

# Evaluating Microbial Content of Low Alcohol Beer Pasteurized to Different Levels



Lucy Chang and Aiden Strath  
Faculty of Science | Brewing and Brewery Operation Program

## Introduction

- Beer is microbiologically stable due to its low pH, hop bitter acids, alcohol content and elevated concentration of CO<sub>2</sub>.
- Without the alcohol, we need to take additional protective measures to ensure low alcohol beer is a microbiologically stable beverage.
- We decided to pasteurized the low alcohol beer to achieve microbiological stability.
- Bottles were pasteurized between: 80~150 pasteurization units (PUs). We set the range based on the recommendations from Brewer's Association and industry practice.
  - White Labs and the Brewer's Association recommend pasteurization of low alcohol beer from 10-100 PUs.

## Objective

To determine the minimum level of PUs required to render low alcohol beer microbiologically stable.

## Method

100 ml samples were membrane filtered (fig. 1) and plated on different media dishes (fig. 2) to evaluate microbiological growth. The following sample were taken:

- Unpasteurized Beer
- Pasteurized Beer at
  - 80PUs,
  - 100PUs,
  - 120PUs and
  - 150PUs

Medias used:

- WLN
- WLD
- LCSM
- LYS
- MacConkey



Figure 2: Microbial colonies formed on various media

Pasteurization greatly reduces microbial content in bottled low alcohol beer



Figure 1: vacuum membrane filter used during plating of bottled pasteurized beer

## Data & Results

Table 1: Microbial Stability in Low Alcohol Beer before and after Pasteurization

Low-Alcohol Beer Sample	CFU*	
	Beer	Control
Unpasteurized Bottle	>300	2
Pasteurized Bottles		
80 PUs	4	2
100 PUs	2	4
120 PUs	1	0
150 PUs	1	4

**Pasteurization Unit (PU):** One Pasteurization Unit (PU) is defined as 1 minute of heating at 60°C.

**Colony Forming Unit (CFU):** is a unit which estimates the number of microbial cells in a sample that are viable and able to multiply via cell splitting under the control conditions.

## Discussion

- We compared the number of microbial counts of the low alcohol beer for the various pasteurization levels with the unpasteurized sample. For the low alcohol beer to be microbiologically stable the aim was to have no microbial counts after pasteurization.
- In table 1 we can see that there is a significant drop in microbial counts from the unpasteurized to the pasteurized beer, showing that pasteurization is destroying microorganisms that can contribute to instability in the beer.
- The control plates used to validate aseptic technique showed microbial counts. This could be due to environment contamination or the manipulations done by the student groups.

## Conclusions

- Even at the lowest unit of 80 PUs; the microbial counts can be reduced significantly from more than 300 to 4 CFUs/100mL.
- As PUs increase, the number of microbial counts goes down even further and stabilizes at a PU level of 120 with 1CFU/100mL.
- With 1 CFU/100L, it cannot be confirmed that the samples are stable, however the sampling technique used could be a source of the microbial contamination.

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## References

- Association , B. (2022, August 19). *Non-alcohol beer*. Non-alcohol Beer: A Review and Key considerations. <https://cdn.brewersassociation.org/wp-content/uploads/2022/08/19105124/BAtch22-Non-Alcohol-Beer-A-Review-and-Key-Considerations-201.pdf>
- White Labs. (2022, December 20). Best practices for brewing low Alcohol, Non-Alcoholic Beers part 2. <https://www.whitelabs.com/news-update-detail?id=79&type=NEWS>