Incidence Of Endophytic Human Pathogens In Fresh Produce

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Incidences Of Endophytic Human Pathogens In Fresh Produce

Abstract

The frequency of documented outbreaks of human illness associated with consumption of raw fruits and vegetables has increased in recent years. In present study 10 different fresh produce were proceed for standard plate count to evaluate the existence of endophytic bacterial human pathogens. This study revealed that out of the tested samples 60% were found to be contaminated with *Salmonella* spp. While 50% were loaded with endophytic *Escherichia coli O157:H7*. Maximum contamination was observed in leafy vegetables like spinach and coriander. While in Carrot, onion and radish pathogens was not observed. The potential internalization of pathogens in fresh produce is a concern of food safety and enlighten the chances of epidemic outbreaks.

**Key Words:** Endophyte, *Salmonella* spp., *Escherichia coli O157:H7*, Fresh produce.

Introduction

The epidemiology of food borne diseases is rapidly changing. The proportion of food borne illness associated with fresh produce has increased over last decade. Factors influencing this raid occurrence include change in agronomic practices, dietary habitats etc.[1]. Vegetables and fruits are frequently identified as the potential source of infection. In farm to table production there are various possible points of contamination of salad vegetables and fruits with disease causing microbes viz. poor quality irrigation water, manure, handling by workers etc. [2]. Regardless the source of contamination in field, the pathogens finds a way to survive and reproduce on the surface of fresh produce and even worse, inside the plant tissues and exist as an endophyte. They find safe environment to survive and cannot be washed off or killed by disinfectants. Therefore, in an effort to address this concern, the present work has been carried out to evaluate the microbiological quality of vegetables with special reference to endophytic bacterial pathogens viz. *Salmonella* spp. and *Escherichia coli O157:H7*.

Methods

The vegetables viz. brinjal, carrot, cauliflower, chili, coriander, lady finger, onion, radish, ridge gourd and spinach were taken as sample vegetables and proceed for surface sterilization, which was carried out using 70% alcohol and 5°C chilled water [3]. These surface sterilized produce samples were chopped aseptically into small pieces and washed with sterile distilled water. This wash water was further used to evaluate the existence of endophytic bacterial pathogens.

Enumeration of endophytic *salmonella* spp. and *Escherichia coli O157:H7* was carried out adopting standard plate count method using selective media viz. Bismuth sulphite agar and sorbitol Macconkey agar respectively. The colonies developed on the media were detected by examining the colony, morphological and biochemical characters [4].

Results and Discussion

The frequency of documented outbreaks of human illness associated with consumption of raw fruits and vegetables [5] has increased in recent years. Therefore the target commodities selected for this research include the produce items which are mostly consumed raw or in minimally processed form.

In the present investigation, endophytic bacterial pathogens viz. *salmonella* spp. and *Escherichia coli O157:H7* were found to be present in different vegetable samples as shown in (illustration1, 2). Bacterial attachment and infiltration do occur and are facilitated by stomata, lenticels, broken trichomes and bruises and cracks in the skin surface of fruits and vegetables [6, 7].

In case of radish, carrot and onion our results are in accordance with Natvig et al.,[8] and Islam et al.,[9] who showed that no pathogens detected by enrichment on radish and carrot at harvest whereas Auty et al.,[10] showed internalization of the *Escherichia coli O157:H7* in carrots where pathogen cells were found mainly at the cell junctions and in
intracellular spaces up to 50µm.

In this study, other produce samples viz. brinjal, cauliflower, chilli, lady finger and ridge gourd were found to be contaminated with endophytic human pathogens. The leafy vegetables like coriander and spinach were found to be heavily loaded with pathogens. Franz et al., [11] also found significant population of both S. enterica serovar typhimurium and Escherichia coli O157:H7 in sterilized leaf samples from plants grown in contaminated soil. The common site of entry of conjectured to be penetration at cracks in seed coat [12] or invasion at lateral root junction in seedling [13, 14, 15]. Exudation of nutrients at these entry sites is hypothesized to act as the trigger for mobilization of pathogens to these sites [13 14, 16] although adhesive characteristics and colonization ability [14] also factor into their proliferation near these sites. Subsequent entry into the tissue is appearing to be depend on the type of the plant [17].

The present study showed that out of 10 tested produce samples 60% and 50% were found to be contaminated with Salmonella spp. and Escherichia coli O157:H7 respectively. Thus the potential internalization of pathogens in fresh produce is a concern of food safety.

Conclusion

The study revealed the ability of enteropathogen to survive as an endophyte. This may possibly bring the mass contamination of vegetables produce with human enteropathogens and hence enlight the chances of epidemic outbreaks especially in the areas having the unhygienic cultivation system. Hence it is needed to prevent or minimize the contact of human pathogens during the cultivation and processing of fresh produce, so as to avoid it as an occultant source of human infection.

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None

References

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17. Solomon EB, Matthews KR. Use of fluorescent microspheres as a tool to investigate bacterial interactions with growing plants. J. Food Prot. (2005); 68:870-873.
Illustrations

Illustration 1

Tables

**Illustration 1**

Presence of endophytic *Salmonella* spp. and *Escherichia coli* O157:H7 in fresh produce

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Name of fresh produce</th>
<th>Endophytic <em>Salmonella</em> Spp.</th>
<th>Endophytic <em>Escherichia coli</em> O157:H7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Brinjal</td>
<td>Present</td>
<td>Absent</td>
</tr>
<tr>
<td>2</td>
<td>Carrot</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td>3</td>
<td>Cauliflower</td>
<td>Absent</td>
<td>Present</td>
</tr>
<tr>
<td>4</td>
<td>Chili</td>
<td>Present</td>
<td>Absent</td>
</tr>
<tr>
<td>5</td>
<td>Coriander</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>6</td>
<td>Lady finger</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>7</td>
<td>Onion</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td>8</td>
<td>Radish</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td>9</td>
<td>Ridge gourd</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>10</td>
<td>Spinach</td>
<td>Present</td>
<td>Present</td>
</tr>
</tbody>
</table>
Population density of endophytic *Salmonella* spp. and *Escherichia coli* O157:H7 in fresh produce

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Name of fresh produce</th>
<th>Endophytic <em>Salmonella</em> Spp. $(\times 10^2$CFU/mL)</th>
<th>Endophytic <em>Escherichia coli</em> O157:H7 $(\times 10^2$CFU/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Brinjal</td>
<td>36</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Carrot</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Cauliflower</td>
<td>-</td>
<td>40</td>
</tr>
<tr>
<td>4</td>
<td>Chili</td>
<td>31</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Coriander</td>
<td>689</td>
<td>452</td>
</tr>
<tr>
<td>6</td>
<td>Lady finger</td>
<td>80</td>
<td>35</td>
</tr>
<tr>
<td>7</td>
<td>Onion</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>Radish</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>Ridge gourd</td>
<td>30</td>
<td>32</td>
</tr>
<tr>
<td>10</td>
<td>Spinach</td>
<td>549</td>
<td>476</td>
</tr>
</tbody>
</table>

Abrevations: CFU: Colony forming units
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