Antimicrobial and preservative activities of *Allium sativum* and *Eugenia aromatica* on fresh tomato puree

Adekalu O. A.*, Olatunde I. G., Echendu B. M., Adepoju T. C. and Fajemisin O. O.

Nigerian Stored Products Research Institute, P.M.B 12543, Lagos, Nigeria.

Accepted 19 December, 2008

This study attempts to develop a method for prolonging the shelf life of ground fresh tomato using fresh *Allium sativum* and *Eugenia aromatica*, as antimicrobial and preservative agent. Fresh tomatoes were purchased from Lagos market, washed and allowed to drain. They were milled using a blender. Known percentages of the spices were added to blended tomatoes placed in covered sterilized plastic bowls. The spices were added to the blended tomato in the following proportion: 5, 4, 3, 2 and 1 percent. Control experiments were also set up. All investigation was carried out at ambient temperature. Both *A. sativum* (Garlic) and *E. aromatica* (Clove) increased the shelf life of fresh tomato puree for a maximum of ten days.

**Key words:** tomatoes, preservative, spoilage, fungi, organoleptic, shelf life

**INTRODUCTION**

*Eugenia aromatica* and *Allium sativum* have been found to possess antimicrobial properties. These properties have been ascribed to the presence of essential oils, acrolein and crotonaldehyde in garlic and Eugenol, methylsalicylate, tannins, methylamine, vanillin, B-caryophylenes and methyl fulful in *E. aromatica* (Alli, 1994; Godwin and Mercer, 1993).

An *in vitro* study of *E. aromatica* extracts showed that they possess antifungal properties against spoilage fungi such as *Aspergillus niger*, *Aspergillus fumigatus*, *Mucor spp* and *Cephalosporium spp* (Adekalu et al., 2007).

Garlic (*A. sativum*) has been found to possess antibacterial activity on ground camel meat (Al-Delaimy and Ali, 1970). Prasad and Sharma (1981) also reported the antifungal properties of garlic in poultry feed substrate. Spices such as clove were found to inhibit both fungal growth and toxin production (Hitokoto et al., 1980). Adekalu and Fajemisin (unpublished data) used garlic to extend the shelf life of tomatoes. The two spices are flavouring agents in cooking and in drug formulation in the United States of America; one billion pounds of dehydrated garlic are used annually. Garlic has also been used as preservatives in food such as Tomatoes and Meat sausages (Al-Dehylaimey and Barakat, 1971). The use of chemical preservatives and antimicrobial extracts from plants to prolong the shelf life of food crops during storage are actively being investigated.

Al-Delaimy and Barakat (1971) reported the prolong of fresh Carmel meat by the use of fresh garlic as an antimicrobial and preservative agent. Plants and their constituents have proved successful as potent fungi toxicant that appear harmless to humans (Fawcett and Spencer, 1970; Beye, 1978). Udo et al. (2001) reported the possibility of utilizing alcoholic extract of garlic to protect potato and yam against rots during storage.

Most homes in this part of the world do not have refrigerators or when they do, limited access to electricity and other modern methods of preservation. It is therefore difficult to store fresh tomatoes and peppers for more than a day under these conditions. This study examines the use of local herbs in the preservation of food.

**METHODOLOGY**

Fresh *A. sativum* (garlic) and *E. aromatica* were purchased from Lagos markets. They were sorted out by removing the spoilt fruits, washed with water and then milled with blender. Fresh tomatoes (*Lycopersicon esculentum*) were milled with a blender and placed in covered sterilized plastic bowls. The spices were added to tomatoes puree in the following proportion 5, 4, 3, 2, and 1 percent (w/w) and control 0 percent (w/w). They were all stored at ambient temperatures and six replicates of each treatment were set up.

**Organoleptic evaluation**

Spoilage was determined by olfactory assessment and colour change. Expression of slight spoilage indicated moderate odour or
Table 1. Olfactory and visual assessments of tomato puree treated with known percentages of Eugenia aromatica.

<table>
<thead>
<tr>
<th>Percentage of Eugenia aromatica</th>
<th>Number of days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>0</td>
<td>-</td>
</tr>
</tbody>
</table>

Grading of acceptability, Very good, 5; good, 4; fair, 3; bad, -.

colour change while complete spoilage indicated potent and objectionable deterioration.

RESULT AND DISCUSSION

Table 1 shows that E. aromatica at 3 – 5% preserved the tomato puree for between seven to ten days while 2 - 3% treatment preserved the tomato for between 5 - 7 days. At 1% the tomato stored for only 2-4 days. The control tomato went bad under 24 h.

Treatment with A. sativum at 4 - 5% preserved the tomato puree for 6 - 10 days and at 3% was fair. Treatment in 1 - 2% of A. sativum only stored for two days while the control went bad before 24 h (Table 2). These results showed that E. aromatica treatment was more potent than that of A. sativum. From the grading we can also deduce that tomato treated with A. sativum are more appealing than the darker colour of E. aromatica treatment. The samples were discarded after deterioration sets in, but it is noteworthy that 3 - 5% of E. aromatica treatment was still good at the end of the tenth day.

The results of this study were in full agreement with the findings of Al-Delaimy and Barakat (1971) who reported that 15 and or 2% garlic preserve meat for four days at room temperature condition, and for twelve days in the incubator while in the refrigerator for 28 days.

Echendu (1999) and Adekali et al. (2007) reported that E. aromatica possess antimicrobial properties. These results also support the idea that fresh A. sativum and E. aromatica exhibited strong antimicrobial activities against meso- philes, psychrophiles and other micro-organisms whether they are present in tomato puree or arise from other sources (Ntirejumoku and kolawole, 1990; Al-Delaimy and Barakat, 1971).

REFERENCES