



Sample of a Visual Cracking - Damaged Blueberry Protocol

Purpose: While freezing enables a longer shelf life for foods, such as blueberries, the freezing process can impart some changes to the overall quality. For example, an increase in cracks and/or splits of blueberries may be an indicator that the processing conditions may need to be adjusted. Implementing a visual inspection protocol is an easy quality testing method that can monitor the overall quality of freezing berries. The method outlined below describes how to implement a quality visual inspection for IQF blueberries.

Method: This method is based of Sanford *et al.* and Wojtas *et al.* (add date). This is an attribute based on observing the blueberries visually. In the freezing process some of the berries crack and damage therefore, implementing a visual inspection can help manage the quality during production.

Supplies:

- Scale
- Sampling vessel/cup
- Camera (optional)

Procedure:

1. Label the boats
2. Weigh a sample of 50 grams and examine each berry as damaged or intact.
3. Weigh and count the amount of damaged (unacceptable) berries.
4. Calculate using the formula

Acceptability threshold: Damaged (unacceptable) berries are defined as berries with noticeable cracking and/or splitting of the produce tissue. Figure 1 displays two samples where one berry (Sample A) is intact compared to the other berry that shows significant cracking (Sample B) due to the freezing process.



Sample A

Sample B

Figure 1. Comparisons of acceptable (Sample A) and unacceptable (Sample B) frozen blueberries. As shown in Sample there is a noticeable cracking.

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Mathematical calculations: Percent damaged blueberry is calculated by dividing the average weight of the damaged blueberries by the average total blueberry weight, times 100%.

$$\% \text{ of Damaged Berry} = \frac{\text{(Damaged Blueberry)}}{\text{(Total Blueberry)}} \times 100\%$$

Example: Below is an example of the calculated damaged berry ratio reported after three sampling pulls at the XYZ Production facility. Sampling accounts for the average using the three reported values. The calculation is reported below the data set.

	Total Blueberry (g)	Damaged Blueberry (g)
m1	51.00	15.00
m2	49.98	17.08
m3	53.10	4.56
Average	51.36	12.21
Percent damaged	23.78%	

Sample of percent damaged calculation:

$$\text{Percent Damaged} = \frac{\text{(damaged blueberry)}}{\text{(total weight)}} = \frac{12.21}{51.36} = 23.78\%$$

Sample of log damaged blueberry:

	Name	
	Production date	
	Production Location	
	Production Parameters	
	Date of analysis	
	Total Blueberry (g)	Damaged Blueberry (g)
m1		
m2		
m3		
Average		
Percent damaged		

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References

Allan-Wojtas, P., Goff, H. D., Stark, R., & Carbyn, S. (1999). The effect of freezing method and frozen storage conditions on the microstructure of wild blueberries as observed by cold-stage scanning electron microscopy. *Scanning*, 21(5), 334-347. doi:10.1002/sca.4950210507