

CHEMISTRY TEST METHODS & TRIALS

ENZYME FILTERABILITY

STEP BY STEP INSTRUCTIONS GUIDE

1. Labelling

For this enzyme trial, you will need the following:

- 3 x 100 mL bottles for enzyme pre-dilution
- 4 x 200 mL glass bottles (3 for enzyme-treated samples and 1 as a control)

Table 1: Labelling Instructions

100 mL Bottle	200 mL Bottle
Diluted Papain (NDB3)	Beer/wort + Papain (NDB3)
Diluted Glucanase	Beer/wort + Glucanase
Diluted Amylex 5T	Beer/wort + Amylex 5T
/	Control

2. Control Sample

Measure out 200 mL of the beer sample using a measuring cylinder and pour into the glass bottle labelled Control. Seal up the bottle and place to one side.

3. Enzyme Dilution

Follow the instructions below to prepare the required enzyme concentrations using the table provided:

1. Add the specified volume of enzyme to a 100 mL bottle (as shown in Table 2).
2. Use a measuring cylinder to measure 100 mL of deionised water. Before adding the water, use a fresh pipette tip to remove an amount equal to the volume of enzyme added (e.g., 0.5 mL or 1.5 mL).
3. Add the adjusted volume of deionised water to the bottle containing the enzyme.
4. Ensure the solution is thoroughly mixed.

Table 2: Volume of enzyme required

Enzyme	Concentration (mg/L)	Volume of Enzyme (mL)
NDB3 100TU	50	0.5
Glucanase	150	1.5
Amylex 5T	50	0.5

SCOPE



This trial aims to establish a method for investigating the causes of filtration issues encountered by brewers. By using a range of enzymes, the study seeks to identify any that improve filtration rates, thereby providing insights into the potential underlying causes of the problem. The enzymes selected for this trial target specific haze-causing components in beer, as outlined below:

- Papain (NDB3): Breaks down proteins into smaller peptides.
- Glucanase: Facilitates the endo-hydrolysis of β -glucans.
- Amylex 5T: Breaks down starch into smaller, soluble sugars.

EQUIPMENT



- Whatman Grade 1 Filter Paper, 24 cm
- Funnel
- 100 mL Measuring Cylinder
- x3 100 mL bottles
- x4 200 mL glass bottles
- Stopwatch / Timer
- Gloves

TIME

FILTER
1 - 4 hours



PREPARATION
1 hour

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4. Beer Samples

Add 200 mL of beer to the remaining labelled 200 mL glass bottles.

5. Enzyme Addition

Add 2 mL of the diluted enzyme solution to the respective sample bottle and mix well.

6. Seal & Leave

Seal all glass bottles and stand bottles in 65-70 °C water for 1 hour.

7. Filter Samples

Pour each sample through Whatman filter paper into a measuring cylinder. Use a timer to record the filtration time for each sample:

10 mL | 20 mL | 30 mL | 40 mL | 50 mL | 60 mL | 70 mL | 80 mL | 90 mL | 100 mL

8. Rate of Filtration

Create a graph using excel to demonstrate the effect each enzyme had on the rate of filtration in comparison to the control. Plot the time taken (seconds) against the amount filtered (mL). Plot all results on the same graph to aid comparison (Figure 1).

9. Conclusion

From this test, you can draw conclusions about which enzyme(s) improved filtration (i.e., if the sample with an enzyme addition filtered at a faster rate). These findings can help identify potential causes of the filtration problems.

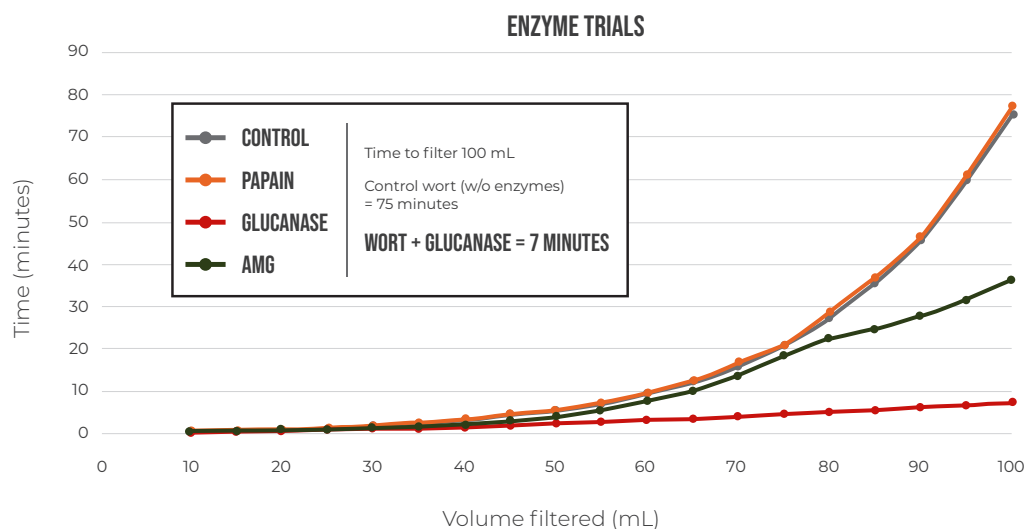


Figure 1: Comparison of filtration rate after the addition of enzymes (Papain, Glucanase or Amyloglucosidase - AMG*) compared to the control (w/o enzyme). Wort was collected after a 100 hl commercial brewing trial and filtration rate was determined immediately on site.

*AMG has been used instead of Amylex 5T in this trial.

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