

**AGRICULTURAL RESEARCH FOUNDATION  
FINAL REPORT  
FUNDING CYCLE 2012 – 2013**

**TITLE:** Sensory Evaluation of Hazelnuts Treated for Microbial Reduction

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**SUMMARY:** Hazelnuts are an important crop for Oregon and represent 98% of the U.S. harvest. There were food borne disease outbreaks associated with hazelnuts in 2009 and 2010. Consequently, there is a need to develop a method that will inactivate pathogens but have a minimal effect on the sensory qualities of the product. Heat treatments that inactivate pathogens were developed by Dr. Joy Waite-Cusic at Oregon State University. Two heat treatments were used (8 min. and 15 min. at 190F steam heat) for whole shell hazelnuts. Consumers could not tell a significant difference in either level of heat treatments. There were no significant differences in the overall appearance liking scores. Consumers liked all three hazelnuts equally for different sensory attributes with. These results provide Oregon hazelnut growers and processors a viable method to reduce pathogens in their product without altering key sensory attributes.

**OBJECTIVES:** Sensory test were run to measure at what level consumers can detect a difference when hazelnuts are heat treated for both 8 minutes and 15 minutes at 190F versus a control(no heat treatment). The acceptability by probing liking of attributes such as the overall liking, appearance, aroma, flavor, sweetness, color and textural aspects of hazelnuts with two different heat treatments were also measured. A final objective was to better understand consumers' habits around hazelnuts through behavioral questions.

**PROCEDURES:** Whole hazelnuts were provided by the Willamette Hazelnut Growers of Newberg, OR, for this study. Hazelnuts were transferred to the OSU Food Innovation Center (FIC) and stored in woven plastic bags at room temperature prior to use. Visual inspection ensured that all hazelnuts included in the sample units were free of cracks, holes, and other abrasions. Hazelnuts underwent heat treatments similar to what would be recommended to industry to reduce pathogens. Sensory tests were run at the FIC sensory testing laboratory, which offers state-of-the-art resources for conducting sensory and consumer tests and evaluations. A total of 100 panelists were chosen from the FIC database of over 23,000 potential panelists. Qualification criteria for participation were: the consumers have no allergies to nuts, have to be between the ages of 18-65 yrs, they had purchased a given quantity of hazelnuts at least once in the past month for preparation at home, and the consumers were interested in purchasing processed hazelnuts if available in their area stores. Each sample was coded with randomized 3-digit numbers, served on eight inch plates and presented to the consumers on plastic trays. A difference test was run to determine whether consumers can distinguish between treated and non-treated hazelnuts. Consumers took two difference tests: control vs. 8 minute heat treatment and control vs. 15 minute heat treatment. A triangle testing was used to determine whether consumers could tell the difference between the heating treatments. . When presented the three samples in which two are the same and one is different, consumers were asked, "Which is the different sample?" A wait time was imposed in between each tasting session to help mitigate panelist fatigue. Each consumer

received two hazelnuts from each treatment in a multiple sample style presentation. Each of the treatment categories will give a sufficient range of these characteristics to allow for statistical analysis to determine differences as well as preferences. Samples of hazelnuts were individually rated for Overall Liking, Appearance, Flavor, and other intrinsic characteristics as well as Purchase Intent. Consumers also answered a number of comment questions related to hazel purchases and attitudinal questions regarding food purchases.

#### **SIGNIFICANT ACCOMPLISHMENTS:**

- Consumers could NOT tell a significant difference in either level of heat treatments, 8 minute or 15 minute. 26 correct responses are required at the 95% confidence level.
- There were no significant differences in the overall appearance liking scores. Consumers liked all three hazelnuts equally for the attribute Appearance, with ratings around “somewhat appealing” on average.
- All three products met the 65% “just about right” scores threshold for acceptance. The 15 minute roast hazelnuts were rated by 30% of the consumers tested as “too dark” in color, while only 13% felt the same of the control. 18% felt the same of the 8 minute roast nuts.
- The Overall Liking scores show that the three hazelnuts were rated statistically similarly, with ratings around “like moderately” to “like slightly” on average.
- The Texture liking scores show that all the products were liked statistically equally, with ratings around “like slightly” on average.
- The purchase intent scores show that all the products were rated statistically equally, with ratings on the side of “would probably buy.”

#### **BENEFITS & IMPACT:**

The hazelnut industry in Oregon has seen tremendous growth in the past 5 years increasing in value from \$45 million in farm gate value in 2006 to over \$100 million in 2014. More than 98 percent of hazelnuts in the U.S. are grown in the state of Oregon, primarily in the Willamette Valley. While there are hopes for continued growth over the next decade, there are several issues with food safety that needed to be addressed. Unfortunately, the surfaces of hazelnuts act as suitable locations for potentially harmful microorganisms to persist. In 2009, detection of *Salmonella* in a processing facility resulted in a recall of 114,350 lbs. of hazelnut kernels. In 2010, a second hazelnut recall took place after eight cases of *Escherichia coli* O157:H7 illnesses were reported in Michigan, Minnesota, and Wisconsin. Exposure to microorganisms from soil is inevitable during the cultivation and harvest of hazelnuts, and potential pathogen contamination prompts the need for improvement of postharvest sanitation procedures and possible postharvest kill steps for pathogens. This study was undertaken to determine if a heat treatment used to inactivate pathogens would affect the flavor and sensory characteristics of hazelnuts. Results showed that there was no statistical difference found among consumers among the hazelnuts that underwent different heat treatments. Furthermore, consumers showed no difference in a willingness to buy between hazelnut that underwent different heat treatments compared to the control.

**ADDITIONAL FUNDING RECEIVED DURING PROJECT TERM:** Dr. Joy Waite-Cusic received funding from the Oregon Hazelnut Commission to determine effective heat treatments to obtain significant reduction in pathogens in whole hazelnuts.

**FUTURE FUNDING POSSIBILITIES:** With implementation of the FDA Food Safety and Modernization Act (FSMA) the agriculture and food industries will need to determine a number of processing steps that may be necessary to reduce pathogens in produce, including tree nuts. There will be need for consumer studies to show that these procedures or processing methods will not alter the acceptable sensory properties of these foods.