

Short Communication

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

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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-caryophlitenes and methyl fufural 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 Adekalu and Fajemisin (unpublished data) used garlic to extend the shelf life of tomatoes.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-Dehlaymy and Barakat, 1971). The use of chemical preservatives and antimicrobial extracts from plants to prolong the shelf life of food crops during sto-

rage 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 spoiled 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

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Table 1. Olfactory and visual assessments of tomato puree treated with known percentages of *Eugenia aromatica*.

Percentage of <i>Eugenia aromatica</i>	Number of days									
	1	2	3	4	5	6	7	8	9	10
5	4	4	4	4	4	4	4	4	4	4
4	4	4	4	4	4	4	4	4	4	4
3	4	4	4	4	4	4	4	3	3	3
2	4	4	4	4	4	3	3	-	-	-
1	4	4	4	4	4	3	3	-	-	-
0	-	-	-	-	-	-	-	-	-	-

Table 2. Olfactory and visual assessments of tomato puree treated with known percentages of *A. sativum*.

Percentage of <i>A. sativum</i>	Number of days									
	1	2	3	4	5	6	7	8	9	10
5	5	5	5	5	4	4	4	4	3	-
4	5	5	5	5	4	4	3	3	-	-
3	5	5	3	3	3	3	2	-	-	-
2	5	5	-	-	-	-	-	-	-	-
1	5	5	-	-	-	-	-	-	-	-
0	-	-	-	-	-	-	-	-	-	-

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 Adekalu 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

mesophiles, 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

- Adekalu OA, Olatunde IG, Echendu BM, Adepoju TJ (2007). Screening of Five plant materials for antimicrobial activities (In press).
- Adekalu OA, Fajemisin OO (Unpublished data) Extension of shelf life of tomatoes using garlic. NSPRI Lagos.
- Al-delaimy K, Barakat MF (1971). Antimicrobial and Preservative Activity of Garlic on fresh Ground meat. J. Sci. Food Agric. 22: 96-98.
- Alli M (1994). Volatile oils. In textbook of pharmacognosy. CBS publishers and distributors. India pp. 143-184.
- Beye A (1978). Insecticides from vegetable kingdom. Res. Dev. 7: 13-31.
- Echendu MA (1999). An *in vitro* study of Antifungal activities of *Acacia nilotica*, *Nauclea latifolia* and *Eugenia aromatica*. Final Diploma thesis submitted to University of Lagos, Lagos, Nigeria.
- Fawcett CH, Spencer DM (1970) Plant Chemotherapy with natural product; Annual Rev. Phytopathol. 8: 403-419.
- Godwin A, Mercer A (1973). Plant Phenolics. In: Introduction to Biochemistry, 2nd Ed. pp. 528-560.
- Hitokoto S, Tomoaki M, Senzos A, Hirosh K (1980). Inhibitory effect of spices on growth and production of toxigenic fungi, Applied Environ. Microbiol. 39 (34): 818-812.
- Prasad G, Sharma VD (1981). Antifungal property of garlic (*Allium sativum*) in poultry feed. Poult. Sci. 60 (3): 541-543.
- Udo SE, Madunagu BE, Isemun CD (2001). Inhibition of growth and sporulation of fungi pathogens on sweet potato and yam by Garlic extracts, Niger. J. Bot. 14: 35-39.