

EVALUATING THE HIGHEST ANTIOXIDANT ACTIVITY of *Melissa officinalis*

VARIABLES

- Independent variable:
 - Extraction conditions and solvents
- Dependent variable:
 - Antioxidant activity
- Constants:
 - Lemon Balm leaves and solvents

MATERIALS

- Reflux condenser
- Round bottom flask
- Pipettes
- 56 well plates
- Melissa officinalis* in large quantities
- Trails scope
- Graduated cylinder
- Hot plates
- Ring stands
- Cellec
- Air filter
- Methanol
- Fritted funnel
- DI water
- Parafilm
- Erlenmeyer flask
- Scale
- Microwave
- Methane
- Lab Coat
- Goggles
- Gloves
- Kek clamps
- Rotary Evaporator
- Gravity funnel
- Filter paper
- Magnetic stir bars
- Vacuum
- Oil
- Fume Hood

PROCEDURE

For our project, our group will be using five different extraction conditions:

1. 1 day at room temperature
2. 7 days at room temperature
3. 40° Celsius for four hours room temperature for 24 hours
4. 80° Celsius for two days
5. Extraction using a microwave

We will be using the following solvents in each condition:

1. Ethanol
2. Water (DI)
3. Ethanol/Water in a 60:40 ratio



ABSTRACT

Our group has decided to study *Melissa officinalis*, which is commonly known as Lemon Balm. Believed to originate from Southern Europe, its herbal uses date back to over 2000 years ago and its medicinal uses were written in Theophrastus' *Historia Plantarum* (written in 300 B.C.). Previous research states that *Melissa officinalis* has been shown to have high antioxidant properties, which is believed to treat free-radicals. Free-radicals are molecules with an unequal number of electrons and are formed when oxygen interacts with other molecules. These radicals search for other molecules to remove their electrons and create other free-radicals. Free-radicals may also arise naturally in your body due to factors like stress, too much alcohol, and smoking. This ultimately leads to cellular death, aging, and other diseases, as these free-radicals cause damage. Antioxidants like Vitamin C and Vitamin E are needed to give an electron to these free radicals, in order to neutralize them.



QUESTION

What extraction method and solvent will give the most antioxidant properties out of *Melissa officinalis*?

HYPOTHESIS

If we know that conditions and solvents affect the amount of antioxidant properties in a specific plant then we predict we will get the most antioxidant properties out of *Melissa officinalis* with a ethanol extraction at 40 °C for 4 hours and then room temperature for 24 hours.



INTRODUCTION

Lemon Balm (*Melissa officinalis*) is a mint plant that originated from Southern Europe. This plant is most commonly used as an essential oil and also consumed as tea. Previous studies have revealed that ethanolic extracts of Lemon Balm have antiproliferative properties, which was shown to prevent colon and erectile cancer. Along with this antiproliferative property, another study showed lemon balm to be an antibacterial, which can prevent infection. Given this background information about Lemon Balm, we will further study the antioxidant properties of Lemon Balm in different extraction conditions. If we know that conditions and solvents affect the antioxidant activity in a specific plant, then we predict we will obtain the most antioxidant activity of *Melissa officinalis* with an ethanolic extraction at 40 °C for 4 hours, room temperature for 24 hours. The antioxidant properties of lemon balm will be assessed using DPPH stable free radical and Gallic Acid (Polyphenol) assays.



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