*is a tree of more than 20 cm of height and 60 to 75 cm in diameter. It grows in the forest zone and especially along the rivers andits green colour takes a brown blackcoloration after drying and they are commonly used as spices. In Nigeria, the leaf extracts are powerful antibiotics and valuable medicine against malaria as well as their application in local anesthesia as pain relief(Kingdom and Baladin., 1993; Bruneton,1999; Harbone,1973).Recently the leaves were documented to possess photochemicals such as alkaloids,saponins,tannins,steroids and flavonoids (Aguoru *et al*., 2016)

In view of the potentials of these plant extracts of *X. aethopica* and *E. Camadulensis*,it is pertinent to explore their abilities as control agent of leaf gall bug of *Terminalia ivorensis.*

MATERIALS AND METHODS

Collection of samples

Fresh leaves samples of *Eucalyptus camandulensis*Dehn*. H*and *Xylopia aethiopia (Dun.)* A. Rich were obtained from Moist forest research station, Benin City, Edo State in November, 2016. The plants used for experiment were authenticated by Mr Emmanuel Isebemhe, the taxonomist of the Moist Forest Zonal Research Station, Benin-City.

Experimental Design

The experiment was set up in a Randomized complete Block Design (RCBD) replicated 4 times with 2 treatments involving sprayed *Eucalyptus Camaldulensis leaves* extract and Xylopia *aethiopia* leaves extract*;* as well as a control.

The plantswere watered daily. Disease severity was recorded on bi-weekly basis. There were two rows with four plants in a sets, there were set A,B,C and D. Each had a total of 16 plantswith a control of 4 plants sprayed with insecticides (Benmoyl). Disease severity was rated as follows; leaves regarded as 'no infections' were the leaves that had no gall bug per leaf, mild infections were leaves with 5-10 spots per leaf and severe infections were leaves with 10-30 spots per leaf and very severe were leaves with 30-150 leaf gall bug per leaf. The leaf gall bugs were taken for 3months. The result obtained was subjected to analysis of variance.

Data Collection and Analysis;

16 plants were sampled for treatment, while disease severity of leaves with varied categories of infection was taken bi-weekly. At 3 months old, the number of leaf gall spots per leaf was taken. The results obtained were subjected to analysis of variance.

RESULTS

The results from this study showed that leaf extracts of both Plants demonstrated no significant difference on the gall growth at different concentration of the extract.Table 1shows the leaf gall growth readings for the initial readings taken before leaves extracts of *Xylopia aethiopia* and *Eucalyptus camaldulensis* were applied.The mean data of unsprayed Eucalyptus leaves extracts designate plants (set A to D) range from 3.4-5.0 and 3.37-5.06 for unsprayed *Xylopia aethiopia* leaves extract designate plants. A t-test analysis (Table 1c) conducted on the mean data of unsprayed Eucalyptus leaves extract designate plants

and unsprayed *Xylop*ia *aethiopia* leaves extract designate plants showed that therewere no significant differences.

TABLE 1a: Leaves with varied categories of infection at 12 weeks for sprayed Eucalyptus leaves extract

SET	CONCENTRATION	N.I	M.I	S.I	V.S.I	TOTAL	MEAN
A	0.5	13.50	5.00	1.00	NIL	15.00	3.75
B	1.0	14.25	2.50	NIL	NIL	17.00	4.25
C	1.5	10.25	2.75	0.50	NIL	13.50	3.38
D	2.0	12.25	4.50	3.25	NIL	20.00	5.00

N.I=no infection,M.I=medium infection,S.=,severe infection,V.S.I= very severe infection.

TABLE 1b : Leaves with varied categories of infection at 12 weeks for sprayed Xylopia leaves extract

SET	CONCENTRATION	N.I	M.I	S.I	V.S.I	TOTAL	MEAN
A	0.5	9.25	3.75	NIL	NIL	13.50	3.38
B	1.0	10.75	6.50	3	NIL	20.25	5.06
C	1.5	12.50	2.50	NIL	NIL	15.00	3.75
D	2.0	10.75	4.75	NIL	NIL	14.50	3.63

N.I=no infection,M.I=medium infection,S.=,severe infection,V.S.I= very severe infection.

Table 1c: T Test analysis of initial readings on mean data of leaves extract at 12 weeks varied categories of infection as shown below

SET	E.E (mean)	X.E (mean)	E.E _X.E(Difference)	t calculated	t critical
A	3.75	3.37	0.38		
B	4.25	5.06	_0.81	1.43954	3.182
C	3.37	3.75	_0.38		
D	5	3.63	1.37		

E.E- Eucalyptus Extract, X.E-Xylopia Extract, E.E-X.E(Difference

There is no significant difference between the means of data obtained because t critical is greater than t calculated. From table 1a and 1b, the mean data of sprayed Eucalyptus leaves extracts plants at different concentration ranged from 3.87-4.87 and 3.69-3.13 for Xylopia leaves extract sprayed plants. A t-test analysis (Table 1c) conducted on mean data of sprayed Eucalyptus leaves extracts plants and sprayed Xylopia extract plants showed that there were no significant difference.

TABLE 2a: Leaves with varied categories of infection at 14 weeks for sprayed Eucalyptus leaves extract as shown below

SET	CONCENTRATION	N.I	M.I	S.I	V.S.I	TOTAL	MEAN
A	0.5	9.75	4.25	3.00	2.50	19.50	4.875
B	1.0	11.75	5.00	0.50	nil	17.25	4.3125
C	1.5	8.50	5.25	1.50	0.25	15.50	3.875
D	2.0	7.25	4.00	4.25	3.25	18.75	4.687

N.I=no infection,M.I=medium infection,S.=,severe infection,V.S.I= very severe infection.

TABLE 2b: Leaves with varied categories of infection at 14 weeks for sprayed with Xylopia extract as shown below

SET	CONCENTRATION	N.I	M.I	S.I	V.S.I	TOTAL	MEAN
A	0.5	5.75	4.00	2.75	0.75	13.25	3.3125
B	1.0	4.75	5.25	2.75	2.0	14.75	3.6875
C	1.5	6.75	3.50	2.25	Nil	12.5	3.125
D	2.0	6.25	6.0	1.0	nil	13.25	3.3125

N.I=no infection,M.I=medium infection,S.=,severe infection,V.S.I= very severe infection.

Table 2c: T-test analysis of 14 weeks reading taken on mean data of the effect of leaves extract with varied categories of infection

SET	E.E (mean)	X.E (mean)	E.E _X.E(Difference)	t calculated	t critical
A	4.888	3.31	1.56		
B	4.31	3.69	0.63	0.9617	3.182
C	3.88	3.13	0.75		
D	4.688	3.31	1.38		

There is no significant difference between the means of data obtained because t critical is greater than t calculated.

From Table 2a and 2b, the mean data of sprayed *Eucalyptus camadulensis* leaves extract plants and*Xylopia aethiopia* leaves extract plants at different concentrations ranged from 3.51-4.87 and 5.25-3.44 for *Xylopia aethiopia* extract sprayed plants showed that there were no significant difference.

TABLE 3a: Leaves with varied categories of infection at 16 weeks for sprayed *Eucalyptus camadulensis*leaves extract as shown below

SET	CONC	N.I	M.I	S.I	V.S.I	TOTAL	MEAN
A	0.5	5.75	5.5	4.00	1.25	16.50	4.125
B	1.0	9.00	5.00	2.50	Nil	16.50	4.125
C	1.5	6.75	5.00	2.25	1.25	14.05	3.512
D	2.0	6.00	6.00	3.50	4.00	19.50	4.875

N.I=no infection,M.I=medium infection,S.=,severe infection,V.S.I= very severe infection.

TABLE 3b: Leaves with varied categories of infection at 16 weeks for sprayed *Xylopia aethiopia* leaves extract as shown below

SET	CONCENTRATION	N.I	M.I	S.I	V.S.I	TOTAL	MEAN
A	0.5	3.00	3.75	4.50	2.50	13.75	3.437
B	1.0	1.75	4.00	3.00	6.75	18.50	4.625
C	1.5	10.00	4.5	2.75	Nil	17.25	4.312
D	2.0	7.00	5.5	6.25	2.25	21.0	5.25

N.I=no infection,M.I=medium infection,S.=,severe infection,V.S.I= very severe infection.

Table 3c: T-test analysis of 16 weeks reading taken on mean data of the effect of leaves extract with varied categories of infection

	E.E (mean)	X.E (mean)	E.E-X.E(Difference)	t calculated	t critical
A	4.125	3.438	0.6875		
B	4.125	4.625	-0.500	2.1745	3.182
C	3.512	4.313	0.8005		
D	4.875	5.25	-0.375		

E.E- Eucalyptus Extract, X.E-Xylopia Extract, E.E-X.E(Difference)

The mean data of sprayed *Eucalyptus camadulensis* leaves extract plants at different concentrations ranged from 3.81-4.87 and 3.81-4.87 and 3.00-6.12 for *Xylopia aethiopia* leaves extract sprayed plants showed that there were no significant difference.

TABLE 4a: Leaves with varied categories of infection at 18 weeks for sprayed*Eucalyptus camadulensis* leaves extract as shown below

SET	CONCENTRATION	N.I	M.I	S.I	V.S.I	TOTAL	MEAN
A	0.5	5.0	5.10	5.00	1.0	15.25	3.813
B	1.0	8.0	6.0	2.00	1.0	18.00	4.500
C	1.5	6.0	5.00	2.20	1.10	15.80	3.950
D	2.0	5.0	6.00	3.00	3.50	19.50	4.875

N.I=no infection,M.I=medium infection,S.=,severe infection,V.S.I= very severe infection

TABLE 4b: Leaves with varied categories of infection at 18 weeks for sprayed *Xylopia* leaves extract as shown below

SET	CONCENTRATION	N.I	M.I	S.I	V.S.I	TOTAL	MEAN
A	0.5	2.5	3.0	4.00	2.00	12.00	3.000
B	1.0	1.25	5.00	4.00	7.00	18.25	4.563
C	1.5	9.00	4.00	3.00	Nil	17.50	4.375
D	2.0	8.00	5.00	6.50	3.00	24.50	6.125

N.I=no infection,M.I=medium infection,S.=,severe infection,V.S.I= very severe infection.

Table 4c: T-test analysis of 18 weeks reading taken on mean data of the effect of leaves extract with varied categories of infection

SET	E.E (mean)	X.E (mean)	E.E _X.E(Difference)	t calculated	t critical
A	4.125	3.438	0.6875		
B	4.125	4.625	-0.500	2.1745	3.182
C	3.512	4.313	0.8005		
D	4.875	5.25	-0.375		

E.E- *Eucalyptus* Extract, X.E-*Xylopia* Extract, E.E-X.E(Difference)

The mean data of sprayed of sprayed Eucalyptus leaves extract plants at different concentrations ranged from 3.70-4.75 and 3.0-6.12 for *Xylopia* leaves extract plants showed that there is a significant difference as shown below.

Table 5a:Leaves with varied categories of infection at 20 weeks for sprayed *Eucalyptus camadulensis* leaves extract

SET	CONC.	N.I	M.I	S.I	V.S.I	TOTAL	MEAN
A	0.5	4	6	4.0	2.0	12.0	3.0
B	1.0	7	6	4.0	7.0	18.25	4.563
C	1.5	5.0	5	3.0	NIL	17.5	4.375
D	2.0	5.0	6	7.5	2.0	24.50	6.125

N.I=no infection,M.I=medium infection,S.=,severe infection,V.S.I= very severe infection.

Table 5b:Leaves with varied categories of infection at 20 weeks for sprayed *Xylopia aethiopia* extract

SET	CONC.	N.I	M.I	S.I	V.S.I	TOTAL	MEAN
A	0.5	2.5	3.0	4.0	2.0	12.0	3.0
B	1.0	1.25	5.0	4.0	7.0	18.25	4.56
C	1.5	8.0	5.0	3.0	0	17.5	4.38
D	2.0	7.0	6.0	7.5	2	24.5	6.13

N.I=no infection,M.I=medium infection,S.=,severe infection,V.S.I= very severe infection.

TABLE 5c: T-test analysis of 20 weeks reading taken on mean data of the effect of leaves extract with varied categories of infection

SET	E.E(MEAN)	X.E(MEAN)	E.E-X.E (DIFFERENCE)	Tcalculated.	t-critical
A	4.375	3.0	1.375	3.5286	3.182
B	4.25	4.56	-0.313		
C	3.70	4.38	-0.675		
D	4.75	6.13	-1.375		

E.E- *Eucalyptus* Extract, X.E-*Xylopia* Extract, E.E-X.E(Difference)

The mean data of sprayed Eucalyptus leaves extract plants at different concentrations ranged from 3.37-5.0 and 3.12-4.75 for Xylopia aethiopia leaves extract sprayed plants showed that there is a significant difference as shown below.

Table 6a: Leaves with varied categories of infection at 22 weeks for sprayed *Eucalyptus camadulensis* leaves extract are presented below

SET	CONC.	N.I	M.I	S.I	V.S.I	Total	Mean
A	0.5	10.0	4.0	2	Nil	16.5	4.125
B	1.0	12.20	2.0	Nil	Nil	15.2	3.80
C	1.5	9.0	2.0	1.0	Nil	13.5	3.38
D	2.0	11.0	4.0	3.0	Nil	20.0	5.00

N.I=no infection,M.I=medium infection,S.=,severe infection,V.S.I= very severe infection.

Table 6b:Leaves with varied categories of infection at 22 weeks for sprayed *Xylopia*Extract in the table below

SET	CONC	N.I	M..I	S.I	V.S.I	Total	Mean
A	0.5	9.0	3.0	Nil	Nil	12.5	3.125
B	1.0	10.0	5.0	3.0	Nil	19.0	4.75
C	1.5	11.0	2.0	Nil	Nil	14.5	3.625
D	2.0	9.0	4.0	Nil	Nil	15.0	3.75

Table 6c: T-test analysis of 22 weeks reading taken on mean data of the effect of leaves extract with varied categories of infection

SET	E.E(MEAN)	X.E(MEAN)	E.E-X.E (DIFFERENC	T.calculated	t-critical
A	4.125	3.125	1	4.022	3.182
B	3.80	4.75	-0.95		
C	3.375	3.625	-0.25		
D	5.00	3.75	1.25		

E.E- *Eucalyptus* Extract, X.E-*Xylopia* Extract, E.E-X.E(Difference)

Table 7: The control readings were taken from 1st-6th readings of leaves with varied categories of infection

WEEK	N.I	M..I	S.I	V.S.I	Total	Mean
1	11.5	3.0	nil	Nil	14.50	3.625
2	9.5	5.25	8.25	Nil	17.00	4.25
3	5.0	7.75	7.0	1.25	21.00	5.25
4	4.5	7.70	8.00	3.00	23.20	5.80
5	4.5	7.70	8.00	3.00	23.20	5.80
6	9.0	5.0	2.0	Nil	16.00	4.00

N.I-no infection, M.I- mild infection, S.I-serious infection, V.S.I-very serious infection.

DISCUSSION

The result of the effect of sprayed *Eucalyptus Camadulensis* and *Xylopia aethiopia* leaves extracts on the development of leaf gall spots on grown Termalinia Ivorensis showed that sprayed leaves extract has no significant effect except for Table 5,6 and control shows that there is a signicant effect on the development of the disease. This is similar to the work of Omokhua *et al,*2009, who used different sterilized granite and river sand and sawdust which are industrial waste that were considered for seed propagation for effective protection of young seedlings.Also according to the findings of (Ukioma *et al*,2016),it was observed that the larvae of *Epicerura pulverulenta* are potential threat to the growth and establishment of *Terminalia ivorensis.* This work agrees with the findings of (Kanga *et al,*1991) who opined that *E.spp* is a major defoliator of *T.ivorensis*. it was suggested in their research that appropriate control measures such as cultural practises (pruning) and recommendedchemical (decamathrin) should be applied in severe cases of infestation.

CONCLUSION

Based on the results of the study, the following can be made:-

1. Sprayed *Eucalyptus camadulensis* and *Xylopia aethiopia* leaves extracts has a negligible effect on the development of leaf gall spots field grown *Terminalia ivorensis.*
2. There is no significant difference between leaves of the varied categories of infection for sprayed *Eucalyptus* and *Xylopia aethiopia* leaves extract except for table 5,6 and the control.

Also as the plants grew older some of the leaves on the plants dropped. Leaf gall spots on the plants starts developing from 2months, it is adviced that management practices such as sterilization of any nursery medium should be done before use. Sawdust which are industrial waste may be considered for seed propagation for effective protection of young seedlings *(*Omokhua *et al,*2009).

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