

**Objective**

Construct a method to extract the oil from organic certified German Chamomile achieve from the Frontier Co-op from the use of Microwave.

**Problem**

Due to its low percent oil yield by mass and its physical property, German Chamomile is difficult to extract using Essen-Ex 300 microwave extraction kit.

**Assumption**

Main chemical composition for Orange Oil is D-limonene and for German Chamomile it's Azulene-7-ethyl-1,4-dimethyl. Based on the chemical structure, these two are soluble to each other (refer to Figure 1). German Chamomile has low oil yield, thus by letting it dissolve into an Orange Oil would provide more oil.

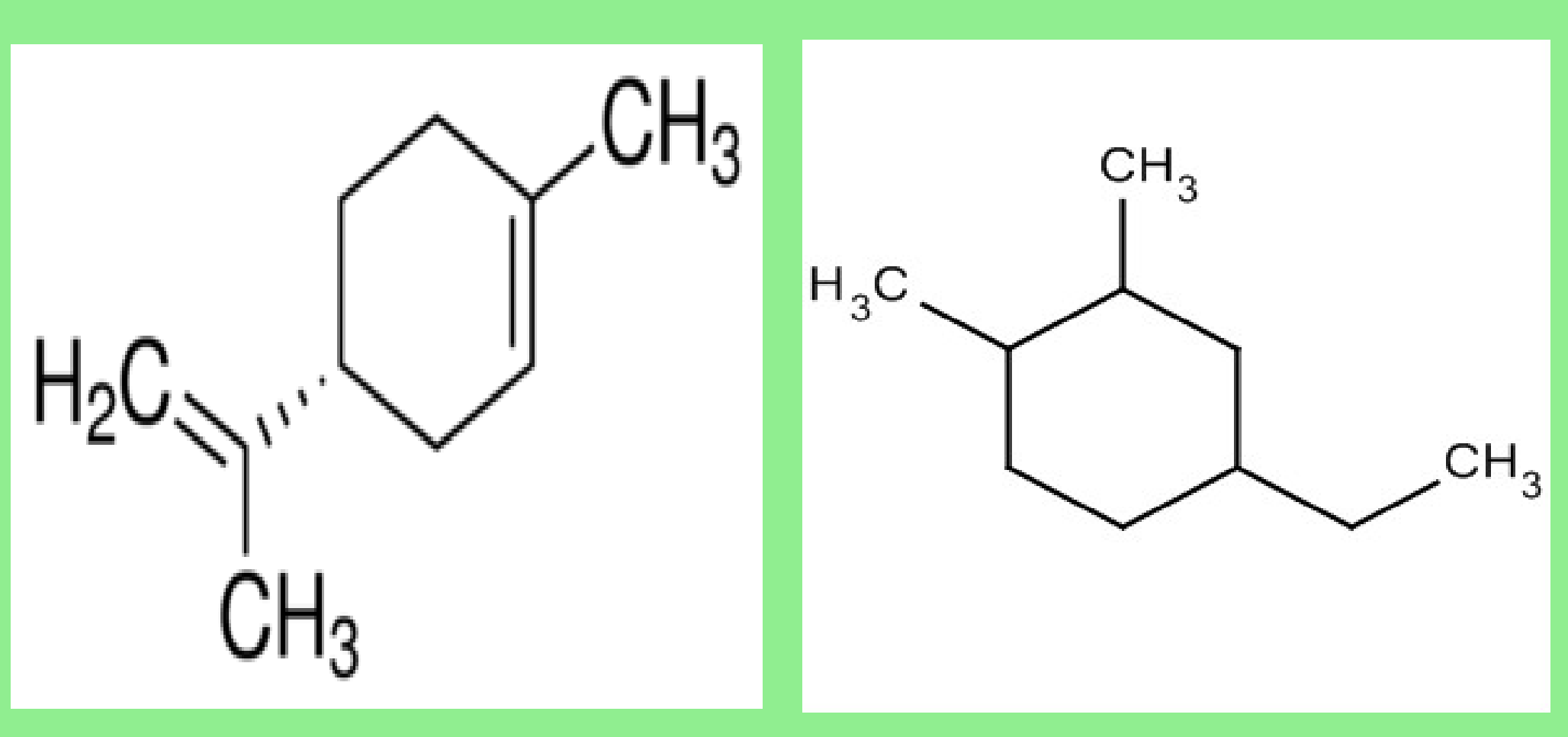


Figure 1A: D-limonene (obtained from Wikipedia)

Figure 1B: Azulene-7-ethyl-1,4-dimethyl (obtained from Wikipedia)



Figure 2A: German Chamomile provided from Frontier Co-op

Figure 2B: Grinded German Chamomile using mortar pestle.



Figure 3: Essen-EX 300 (shown above with the German Chamomile and a mug) was used prior to Microwave Extraction.

**MICROWAVE EXTRACTION OF GERMAN CHAMOMILE OIL**

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**Project Description**

**Botanical Information**

**Name:** German Chamomile  
**Percent Oil Yield by Mass:** 0.3%-1.0%  
**Density:** 0.902 g/mL  
**Solubility:** Insoluble in water

**Color of Oil:** Dark Blue due to high content of Azulene

**Usages:** German Chamomile Oil is used as a mild sedative, antispasmodic, and mild skin irritation and inflammatory treatment.

**Pre-cautions:** Oil is considered as safe, except for people who...

- 1) Have asthma
- 2) Are pregnant
- 3) Have allergic reactions

**Botanical Preparation**

100 grams of German Chamomile was grinded into a powder form using a mortar pestle (refer to Figure 2B). 40 mL of tap water was added and mix it well. At the same time, Orange peel was zested using a zester. Both German Chamomile and Orange zest were added to Essen-Ex 300 prior to the extraction (refer to Figure 3). Mug is always placed inside the microwave during the extraction to regulate the temperature.

**Microwave Extraction**

After both of orange and German chamomile are placed in the Essen-Ex 300, it was ran in the microwave with full power (1200 Watts) for 12 min and 30 seconds with 7 min cool down. Cool down time will give the vaporized oil to condense back to the liquid form. Essen-Ex 300 is extremely hot after the run thus use of oven glove is recommended.

**After the run**

From the first run of microwave extraction, lighter blue oil was obtained (refer to Figure 5)

On the second trial, using the same botanical from first trial, darker blue oil was obtained (refer to Figure 5). This darker color is an oil obtained from first trial and second trial combined. Therefore, multiple run is necessary to obtain condensed oil.

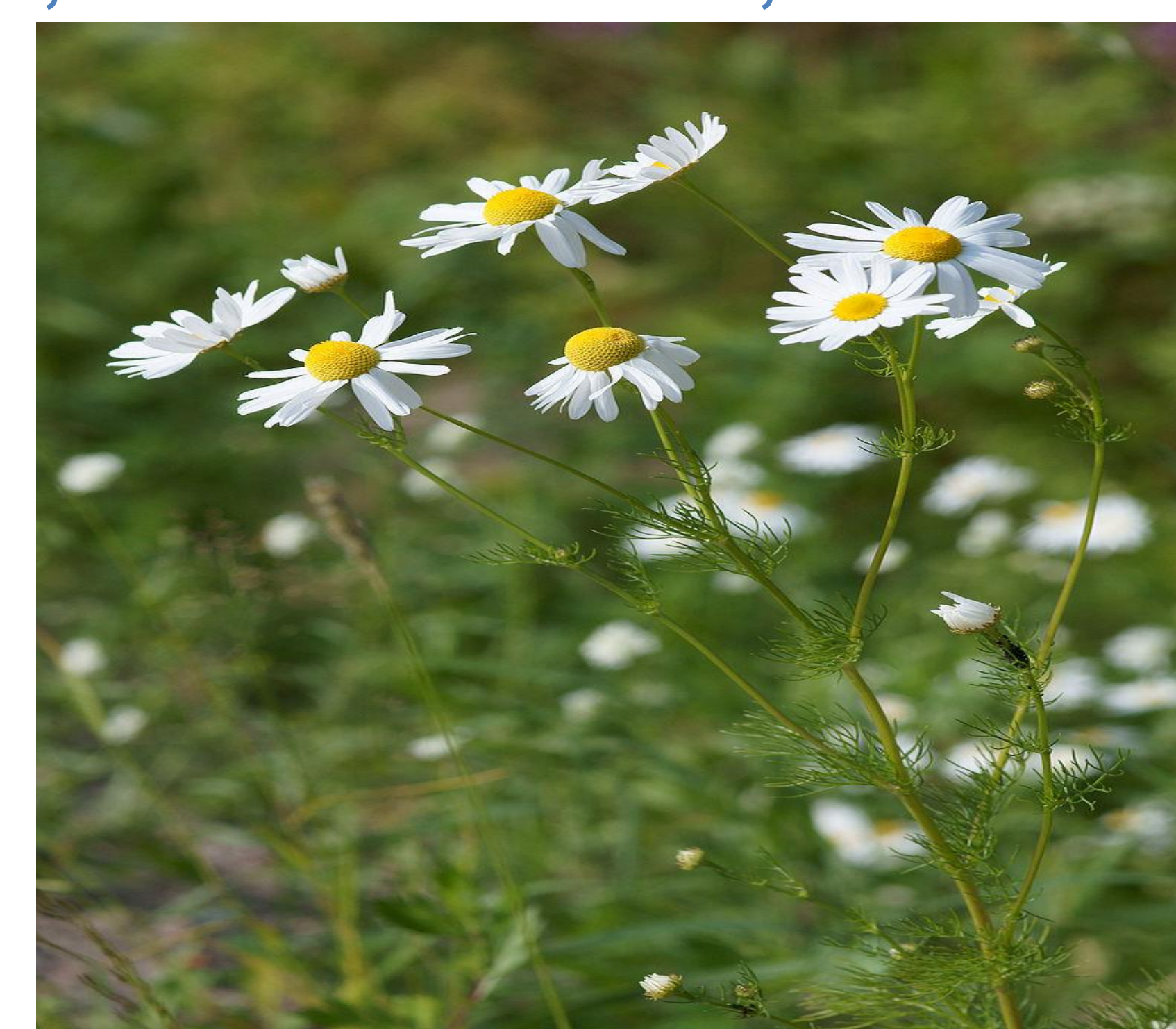


Figure 4: German Chamomile (obtained from Wikipedia)

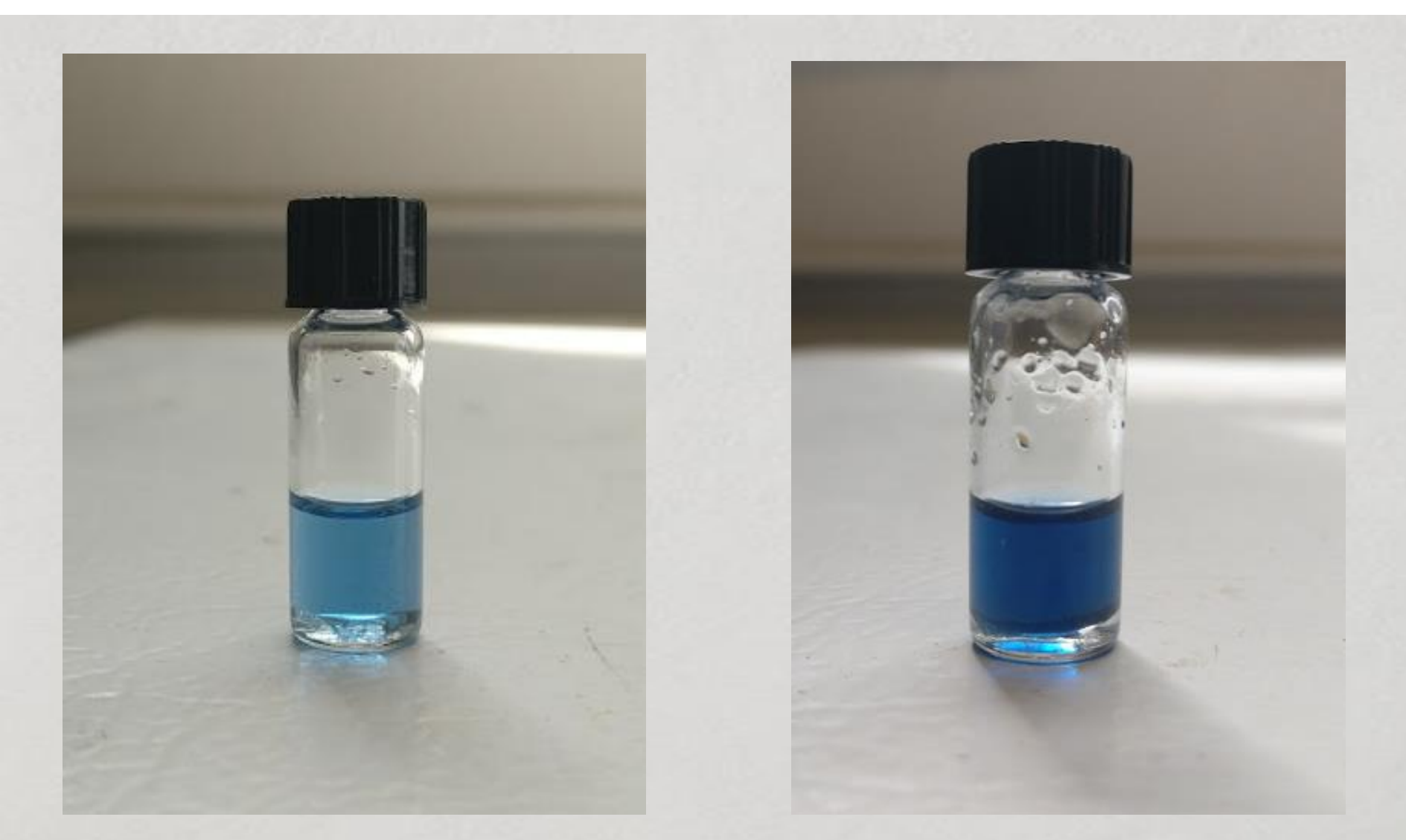


Figure 5. Oil only collected with the 1<sup>st</sup> trial on the left, Oil collected with the 2<sup>nd</sup> trial shown on the right.

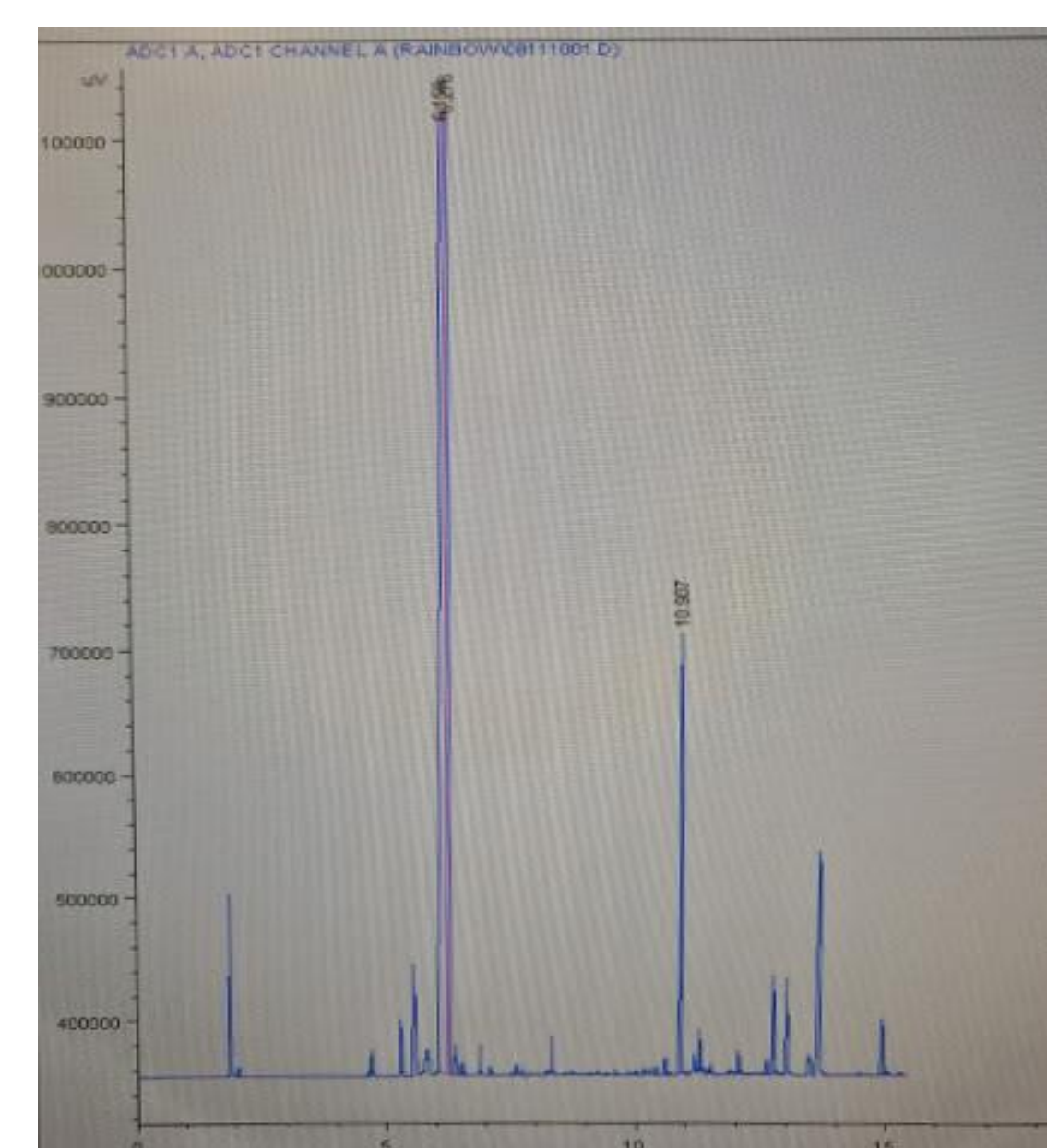


Figure 6. uV\*s vs time graph. Data obtained from GC Analysis in Johnson's Hall

**GC Analysis**

As it is shown left as Figure 6, area of the D Limonene curve is approximately 8.89e6 uV\*s and for Azulene it's approximately 0.767e6 uV\*s. Thus overall Azulene component in the collected oil is approximately 7.93%.

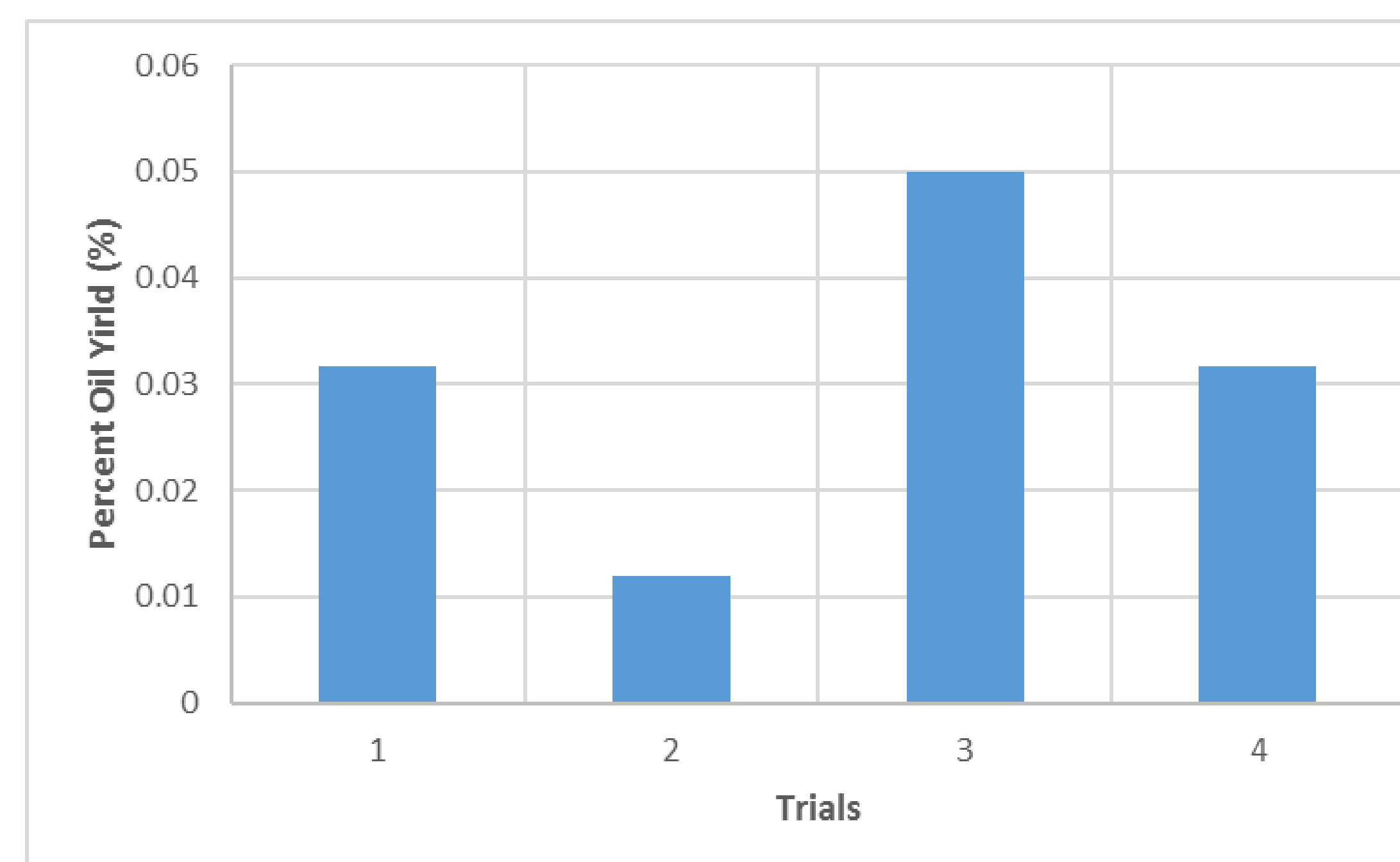


Figure 7. Oil collected with the 2<sup>nd</sup> trial on the left, Oil collected only with the 1<sup>st</sup> trial shown on the right vial

**Experimental Results**

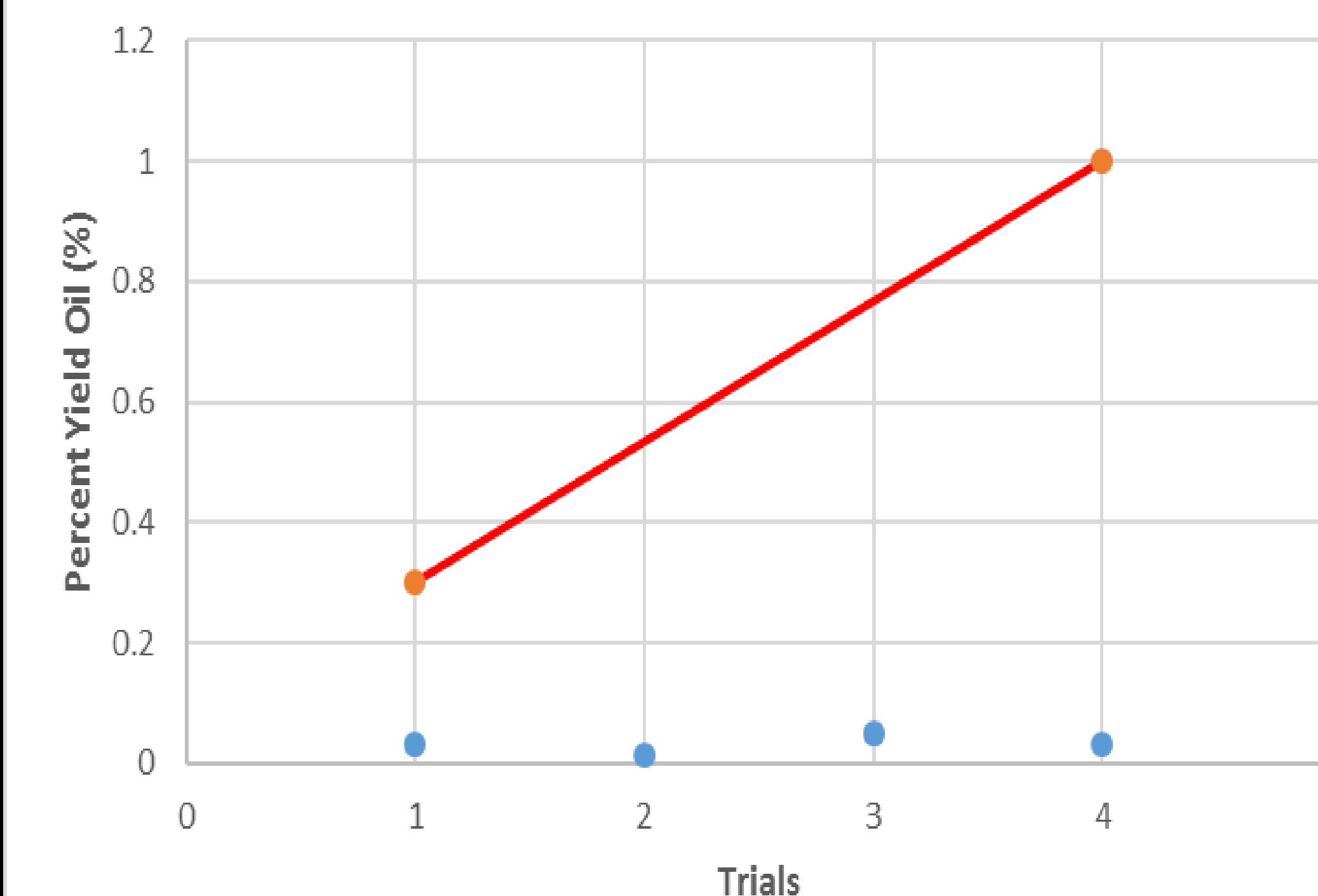


Figure 8. Comparison between theoretical percent oil yield vs experimental oil yield

**Discussion**

Based on GC analysis, the amount of German Chamomile Oil present in the collected was measured, average of approximately 0.03% from the experimental data. This oil yield percent is significantly small compared to the theoretical oil yield percentage, 0.3%-1.0%.

**Conclusion**

As a result, the amount of German Chamomile Oil achieved were significantly small amount. Although, since the method to extract oil from German Chamomile using Microwave was determined, objective was satisfied.

**Future Work**

Since the average percent oil yield by mass of oil collected was approximately 0.03%, further research need to be done to get theoretical percent oil yield of 0.3-1.0%.

**Acknowledgement**

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**Reference**

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