



Lesson plan #3

# Propolis benefits-tincture preparation

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Messini / Greece

## TITLE

**Propolis benefits-tincture preparation**

## TARGET GROUP

Students age 15-18 years old

## DURATION

2 school hours (90 min) 1 hour the theoretically part-1hour the practical part

1 school hour (45min) after a month to complete the tincture procedure

## EXPECTED LEARNING RESULTS (AIM AND OBJECTIVES)

Students will be able to

- mention the use of propolis for beehives
- recognize the benefits of propolis to human health and be aware of side effects
- present the variety of forms that propolis is available
- prepare a propolis tincture

## STUDENT KNOWLEDGE AND PERCEPTIONS

Bees biology, bees' products, use of pc, presentation skills, follow chemical laboratory instructions

## CLASSROOM ORGANIZATION AND REQUIRED INFRASTRUCTURE

The lesson takes place the first hour at pc lab and the second at chemistry lab. Students are organized in working teams of 3 members. Internet connection is required.



## MATERIALS & SOFTWARE

Internet browser, Gmail account, Google docs (Word, power point) frozen Propolis (from a beekeeper), Ethyl Alcohol 95° (distilling-drinking), Airtight jar, Coffee filter, Syringe, Small vials a Weighing scale and Volumetric tube

## DESCRIPTION (BRIEF DESCRIPTION OF THE TEACHING PROCESS)

### First Teaching Hour

The lesson begins with an inquiry-based discussion prompted by the questions “What do you think propolis is and how do bees use it?”. Students share their initial ideas, which are recorded on the board and discussed collectively. They are then divided into groups of three and receive the worksheets. With the support of a teacher-led presentation, students are introduced to the basic concepts related to propolis, including its definition, chemical composition, how bees produce it, and how it is used inside the hive. Using a provided online resource on propolis, students complete Activity 1 of the first worksheet.

Next, each group conducts online research to identify the benefits and possible side effects of propolis for humans and records their findings in Activity 2 of the worksheet. In Activity 3, each group focuses on one category from the table and investigates the different forms in which propolis is available. The results of the research are added to a shared class presentation. The first teaching hour concludes with group presentations and discussion of the findings.

### Second Teaching Hour

The second teaching hour takes place in the chemistry laboratory and focuses on hands-on experimentation. Students work in their groups at assigned workstations and receive worksheets with detailed instructions for preparing propolis tincture. The teacher provides the necessary materials and guides the process, offering support and clarifications when needed. Students clean the raw propolis with cold water and prepare the propolis–ethyl alcohol mixture. The mixture is then set aside for one month to allow the alcohol to extract the active substances from the propolis. At this stage, the preparation process is completed.

### One Month Later

After the extraction period is completed, students continue the final steps of the process. Using a syringe, the upper part of the mixture is carefully collected and filtered through a coffee filter. The filtered tincture is then transferred into small bottles. At this point, the propolis tincture is ready for use, allowing students to observe and understand the full preparation process and reflect on the scientific principles involved in extraction and filtration.

## WORKSHEET #1

**Group:** .....

Students' Names: 1).....

2) .....

3).....

### Instructions

After the presentation on propolis and with the help of the attached text about Propolis, complete Activity 1.

#### Activity 1 – Propolis and Bees

Complete the table below.

Trees that produce resins	Additional materials needed for bees to produce propolis	Uses of propolis by bees inside the hive

#### Activity 2 – Benefits and Side Effects of Propolis for Humans

Search online with your group and record information about the benefits and possible side effects of propolis for humans.

Health	Beauty	Nutrition	Possible Side Effects

#### Activity 3 – Forms of Propolis

Search online with your group for the different forms in which propolis is available (e.g. tincture, spray, capsules, ointment).

Each group will focus on one category from the table in Activity 2.

Add the results of your research to the shared class presentation.

## **Extra reading material**

### **Propolis**

The word propolis comes from the Greek words pro (in front of) and polis (city), meaning “in front of the city.” Its etymology reflects the idea of protection and defense, which is directly connected to its role in the society of bees.

#### **What is propolis?**

Propolis is a sticky substance produced by bees in order to fortify and protect their hives. It is considered a structural material of the hive and is used to protect and disinfect its interior, where bee larvae develop and where honey and pollen are stored. Bees also use propolis to seal cracks and holes, protecting the hive from enemies and adverse weather conditions.

Bees produce propolis from plant resins secreted by certain trees. Among the most common plants used are poplar, birch, willow, oak, beech, horse chestnut, and various coniferous trees. The final processing of propolis includes the addition of wax, pollen, enzymes, and other substances, giving it its final sticky form.

#### **Chemical composition of propolis**

The final characteristics of propolis depend on several factors, such as geographical location, season, bee genetics, and plant species. As a result, propolis products may have different properties and colors.

The color of propolis ranges from yellow-green and orange-green to brown and dark brown. Both its color and composition depend on the plant of origin, the proportion of wax and pollen mixed in, and the length of time propolis remains in the hive.

Propolis has a highly complex chemical composition, with more than 300 different chemical compounds identified. It mainly consists of resins (50%) and wax (30%), while smaller amounts of essential oils, pollen, vitamins, trace elements, and other substances are also present. At temperatures below 15°C, propolis becomes hard and brittle, while at temperatures above 30°C, it softens and becomes sticky.

#### **Beneficial properties and uses of propolis**

Propolis is a natural substance with significant health benefits for the human body. It is widely used for its anti-inflammatory properties and for the treatment of burns and ulcers. These effects are mainly attributed to its flavonoid content, which also helps strengthen the immune system and enhance the body's natural defenses.

Propolis is commonly used to help protect against:

- seasonal flu,
- tonsillitis,
- viral infections and inflammations in general.

In addition, propolis contributes to:

- oral health, by inhibiting the growth of pathogenic microorganisms,
- protection against various infections,
- digestive health.

It also promotes cell regeneration, which is why it is widely used in cosmetic and beauty products.

Propolis is available in many forms, including creams and ointments, toothpaste and mouthwashes, lozenges and chewing gums, syrups, tinctures, oral and nasal sprays, tablets, soaps and shampoos, as well as various beauty and dietary products.

### **Dosage and proper use of propolis**

The appropriate dosage of propolis depends on several factors, such as age, health profile, and product composition. It is important to remember that natural products are not always completely safe, and correct dosage plays a crucial role. Users should always follow the instructions on product labels and consult a doctor or pharmacist before use.

### **Possible side effects of propolis**

Despite its benefits, propolis may be associated with certain side effects, such as:

- allergic reactions to honey or bee products,
- possible increased bleeding due to its effect on blood clotting,
- potential worsening of asthma,
- possible complications during pregnancy and breastfeeding,
- possible interactions with certain medications, such as propranolol and some antidepressants (e.g. SSRIs).



## WORKSHEET #2

**Group:** .....

Students' Names: 1).....  
2) .....  
3).....

### **Materials Needed**

- Propolis (previously placed in the freezer)
- Ethyl alcohol 95° (food-grade / drinkable)
- Airtight glass jar
- Coffee filter
- Syringe
- Small dark glass bottles
- Scale
- Graduated cylinder

### **Procedure**

1. Clean the propolis by spreading it on a large surface and removing any foreign materials.
2. Place the propolis in a container with cold water, stir, and remove any floating impurities. Repeat the process if necessary.
3. Allow the propolis to dry completely.
4. To prepare a 10% propolis tincture, use 1 part propolis and 9 parts ethyl alcohol. Refer to the table provided by your teacher for proportions.
5. Propolis tinctures are commonly prepared at concentrations up to 30%. Do not exceed 30%, as higher concentrations may result in less effective or incomplete extraction.
6. Calculate the ratio you will use.
7. Place the mixture in an airtight jar and store it in a dark place, away from moisture.
8. During the first week, shake the mixture once or twice per day.
9. Leave the mixture for at least one month to allow the alcohol to extract the active substances from the propolis (extraction process).



tincture	100% alcohol			propolis
	grams	or	ml	grams
10%	900		1146	100
20%	800		1019	200
30%	700		892	300
tincture	70% alcohol			propolis
	grams	or	ml	grams
10%	900		1073	100
20%	800		953	200
30%	700		834	300

*img src: University of Minnesota*

### **One Month Later**

1. Using a syringe, carefully collect the upper part of the mixture, avoiding the sediment at the bottom.
2. Filter the liquid through a coffee filter, fill the small bottles, and the propolis tincture is ready for use.
3. Label all bottles clearly, indicating the composition, propolis concentration (10%, 20%, or 30%), and the date.

### **⚠ Important Notice**

- The liquid solution should be clear, free of particles, and dark brown or slightly reddish in color.
- It must be stored in clean, dark, airtight bottles.