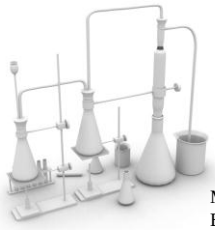
Lab 6



Garlic Concentration vs. Yeast Fermentation

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Introduction

- A yeast infection is a very common disease.
- Many home remedies exist, one of which is garlic.
- Garlic contains a compound called allicin which has antifungal properties.

(Allicin and Candida, 2010)

Question and Hypothesis

- How does concentration of garlic affect the yeast fermentation?
- If the concentration of garlic is increased, then the yeast fermentation will decrease because allicin's anti fungal properties.
  - Believed garlic may contain antifungal properties that stop the growth of Candida albicans, which causes yeast infections.

(Mendham)

Variables

- Independent Variable:
  - Concentrations of garlic (grams/100mL).
- Dependent Variables:
  - Rate of fermentation (kPa/min).
- Controls:
  - Total volume (6 mL)
  - Temperature (37°C)
  - Incubation times (yeast @ 10 min, yeast/sucrose @ 3 min, garlic @ 10 min)
  - Concentration of yeast (7g/100mL)
  - Centrifuge time (5 or 10 min)

Garlic Extraction

- Crushed garlic using a garlic press.
- Weighed out different amounts:
  - 29.447 grams, 15.000 grams, 7.5000 grams, 3.7515 grams
- Diluted in a 100mL volumetric flask.
- Centrifuged to take out supernatant liquid.
- Concentrations Made:
  - 29.447 grams/100mL, 15.000 grams/100mL, 7.5000 grams/100mL, 3.7515 grams/100mL

Setup for Controls

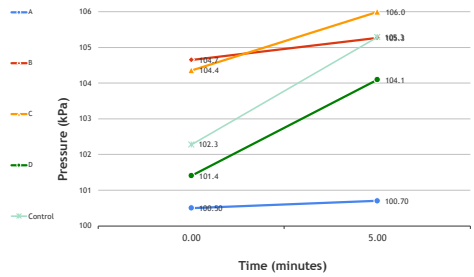
Control #	Yeast	Sucrose	DI Water	Garlic
1		X	X	
2	X		X	
3	X	X	X	
4	X	X		X

- Used a total volume of 6 mL through out the experiment.

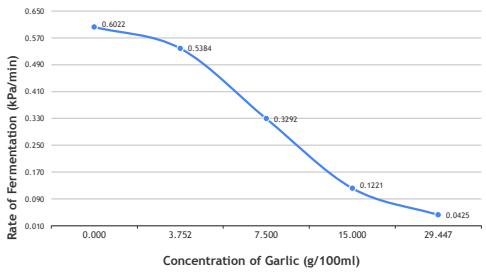
Analysis of Data

- Highest concentration (**A**) , 29.447 g/100mL, resulted in lowest rate of fermentation, 0.0425 kPa/min.
- Concentration (**B**), 15.000 g/100mL, had an average rate of 0.1221 kPa/min.
- Concentration (**C**), 7.500 g/100mL, produced an average rate of 0.3292 kPa/min.
- Lowest concentration (**D**), 3.752 g/100mL, resulted in the highest rate of fermentation, 0.5384 kPa/min.

Yeast Fermentation vs. Garlic Concentration



Average Rate of Fermentation vs. Garlic Concentration



Conclusion

- As you increase the concentration of garlic the rate of fermentation decreases.
- Allicin can inhibit enzymes in an organism by oxidation.
- Garlic would make a good home remedy used to treat yeast infections.
- Refrigerated garlic may still have allicin present after long periods of time.

Improvements

1. Increase the amount of the garlic solutions used in this experiment.
2. Use instruments that measure more accurate amount.
3. Preserved time
4. Use garlic powder
5. Smash the garlic in water

(Brodnitz and Yu. T-H)

Additional Questions

- Separate the enzyme, allicin, from garlic. Does allicin effect the rate of fermentation exclusively?
- Will increasing the time of incubation for the yeast and sucrose together cause a different response?
- Conduct tests to find out why there is an initial change in pressure.

Sources

- "Allicin and Candida." *Allicin Now*. N.p., 11 2010. Web. 1 Dec 2012. <http://www.allicinnow.com/allicin/allicin-candida/>.
- Brodnitz, M.H. Pascale, J.V., and Derslice, L.V. Flavor components of garlic extract. J. Agr. Food. Chem. 19(2):273-275, 1971
- "Enzymes." Bake Info. Baking Industry Research Trust, n.d. Web. 3 Dec 2012. <http://www.bakeinfo.co.nz/Facts/Bread-making/Bread-ingredients/Enzymes>.
- Higdon, Jane, Victoria Drake , and Larry Lawson. "Micronutrient Information Center." *Linus Pauling Institute*. Linus Pauling Institute, n.d. Web. 2 Dec 2012. <http://lpi.oregonstate.edu/infocenter/phytochemicals/garlic/
- Mendham, Trevor. "Chemistry of Allicin." Garlic Central. Garlic Central, n.d. Web. 3 Dec 2012. <http://www.garlic-central.com/allicin-chemistry.html>.
- Thrash, Agatha. "The Effect of Garlic on Candida albicans and Other Opportunistic Yeast-Like Fungi." Uchee Pines. Uchee Pines, n.d. Web. 3 Dec 2012. <http://www.ucheepines.org/index.php?p=counseling.the_effect_of_garlic_on_candida_albicans_and_other_opportuni>.
- Yu. T-H, and Wu, C-M. Stability of allicin in garlic juice. J. Food Sci. 54(4): 977-981, 1989