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Evaluation of vinegar and Limon fruits juice on bacterial contamination surface of lettuce and tomato

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Abstract

An increase in consumption of fresh fruits and vegetables worldwide has been paralleled by an increase in the number of food-borne illnesses attributed to fresh products. Raw vegetables may harbour potential food-borne pathogens. Pathogenic bacteria contaminate raw agricultural commodities through various pathways such as irrigation with untreated water, use of non-composted animal manure as fertilizer and wash water systems. Two vegetable crops has been tested with vinegar and limon fruits juice on bacterial contaminated surface of lettuce leaves and tomato fruits. The evaluation revealed that vinegar effectively inhibit the bacteria on the surface of lettuce at concentration of 7% and 10% for 6 minutes while the tomato fruits 7% and 10% for 9 minutes without damaging the tissues. Meanwhile, limon fruits juice concentration of 3% and 4% for 15 minutes appeared to be effective against the contaminated tomato fruits. Concentration of 3% and 4% for 12 minutes found effective against contamination of leaf surface of lettuce leaves without any damage. Studies show that treated with preservation available at home like vinegar and limon fruits juice helping to get rid off bacterial contamination from surface of lettuce leaves and tomato fruits.

Keywords: Vinegar, Limon fruits juices, bacteria, food-borne, tomato, lettuce

Introduction

An increase in consumption of fresh fruits and vegetables worldwide has been paralleled by an increase in the number of food-borne illnesses attributed to fresh products. Numerous reports have indicated that raw vegetables may harbour potential food-borne pathogens (Beuchat, 1996) ^[1]. Vegetables can become contaminated with pathogenic organisms during growth, harvest, postharvest handling or distribution (McMahon and Wilson, 2001) ^[4]. Several bacterial species classified in different genera were isolated from surfaces of vegetables leaf the bacteria are as following *Escherichia coli*, *Salmonella* spp, *Klebsiella* spp, *Enterobacter* spp, *Vibrio cholera*, *Pseudomonas* spp.. and *Streptococci* spp. Wastewater is a commonly used in the fresh vegetables irrigation in some of the Yemen cities. Hence, it was necessary to conduct some studies to reduce the contamination on some vegetables tested. Some of these studies were conducted by using cheap and safe domestic solution such as vinegar, food salt and limon fruit juices used for the bacterial control and their contamination.

Materials and Methods

Experiments were designed to study the effect of vinegar and lemon fruits juice on bacterial growth collected from the surface of plant tissues samples by using different concentrations and different dipping duration in each solution mentioned.

Plants parts used

Lettuce leaves and Tomato fruits

Concentration of solutions

Vinegar (3%, 7%, 10%, 15% and 30%)

Limon fruit juice per 100ml water (0.5%, 1%, 2%, 3% and 4%)

Duration of treatments

3, 6, 9, 12, and 15 minutes

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The samples of tomatoes fruits and lettuce leaves were collected from the market. Samples of lettuces were cut into small pieces with an area of 3 * 5 cm whereas the tomatoes samples were taken the entire fruit for bacterial test. Healthy surface of each tested sample was sterilized by alcohol 70% for 5 minutes and washed with sterile distil water to get rid of alcohol. Then soaked with bacteria suspension $1 * 10^{18}$ cfu/ml of *Salmonella* sp, *Shigella* sp, *Vibrio cholera*, *Vibrio* sp, *Escherichia coli*, *Klebsiella* sp and *Enterobacter* sp. The samples were transferred and put into various acid of different

concentration solutions prepared for different minutes of time. The impact of each solution on the plant tissues was observed such as symptoms of yellowish, burn and wilted tissue. Although from all the contaminated plant pending 0.5 ml was cultured in combination way on solid media in addition two extenuation of pending were put in Petridishes with melted nutrient agar media at 50 °C and as three Petri dishes incubated for 24 hours. Data were taken from the Petri dishes for all treatments as prevailing colonies counts Saqran (1994) [5] Gulf Quality Standards (1997) [2] and Al-Gazaeree (1998).

Table 1: Effect of different concentrations of vinegar on the surface of tomato fruits and lettuce leaves of bacterial contamination (cell/cm²)

Type of Plant tissue	Concentration (%) Time (min)	3	7	10	15	30
Tomato fruits	3	1359	913	308	80	19
	6	997	791	341	1	8
	9	879	623	240	138	70
	12	360	153	160	3	0
	15	287	119	83	77	3
Lettuce leaves	3	1324	281	126	72	4
	6	594	101	55	10	6
	9	956	192	61	10	0
	12	555	344	57	16	36
	15	375	38	16	6	0

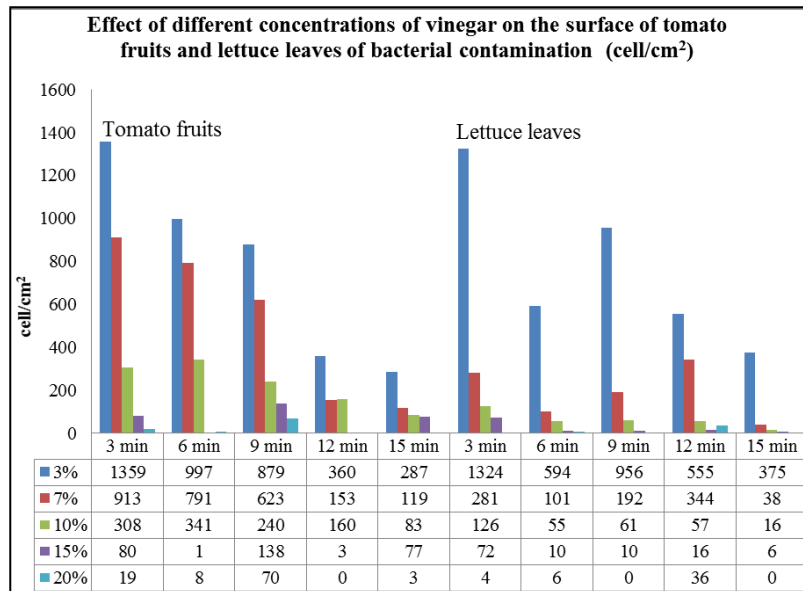


Fig 1

Table 2: Effect of different concentrations of Limon fruits juice on the surface of tomato fruits and lettuce leaves of bacterial contamination (cell/cm²)

Type of Plant tissue	Concentration (%) Time (min)	0.5	1	2	3	4
Tomato fruits	3	2533	2076	1477	1364	1308
	6	2145	1505	896	747	817
	9	1709	1307	667	433	299
	12	2045	1171	792	551	51
	15	2047	1230	369	653	45
Lettuce leaves	3	3753	2950	2851	1996	1722
	6	3982	2437	1851	1889	932
	9	3702	2284	1804	1420	1040
	12	3921	1214	1162	680	853
	15	2455	675	793	755	622

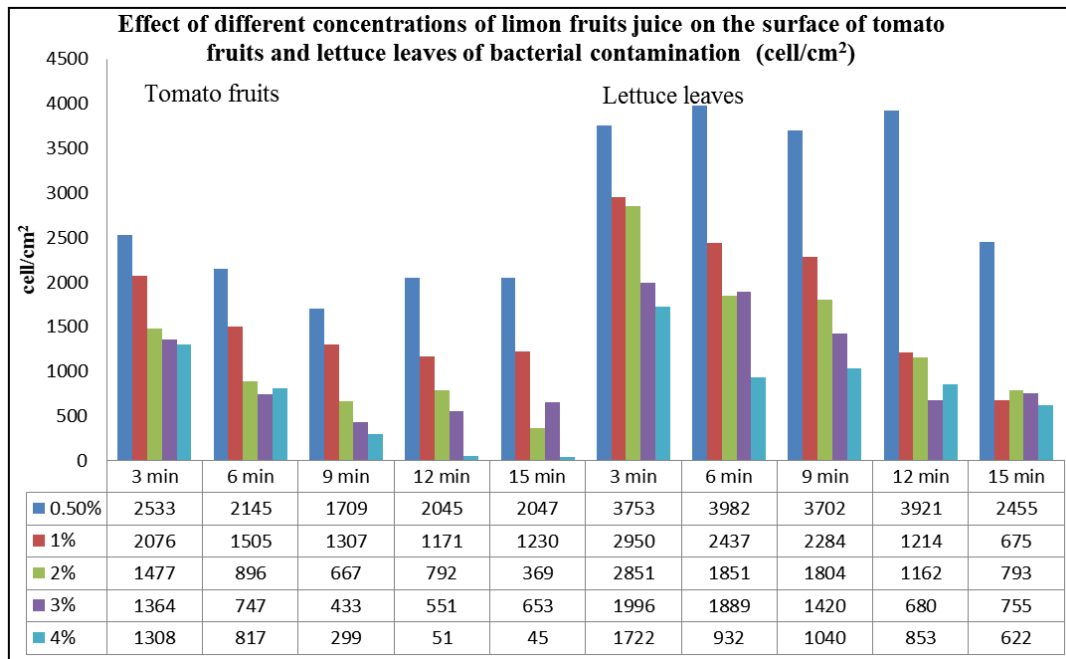


Fig 2

Results and Discussion

An experiment was carried out to investigate the effect of some chemical solutions on growth of domestic vegetables contamination bacteria (DVCB). Results of this experiment are presented in tables (1 and 2). Vinegar inhibited the DVCB and significant difference was observed, the vinegar significantly reduced contamination by bacteria at all concentrations at different exposure times on lettuce tissues and tomato fruits. The evaluation revealed that vinegar effectively inhibit the bacteria on the surface of lettuce at concentration of 7% and 10% for 6 minutes while the tomato fruits 7% and 10% for 9 minutes without damaging the tissues. Meanwhile, Limon fruits juice concentration of 3% and 4% for 15 minutes appeared to be effective against the contaminated tomato fruits. Concentration of 3% and 4% for 12 minutes found effective against contamination of leaf surface of lettuce leaves without any damage. Limon juice was found less effective on the DVCB compared with vinegar solutions. Studies show that treated with preservation available at home like vinegar and limon fruits juice helping to get rid off bacterial contamination from surface of lettuce leaves and tomato fruits.

Conclusion

The inference could be drawn that lettuce and tomato fruits grown in Yemen city for livelihood. Due to contamination severe illness to common people. Among food preservative vinegar effectively inhibit bacteria of lettuce at concentration of 7% and 10% for 6 minutes while the tomato fruits 7% and 10% for 9 minutes without damaging the tissues. Meanwhile, Limon fruits juice concentration of 3% and 4% for 15 minutes appeared to be effective against the contaminated tomato fruits. Concentration of 3% and 4% for 12 minutes found effective against contamination of leaf surface of lettuce leaves without any damage. The management practices would help common people get rid off from illness, environmentally safe, economically viable which help small land holders to get benefitted.

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