EFFECT OF TEMPERATURE ON THE MAIZE WEEVILS INFESTING STORED MAIZE

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INTRODUCTION

• Maize (zea mays) is important for agriculture and livelihoods in Kenya and is the major staple food. However, maize yield is very low unable to meet the demands of increasing population (De Groote et al. 2003).

• Constraints to maize production include both abiotic and biotic factors. The most important pests of maize include stem borers in field and maize weevils and Large Grain Borer in storage (Setamou et al. 1995).

• *Sitophilus zea mays* is in the order Coleopteran and family Curculinidae. It causes up to 80% losses in untreated maize grain stored in tropical countries (Boxall 2002).
PROBLEM STATEMENT

- Maize weevils are contribute to the fundamental physical cause of declining food production in Kenya they cause up to 80% loss in maize after harvest.

JUSTIFICATION

- Insecticides have become expensive hence the need for alternative ways of controlling this pest.
- Lack of expertise in the use of the insecticides have either lead to under application or over application and this is detrimental in terms of insect chemical resistance and chemical residue hazards, respectively.
OBJECTIVES

Broad objective
• To contribute towards reducing post-harvest losses caused by maize weevils and increase food security in Kenya

Specific objective
• To determine the critical storage temperature for maize to eliminate the maize weevil losses

• HYPOTHESIS
Temperature levels does not affect the maize weevils when infesting maize grains
MATERIALS AND METHODS

EXPERIMENTAL SITE
• The experiment was conducted at the University of Nairobi, in the Entomology laboratory in the field station, upper Kabete campus as from January to April of 2014.

Experimental design
• The trials were laid in a complete randomized design (CRD) with 4 treatments replicated 4 times
• Electrical bulbs of different watts were used to modify temperatures to 47 °C, 40° C and 34° C. the control was at room temperature, 25° C
• By use of electric cables these bulbs were connected and each inserted in a carton to regulate the heat of the bulbs hence different temperature in each carton since a bulb of different watts were used. The control experiment was done at room temperature (27).

• Maize grains was bought from Ndumbuni market stores.

• The maize weevils were obtained from infected maize grains from within Nairobi cereal stores.
# RESULTS

The Means of Final Weight of 100 Seeds and mean of damaged seeds out of 100 seeds

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Final weight</th>
<th>Weight of damaged seeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>45°C</td>
<td>24.34 a</td>
<td>0.000 a</td>
</tr>
<tr>
<td>40°C</td>
<td>25.79 b</td>
<td>0.000 a</td>
</tr>
<tr>
<td>34°C</td>
<td>25.39 ab</td>
<td>0.812 a</td>
</tr>
<tr>
<td>27°C</td>
<td>30.11</td>
<td>3.213 b</td>
</tr>
<tr>
<td>c.v%</td>
<td>1.0%</td>
<td>11.9%</td>
</tr>
<tr>
<td>Lsd</td>
<td>2.280</td>
<td>2.074</td>
</tr>
<tr>
<td>P&lt;0.05</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>
• There is a significant difference between maize sample place under temperature of $47^0\text{C}$ and those under $40^0\text{C}$ in the final weight.

• weight of the damaged seeds at $47^0\text{C}$, $40^0\text{C}$ and $34^0\text{C}$ is insignificantly different.

• weight of the damaged grains at $27^0\text{C}$ is significantly different from all the others.
Cont....

Means of no. of weevils and number of damaged grains out of 100 seeds

<table>
<thead>
<tr>
<th>TREATMENT</th>
<th>No. Damaged seeds</th>
<th>No of weevils</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td></td>
<td></td>
</tr>
<tr>
<td>47°C</td>
<td>18.75 a</td>
<td>0.000 a</td>
</tr>
<tr>
<td>40°C</td>
<td>18.75 a</td>
<td>0.000 a</td>
</tr>
<tr>
<td>34°C</td>
<td>33.12 b</td>
<td>1.906 a</td>
</tr>
<tr>
<td>27°C</td>
<td>33.66 b</td>
<td>5.750 b</td>
</tr>
<tr>
<td>C.V %</td>
<td>1.2</td>
<td>17.6</td>
</tr>
<tr>
<td>Lsd</td>
<td>11.29</td>
<td>2.074</td>
</tr>
<tr>
<td>P&lt;0.05</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>
• The no of weevils at 47° C, 40° C and 34°C are insignificantly different’
• No of weevils at 27 °C are significantly different from the ones at 47° C,40° C and 34° C.
• The no of damaged seeds at 47°C and 40°C are insignificantly different
• The no of damaged seeds at 34°C and 27°C were significantly indifferent.
DISCUSSION

• There were no damaged seeds at temperature 47°C and 40°C and only few seeds were damaged at 34°C also the weight of damaged seeds was low at 34°C and high no. of maize weevils died at this temperatures. This could be due to the high temperature hardened the seed coat of the grains and the weevils starved leading to early death of the weevils due to high temperatures.

• Temperature at 25°C showed the highest weight of the damaged seeds, highest no. of weevils and highest no. of damaged seeds because maize weevils breed well temperatures above 20°C and below 32°C.
CONCLUSION

- Temperature influenced the damaging behavior of maize weevils on the grain.
- I recommend more research on the same for confirmation to ascertain the factors that could influence the behavior of maize weevils to attack the grains in order to reduce grain losses.
PHOTOS OF THE SETUP