



**PACIFIC NW POLLUTION PREVENTION RESOURCE CENTER
POLLUTION PREVENTION RESEARCH PROJECTS DATABASE**

Project Name: Destruction of Microorganisms by Ozone During Food Processing Operations

Date Last Updated: 9/98

Project Summary:

OBJECTIVES: PROJ. #9204153. The objective of this project is to evaluate the use of ozone (O₃) as a sanitizing agent/disinfectant for use in fruit and vegetable processing waters.

APPROACH: This study will examine the use of ozone in processing wash waters to reduce the number of microorganisms on raw agricultural commodities such as carrots, onions, peppers, and cherries. Such treatment should kill many bacteria responsible for foodborne illness and will lead to the production of foods which are more safe for the consumer. Other spoilage microorganisms, such as yeast and mold may be greatly reduced in number.

The long-term goal or objective of the study is to transfer the results of the project to the fruit and vegetable processing industries. This will assist in increasing the overall safety and quality of the commodities. Ozone may prove to be an effective substitute for chlorine in processing operations. It is known that chlorine produces hazardous by-products, such as chloroform, and its use for food contact is being restricted worldwide.

PROGRESS: As of the last progress report, the ozone test system has been increased in size from 20 gallon to 200 gallon capacity, allowing for larger test loads. In addition, the new system has a larger ozone generator, is skid-mounted, and better simulates a flume-water wash system for raw agricultural commodities. The test system was designed to provide turbulent flow in the treatment tank, an oxygen purifier was added, and diffusion of ozone into the water was optimized through improved engineering.

In further experiments, onions, broccoli, and broccoflower were washed in the flume system using ozonated water, and appropriate controls. An ozone concentration of approximately 0.75 mg/L was able to be maintained with the system and commodities were washed for periods of 1, 3, 5, and 10 minutes. The food was then tested for the germicidal effect of ozone by enumerating the aerobic bacteria and fungal (yeast & mold) populations using standard microbiological methodologies.

As in previous studies, compared to non-ozonated control samples (washed with plain water or no wash treatment), a significant effect was observed after 1 minute of ozone

wash treatment, and by 10 minutes the microbial load could be reduced greater than 2 log-fold, except for onion which harbors most indigenous microbes under the first few layers of skin, inaccessible to the ozone-wash water.

Project Keywords: microorganism, ozone, O₃, food, processing, fruit, vegetable, water, bacteria, spoilage, yeast, mold, chlorine

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Publications Based on Research:

1. HAMPSON, B.C., S. FIORI, and S. ODLE. 1994. A Pilot-Scale System for Ozone Treatment of Fruits and Vegetables. Abstracts of the Institute of Food Technologists Meeting, p. 105.
2. FIORI, S. 1994. A Pilot-Scale System for Ozone Treatment of Raw Agricultural Commodities. M.S. Dissertation, California Polytechnic State University, San Luis Obispo, CA, 62 pp.
3. HAMPSON, B.C. 1995. FDA Protocol for the Treatment of Fresh-Market Tomatoes with Ozone. Submitted to the Office of Premarket Approval, Center for Food Safety & Applied Nutrition, U.S. Food and Drug Administration.
4. ODLE, S. 1995. M.S. Dissertation (in preparation, returned for revisions), California Polytechnic State University, San Luis Obispo, CA.
5. HAMPSON, B.C., D. LEE, S. FIORI, S. ODLE, and J. MONTECALVO. 1995. Effect of Ozone-Containing Wash Water on the Microbial Load of Vegetables. In preparation for submission to the J. of Food Science.

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