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Soxhlet Extraction

Experiment Number (8)

Short Report

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1. ABSTRACT

Soxhlet extraction is a solid-liquid extraction process (leaching) using the Randall modification, sometimes called the submersion method. Many Soxhlet applications are routinely used in food, feed, industrial, and environmental laboratories for the measurement of fats and oils. By this process, several aspects of the extraction process, such as solvent type, time (depending on cycle number), and temperature, are explored. In this experiment, we investigated the effect of residence time and solvent type on the extraction of oil from olive cake. We used hexane as a solvent due to the lower boiling point. We found that the maximum amount of oil that can be extracted is 18.30% which can be extracted by applying 12 cycles of extraction this is considered an optimum number of cycles and applying more cycles will just lead to consuming time without significant change in the percent was extracted.

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2. RESULT

Table 1: Data of the experiment.

Type of Solvent: Hexane					
no. of cycles	thimble's weight (g)	Olive cake weight (g)	initial weight (g)	final weight (g)	oil%
3	3.8	11.2	15	14.00	6.67
6	3.6	11.6	15.2	13.70	9.87
9	3.9	10.8	14.7	13.00	11.56
12	3.8	11.5	15.3	12.50	18.30

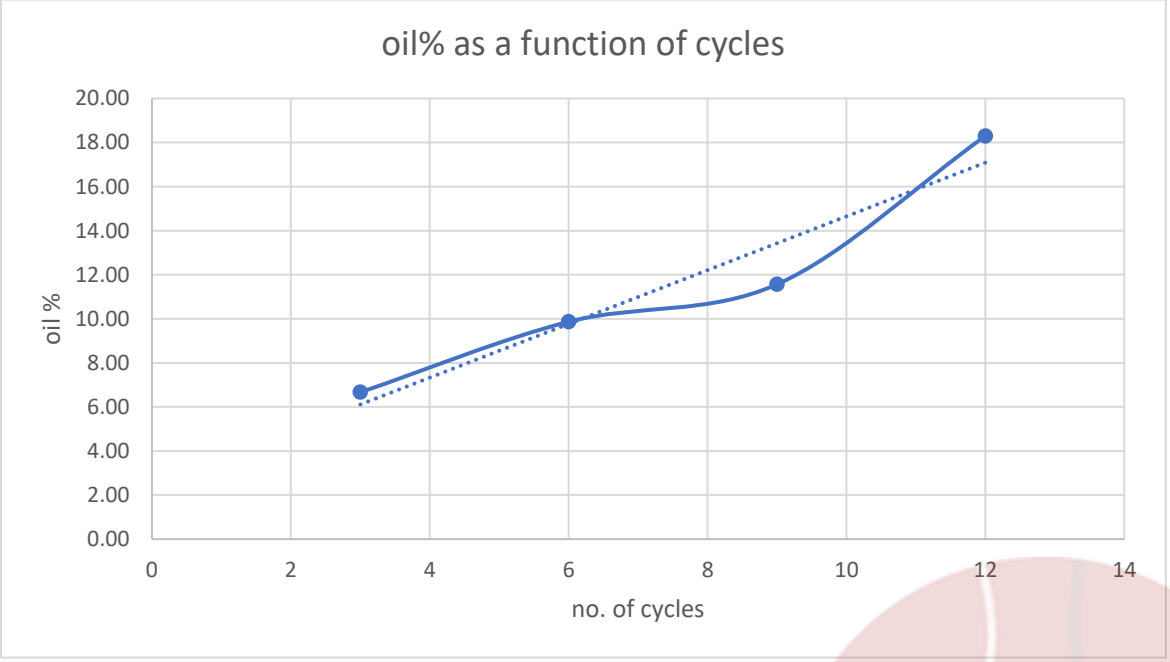

Figure 1: oil percentage vs. number of cycles.

3. DISCUSSSION

The results show a correlation between the number of cycles and the percentage of oil extracted from olive peat, as illustrated in Figure 1, a continuous increase in oil extraction is observed with an increasing number of cycles until an optimal point is reached. Beyond this optimal point, further cycles do not lead to a significant change in the percentage of oil extracted. Thus, there is no necessity to achieve an optimal number of cycles, as it would result in a waste of time. The reason for the increase in the oil percentage is that the sample took enough time for the extraction process to occur more efficiently, and the largest oil percentage was after 12 cycles with a value of 18.30%.

As shown in Table 1, the amount of oil extracted between 9 and 6 cycles is close, while between 9 and 12 there is a difference. This may be due to an imbalance in the amount of hexane, as it decreased and was not increased sufficiently. There is a possibility of inaccuracy in the results due to the inaccuracy of the scale used.

4. CONCLUSIONS

Solid liquid extraction using a Soxhlet extractor is a technique that involves repeatedly circulating the same solvent through the extractor. One cycle of the Soxhlet extraction method involves extraction following the evaporation of the solvent. The desired compound needs to be soluble in the solvent at a high temperature.

From what the result shows, it can be concluded that:

- The amount of oil extracted increases as the cycle time increases, so the oil percentage increases and extraction efficiency increases.
- The proportion of extracted oil increases to a specific value as the number of cycles increases.
- Exceeding the optimum number of cycles within this process is considered time-wasting because no more extraction will happen after that.
- The optimum number of cycles is 12, with 18.5% of oil extracted.
- Solvents with low boiling points are more suitable than those with high boiling points since they can be separated more readily and require less energy to boil.

5. REFERENCES

1. Geankoplis, Christie J., Transport Processes and Unit Operations, 3rd Edition, Prentice- Hall International, inc.
2. Welty, James, Fundamentals of Momentum, heat and, Mass transfer, 5th edition, Wiley.
3. Percentage of Oil in Oil Cake, January 2011 ResearchGate, Slovak University of Technology in Bratislava.

6. APPENDIX

6.1 Sample of calculation:

First run

Number of cycles = 3

Weight of olive cake before extraction = 11.2 g

Weight of olive cake after extraction = 10.2 g

$$\text{Oil percentage} = \frac{\text{Weight of solid before extraction} - \text{Weight of solid after extraction}}{\text{Weight of solid before e}} * 100\%$$

$$\text{Oil\%} = \frac{11.2-10.2}{11.2} * 100\% = 8.9\%$$