Microbiological Analysis And Effect Of Selected Antibacterial Agents On Microbial Load Of Fluted Pumpkin, Cabbage And Bitter Leaves

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Citation

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Abstract

Fresh vegetable are exposed to potential microbial contamination from farm to point of consumption. Bacteriological safety survey of three vegetable; fluted pumpkin, cabbage and bitter leaf was carried out to assess the effect of selected antibacterial agents on their decontamination. The vegetable were analysed bacteriologically by total aerobic count and total coliform count. Various pathogens were identified from the surface of these vegetables. E. coli, Pseudomonas Sp, Staphylococcus aureus, Klebsiella Sp, Seratia Sp and Enterobacter Sp were found to be the commonest bacterial species in all the vegetables. Three different antibacterial agents: ethanol, citric acid and sodium hypochlorite (water guard) at 5% concentration were applied to decrease the microbial load of these vegetables. Ethanol showed 40-50% reduction in the total bacterial count followed by citric acid and least by water guard. A combination of these agents can be used as rising agents to improve the bacteriological quality of these fresh vegetables.

INTRODUCTION

Fresh fruits and vegetables are important source of nourishment and a vital ingredient in healthy and balanced diets. Fruits and vegetables carry microbial flora while passing from farm to the table(10). The produce is exposed to potential microbial contamination at every step including cultivation, harvesting, transporting, packaging, storage and selling to the final consumers in the local market (6). Apart from the great beneficial aspects of fresh fruits and vegetables they are as well a good source of food borne illness when contaminated with pathogenic microorganism during harvesting with fecal materials, human handling, transport containers and display in street markets (1).

Fruits and vegetables can be contaminated whilst growing in fields as a result of organic fertilizer or contaminated irrigated water or during harvesting, processing, distribution, sale and use (2). The lack of effective antimicrobial treatments at any step from planting to consumption means that pathogens introduced at any point may be present on the final food product. Fresh vegetables and fruits may be washed or treated specifically to minimize microbial load (13). As consumers, we need to recognize that food safety is important for fresh fruits and vegetables foods from sources like street market. They should be protected from contamination and spoilage (7) during subsequent handling, packaging, storage and while in transit.

Food safety is a growing concern for consumer and professional in the food and food service world (10). Food safety in ready to eat produce especially raw foods live fruits and vegetables has long been an object of study with many assessing the microbiological condition of raw fresh fruits and vegetables available in street markets as well as in self service and fast food restaurants (5).This present work was carried out to determine the total bacterial load of the fresh vegetables from a named market in Ondo State, and to assess the effectiveness of selected antibacterial agents in decontamination of the vegetables.

MATERIALS AND METHODS

Collection of Vegetables: The fresh leaves of cabbage, bitter leaf and fluted pumpkin used for this work were bought from Ogbese market in Owo Local Government, Ondo State, Nigeria.

Vegetable sample preparation: The fresh leaves of these vegetables were thoroughly cleaned with sterile distilled water before microbiological assessment and later decontaminated with 5% concentration of each of ethanol, citric acid, and sodium hypochlorite (water guard) for 30

minutes.

Bacteriological Analysis: The washed and decontaminated fresh leaves of the three vegetables were subjected to total aerobic and total coliform count according to the methods of Speck (11). Gram staining test and standard biochemical tests such as motility, oxidase, catalase and coagulase were carried out on distinct colonial to establish their general or species with reference to Bergey's manual of determinative bacteriology (8).

RESULT AND DISCUSSION

A total of 24 samples were analysed for total aerobic count and total coliform count. 15 distinct colonies were screened for gram staining and biochemical tests from the total aerobic count plates while 6 colonies were analysed for both tests from the total coliform count plate. Table 1 showed the total aerobic count of washed and decontaminated vegetables while table 2 showed the total coliform count of washed and decontaminated vegetables. The colony forming unit per gram (cfu/g) of the vegetables ranged between 36 x 10^3 (cfu/g to 61 x 10^3 cfu/g in washed vegetables, 18 x 10^3 cfu/g to 36 x10^3 cfu/g, 22x10^3 cfu/g to 43 x 10^3 cfu/g and 30 x10^3 cfu/g to 48 x10^3 cfu/g in decontaminated vegetables with 5% ethanol citric acid and sodium hypochlorite (water guard) respectively. The total aerobic count and total coliform count were higher in the washed samples than in the decontaminated samples. The high cfu/g of viable count of the vegetable could be because of unhygienic conditions of the local market while the sterile distilled water could only wash off few microbes from the surface of the vegetables and the low concentration of the decontaminated agents. Generally, there is no pre-treatment given to the fresh vegetable before transporting to retailers and hence number of contaminant is high.

A cross reference of the cultural characteristics gram staining reaction and biochemical tests of the studied isolates with the Bergey's manual of determinate bacteriology, pathogens like Pseudomonas Sp, Staphylococcus Sp, Klebsiella Sp, E Coli, Enterobacter Sp, and Salmonella Sp were found to be the major microbes associated with the contamination of the three vegetables. This result was similar to Ibeyessie's (7). He reported high total viable count for various vegetables sample collected from local markets. E Coli, Staph aureus, and Pseudomonas Sp were the commonest pathogens found on the vegetables.

The presence of E. Coli, and Enterobacter Sp as indicator organisms indicates facal contamination of these vegetables (2). Other organisms like Shigella Sp, Proteus Sp, Seratia Sp, were also found on the examined vegetables. Viswanthan and kaner (14) also observed presence of Salmonella Sp, Seratia Sp, Pseudomonas aeroginosa, Staphylococcus aureus in vegetables and fruits. These results indicate that as a consumer, one should properly clean these vegetables before consumption where adequate heat processing is not required.

Various means has been used to reduce microbial load of fresh fruit and vegetable mainly washing with clean or sterile water. The use of disinfections has been a long history in food preservation, however the safety assessment of these antibacterial agents and legal requirements concerning such treatment also have to be taken into consideration (9). The purpose of using these agents is to control food pathogens. The effect of disinfectants on contaminant depends on many factors including the concentration used, treatment time, temperature, P^H and sensitively of the target organism (12). All the antibacterial agents showed substantial reduction in the average microbial load density at 5% (v/v) concentration for 30 minutes. Ethanol showed the best activity in decreasing the microbial density from 42x10^3 cfu/g to 22x10^3 cfu/g for cabbage, 36x10^3 cfu/g to 18x10^3 cfu/g in bitter leaf and 61x10^3 cfu/g to 36x10^3 cfu/g in fluted pumpkin citric acid was the second effective agent showing a remarkable decrease in cell density from 42x10^3 cfu/g to 28x10^3 cfu/g for cabbage, 36x10^3 cfu/g to 22x10^3 cfu/g in bitter leaf and 61x10^3 cfu/g to 43x10^3 cfu/g in fluted pumpkin. The least of the antibacterial agent was sodium hypochlorite (water guard). It showed a partial cell density reduction from 42x10^3 cfu/g to 31x10^3 cfu/g for cabbage, 36x10^3 cfu/g to 30x10^3 cfu/g in bitter leaf and 61x10^3 cfu/g to 48x10^3 cfu/g in fluted pumpkin. Similar results were reported by Dike (4) for hydrogen peroxide at 2.2% and 5% concentration. This study suggests that fresh vegetable habours high number of contaminants and pathogens in case of major and big local market like Ogbese market, hence are more prone to contamination and spoilage making it necessary to process them well before consumption. Although a wide rage of different agents are available for sanitizing fresh produce, their efficacy vary and none are able to ensure elimination of pathogen completely.

Beuchat (3) concluded that prevention of contaminants at all points of the food chain through asepsis method is preferred over the application of sanitizers. It was good to know that

the maximum count for aerobic mesophillic microorganisms in vegetables was established as 105 cfu/g (5). The results obtained in the present study were below this limit indicating that the microbial contamination of the vegetable were minimal but never the less great measures should be devised to reduce microbial load.

CONCLUSION

Fresh vegetable and fruits habour potential pathogens and the precise establishment of the origin of food borne illness is important in strategizing means of prevention or control vegetables associated with food borne outbreaks lately which necessitated their decontamination. The three vegetables assessed bacteriologically had high viable counts even though within the tolerable limit. A good pre-decontamination of the vegetables as shown by this study will reduce the density of the microbial load by the antibacterial agents used.

Figure 2

TABLE 2: TOTAL COLIFORM COUNT OF WASHED AND DECONTAMINATED VEGETABLES

vegetables	Washed samples (10^3 cfu/g)	Decontaminated samples (10^2cfu/g) Ethanol	citric acid	sodium hypochlorite
Cabbage	42	22	28	31
Bitter leaf	36	18	22	30
Fluted pumpkin	61	36	43	48

{image:2}

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