

PREVALENCE OF BACTERIAL PATHOGENS ON SOME RAW STREET VENDED SALAD VEGETABLES SOLD IN NAGPUR CITY

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Abstract:

Raw eaten salad vegetables are normally consumed without heating and therefore the possibility of food poisoning occurs. The present study was undertaken to examine the general bacteriological quality of some raw eaten salad vegetables in Nagpur city. A total of 30 ready-to-eat salad vegetable samples of 5 different varieties were collected from local market in Nagpur city. From these 30 samples, 91 different bacterial pathogens were isolated and identified. The results revealed active participation of the following species of organisms in the ascending order of percentage as *Escherichia coli* (29.67%), *Enterobacter* spp. (23.07%), *Proteus* spp. (14.28%), *Pseudomonas* spp. (12.08%), *Klebsiella* spp. (7.69%), *Salmonella* spp. (7.69%) and *Staphylococcus aureus* (5.49%). Salad vegetables collected namely coriander (23.07%), radish (20.87%), carrot (19.87%), cucumber (18.68%) and tomato (17.58%) showed percentage contamination of bacterial pathogens.

Key Words:

Salad vegetables, Contamination, Bacterial Pathogens.

Introduction:

Salad can be defined as a food made primarily of a mixture of raw vegetables. Health benefits of salads are many. Vegetables are a good source of antioxidants and phytonutrients. They are low in calories and are rich in complex carbohydrates, vitamins and minerals. Salads should be cleaned properly, as they are generally eaten raw or partially cooked. If these are not cleaned properly, these become source of food-borne illnesses (Rajvanshi, 2010).

Several outbreaks of gastroenteritis have been linked to the consumption of contaminated fresh vegetable borne outbreak, occurred in Japan in 1996 in which 11,000 people affected. The outbreak involved the death of three children and was carried by *Escherichia coli*. The most common bacterial enteropathogens associated with fruits and vegetables are *Salmonella* spp (Thunberg *et al.*, 2002). *E. coli*O157 outbreaks were associated with apple cider, lettuce, radish, alfalfa sprouts, and other mixed salads (Beuchat, 1996). As the salads viz. carrot, coriander and cucumber have a very high consumer preference and eaten raw or partially cooked due to health effect throughout the country. Salad vegetables are consumed without any heat treatment, sometimes without washing and peeling and vegetable can become contaminated with pathogenic microorganism during harvesting through human handling, harvesting equipments, transport containers, wild and domestic animals (Report of codex committee, 2001). Several studies have associated outbreak of food with consumption of raw vegetable salad (Herd berg *et al.*, 1994; Portnoy and Geopfert, 1996). Therefore the present work was undertaken to determine the bacteriological quality of salad vegetables of Nagpur city.

Materials and Methods:

Collection of samples from market place: A total of 30 ready-to-eat salad vegetable samples of 5 different varieties were collected from local market in Nagpur city. These samples were collected in sterile polythene

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bags and were transported to laboratory for its bacteriological analysis.

Sample Analysis: A 25 gm of each vegetable was weighed and washed with 100 ml sterile distilled water. A 0.5 ml of this washed water was inoculated in 4.5 ml of MacConkey broth. The inoculated MacConkey broth then incubated at 37°C for 4-5 hours. After incubation the loopful of growth from MacConkey broth was subcultured on Cystein Lactose Electrolyte Deficient agar plate by streak plate method. The plates were incubated at 37°C for 24 hours. The isolated pathogens were identified on the basis of morphological, cultural and biochemical characteristics (Collee *et al.*, 1996).

Results and Discussion:

A total of 30 different ready-to-eat salad vegetable samples which includes carrot, coriander, cucumber, radish and tomato were analyzed. These salad vegetables were collected from different areas in Nagpur city. From these 30 samples, 91 different bacterial pathogens were isolated and identified (Table 1). The presence of microorganisms on vegetables is a direct reflection of the sanitary quality of the cultivation water, harvesting, transportation, storage, and processing of the produce (Beuchat, 1996). Out of 91 different pathogens, *Escherichia coli* (29.67%) was predominant and found in all salad vegetables followed by *Enterobacter* spp. (23.07%), *Proteus* spp. (14.28%) and *Pseudomonas* spp. (12.08%). *Escherichia coli* was found to be predominant on coriander followed by tomato, radish, cucumber, and carrot (Table 2, 3) (Fig.1). The sewage, faeces, soil and water might be the main sources for these organisms. Vishwanathan and Kaur (2000) examined salad vegetables such as carrot, radishes, tomatoes, lettuces, cabbage, cucumber and coriander and reported presence of *Staphylococcus aureus*, *Escherichia coli*, *Enterobacter* spp., *Klebsiella* spp., *Providencia* spp. and *Pseudomonas* spp. The least Contamination of *Staphylococcus aureus* (5.49%) on salad vegetables may be due to its carriage, in nasal passage of vegetable handlers or by infected workers (Table 2) (Beuchat, 1998). The *Klebsiella* spp. and *Salmonella* spp. each showed 7.69 % Contamination in vegetables (Table 2). This is due to thee washing of the vegetable with contaminated water, handling of vegetable by infected workers, vendors and consumers in the market place which help to spread pathogenic microorganisms (Mc-Mahon and Wilson, 2001).

Out of 5 Different types of salad vegetable analyzed, coriander showed highest bacterial contamination (23.07%) (Table 4) (Fig.2). This may be due to the fact

that vegetable coriander is dwarf and grown in close contact of salad which may contaminated with fecal matter and unrelated water. Carrot (19.78%), cucumber (18.68%) and radish (20.87%) showed near about equal contamination which may be due the reason that these vegetable are not leafy in nature. The least bacterial contamination (17.58%) was found in tomato.

The results in the present study clearly indicate the poor hygienic conditions of these salads and the consumers are at risk of contacting food borne infections. While the practice of consumption of salads cannot be stopped on nutritional grounds, therefore measures should be taken to spread awareness amongst the vendors about the safe and hygienic practices and Government agencies can take initiatives in this direction to lay out guidelines for selling of fresh fruits and vegetables. As consumers, we need to recognize that food safety is important for salad vegetables.

Table 1: Total Bacterial Contamination on Salad Vegetables

Total Salad Vegetables Analyzed	Contaminated Samples	Total Bacterial Pathogens Isolated
30	30	91

Table 2: Distribution of Bacterial Pathogens on Salad Vegetables

Sr. No.	Salad Vegetable	<i>Staphylococcus aureus</i>	<i>Escherichia coli</i>	<i>Enterobacter</i> spp.	<i>Klebsiella</i> spp.	<i>Proteus</i> spp.	<i>Salmonella</i> spp.	<i>Pseudomonas</i> spp.	Total Pathogens
1	Carrot	2	4	4	1	3	2	2	18 19.87%
2	Coriander	1	8	4	3	2	2	1	21 23.07%
3	Cucumber	1	4	3	1	3	2	3	17 18.68%
4	Radish	1	5	6	2	1	1	3	19 20.87%
5	Tomato	-	6	4	-	4	-	2	1 17.58%
6	Total	5 5.49%	27 29.67%	21 23.07%	7 7.69%	13 14.28%	7 7.69%	11 12.08%	91

Table 3: Different Bacterial Pathogens Isolated from Salad Vegetables

Sr. No.	Bacterial Pathogens	% Contamination
1	<i>Staphylococcus aureus</i>	5.49%
2	<i>Escherichia coli</i>	29.67%
3	<i>Enterobacter</i> spp.	23.07%
4	<i>Klebsiella</i> spp.	7.69%
5	<i>Proteus</i> spp.	14.28%
6	<i>Salmonella</i> spp.	7.69%
7	<i>Pseudomonas</i> spp.	12.08%

Table 4: Total Bacterial Contamination on Different Salad Vegetables

Sr. No.	Salad Vegetable	% Contamination
1	Carrot	19.87%
2	Coriander	23.07%
3	Cucumber	18.68%
4	Radish	20.87%
5	Tomato	17.58%

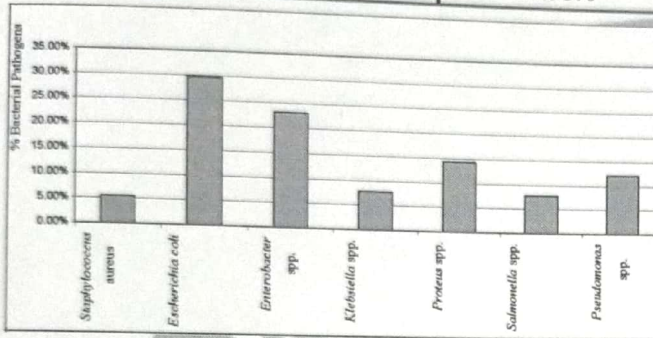


Fig. 1: Different Bacterial Pathogens Isolated from Salad Vegetables

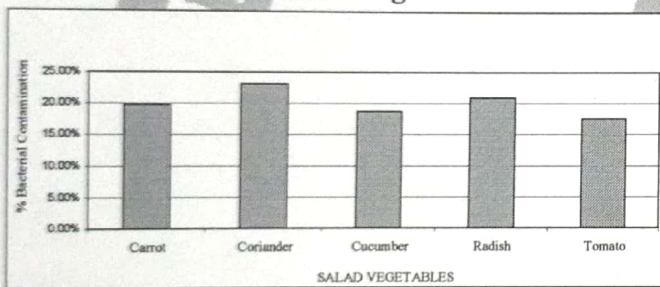


Fig. 2: Total Bacterial Contamination on Different Salad Vegetables

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