Week 7 Lab
(Group Assignment)
Fruits, Vegetables, & Legumes

This lab will build off chapters 13 & 14 from your lecture text and Units 9 & 10 from your Lab Manual.

Assignment:

Unit 9:

- **Lab A-1: Enzymatic Oxidative Browning (Do not do pH testing)**
- **Lab B-1: Comparison of Effects of Cooking Mediums on Apples**
- **Lab C: Effects of Cooking Treatments on Vegetables Pigment (Do not do pH testing)**
- **Lab D: Factors that Affect Chlorophyll**

Unit 10:

- **Lab A: Preparing Dried Legumes (Do not do pH testing)**

*****Include selfies for each lab; can but included within the specific lab section or at the bottom of this document*

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Lab C: Effects of Cooking Treatments on Vegetable Pigments

Objectives

Do not complete pH testing

Follow procedures on page 111 of your lab manual and complete the tables below.

Broccoli - 6

Cooking Method	Appearance		Texture	Flavor	Explanation of Observations
	Liquid	Vegetable			
Control	Light Green	Green, firm, intact	Tender on the outside but firm inside	Vegetable taste, nothing distinct	Moderate cooking time preserves texture, pigment and flavor
Steamed	Clear	Bright green, firm, intact	Very crisp	Fresh vegetable smell and taste	Steaming preserves nutrients and structure; enhances color
25 min.	Light Green	Brown, partial decomp.	Tender but not limp	Very bland, no flavor	Heat oxidizes the pigments, impacts color
Cream of tartar	Cloudy	Dark Brown with yellow	Crunchy	Sour, vinegar taste	Acid flavor imparted to vegetables; chlorophyll leached by acid, prevents mushy
Baking soda	Bright Green	Green, Compressed, disintegrated	Mushy	Bland, some broccoli flavor	Alkaline water converts chlorophyll to a water-soluble form – leach in water
Microwave	Clear	Bright green, compressed, wilted appearance	Mushy, collapsed structure	Broccoli flavor	Microwave removes air between plant cells -

					compressed

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Carrots- 6

Cooking Method	Appearance		Texture	Flavor	Explanation of Observations
	Liquid	Vegetable			
Control	Cloudy	Orange, whole, pale exterior	Tender, with some crunch inside	Carrot, fresh flavor	Moderate cooking time, heat preserves nutrients
Steamed	Clear	Orange, bright colored	Tender on outside, crisp thorough	Carrot, fresh flavor	Steaming prevents heat damage, nutrient loss
25 min.	Clear	Bright orange, mushy exterior	Tender all the way through	Very bland	Heat, oxygen exposure causes nutrient, flavor, chemical changes that impact pigment
Cream of tartar	Clear	Light orange, very pale	Crisp, some tender on outside	Sour, acid flavor	Acid created a vinegar taste, lightens color and prevents full cooking
Baking soda	Yellow	Mushy, loss of orange color	Mushy outside, crispy inside	Bland	Disintegrated due to base acting catenoid
Microwave	Clear	Pale, shrunk	Chewy	Carrot taste, fresh	Dry exterior

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Red Cabbage - 6

Cooking Method	Appearance		Texture	Flavor	Explanation of Observations
	Liquid	Vegetable			
Control	Blue	Shiny, purple color	Tender outside but retained shape	Sharp, Bitter, Cabbage flavor, sulfur odor	Not overcooked, no acid/base – nutrients preserved
Steamed	Light Green	Dull purple color	Retained shape, tender outside	Sharp, bitter cabbage flavor	Proper cooking time, nutrients retained
25 min.	Deep Purple	Pale, dull purple color	Tender, able to cut w/ fork	Bland, lost some sharp flavor	Nutrients cooked out, leached in water, heat impacted structure/turgor
Cream of tartar	Purple	Bright Pink	Generally crisp, retained shape	Sour, increased bitterness	Acid reacted with the anthocyanin, acid prevent mushy
Baking soda	Green	Wilted green, compressed	Mush	Bland	Base acted with the anthocyanin
Microwave	Purple	Pale Violet	Compressed,	Bland, some sulfur odor	Nutrients cooked out in microwave/heat

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Answer the following questions:

1. Compare the textural differences observed between apples cooked in water and apples cooked in a sugar solution. Account for these differences. How did the apples cooked with sugar substitute and apple juice compare?

2. Do any of the pigments change color when heated for a long period of time? Which? Explain the reaction.

   Yes, after long heating the broccoli (chlorophyll) leached out, reacted or underwent other chemical transformation and the vegetable started turning brown/yellow. In contrast the anthocyanin, although it is water soluble, did not seem to fade in color as expected in the 25minute cooking process. Perhaps an even longer cooking time would have resulted in more significant change.

3. Does microwave cookery cause a greater or lesser color change than stove-top cooking? Why?

   It seemed to result in a lesser color change, in general there was better retention of original color. There are two reasons, first, there was less water used and second, the time and overall temperature was less than stovetop. The reduction of water and temp reduces the effect of heat – retaining cellulose structure and turgor. Excessive heat has the opposite effect – softens cellulose and reduces turgor.

4. Describe the color and texture of vegetables cooked with baking soda. Explain the reaction.

   Color: Baking soda reacted with the catenoid, creating a brownish color, it reacted with the chlorophyll to make the broccoli brighter green and it reacted with the purple cabbage turning it to green.

   Texture: Baking soda had an impact on texture, most noticeable in the carrots and cabbage. The soda “compressed” the texture, and created a soft exterior. This is most likely due to changes in the cell wall. As shown in the picture, the carrot exterior became extremely soft and similarly the interior of the cabbage was so soft it could be cut with a fork.

   The reaction was is due to the base raising the pH, causing the starch (cellulose and pectin) to gelatinize – thus the mushy consistency.

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5. Compare the color and texture of the various cooked green beans.

6. What is the impact of the addition of baking soda to the final texture, appearance and flavor of the cooked legumes?