



## Phytochemical study of the plant *Foeniculum vulgare* Mill

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### ABSTRACT

Phytochemical tests conducted in this study on the 3 parts of the plant *Foeniculum vulgare* Mill (fennel) (stem, roots, seeds) have identified the different families of chemical compounds existing in the plant. The tests reveal the presence of Flavonoids, Tannins, Coumarines, Saponins, Stérols, essential oil and absence of Anthocyanes and Alkaloids.

**Keywords:** *Foeniculum vulgare* Mill, phytochemical studies, essential oil, Tannins, Quinones, Alkaloids, Saponins

### INTRODUCTION

Bitter fennel (*Foeniculum vulgare* Mill. var. *vulgare*. Apiaceae) is a perennial hemicryptophyte, common in the Mediterranean basin and known since antiquity as a medicinal and aromatic herb. The fruit of bitter fennel is commonly used as a natural remedy against digestive disorders. Bitter fennel is also used to flavor foods, liqueurs and in the perfumery industry [1].

### MATERIALS AND METHODS

The plant studied was harvested in February 2010 in the region Nedroma located at an altitude of 450 m and 65 km north of Tlemcen (Algeria).

The three plant parts (roots, stems and seeds) are dried and finely ground using a coffee grinder to allow a good extraction of plant constituents, then stored in glass vials protected from light.

The researches of organic compounds are performed on different extracts prepared from different parts of the plant.

During the phytochemical examination, three solvents of different polarity (water, diethyl ether, ethanol) are used for the extraction of different families of chemical compounds.

The extraction method involves projecting the sample of the plant in small quantities in one of the extraction solvents. The mixture is then heated to boiling, which can extract all the principles of the plant.

### **1. Polyphenolic substances**

For assays of tannins, flavonoids and anthocyanins, we prepared a 5% of extract.

#### **1.1. Tannins**

5 ml of extractare added to 1 ml aqueous solution of FeCl<sub>3</sub> to 1%. A dark blue color, black or green indicates the presence of tannin or gallic catechism.

To make the differentiation between tannins we used Stiasny reagent (10 ml 40% formalin and 5 ml concentrated HCl):

30 ml infused were added to 15 ml reagent Stiasny. Heated in a water bath at 90 ° C / 15 min.

- Obtaining a precipitate indicates the presence of tannin catechism.

- The precipitate filtered and saturated with sodium acetate and 1 ml of 1% FeCl<sub>3</sub>. A blue-black staining indicates the presence of gallic tannin [2].

#### **1.2. Flavonoids**

2 ml of extractare added to 2 ml of hydrochloric alcohol and 0.2 g of powdered magnesium. Orange or red coloration indicates the presence of flavonoids [2, 3].

#### **1.3. Anthocyanins**

2 ml of extractare added to 2 ml of 2 N HCl The appearance of a pink-red turns blue-violet by the addition of ammonia indicates the presence of anthocyanins[2, 3].

#### **1.4. Anthracene free: quinine**

2 ml of extract are added to NH<sub>4</sub>OH diluted by half. A red color indicates the presence of quinones[2].

#### **1.5. Coumarins**

1 g of plant powder is placed in a tube in the presence of a few drops of distilled water. The tube is covered with paper soaked in NaOH is diluted and boiled. Yellow fluorescence indicates the presence of coumarins after examination under ultra-violet [4].

### **2. Alkaloids**

Maceration for 24 hours, 2 g of plant powder with a mixture of 50 ml H<sub>2</sub>SO<sub>4</sub> diluted to half. The mixture filtered and rinsed with water to obtain 50 ml of filtrate.

Then we took two test tubes in which we introduced 1 ml of macerated. We added to tube 1: 5 drops of reagent and Mayer in tube 2: 5 drops of reagent Wagner. The presence of turbidity or precipitate after 15 minutes indicates the presence of alkaloids [2].

### **3. Steroids**

#### **3.1. Saponins**

In a test tube containing about 5 ml of extract, a drop of sodium bicarbonate solution was added. The test tube was shaken vigorously and left for 3 minutes. Formation of froth indicates the presence of saponins[2].

### 3.2. StérolsandTerpènoïdes

Liebermann-Burchard's test

2 mg of dry extract was dissolved in acetic anhydride, heated to boiling, cooled and then 1 ml of concentrated sulphuric acid was added along the sides of the test tube. Formation of green colour indicates the presence of steroids[2].

## RESULTS AND DISCUSSION

These reactions are generally simple identity, quick to implement, performed mostly in test tubes, they appear either mowing staining or precipitation, which can give an idea, according to the intensity of the result, the concentration of certain constituents. The results obtained from different organs of fennel are represented respectively in the following tables.

**Tables 01: Phytochemical test results obtained from the seeds of fennel.**

Exhaustion with Family of compounds	Ethanol	Water	Ether	Results Final
Saponin		++		Présence
Flavonoids	+++			
Tannins	++	++		
Sterols and Stéroïdes	-		+	
Coumarins	+++			
Volatile oils			+++	None
Anthracénosides	-			
Anthocyanosides	-			
Alkaloids	-		-	

**Tables 02: Phytochemical test results obtained from the stems of fennel.**

Exhaustion with Family of compounds	ethanol	water	Ether	Results Final
Saponosides		+		Présence
Flavonoïdes	+			
Tanins	+	+++	-	
Stérol et Stéroïdes	+		+	
Coumarines	++			
Huiles volatiles			++	None
Alcaloïdes	-		-	
Anthracénosides	-			
Anthocyanosides	-			

**Table 03: Phytochemical test results obtained from the roots of fennel.**

Exhaustion with Family of compounds	Ethanol	Water	Ether	Results Final
Saponosides		++		Presence
Stérol et Stéroïdes	-		+	
Huiles volatiles			+	
Anthracénosides	-			None
Anthocyanosides	-			
Coumarines	-			
Flavonoïdes	-			
Tanins	-	-		
Alcaloïdes			-	

The purpose of these tests is to characterize the major families of chemical compounds co-existing in different parts of the plant studied. Indeed, the method of detection of these different families is a precipitation reaction or staining reagents. These reactions result in the appearance of turbidity, flocculation or a color change that tells us about the nature of these families.

The experimental results mentioned in the previous three tables summarizing the phytochemical examination show that the saponins, steroids, sterols and volatile oils are present in all plant parts, in varying quantities. The roots and seeds are rich insaponins from the stems.

The seeds are rich involatile oils from stems and roots. This result is consistent with the data of Paris M. & al (1981)[5 ] on the fennel, as well as the results of Lamarti A& al (1996) [6 ]who found that the root part accumulates less fuel than the aerial part of the plant.

There is evidence that flavonoids and coumarins are present in significant quantities in the seeds, relative to the rods, by cons absent in roots.

The presence of flavonoids and coumarins in the plant is confirmed by data from Witchl& al (1999)[7 ], while the results of Harborne JB & al. (1971) [8 ]; Ghodsi MB & al (1976) [9 ]; Kunzemann J. & al, (1977)[10 ]; Fathy M. & al (2002) [11 ] confirm the presence of flavonoids in fruits of fennel.

The presence of tannins in the stems and seeds, average amount is confirmed by a positive reaction with ferric chloride solution giving a dark blue color in the stem (gallic tannins) and dark green in the seeds (tannins catechists).By cons they are absent in roots.

Finally it was noted the total absence of alkaloids, anthracénosides, anthocyanins studied in all parts of fennel.

## CONCLUSION

This phytochemical study based on laboratory tests, which allowed us to characterize the family of chemical compounds that exist in our plant. Indeed, there is evidence that coumarins, flavonoids and essential oils are present in significant quantities in the plant.

According to Moulins SY, 1991[12] and Karnick, 1994[13], the beneficial effect of fennel on infantile colic may be explained by the presence of the essential oil which is rich in anethole.

The presence of tannins, which have antibacterial activity and diarrhea in the plant explains the traditional use that is actually to treat diarrhea.

The diuretic effect of the root of fennel can be attributed to its high saponin that is used as a stimulant diuretic. While the richness of these seeds in flavonoids and coumarins may explain their effects and ophthalmologic antispasmodic.

These families of compounds may be responsible for the discovery of therapeutic agents. In this context the implementation techniques of extraction, purification, separation and recrystallization and possible identification will enable the discovery of active principles.

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