World Academy of Science, Engineering and Technology
International Journal of Nutrition and Food Engineering
Vol:9, No:07, 2015

Control of Listeria monocytogenes ATCC7644 in Fresh Tomato and Carrot with Zinc Oxide Nanoparticles

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Abstract : Preference for consumption of fresh and minimally processed fruits and vegetables continues to be on the upward trend however food-borne outbreaks related to them have also been on the increase. In this study the effect of zinc oxide nanoparticles on controlling Listeria monocytogenes ATCC 7644 in tomatoes and carrots during storage was investigated. Nutrient broth was inoculated with Listeria monocytogenes ATCC 7644 and thereafter inoculated with 0.3mg/ml nano-zinc oxide solution and 1.2mg/ml nano-zinc oxide solution and 200ppm chlorine was used as a control. Whole tomatoes and carrots were also inoculated with Listeria monocytogenes ATCC 7644 after which they were dipped into zinc oxide nanoparticle solutions and chlorine solutions. 1.2 mg/ml had a 2.40 log reduction; 0.3mg/ml nano-zinc oxide solution had a log reduction of 2.15 in the broth solution. There was however a 4.89 log and 4.46 reduction by 200 ppm chlorine in tomato and carrot respectively. Control with 0.3 mg/ml zinc oxide nanoparticles resulted in a log reduction of 5.19 in tomato and 3.66 in carrots. 1.2 mg/ml nanozinc oxide solution resulted in a 5.53 log reduction in tomato and a 4.44 log reduction in carrots. A combination of 50ppm Chlorine and 0.3 mg/ml nanozinc oxide was also used and resulted in log reductions of 5.76 and 4.84 respectively in tomatoes and carrots. Treatments were more effective in tomatoes than in carrots and the combination of 50ppm Chlorine and 0.3 mg/ml ZnO resulted in the highest log reductions in both vegetables. Statistical analysis however showed that there was no significant difference between treatments with Chlorine and nanoparticle solutions. This study therefore indicates that zinc oxide nanoparticles have the potential for use as a control agent in the fresh produce industry.

Keywords : Listeria monocytogenes, nanoparticles, tomato, carrot
Conference Title : ICFSNPH 2015 : International Conference on Food Safety, Nutrition and Public Health
Conference Location : Zurich, Switzerland
Conference Dates : July 29-30, 2015