CONTROL OF INSECT INFESTATION IN SMOKED WEST AFRICAN SARDINES
SARDINELLA MADERENSIIS "SAWA" USING ACTELIC 50 EC SOLUTION.

By

G.R. Akande and M.A. Asuquo-King.

Nigeria Institute for Oceanography and Marine Research, P.M.B. 12927,
Victoria Island, Lagos.

ABSTRACT

Fish which has been cured or are in the process of being cured by traditional methods are usually infested by insects posing a real problem to traders and processors. The effects of 0.03% actellic 50 EC solution and vegetable oil on insect infestation were studied using West African sardines Sardinella maderensis. Actellic solution was more effective in combating insect infestation than vegetable oil. Appearance and perceived smoked fish flavour of fish treated with Actellic and vegetable oil differed (P<0.05), while taste was unaffected by treatment. Actellic 50 EC solution though effective, could be subject to abuse.

INTRODUCTION

Fish is a major source of animal protein in Nigeria especially among the rural and urban poor, being relatively cheaper than meat and eggs (Oni et al., 1992). The artisanal sector which contributes about 90 per cent of the total fish production in the country depends mainly on smoking and drying as the means of preserving their catch that cannot be sold fresh, probably because the process requires a minimum of capital investments.

Although few detailed studies have been conducted on postharvest losses of cured fish, particularly in Nigeria, losses ranging form about 25 to 50 per cent have been reported (Moes 1980; Rollings and Hayward, 1963). Blowfly infestation has been identified as the major cause of losses during processing and the early stages of storage in cured fish. Blowflies are notorious carriers of diseases particularly cholera, diarrhoea and dysentery in developing countries (Yu, 1994). In addition, smoke-dried fish are attacked during storage and marketing by dermestes maculatus Deg (Osuji, 1975).

Fisherfolks usually resort to redrying of fish or the illegal use of chemical insecticides such as Baygon, Shelltox and Gamalin 20, to combat this problem. Excessive heat treatment is known to impair the availability of amino acids such as lysine in fish protein (Carpenter and problems. There is therefore an urgent need to develop safe, practical alternative methods for reducing infestation.

Insecticides which have been used are deltamethrin, a pyrethroid insecticide and cycloprothrin. However, deltamethrin is not currently permitted for use on fish. Cycloprothrin was developed by the CSIRO, Australia and it has shown insecticidal activity against pests in paddy, vegetables, fruits and tea pastures with a very low toxicity to humans (Yu, 19940.

Evaluation trials of pirimiphosmethyl have shown that a 0.03% dip for 15 seconds, was sufficient to control insect infestation during processing and storage with a residual level within the recommended FAO/WHO maximum residue limit (MRL) of 10mg/kg.

The objective of the present work was to investigate the effect of actellic 50, a pirimiphosmethyl compound on the larvae and adults of Dermestes beetle and its effect on the organoleptic properties of the smoked fish.
Materials and Methods
Fresh West African sardines (*Sardinella maderensis*) were purchased from Orimedu, a fishing village in Ibeju Local Government Area of Lagos State. The fish were divided into three batches. The first batch representing the control was smoked without any treatment. The second batch was dipped in vegetable oil for about 5 seconds and allowed to drain prior to smoking, while the third batch was dipped in 0.03% actellic 50 EC solution. All the treatments were smoked using half the traditional 44-gallon oil drum oven, using firewood as a source of fuel, to a moisture content of between 8 and 10 per cent.

Each of the three treatments were further divided into two batches, one batch for the sensory evaluation tests and the other batch for insect infestation study. In the batch used for the insect infestation study, two wholesome smoked fish were selected from each treatment and placed in a previously - weighed kilner jar. The weight of the fish and jar were obtained. Each jar was infested with 8 larvae and 2 adults of *Dermentes maculatus* Deg which have been cultured in the laboratory of the Nigerian Stored Products Institute (NISPRI), Akoka, Lagos.

The jars appropriately labelled and covered with wire mesh and muslin cloth, to allow aeration and at the same time prevent escape of insects. Observations were made after 8 weeks of storage. The tests were replicated.

Sensory evaluation tests were conducted on the samples using 10 panelists. The coded samples with questionaires were presented to panelists to test for appearance, taste and smell. Whole fish was used to evaluate appearance and smell while broken pieces were used to evaluate the taste. Each panelist evaluated the samples independently. The test was replicated by changing the code at each session.

Treatments were compared using the multiple comparison difference test against a given reference "R" which is the control. The ratings were assigned numerical scores on a nine point scale with "no difference" equalling 5, "extremely better than R" equalling 9 and "extremely inferior to R" equalling 1. (Lamond, 1977). Treatment means were further subjected to Turkey's test to evaluate the differences that exist between samples.

Results and Discussion
Table 1 shows level of insect infestation in the control and treated samples of smoked "sawa". At the 8 - week storage period, the control samples contained 15 larvae and 7 adults, 2 of which were still living. Samples treated with oil contained 30 larvae and 8 adults, 2 of which were still living.

Table 1: Insect infestation in fish treated with vegetable oil and actellic 50 EC solution after 8 weeks storage.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No of dead Insects</th>
<th>No of Living Insects</th>
<th>No of Larvae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>5</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>Actellic 50 EC Solution</td>
<td>4</td>
<td></td>
<td>4 (dead)</td>
</tr>
<tr>
<td>Vegetable oil</td>
<td>6</td>
<td>2</td>
<td>30</td>
</tr>
</tbody>
</table>

The treatment with actellic 50 EC solution contained 4 adult insects and 4 larvae, all dead. Fish treated with actellic 50 EC solution were largely intact and frass negligible compared to control where the quantity of frass was highest.

Table 2 shows the effect of treatment with vegetable oil and actellic 50 EC solution on the
appearance, taste and smell of smoked "sawa" compared to control.

Table 2: Effect of treatment with vegetable oil and actellic 50 EC solution on the appearance, taste and "smell" of smoked fish

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Sensory attributes of smoked fish</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Taste</td>
</tr>
<tr>
<td>Control</td>
<td>5.40</td>
</tr>
<tr>
<td>Vegetable oil</td>
<td>5.35</td>
</tr>
<tr>
<td>Actellic 50 EC</td>
<td>5.25</td>
</tr>
</tbody>
</table>

*Any two means not followed by the same letter in a column are significantly different at p = 0.05 by Tukey's test. Higher values indicated greater preference.

The taste of smoked sardines ("Sawa") was not significantly (P>0.05) affected by the treatment with actellic 50 EC solution or oil compared to control, whereas, "sawa" treated with oil were rated significantly (P<0.05) inferior in appearance to actellic solution treated fish and the control reference samples "R". Similarly, the sensory perception of traditional smoked fish "smell" in the treatment with actellic solution was scored significantly (P<0.05) lower than the control and vegetable oil treated samples.

The results showed that actellic 50 EC solution was effective against insect infestation without serious deleterious effect to the organoleptic properties of smoked fish. However, given the level of literacy among the fisherfolks and accuracy required for the application of this solution, restraint should be exercised in introducing it for use. Rather, more extension work should be carried out to educate the rural small-scale fish processors and retailers especially on ways by which they can prepare the recommended concentrations accurately. Further work is also necessary to determine the maximum residue limit (MRL) of 10mg/kg as recommended by FAO/WHO for any actellic solution treated smoked or dried fish. However, in spite of the approved use of actellic 50EC solution by the FAO/WHO, it is still important to examine the use of natural alternatives which are less dangerous, non-toxic and generally safer.

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