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Extraction of essential oil of Epazote *(chenopodium ambrosioides L.)* for its use in the control of agricultural pests by the steam extraction method at laboratory level

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Abstract

Essential oils are compounds composed of various volatile organic substances that are produced and stored in different parts of the plant such as leaves, stem and roots. These oils are highly volatile, oily, less density than water, soluble in difernetes organic solvents such as alcohol, ether and carbon tetrachloride and others, are responsible for the aroma, color and taste of plants. Due to their volatility, these oils can be extracted by different methods such as: maceration, steam extraction, extraction with solvents, extraction by supercritical fluids among other methods. Because of their properties, essential oils have been used in a therapeutic way, but they are also used in perfumery, in food and there is now a great interest in its effectiveness in agriculture as a natural form for non-aggressive pest control for environment. According to the described, the present article presents the process to carry out the extraction of the essential oil of epazote, which is intended to be a further alternative for the control of pests in the agriculture

Extraction, Pests, Agriculture, Environment

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1. Introduction

Aromatic plants have been used for a long time for different purposes. In many places in our country the essential oils of these plants are used as a culinary ingredient, to cure diseases and ailments. The essential oils of these plants are found in seeds, leaves, stems, glands, sacs, or in various places on the plant. Most plants contain 0.01 to 10% essential oil content. The average amount found in most aromatic plants is around 1 to 2%. The quality and intensity of essential oils vary due to: variety of the plant, cultivation conditions, time of harvest, part harvested from the plant, handling of plant material, extraction methods, others. For this study it was decided to extract the essential oil from the epazote Chenopodium ambrosioides L.) Using the steam extraction method.

Justification

According to the vision of FAO, the management of agriculture is based on knowledge based on the best available scientific information, and adaptation at the community and national levels to ensure local relevance and its applicability.

An alternative to try to stop the affectation towards the agricultural sector, by the indiscriminate use of products of synthetic origin, is the natural control based on active ingredients extracted from plants for the manufacture of organic products friendly to the environment and that do not cause damage to human beings. This is how the use of the epazote plant (Chenopodium ambrosioides L.) is intended to extract the active substances that constitute it and offer an alternative to prepare an organic product.

This plant has long been used as a means to combat certain parasites in humans and is believed to have a beneficial effect on the control of pests in plants.

1.2 Problem

Currently there is a large amount of chemical products harmful to the environment so there is great concern throughout the world to reduce the effects of pesticide contamination and promote sustainable agricultural development through more friendly products from different aromatic plants.

1.3 Hypotesis

The extract of epazote represents a sustainable alternative for the control of agricultural pests.

1.4 Objectives

1.4.1 General objectives

Extract the essential oil of the epazote (chenopodium ambrosioides, L.) through the steam extraction method at the laboratory level as an alternative for the control of agricultural pests.

1.4.2 Specific objectives

- To know the effectiveness of the steam extraction method with water in comparison with the use of alcohol as well as the combination of alcohol and water.
- Know the physicochemical properties of the epazote extract obtained.

2. Theoretical framework

The epazote is an aromatic plant, perennial, more or less pubescent, with the stem usually prostrate, strong odor, of approximately 40 cm of height; the leaves are oblong-lanceolate and serrated, between 4 cm long and 1 cm wide, with small green flowers in dense terminal panicles, each with five sepals; the persistent chalice surrounds the fruit, and the seeds are black and not larger than 0.8 mm in length (Gómez, 2007 quoting Gadano et al., 2006, Jamali et al., 2006).

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Epazote essential oil is a colorless, or slightly yellow, liquid with a non-viscous consistency, with a pungent and pungent odor resembling camphor, with a slightly bitter taste that is extracted from the whole plant, especially from seeds and fruits. steam distillation. (Gómez 2007 citing Gadano et al., 2006).

Essential oils are volatile liquid fractions, usually distilled by steam stripping. Essential oils are generally complex mixtures of up to more than 100 components that can be: Low molecular weight aliphatic compounds (alkanes, alcohols, aldehydes, ketones, esters and acids), Monoterpenes, Sesquiterpenes and Phenylpropanes (Martinez, 2003).

For the most part, essential oils have a pleasant smell, although there are some with a relatively unpleasant smell, such as those of garlic and onion, which contain sulfur compounds (Martínez, 2003). According to Peredo, Palou & López (2009), there are the following methods of extracting essential oils:

Distillation by steam drag: Consists of separating by heating, in stills or other vessels, volatile substances called essences, relatively immiscible with water, of other more fixed, then cooling their vapor to reduce them back to liquid. Maceration in fat. It is an extraction method with hot fat based on immersing the flower petals in the fat, and then extracting the essences with alcohol. This method has been completely replaced by extraction with organic solvents.

Extraction with volatile solvents It is based on dissolving its volatile oils, due to differences in boiling point between the essential oil and the solvent. It has the advantage of working at low temperatures, so it does not cause thermodestruction or chemical alteration of the oil components. It also offers the possibility of separating organic solvents easily to penetrate the plant material and individual components and / or present in small quantities.

It is used on a laboratory scale because at an industrial scale it is expensive due to the commercial value of solvents. Doped essences are obtained with other substances (sometimes toxic). Extraction by Supercritical Fluids (EFS): it consists of using chemical substances under special conditions of temperature and pressure. The plant material is cut into small pieces, liquefied and packed in a stainless steel chamber through which a supercritical liquid is circulated. The essential oils are solubilized and the supercritical liquid that acts as an extractor solvent is eliminated by progressive decompression until reaching the pressure and room temperature. Finally you get a pure oil.

3. Research Methodology

The present investigation was carried out by means of the laboratory study by means of the steam extraction method, since it represents a simple and low cost method.

3.1 Type of Research

An experimental research was carried out, performing different runs to observe the extraction time, the volume obtained as well as pH, color and smell.

3.2 Theoretical methods

The method used to extract essential oil from epazote was extraction by steam drag which consisted of heating the solvent for its passage to the vapor phase and contacting the dry sample and obtaining the essential oil by the condensation of said steam, and Afterwards, separation by decantation was used to obtain the essential oil of epazote.

3.4 Development methodology

– Research on the properties of the epazote and the extraction methods of the essential oil of aromatic plants.

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- Collection of the epazote sample necessary for the extraction process of the essential oil.
- Pre-drying the epazote sample to begin the extraction process.
- Execution of the extraction according to the vapor-trapping method at the laboratory level.
- Obtaining data about the physicochemical properties of extracted oil

4. Results

Different volumes of essential oil were extracted using water, alcohol and the combination thereof as solvents. When using only alcohol, a small amount of 5ml extract was obtained. When using the combination of water and alcohol the amount of product extracted increased compared to the previous one up to 8 ml.

When using only water, a greater quantity of final product was obtained, being 12 ml, since the vaporization of the water lasted longer and this allowed to collect a greater quantity of final product that contained a part of water and another of essential oil. Table 1 With respect to physicochemical properties the extractions were of a light yellow color to an intense yellow, with a strong and pungent odor with different pH data as shown in Table 1.

Run	Time	Solvent	Volume obtained from extract	PH
1	1 hour and 30 min	Alcohol	5 ml	8.7
2	3 hours 10 min	Alcohol + water	8 ml	7.8
3	2 hours and 30 minutes	Water	12 ml	7.4
4	2 hours and 30 minutes	Water	11 ml	7.4
5	2 hours and 31 min	Water	12 ml	7.5

Table 1 Record of obtained data
Source. Own, 2017

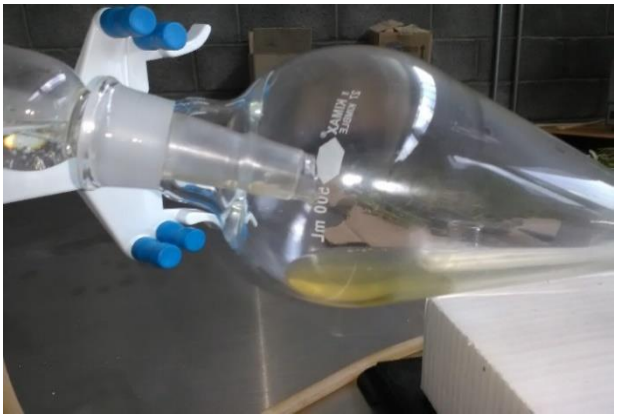

Figure 1 Extract obtained
Source: Own, 2017

5. Conclusios

So far, different volumes of product derived from extraction have been obtained, however it is necessary to continue working on the chosen technique to obtain a purer product that leads us to the evaluation in different agricultural pests.

It is also necessary to test the extraction by means of other techniques to verify its effectiveness, since the technique of steam drag is very slow and there are low yields.

6. References

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Annexes

Figure 2 Drying the simple
Source: Own, 2017

Figure 3 Extraction process
Source: Own, 2017