

FINAL PROJECT REPORT

Project Title: Physiological, economic and consumer evaluation of sliced pears

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Cooperators: Crunch Pak: Tony Freytag and Ozgur Koc
WSU: Seanna Hewitt, Christopher Hendrickson, Scott Mattinson and Frank Younce
Pear Bureau – Kevin Moffitt

Other funding sources

Agency Name: Washington State Department of Agriculture
Amt. awarded: \$204,466
Notes: “Sliced Pears – A novel avenue for pear consumption”. Support for a scientist, graduate student and organized taste panels to perform large scale evaluation of sliced pears in the market.

Agency Name: NIH Protein Biotech Training Program
Amt. awarded: \$52,234
Notes: Support for Seanna Hewitt, Ph.D. student includes stipend, travel, medical, tuition and fees

Agency Name: Crunch Pak
Amt. awarded: \$30,000
Notes: Support for pear slicing, packaging, purchase of fruit, labor and fruit quality analysis

Agency Name: USA Pears
Amt. awarded: \$6,895
Notes: Support for economic analysis and consumer surveys

Total Project Funding: \$69,921

Budget History

Item	2015
Wages ^a	19,200
Benefits	8,221
Equipment ^b	29,500
Supplies ^c	8,500
Travel ^d	1,500
Miscellaneous ^e	3,000
Total	69,921

Footnotes: **a:** Wages for technician to assist in fruit processing, quality assessment and gas analysis; **b:** Purchase of two separate pieces of equipment for analysis of respiration and ethylene in whole and sliced fruit; **c:** Purchase of ripening compounds, lab reagents and consumables; **d:** Travel costs for picking up of whole fruit and sliced fruit; **e:** Cover the cost of fruit

OBJECTIVES

1. Physiological evaluation of sliced pears derived from 1-MCP fruit treated with ripening compounds.
2. Economic analysis – willingness to pay for sliced pear product will be conducted.
3. Trained panel surveys will be conducted to accurately quantify organoleptic preferences.

This project requires post-harvest fruit which starts becoming available late January/early February after the controlled atmosphere rooms begin to open up. We have received some fruit from Blue Star Growers and conducted a taste panel during the annual Washington State Tree Fruit Association meeting in Yakima in December 2015.

SIGNIFICANT FINDINGS

1. Physiological evaluation of sliced pears derived from 1-MCP fruit treated with ripening compounds.
 - Ethylene levels were observed to increase during storage in modified atmosphere bags.
 - Sliced fruit lasted for over 20 to 30 days in the bags exceeding the shelf life requirements.
2. Economic analysis – willingness to pay for sliced pear product will be conducted.
 - To be conducted on March 2 and 3, 2016 by Karina Gallardo at the OSU Food Science Innovation Center
3. Trained panel surveys will be conducted to accurately quantify organoleptic preferences.
 - Consumer panel at the annual WSTFA meeting ranked the Ripening Compound-treated 1-MCP fruit (sliced) as the most acceptable in all categories tested.
 - Additional surveys are scheduled to be conducted in March 2016 at the WSU Food Science Sensory lab.

RESULTS & DISCUSSION

Objective 1: Physiological evaluation of sliced pears derived from 1-MCP fruit treated with ripening compounds.

Smartfresh-treated Fruit was obtained from Blue Star Growers and sliced in the lab. Sliced fruit was treated with various concentrations of ripening compound which was directly mixed in with the non-browning mix (Crunch Pak) and packaged in modified atmosphere bags provided by Crunch Pak. Fruit was stored at 40 deg F and monitored visually for browning for 20 days. A total of 20 bags per treatment were prepared and measurement of ethylene and respiration was performed on 4 bags each after every 5 days. Figure 1 demonstrates the release of ethylene from sliced fruit directly measured from modified atmosphere bags. Respiration was also measured in the modified atmosphere bags. It was noteworthy to observe that the respiration levels remained similar however there was a sharp increase on day 20 (Figure 2). This implies that the modified atmosphere bags were able to maintain the carbon dioxide levels and avoid anaerobic respiration. Overall, these results confirm previous observations that sliced pears can be maintained in modified atmosphere bags with an extended shelf life.

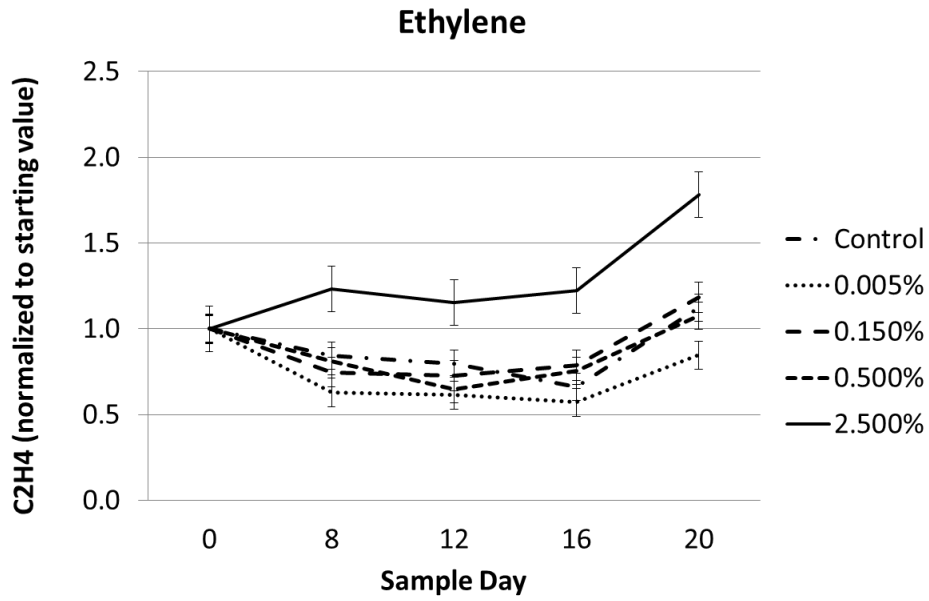


Figure 1: Ethylene released by sliced fruit in modified atmosphere bags. All the fruit used was Smartfresh treated and was further treated with ripening compound post-slicing.

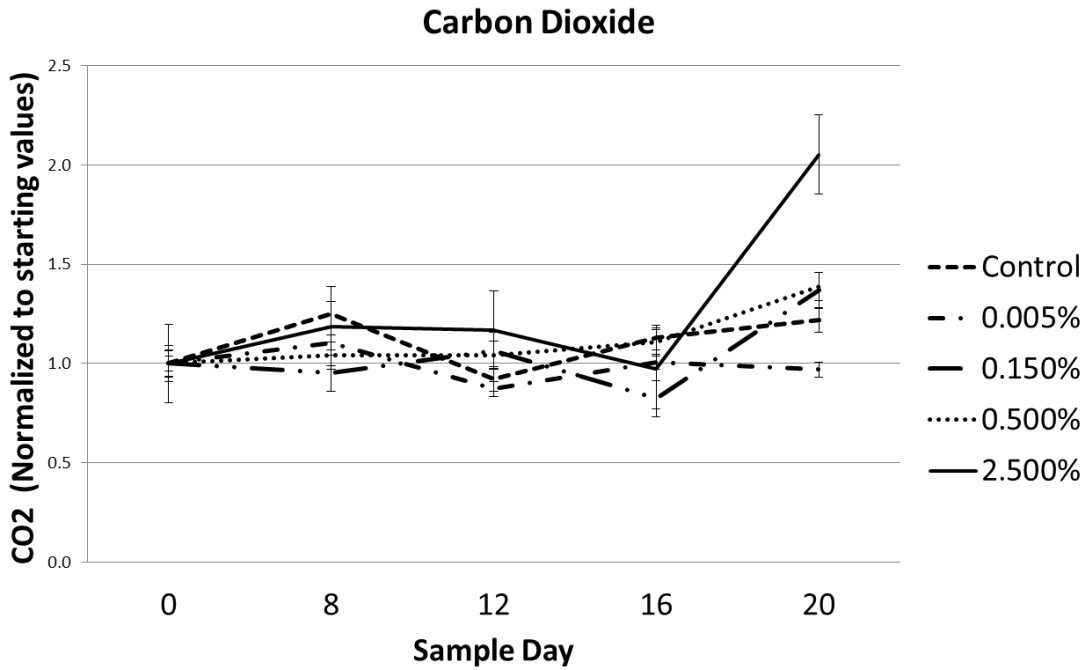


Figure 2: Carbon dioxide (respiration) levels in modified atmosphere bags.

Objective 2: Economic analysis – willingness to pay for sliced pear product will be conducted.

- To be conducted on March 2 and 3, 2016 by Karina Gallardo at the OSU Food Science Innovation Center

Objective 3: Trained panel surveys will be conducted to accurately quantify organoleptic preferences.

While the trained panel surveys are scheduled to be conducted in March 2016, we conducted a consumer taste panel at the annual WSTFA meeting in December 2015 in Yakima. The results are summarized in Table 1 and indicate that Smartfresh treated pears when sliced and treated with the ripening compound are favored over control Smartfresh treated pears. The 3% RC treated fruit was most acceptable in all categories except for appearance, it indicates that there is a need to standardize the amount of non-browning mix and the type of modified atmosphere bag.

Table 1: Summary results of a consumer taste panel conducted at the annual WSTFA meeting in December 2015.

Ranking 2015 - Anjou				
	Overall acceptance	Appearance	Taste/ Flavor	Texture
Most acceptable	3% RC	1%	3% RC	3% RC
	2%	Control	2% RC	2% RC
	Control	2%	1%	1%
Least acceptable	1% RC	3% RC	Control	Control

OUTREACH

- Good Fruit article - <http://www.goodfruit.com/sliced-pears-show-potential/>
Sliced pears show potential Published September 25, 2015
- Woot Fruit – Established connection with Kim Gaarde at Woot Fruit, CA to establish collaboration for sliced pears.
- Naumes fruit – Amit Dhingra visited Naumes fruit to discuss the feasibility of producing sliced pears with Comice and Bosc varieties.

EXECUTIVE SUMMARY

Enhancement of per capita consumption of pears has remained a long-desired goal of the pear industry. This has been recorded repeatedly in every annual pear industry research priority document since George Ing published his seminal summary in 1994 (Ing 1994). Sliced pears offer a novel avenue for enhancing pear consumption. In this project we have demonstrated that sliced pears produced by using Smartfresh treated pears which are then sliced and treated with the ripening compound last on the shelf for over 20 days. The commercial requirement is about two weeks. While we have engaged Crunch Pak in the Wenatchee valley, collaborative arrangements are underway with Woot Fruit in CA to evaluate the ripening compounds with them. Woot Fruit has already introduced sliced pears in the market.

In the immediate future, sliced pears are expected to add an additional 10% resulting in a potential value of \$40M to the current U.S. Pear Market. The customer's willingness to pay a premium for a novel product will be evaluated in 2016 and 2017 and this information is expected to be useful for adoption of the product by the retail market.

This project will contribute in increasing per capita consumption and will specifically enable the utilization of fruit ranging in size from 120 to 135, which is currently underutilized or undervalued. Further, the application of 1-MCP prior to slicing, and then having the ability to reverse the effect of 1-MCP, can enable longer storage of the fruit, resulting in expansion of the marketing timeline. This is expected to contribute to further economic benefits to the pear industry.