| Extraction and Isolation of Caffeine in Teas | Project ID# |
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## Q1: Research Question/Engineering Goal

The research question of this project is, which type of tea (organic or commercial) would have the greatest caffeine recovered using extraction and purification methods?

## Q3: Data Analysis & Results

In the first part of the experiment, two trials were conducted for the extraction and isolation of caffeine in the four teas. Next the amount of caffeine extracted were converted to percentage of recovery and averaged. The Earl Grey Tea had 12% caffeine recovered. Lipton Tea had 10.5% caffeine recovered. Organic Navajo tea had 10% caffeine recovered. Decaffeinated Green Tea had 4% caffeine recovered. Using thin-layer chromatography, I measured the solvent tea samples with the use of ethyl acetate. The Retardation Factor or Rf measured were 0.5 for Earl Grey, 0.71 for Lipton, 0.75 for Navajo Tea, and 0.5 for Decaffeinated Green Tea. The measurement of Rf did not depend on the amount of caffeine in the four teas.

## Q2: Methodology/Project Design

Hypothesis: If the caffeine from one organic and two commercial teas is extracted and measured, then the commercial teas will have the highest percent caffeine recovery because of the production of it compared to the organic (native grown) Navajo tea. The independent variables of this investigation are Earl Grey tea (commercial), Lipton (commercial), Organic Navajo Tea (native grown), and Decaffeinated Green Tea (commercial). The dependent variables are the Caffeine Paper Chromatography, the Rf Value, Extraction, and percent caffeine. A Control variable will be the caffeine standard.

## Q4: Interpretation & Conclusions

The results found in this investigation provided an acceptance to the hypothesis. The commercials teas Earl Grey and Lipton tea had higher percentages of caffeine recovered. Navajo tea was the lowest of the three caffeinated teas. Compared to other experiments like Trimle's, show that Lipton tea had an 18.8% of caffeine in one bag, differing from the experiment's results of 10.5%. However, this experiment differs from Trimble's by the amount of variables. Trimble had one variable, Lipton, and this investigation utilized 3 types of caffeinated teas. Overall, organic tea is healthier for consumption with less caffeine detected in the tea. Interestingly, caffeine was extracted from decaffeinated tea, showing the caffeine was not completely extracted, yet reduced significantly.