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| [Procedure](http://docs.google.com/procedure.html) | **Results and Discussion**  In the first ginger test, zones of inhibition were measured caused by varied concentrations of ginger over a 24 hour period. Initially, the ginger concentration was determined using percentages of ginger extract diluted with distilled water. However, it is not possible to find the true concentration of ginger extract because the fraction of ginger juice in which the extract contained the active ingredient is unknown. Furthermore, it was impossible to have the dosages of ginger and erythromycin equal because of this fact. All data was collected over a 24 hour incubation period.  **Data table 1**: Varied zones of inhibition measurements, measured form the respective chromatography disk. Averages for each concentration are shown below the data for individual samples. (measured in mm)   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | Ginger extract test 1 |  |  |  | | samples | A:100% | B:75% | C:50% | D:25% | | 1 | 0.5 | 0.5 | 0.5 | 0.5 | | 2 | 0.5 | 0.5 | 0.5 | 0.5 | | 3 | 0.5 | 0 | 0.5 | 0 | | 4 | 0.5 | 0.5 | 0 | 0 | | 5 | 0.5 | 0.5 | 0 | 0 | | 6 | 0.5 | 0.5 | 0 | 0.5 | | 7 | 0.5 | 0 | 0 | 0 | | 8 | 0.5 | 0 | 0 | 0 | | 9 | 0.5 | 0.5 | 0 | 0.5 | | 10 | 0.5 | 0.5 | 0 | 0 | | 11 | 0.5 | 0 | 0.5 | 0 | | 12 | 0.5 | 0.5 | 0 | 0 | | 13 | 0.5 | 0 | 0.5 | 0.5 | | 14 | 1 | 0.5 | 0 | 0 | | 15 | 0.5 | 0 | 0 | 0 | |  |  |  |  |  | |  | Averages |  |  |  | |  | A:100% | B:75% | C:50% | D:25% | |  | 0.533333 | 0.3 | 0.1666667 | 1.666667 |   The data for table 1 is not very accurate because the measurements only range from .5 to 1. However, as the ginger extract concentration became less, there were less and less observable zones of inhibition.  **Zones of Inhibition for ginger 100%. 75%, and 50%**  **Zones of Inhibition for ginger 25%, water and a single petridish**  **Ginger chromatography disk 100%close u**  **Statistical Analysis for Data table 1**: The statistical analysis shows the indicated 95% error using the T interval test. If the tests were to be repeated again there would be a ninety five percent chance in getting values of inhibition zones somewhere along the bar after a 24 hour period of incubation.  For 100% ginger extract  The 95% confidence T interval test shows:  The zones of inhibition produced have a 95% confidence interval of .46184 to .60484.mm This shows that the measurement for the zone of inhibition varies +/-.076mm away from the average of .53333mm  For 75% ginger extract  The 95% confidence T interval test shows:  The zones of inhibition produced have a 95% confidence interval of .15959 to .44041mm. This shows that the measurement for the zone of inhibition varies +/-.140mm away from the average of .3mm  For 50% ginger extract  The 95% confidence T interval test shows:  The zones of inhibition produced have a 95% confidence interval of .03156 to .30178mm. This shows that the measurement for zone of inhibition varies .135mm away from the average of .16666667mm  For 25% ginger extract  The 95% confidence T interval test shows:  The zones of inhibition produced have a 95% confidence interval of .03156mmto .30178.mm This shows that the measurement for zone of inhibition varies .135 away from the average of .16666667  From this statistical analysis it is reasonable to believe that the data is quite constant because each 95% confidence interval for each concentration is very small.  **Graph 1**: A graph of the average zones of inhibition produced by ginger.  From graph 1 it is clearly visible that ginger has an antibacterial effect that is pretty much constant when the concentration is varied. There is a decrease in the zone of inhibition when the concentration of ginger extract decreases.  In order to have a valid comparison of the antibacterial effects of ginger an antibiotic was used and was treated similarly as the ginger. One 400mg table of erythromycin was diluted in 100ml of distilled water to simulate excess water in the ginger extract. The diluted solution was then further diluted similar to the ginger. However, it is impossible to compare the antibacterial effects of ginger to erythromycin because the actual amount of the active ingredient in both is indeterminable.  **Table 2**: The variation in zones of inhibition produced by one erythromycin tablet diluted in 100 ml of distilled water. Averages of each concentration are below the chart of the individual samples.(measured in mm)   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | Erythromycin concentration tet 1 for 1 400 mg tablet diluted in 100ml of distilled water |  |  |  | | sample | A:100% | B:75% | C:50% | D:25% | | 1 | 10 | 12 | 9 | 8 | | 2 | 12 | 11 | 7 | 9.5 | | 3 | 13.5 | 11 | 8.5 | 7 | | 4 | 10.5 | 10 | 10 | 9.5 | | 5 | 13.5 | 12 | 9.5 | 9.5 | | 6 | 12 | 10.5 | 10 | 10 | | 7 | 9.5 | 8.5 | 5.5 | 7 | | 8 | 9.5 | 8.5 | 3.5 | 5.5 | | 9 | 14 | 8 | 10.5 | 9.5 | | 10 | 9.5 | 6 | 5.5 | 9.5 | | 11 | 14 | 6.5 | 7 | 8.5 | | 12 | 9.5 | 9.5 | 7 | 7 | | 13 | 9.5 | 8.5 | 8 | 4 | | 14 | 9.5 | 8.5 | 7.5 | 4.5 | | 15 | 8.5 | 7 | 9 | 9.5 | |  |  |  |  |  | |  | Averages |  |  |  | |  | A:100% | B:75% | C:50% | D:25% | | (mm) | 10.56 | 9.166667 | 7.90625 | 7.90625 |   **Statistical Analysis for Data table 2**: The statistical analysis shows the indicated 95% error using the T interval test. If the tests were to be repeated again there would be a ninety five percent chance in getting values of inhibition zones somewhere along the bar after a 24 hour period of incubation.  For 100% erythromycin dilution  The 95% confidence T interval test shows:  The zones of inhibition produced have a 95% confidence interval of 9.447 to 11.673. mm This shows that the measurement for the zone of inhibition varies +/-1.113 mm away from the average of 10.56mm  For 75% erythromycin dilution  The 95% confidence T interval test shows:  The zones of inhibition produced have a 95% confidence interval of 8.1166 to 10.217mm This shows that the measurement for the zone of inhibition varies +/-1.050mm away from the average of 9.16666667  For 50% erythromycin dilution  The 95% confidence T interval test shows:  The zones of inhibition produced have a 95% confidence interval of 6.7424 to 8.9243.mm This shows that the measurement for zone of inhibition varies +/-1.091mmaway from the average of 7.83333333mm  For 25% erythromycin dilution  The 95% confidence T interval test shows:  The zones of inhibition produced have a 95% confidence interval of 6.7424 to 8.9243mm. This shows that the measurement for zone of inhibition varies +/-1.091mm away from the average of 7.83333333mm  From this statistical analysis it is reasonable to believe that the data is quite constant because each 95% confidence interval for each concentration is very small.  **Picture of typical bacteria innoculated petridish for dics soaked in erythromycin dillute**  Graph2: Graph of the average zones of inhibition produced by erythromycin.  A comparative analysis was done to study the relationship between erythromycin and ginger to determine if ginger is an effective antibiotic.  **Figure 3**: Comparison of the antibacterial effects of ginger and erythromycin at same varied percentages of concentration.(measured in mm)   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | Averages by concentration |  |  |  | | subject | A:100% | B:75% | C:50% | D:25% | | ginger | 0.5333 | 0.3 | 0.1666 | 0.1666 | | erythromycin | 10.56 | 9.1666 | 7.906 | 7.906 |   **Graph3**: Comparative study of antibacterial effects of the averages of both ginger and erythromycin  The differences between the average zones of inhibition for ginger and erythromycin are so great apart that there is no visible significance of the antibacterial effects of ginger compared to erythromycin. However, you must take into account that the mass of the active ingredient in ginger is unknown.  Therefore, the experiment was repeated, this time boiling the ginger extract for 5 minutes to a fine paste, further concentrating the extract and removing excess H20. I also decided to repeat the experiment because the data for the ginger extract mainly consisted of the measurement .5mm.  **Data Table 4:** The variation in zones of inhibition produced by varying the concentrations of ginger concentrate (obtained by boiling the ginger extract for five minutes). The averages of each concentration are underneath the individual sample table.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | Ginger extract boiled |  |  |  | | ssamples | A:100% | B:75% | C:50% | D:25% | | 1 | 3 | 2.5 | 1.5 | 0.5 | | 2 | 4 | 2 | 1 | 0.5 | | 3 | 3.5 | 3 | 1.5 | 0.5 | | 4 | 3 | 2.5 | 2 | 1 | | 5 | 3 | 2 | 2 | 1 | | 6 | 3 | 2.5 | 1.5 | 5 | | 7 | 4 | 2.5 | 1.5 | 0.5 | | 8 | 3 | 2 | 1 | 1 | | 9 | 4 | 2 | 2.5 | 0.5 | | 10 | 4 | 3.5 | 2 | 0.5 | | 11 | 4 | 3 | 2 | 0.5 | | 12 | 4 | 2.5 | 1.5 | 1 | | 13 | 4 | 2 | 1.5 | 1 | | 14 | 3.5 | 2 | 1.5 | 0.5 | | 15 | 4 | 2 | 1 | 1 | |  |  |  |  |  | |  | Averages |  |  |  | |  | A:100% | B:75% | C:50% | D:25% | | (mm) | 3.6 | 2.375 | 1.6 | 0.7 |   **Statistical Analysis for Data table 4:** The statistical analysis shows the indicated 95% error using the T interval test. If the tests were to be repeated again there would be a ninety five percent chance in getting values of inhibition zones somewhere along the bar after a 24 hour period of incubation.  For 100% ginger concentrate  The 95% confidence T interval test shows:  The zones of inhibition produced have a 95% confidence interval of 3.3394mm to 3.8606mm This shows that the measurement for the zone of inhibition varies +/-.2606mm away from the average of 3.6mm  For 75% ginger concentrate  The 95% confidence T interval test shows:  The zones of inhibition produced have a 95% confidence interval of 2.1394 to 2.6606mm This shows that the measurement for the zone of inhibition varies +/-.2606mm away from the average of 2.4mm  For 50% ginger concentrate  The 95% confidence T interval test shows:  The zones of inhibition produced have a 95% confidence interval of 1.3614 to 1.8386mm. This shows that the measurement for zone of inhibition varies +/-.2386mm away from the average of 1.6mm  For 25% ginger concentrate  The 95% confidence T interval test shows:  The zones of inhibition produced have a 95% confidence interval of .55959 to .84041mmThis shows that the measurement for zone of inhibition varies +/-.140mm away from the average of .7mm  From this statistical analysis it is reasonable to believe that the data is quite constant because each 95% confidence interval for each concentration is very small.  **Graph 4:** Graph of the average inhibition zones produced by ginger at varied concentrations by percentage.  Again, it is clearly visible that ginger has anti-bacterial properties. The line produced is quite linear meaning that varying the concentration of ginger will indeed affect the zone of inhibition created.  **Data table 5**: A comparison between the average zones of inhibition for the ginger concentrate at various concentrations and the erythromycin (400 mg tablet diluted in 100ml distilled water) at various concentrations.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | Averages |  |  |  | |  | A:100% | B:75% | C:50% | D:25% | | ginger concentration | 3.6 | 2.375 | 1.6 | 0.7 | | erythromycin | 10.56 | 9.1666667 | 7.90625 | 7.90625 |   **Graph 5:** A study of the ginger concentrate at various concentrations and the erythromycin dilution at various concentrations.  Again, the difference between the averages for ginger concentrate and erythromycin is so great that with the given concentrations of erythromycin and ginger there is no comparable similarity. However, both lines are liner and somewhat parallel to each other. It leads me to believe that ginger has similar antibacterial properties as the concentration is varied and that at higher concentrations could have a comparable antibacterial effect as erythromycin.  Note, however, that the actual mass of both erythromycin and ginger couldnít be measure in this experiment, and the amount of active ingredient in the ginger extract and ginger concentrate could not be obtained to properly compare it with erythromycin. | |
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