BOTANICAL INSECTICIDES
PRESCRIPTION FOR FISH PEST CONTROL AND INFESTATION FREE PROTEIN YIELD.

By

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ABSTRACT

The dry powders of four local spices namely Piper guineense schum and Thonn. Aframomum melegueta schum. Zingiber Officinale Rose: Capsicum annum Miller at three concentrations of 15g. 20g and 25g/kg were evaluated for their insecticidal effects against the larvae of the dried fish weevil Demestes maculates Degeer. All the four spices showed some effectiveness with P guineense given a 100% mortality at the end of 72 hours at the three concentrations. The other spices. though gave less mortality. were able to slow down the rate of development of the larvae to the adult stage.

INTRODUCTION

Fish protein is known to be the best and cheapest source of animal protein (Olayide, 1973) The loss of protein in dried fish due to known fish pet, D. Maculatus has been variously quantified Loss of value up to US & 500.000 per annum was reported by Rolling and Hayward (1962). Losses worth of US $1,500,000 were also reported in Mali (Aref et al, 1964)..

To prevent insect infestation, according to Talabi et al(1983), a lot of fish were dipped in 80% formulation of Gammalin 20 before being sundried in the open in the lake Chad area of Nigeria This practice of applying synthetic insecticides has been found to be potentially dangerous when such fish is consumed. In some villages in Ghana. where fish have been treated in this manner, people who consumed them, suffered blurred vision, dizzines and vomiting (Bull, 1982) Due to this harzards many researchers have picked up interest in the alternative use of botanical insecticides. This is currently going on in Nigeria, Ghana, Kenye, Egypt, Pakistan, The Philippines and Japan (Dale, 1996). As animals are highly tolerant to plants insecticides. they are particularly valued for use against the insect pests of folders, fruits. vegetable and stored produce

In this presentation the idea of a source for controlling D. Maculatus infestation in fish. In the following scheme. are prescribed and dispensed a kind of botanical insecticide meal in treating fish against the insect infestation. This has been found to be efficient in providing high quality fish protein.

MATERIALS SETTINGS & METHODS

D. maculatus lavae of between 0-24 hours old were bred and used for the experiment. Ten adults of this pest were separated into males and females and kept in each of six large kilner jars. containing large pieces of wet cotton wool to provide a source of water to the insects. As a source of food and substratum for ovipositiion, large pieces of disinfected dried fish were also added to the contents in the each jar.

The four spices used Piper guineense (PG), Aframonium melegueta (AM) Zingiber officinale (ZO) and Capsicum annum were ground and sieved with 2mm size sieve and were weighed into the following concentrations 0.1g, 0.20g and 0.25g respectively and then replicated

three times each 1g pieces of dried fish were thoroughly rubbed with the powders of the spices at the different concentrating materials. The controls were prepared with fish not treated with the spices.

Readings were taken at every 24 hours for 5 days after which the development of the remaining larvae was monitored from larvae to pre-pupa, pre-pupa to pupa and pupa to adult stages.

OBSERVATION RESULT

From table 1. it can be seen that P. guineense at 0.25g concentration gave a 100% mortality at 24hrs, followed by the same spice at 0.20g and 0.15g respectively. By the end of 72hours, 100% mortality was recorded in P. guineense at all the concentrations. The other spices gave less moralities with A. melegueta at 0.25g giving a mortality level of 53.3%, though compared with the controls, all the spices performed well.

The mean number of days taken for the larvae to develop into the adult stage was found to have increased at higher concentrations of 0.025g in all the spices (Table 2) compared with controls, there are no significant differences with 0.15g concentration in all the spices in the developmental period all at $P<0.05$. The statistical analysis carried out are as shown in tables 3,4, and 5

Table 4.3.1
ANALYSIS ON MEANS MORTALITIES OF D MACULUTUS LARVAE EXPOSED TO DIFFERENT CONCENTRATIONS OF FOUR SPICES AT THE END OF 120 HOURS.

Factor Treatment (g/kg)	Spice Concentration	(HOURS) LARVAL MORTALITY 24H	45H	72H	96H	120H	
PGP	15	8.0	9.7	10.0	-	-	27.70
	20	8.3	9.3	10.0	-	-	27.60
	25	10.0	10.0	10.0	-	-	30.00
AMP	15	1.0	2.0	2.0	2.3	2.3	9.60
	20	1.3	2.3	2.7	3.3	3.3	12.70
	25	1.6	4.0	4.7	4.7	5.3	15.30
ZOP	15	0.33	2.0	2.0	2.3	2.3	8.93
	20	1.3	2.7	2.7	3.0	3.0	12.70
	25	1.3	3.3	3.3	3.7	3.7	15.30
CAP	15	1.0	1.3	2.0	2.0	2.0	8.30
	20	1.0	2.0	3.0	3.3	3.3	12.60
	25	1.0	2.3	3.7	4.0	4.2	15.20
Total	y_j	36.13	50.90	56.16	28.60	29.4	y_j = 201.13

Table 3.2

Treatment	15g/kg	20g/kg	25g/kg	Total
PGP	27.7	27.6	30.0	85.3
AMP	9.6	12.9	20.?	42.8
ZOP	8.93	12.7	15.3	36.93
CAP	8.3	12.6	15.2	36.1
Total	54.53	65.8	80.8	201.13 = $y_{..}$

ANOVA TABLE 3.3

Sources of variation	D.F	SS	MS	F^{o}
SS treatment	3	359.25	119.75	128.76
SS block (kg)	2	19.3	9.65	10.38
Ssinteraction	6	2.89	0.48	0.52
SS_{TS}	11	381.44		
SS_{error}	40	37.25	0.93	
SS_{T}	53	418.70		

Table 4.1

Centage mortality of D maculatus exposed to different concentrations of four spices at the end 120hours.

Treatment	Spice (g/kg)	LARVAL MORTALITY (%)					
PGP	15	8.0	97.7	100.0	-	-	277.7
	20	8.3	93.3	100.0	-	-	276.6
	25	100.0	100.0	100.0	-	-	300.0
sAMP	15	10.0	20.0	20.0	23.3	23.3	96.6
	20	13.3	23.3	26.7	33.3	33.3	129.9
	25	16.7	40.0	46.7	46.7	53.3	203.4
ZOP	15	3.3	20.0	20.0	23.3	23.0	89.3
	20	13.3	27.0	27.0	30.0	30.0	127.3
	25	13.3	33.0	33.0	37.0	37.0	153.3
CAP	15	10.0	13.3	20.0	20.0	20.0	83.0
	20	10.0	20.0	30.0	33.0	33.0	126.0
	25	10.0	23.0	37.0	37.0	42.0	152.0
Total	y_{j}	36.13	50.90	56.16	28.60	29.4	y_{j} = 201.13

Table 4.2

Suitable Of the treatments and the level of spice (G) used

Treatment (g/kg)	15	20	25	Total (Y_{i})
PGP	27.7	276.6	300	854.3
AMP	96.6	129.9	203.4	429.9
ZOP	89.3	127.3	153.3	369.9
CAP	83.3	126	152	361.3
TOTAL ($Y_{.j}$)	546.9	659.8	808.7	$y_{..}$ = 2015.4

ANOVA TABLE 4.3

Source of variation	Sum of square	D.F	Mean of square	F^{o}
Treatment	36018.03	3	12006.01	130.61
Spice (kg)	1915.86	2	957.93	10.42
Integration	290.52	6	48.42	0.53
Subtotal	3822.41	11		
Error	3676.80	40	91.92	
Total	41901.21	53		

Table 5:1
Number of days taken for the larval stages to reach the adult stage

Factors		REPLICATION			
Treatment	Spice g/kg	Days To Pre-Pupa	Days To Pupa	Days to Pupa	Total $Y_{..}$
AMP	15	46.2	48.8	53.1	148.1
	20	43.4	46.8	51.8	142
	25	36.0	39.4	47.4	122.8
ZOP	15	41.1	44.4	50.8	136.3
	20	40.6	43.1	49.9	133.6
	25	33.8	38.6	46.4	118.8
CAP	15	35.8	37.3	43.0	116.1
	20	38.8	38.2	45.2	122.2
	25	35.5	38.7	45.4	119.2
Total $Y_{.}$		351.2	375.3	433	$y_{..}$ = 1159.5

SUBTABLE OF THE TREATMENTS AND THE LEVEL OF SPICE (G) USED

Treatment g/kg	15	20	259	Total $Y_{i..}$
AMP	148.1	142	122.8	412.9
ZOP	136.3	133.6	118.8	388.7
CAP	116.1	122.2	119.6	357.9
Total ($Y_{.j.}$)	400.5	397.8	361.2	1159.5 = $y_{...}$

ANOVA TABLE 5:3

Source of Variation	D.F	S.S	MS	F^{o}
Treatment	2	168.87	84.44	3.67
Spice (g)	2	107.09	53.55	2.33
Interaction	4	74.54	18.64	0.81
Subtotal	8	350.50		
Error	18	414.37	23.02	
Total	26	764.87		

TABLE

Percentage mortality of D maculates exposed to different concentrations four spices at the end of 120 hours.

Treatment (g)	LARVAE MORTALITY (%)				
	24H	48H	72H	96H	120H
PGP 15	80.0	97.7	100.0	-	-
20	83.3	93.3	100.0	-	-
25	100.0	100 0	100 0	-	-
AMP 15	10.0	20.0	20.0	23.3	23.3
20	13.3	23.3	26.7	26.7	33.3
25	16.7	40.0	46.7	46.7	53.3
ZOP 15	3 3	20.0	20.0	20.0	23 0
20	13.3	27.0	27.0	30.0	30.0
25	13.3	33.0	33.0	37.0	37 0
CAP 15	10.0	13.3	20.0	20.0	20.0
20	10.0	20.0	30.0	30.0	33.0
25	10.0	23.0	27.0	40.0	47.0
Control	0.0	0.0	0.0	10.0	10.0

PGP = P. guineese powder.
AMP = A. melegueta powder
ZOP = Z. officinale powder
CAP = C. annum powder

Table 3: Mean Number of days for the development of larvae to adults under different spice treatments.

Conc Of powdered material	Duration of Stage	A MELEGUETA			Z OFFICINALE			CAPSICUM ANNUM		
		n	Mean	S(X)	n	Mean	S(X)	n	Mean	S(X)
0 15	Prepupa	23	36	±1 2	23	33.8	±1	24	35 5	± 0 6 1
	Pupa	23	39.4	±2.6	23	38.6	±3	24	37 3	±0 89
	Adult	23	47.4	±2.9	23	46.4	±3	23	43	±1 1
0 20	Prepupa	21	46 4	±1 2	21	40.6	±1	21	35.8	±1
	Pupa	21	46 8	±1.2	21	38.2	±1	21	38.2	±0 65

	Adult	21	51.8	±1.7	21	49.9	±1	21	45.2	±0.7
0.25	Prepupa	14	46.2	±1.3	14	41.1	±1	16	35.8	±0.88
	Pupa	13	48.6	±1.5	10	44.4	±2	16	38.7	±1.1
	Adult	11	53.1	±1.7	10	50.8	±2	11	45.4	±1.1
0.00	Prepupa	29	34	±0.3						
	Pupa	29	38.6	±0.4						
	Adult	29	42.9	±0.4						

4 **Control Test** Statistic and Findings

Mean Mortality Analysis: The observation values (Table 1) are represented in a format (Table 1.2) that motivates statistic model, which takes

Y_{ijk} =

To obtain

On interchanging the i and j subscripts, we have the values (Table 1.2) that provide us with

With the previous value for

And the summary for table interrelationship (ANOVA table 1.3) is provided below

Let us consider a test hypothesis, consisting of

H_o

H_1

Decision

Rule: reject H_o if $f^0 > f'(3,40)$ (2,40), 96.40) at $\alpha = 0.05$

From table,

$F^{0.05}_{(3,40)} = 2.84$

$_{(2,40)} = 3.23$

$^{(6,40)} = 2.34$

As $f^{0.05}_{(6,40)} = 2.34$

$> f^0 = 0.52.$

H_o is not rejected and the mean of both treatments and grams are not significantly different. For

$F^0 = 10.38 > f^{0.05}_{(2,40)} = 3.23$

$> f^0 = 128.76 > f^{0.05}_{(3,40)} = 2.84$

H_o is rejected and the mean of treatments and grams are significantly different. Therefore, our findings support that treatments of the four selected spices on D. maculatus larvae are not equally effective.

Percentage Mortality Analysis:

The observation results (Table 2) are conveniently represented (Table 2.1) to equally motivate analysis of mortality variation. We obtain that.

With i and j interchanged we have values (table 2.2) that provide

and the statistical summary (table 2.3) is provided below. From table,

$F^{0.05}_{(3,40)} = 2.84$

$_{(2,40)} = 3.23$

$_{(6,40)} = 2.34$

As $f^{0.05}_{(6,40)} = 2.34 > f^0 = 0.53$. H_o is not rejected. For $f^o = 10.42 = f^{0.25}_{(2,40)} = 3.23$ and $f^0 = 10.42 = 3.23$ and $f^0 = 130.61 > f^{0.05}_{(3,40)} = 2.84$

We state that the treatments are again not equally effective.

Mean Number of Days Analysis:

The observation values (Table 1) are represented (Table 3.1) usual, to enable us obtain.

With i and j interchanged, the values (in Table 3.2) provide

and the following summary (table 3.3) provides

$F^{0.05}_{(2,18)} = 3.56$

$_{(4,18)} = 2.93$

As $f^{?} = 0.81 < f^{0.05}_{(4,18)} = 2.93$ and $f^0 = 2.33 < f^{0.05}_{(2,18)} = 3.56$, H_o is not rejected.

These three instance reflect that the treatments are not equally effective.

DISCUSSION

On D. Maculatus larvae, four different treatment schemes were considered typified by

i. P. guineense powdered (PGP)
ii. A. melegueta powdered (AMP)
iii. Z. Officinate powdered (ZOP)
iv. C. Annum powdered (CAP)

The findings in respects of mean mortality percentages means mortality and means numbers of days for the larvae to develop to the adult stage, reveal that the three concentrations of the powders used (15g/kg, 20g/kg and 25g/kg) were not equally effective in controlling the D. Maculatus in this experiment. The statistical analysis also indicates this. The results found in this experiment is smaller to those of several other researcher which includes Okonkwo and Okoye (2001), who recorded a 100% mortality in the adult of D. maculatus when they used P. guineense. Adedire and lajide (2000) also recorded a high level of protection for dried fish when Treated with this same spice. The action of other spices on the development of the insect is encouraging as this have effect in slowing down the rate of growth of the insect.

From there findings it is believed that, there is all the need for fisheries professionals to look more into the use of plant materials in the preservation of dried fish to enhance the protein intake of the populace.

REFERENCES

Adedire C.O and Lajide L. (2000): Effect of Pulverised Plants materials on Fish Damage and growth performance of the fish beetle, Dermestes maculatus (De Geer).

Aref M.: Timberley A and Daget J. (1964) Fish and fish processing in republic of Mali (3) on the destruction of dried fish by Darmestes insects: Alex J Of Agric Res. 12: 95-98

Bull, D. (1982): Pesticide and Third world poor. Oxfam Public Affairs unit Pp54-62

Dales M.J (1996): A review of plant materials used for controlling insect pet of store products NR1 bulletin 65, Chatman UK: Natural Resources Institute.

Okonkwo E U and Okoye W.I (2001): Insecticidal activity of Dennatia rripetala Baker F and Piper guineense Shum and Thonn against. Dermestes maculatus Degeer (Dermestes maculatus Degeer (Coleoptera: Dermestae and Necropia rufipes Degeer (Coleoptera: Cleridae) on dried fish.

Olayide S.O(1973): A quantitative study of food requirements, Study and Demand in Nigeria, U I Press 1972: 113p

Rollings M.J, and Hayward L.A.W, (1963): Aspects of dried fish trade in Nigeria with particular reference to lake Chad. Tropical stored Product information 5; 162 – 167.

Talabi S O (1983): Fish dying and smoking in NIOMR A Technological breakthrough in fish Preservation. Nigerian Institute of Oceanography and Marine Research (NIOMR) Seminar series No. 2 10pp