Bacteriological analysis of Fresh vegetables and Fruits of local market and effect of Pretreatment by Antimicrobial agents on their Quality

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Abstract

Fresh vegetables and fruits are most recommended and widely consumed highly nutritious form of food. Chemical composition and nutritive value of these produce are often influenced by a number of pathogenic microorganisms. The damage and losses incurred very with the crop growing conditions in the field, improper and unhygienic handling during harvesting as well as transit and storage conditions. So, it is very important to detect and identify the microbial flora associated with fresh fruits and vegetables. 75 samples collected randomly from different sources, were analyzed and various pathogens were isolated and identified. Among them E.Coli was found to be pre-dominant, followed by Enterobacter, Pseudomonas, Staphylococcus, Salmonella and Shigella sps. The antimicrobial agents were found suitable for eradicating pathogenic bacteria from these produce after rinsing by them.

Keywords: Pathogenic microorganisms, microbial flora, antimicrobial agents.

Introduction

In Bhopal City, the capital of Madhya Pradesh and heart of India ,It has been observed that the local formers are using municipal waste water discharged for irrigation and washing purpose which is primary source of contamination of microorganisms in fresh fruits and vegetables[1]. Increasing health awareness has led to consumption of raw and minimally processed foods in recent years. Fruits and vegetables get contaminated at each step from cultivation to consumers. Many studies have been carried out on various aspects of fruits and vegetables contamination at different sources[2,3].

Vishwanath and Kaur reported bacterial contamination from these fresh produce[4]. Beuchat[2] reported pathogenic bacteria which are responsible for food borne out break. So it is very important to detect and identified these pathogenic micro flora from fresh fruits and vegetables to prevent its evil consequences on mankind. An investigation was also carried out to study the effect of antimicrobial agent on pathogenic bacteria.

Material and Methods

Isolation and identification of Pathogenic Bacteria: Randomly collected 10 samples of vegetables viz. Cucumber, Beetroot,, Capsicum, Tomato, Spinach, Coriander. Cabbage, Cauli-flower, Brinjal, Pea and 5 fruits Lemon, Banana, Chikoo, Apple and Papaya were brought in sterile packet and analyzed for isolation and identification of pathogenic bacteria following standard methods[5]. 25 gm of vegetable and fruits samples were rinsed thoroughly with sterile water and these were serially 10 fold diluted. The highest three dilution were taken for analyzing the total microbial count. Bacterial pathogens were isolated and identified on the basis of morphological cultural and biochemical tests[6].

Effect of anti-microbial agents: Methods of Dike O. Ukuku[7] were followed to study the effect of antimicrobial agent on fresh fruits and vegetables. Samples were treated with five common antimicrobial agents-Hydrogen peroxide, Ethanol, Calcium chloride, Citrate and Benzoate with various concentrations ranging from 0.5 to 3%. Samples washed with these solutions for 5 min. and again washed with sterile distilled water, 0.1 ml of these was taken and inoculated in 3 ml. sterile nutrient broth. Control samples were washed only with sterile distilled water and then further treated as above. They were incubated at room temperature for 24 hrs. Density was checked calorimetrically at 540 nm. And effects of these agents were compared with control. Effect was studied on the basis of % decrease in bacterial density, which was calculated by

Actual cell density decreased=cell density of control-cell density at highest concentration and then % decrease was calculated[8].

Results and Discussion

The increasing consciousness in people regarding the nutrition has resulted in the increased consumption of raw fresh unprocessed vegetables and fruits. These foods carry indigenous micro flora besides pathogenic microorganisms. A number of diseases out breaks due to consumption of these produce have been reported[8-10]. A total of 75 samples (10 vegetables and 5 fruits, 5 samples for each) procured from different places of Bhopal city, were tested for Aerobic plate count, Coli form count and screened for the presence of pathogens viz. Salmonella, E.Coli, Listeria, Staphylococcus etc[5].

Among them E. Coli was found to be predominant (49.33%) followed by E. aerogenes (26.6%), Pseudomonas (20%), Staphylococcus (16.4%), Salmonella (12%), Klebsealla aerogens (20%), Proteus sps (8%) and Shigella sp (3.5%) (table-1). E.Coli and Enterobacter aerogens were detected in all the samples in all the seasons. Both are generally present in sewage, fasces, soil and water commonly comes in contact with vegetables. The contamination of other pathogenic bacteria may be due to unhygienic handling by workers, washing by contaminated water and improper irrigation by untreated water in the forms. Similar findings were observed by Beuchat, Joshi and Patel, Tambekar and Mundhana[2,3 9,10]. Physical hazards that contaminated fruits and vegetables during production or handlings are likely to be removed by proper washing and rinsing by suitable antimicrobial agents to reduce contamination before consuming. All the tested antimicrobial agents showed maximum reduction at 3% concentrations as compared to microbial density of control (table-2). Hydrogen peroxide found most suitable antimicrobial agent it decreases microbial load up to 85% followed by Ethanol, Benzoate citrate and Calcium chloride.

Similar results were reported by Dike O. Ukuku[7], that Hydrogen peroxide (2.5% and 5%) reduces surface micro flora up to 80% (table-2). Thus use of Hydrogen peroxide as rinsing agent for fresh fruits and vegetables can play an important role in food safety.

Table-1
Pathogenic Bactria isolated from various vegetables and fruits. (No. of Samples taken-05 each fruit and vegetable)

S. No	Name of Fruit and Vegetables	Pathogenic Bacteria / Samples.							
		E Coli	E. Aerogens	Pseudomonas Species	Staphy lococcus arenas	Salmonella Species	Shigella Species	Klebsealla aerogens	Proteus vulgoris
1.	Tomato	3	2	1	1	-	-	-	2
2.	Spinach	4	2	3	3	2	1	2	1
3.	Coriander	5	3	2	2	2	1	3	1
4.	Cucumber	2	1	1	1	-	-	-	1
5.	Cabbage	3	1	2	-	1	1	-	1
6.	Beet Root	3	1	1	-	1	-	1	-
7.	Capsicum	2	2	-	1	-	-	1	-
8.	Cauli flower	4	2	1	1	1	-	1	-
9.	Eggplant (Brinjal)	2	1	-	-	-	-	2	-
10.	Pea	2	1	1	1	1	1	-	-
11.	Lemon	1	-	-	-	-	-	-	-
12.	Banana	2	1	-	-	-	1	1	-
13.	Chikoo	1	-	1	1	1	1	-	-
14.	Apple	2	1	-	-	-	-	1	-
15.	Papaya	1	2	1	1	-	2	3	-
	Total	37	20	14	12	9	8	15	6
	% (Percentage)	49.33%	26.60%	20%	16%	12%	10.60%	20%	8%

Table-2
Percent inhibition of Microbial Cell density affected by antimicrobial agents (in %) (Cell Density for 05 Samples)

CONC. (%)	H_2O_2	Ethanol	Benzene	Citrate	$CaCl_2$
0.5	90	96	98	100	100
1.0	80	84	94	90	96
1.5	66	70	86	78	82
2.0	50	54	74	60	68
2.5	46	48	62	50	54
3.0	34	44	54	48	52
Control	100	100	100	100	100

Conclusion

The presence of pathogenic micro flora on the surface of fresh fruits and vegetables indicates the necessity for observing hygienic conditions during production, because such type of contamination can occur from water, soil, waste and humans. For raw consumption further processing of these products is compulsory to ensure their quality and safety of the user. This can be done by proper washing with water and pretreatment by different antimicrobial agents to decrease the density of microbial contaminants from the surface of the fresh produce. The Government intervention is also required to protect the consumer and to ensure the quality of the products.

Acknowledgement

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