African Scientist Vol. 11, No. 1 March 31, 2010
Printed in Nigeria

1595-6881/2010 $12.00 + 0.00

http://www.klobex.org/afs

AFS 2009038/11101

Effects of Four Vegetable Oils on the Life cycle of *Dermestes maculatus*, Degeer, reared on dry fish (*Clarias* sp.)

R. A. Owoade*, A. A. Adesiyun** and E. E. A. Oyedunmade**

*Biology Department, Kwara State Polytechnic, Ilorin, Nigeria
**Department of Crop Protection, University of Ilorin, Ilorin, Nigeria

(Received April 18, 2009)

ABSTRACT: The mortality of adult *D. maculatus* on fish treated with palm oil, groundnut oil, coconut oil and palm kernel oil at 2.5ml / kg, 5.0ml / kg and 10.0 ml kg respectively was monitored over a 15 day period. The highest mortality of 40% was recorded in groundnut oil, palm kernel oil and coconut oil at 10ml / kg treatment respectively at the end of the period. Lowest mortalities of 3.3% were recorded in the palm oil groundnut and coconut oil treatments at 2.5 ml/kg and 5.0 ml/kg respectively. The mortality recorded at the end 15 day period at 5ml / kg and 10 ml / kg concentrations were significantly different in all the oil compare with the control all at 5% level. Results of the survival and development of emerging larvae were also monitored up to the adult stage. Analysis of survival to adult shows the effect of the oils ranked as follows, groundnut oil > palm kernel oil > palm oil > groundnut oil (at 11% > 5.6% > 5.33% > 3.0% in the 2.5 ml / kg concentration. While the number of insects that developed into adults in the control were significantly different from that in treatment with other oils ($P \leq 0.5$).

Key words: Mortality, Vegetable oils Life cycle, *Dermestes maculatus.*

Introduction

Fish is the cheapest source of animal proteins to human diet and livestock feeds. It is known to be rich in essential amino acids such as lysine, methionine, poly – unsaturated fatty acids and vitamins (Osuji, 1974; Anon, 1981). Fish are liable to damage as soon as they are caught and plagued in storage by insect pests belonging mainly to the orders Coleoptera and Lepidoptera.

These stored fish pests cause damage by eating portions or all of the stored fish manifested by reduction in weight of the stored fish and contamination of produce with frass. Exuviate and mummified bodies of the dead pests. In poor countries, fish are preserved by salting or by smoking and sun-drying, but smoking appears to be most commonly used (Osuji, 1974).

The insect pests of dried and smoked fish are mainly from order Coleoptera (beetles) and from the family Cleride and Dermestidae respectively. *Dermestes maculatus* is known to be the pest of dried fish in Nigeria (and the tropics) and is known to be associated with dried fish especially during storage, transportation and marketing stages (Rollings, 1963; Osuji, 1974).

In Nigeria, Don Pedro (1987) reported that fish merchants rub vegetable oils on dried fish for protection against pests or for cosmetic reason. Synthetic insecticides with their attendant problems may be imbibed

by the flesh of the dry fish, which may not be easily removed and are therefore not suitable for use on them as protectants, therefore the need for non – harmful alternatives. This study was carried out to investigate the effectiveness of groundnut oil palm oil palm kernel oil and coconut oil as protectants for dry fish.

Materials and Methods

The vegetable oils (Groundnut oil, palm oil, palm kernel oil and coconut oil) were purchased from a local market and brought to the laboratory. The oils were filtered with Whatman no. 1 filter paper to remove impurities and kept in separate containers. Three concentrations of the oils were used (2.5 ml / kg, 5.0 ml / kg and 10 ml / kg). The dried fish used were also obtained from the same local market in Ilorin, Kwara state brought to the laboratory and kept in a freezer for seven days for disinfestations. The test insects were obtained from an existing culture and separated into males and females according to Osuji's (1985) method.

Bioassay

One kilogram of fish muscle chip was cut from large whole fish rubbed fully with the three concentrations of the oils and were kept in large Kilner jars. Ten adults *D. maculatus* (5 $0^{\nearrow}$ and 5 $_{+}{}^{0}$) were kept in each of the bottles and pieces of wet cotton wool were added to serve as a source of drinking water (Haines, 1991). The bottles were securely covered with pieces of muslin cloths to allow for ventilation and to prevent the escape of the insects. Each of the concentration was replicated three (3) times. Parameters taken included adult mortality, F1 larval emergence, survival and development to adult. Four readings were taken on the 1^{st} , 5^{th}, 10^{th} and 15^{th} day at the end of which all the test insects both dead and living were removed from the bottles and fish were left and monitored for the emergence of F1 generation.

Data collected were subject to analysis of variance and treatment means were partitioned using the New Duncan's Multiple Range test at 5% level of significance.

Results and Discussion

The highest mortalities recorded were in the 10ml / kg concentrations in all the oils. At the end of the 15^{th} day, the mortality recorded in the control was not significantly different from that under 2.5ml/kg in palm kernel oil, coconut oil and palm kernel oil (Table 1). The highest level significantly led to higher mortalities.

Table 2 shows the mean number of larvae that emerged. The highest value was recorded in the control, while no larval emergence was recorded in groundnut oil, palm kernel oil and coconut oil at 5ml and 10ml kg respectively. The order of larval emergence deterrence by the various oils was coconut oil > palm oil> palm kernel oil> groundnut oil.

The mean number of larvae that developed into pupa was also highest in the control. The closest to the control was in the coconut oil at 2.5ml / kg. Finally, the control gave the highest mean number of F1 adults followed by coconut oil at 2.5 ml / kg (111.6 and 11.0) respectively (Table2).

Vegetable oils are generally reported to exert an ovicidal action as well as adult mortality. Such oils sometimes referred to as "fixed oils" are used against a variety of insects especially to kill eggs (Schoohoven, 1978; Don Pedro, 1989). The low mortalities recorded in the adult with the use of these vegetable oils, which include groundnut oil and coconut oil showed that they had no significant direct toxicity against active stages of the insect. This however, is contrary to what other researchers (Ivbijaro *et al*, 1985: Salas, 1985; Kumar and Okoronkwo, 1991) who used these oils on smaller storage insects reported. They recorded up to 100% mortality in some cases. Similarly, this was different from the findings of Okonkwo and Okoye (2001) who also recorded 100% adult mortality in *D. maculatus* when they applied groundnut oil to dried *Clarias* fish. The low larval emergence and the low number of larvae development to the adult stage recorded in this study are similar to the findings of Frank *et al.* (1983). These researchers concluded that oils may increase adult mortality, lower oviposition rates or may interfere with larval development. Don Pedro (1989), in his own submission said the effect on the insects was due to interference with respiration, rather than with specific chemical effects. A casual visit to some dried fish

markets reveal that oils (especially groundnut oil) is already in use by big fish sellers, but only to make their wares attractive to customers. Exploring the possible synergistic effect of oils along with the use of plant powders is an area that needs further attention.

Table 1: Percentage mortality of adult *D. maculatus* treated with four vegetable oils at different concentrations over 15 days.

	TREATMENT (ml/kg)			
	Day 1	Day 5	Day 10	Day 15
Palm oil				
2.5	0.0b	0.0b	3.3c	3.3e
5.0	0.0b	0.0b	3.3c	3.3e
10.0	0.0b	3.3b	10.0e	20.0bcd
Groundnut oil				
2.5	0.0b	3.3b	6.7c	13.0cde
5.0	3.3b	3.3b	17.0bc	23.0bcd
10.0	3.3b	20.0ab	30.3ab	40.0a
Palm Kernel Oil				
2.5	0.0b	0.0b	0.0c	6.7de
5.0	3.3	20.0ab	30.0ab	30.0ab
10.0	6.7b	33.0a	40.0a	40.0a
Coconut Oil				
2.5	3.3b	3.3b	6.7c	6.7de
5.0	3.3b	10.0b	27.0ab	27.0bc
10.0	20.0a	23.0ab	27.0ab	40.0a
Control	0.0b	3.3b	3.3c	3.3e

Figures followed by the same letter (s) are not significantly different at 5% level (NDMRT).

Table 2: Effect of the oils on the emergence and the development of *D. maculatus* from the larvae to the adult.duration and development.

Vegetable type	Oil Concentration (ml/kg)	Emergence of larvae (mean)	Development to pupae (mean)	Development to adult (Mean)
Palm oil	2.5	24.0bc	11.0bc	5.3b
	5.0	9.67c	4.0c	1.6b
	10.0	0.0c	10.0bc	0.0b
Groundnut oil	2.5	11.6c	4.6c	3.0b
	5.0	0.0c	0.0c	0.0b
	10.0	0.0c	0.0c	0.0b
Palm Kernel Oil	2.5	18.6bc	10.3bc	5.6b
	5.0	0.0	0.0c	0.0b
	10.0	0.0c	0.0c	0.0b
Coconut Oil	2.5	41.6bc	27.3b	11.0b
	5.0	0.0c	0.0c	0.0b
	10.0	0.0c	0.0c	0.0b
Control	0.0	119.3a	117.6a	111.6a

Mean followed by the same letter (s) are not significantly different at 5% level (NDMRT).

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