

## PRELIMINARY PHYTOCHEMICAL SCREENING FROM DIFFERENT EXTRACTS OF SOLANUM NIGRUM PLANT GROWING IN SOUTH OF ALGERIA

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### ABSTRACT

Bioactive substances are responsible for therapeutic properties of the plant in folk medicine. They have actions in the body that may promote good health. They are being studied in the prevention of disease. The present investigation is focused on screening of bioactive substances present in the various parts (leaves, stems, and grains) of *Solanum nigrum*. Qualitative tests for the presence of phytochemicals in different extracts using solvents with different polarity such as methanol, chloroform, petroleum ether and aqueous extracts. Phytochemical investigation indicated the presence of various groups of compounds including alkaloids, flavonoids, tannins, coumarins, sterols and triterpenoids, saponins. *Solanum nigrum* L. acts an important role in traditional medicine and represent natural source of bioactive compounds.

**Keywords:** *Solanum nigrum*; bioactive substances; preliminary screening; polar solvent; non polar solvent.

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## 1. INTRODUCTION

The world is witnessing in recent years, a growing interest in medicinal plants, which are a natural source of remedy and which are used since ancient times in traditional medicine [1, 2]. *Solanum nigrum* L. has been selected as there were not so many studies about it previously in Algeria. It is widely used in the traditional treatment folk, it is one of the largest and the most variable group of species in the genus *Solanum*, commonly known as Makoi or black nightshade and Black Berried too. This plant is native to Eurasia, and introduced later in America, Australia and South Africa; is an annual herbaceous plant usually grows as a weed in moist habitats in different kinds of soils, including dry, stony, shallow, or deep soils [3]. Phytochemicals are responsible for pharmacological properties of the plant [4, 5]. the purpose of this study is to identify the chemical content of the different parts of the plant from different extracts polarity.

## 2. MATERIALS AND METHODS

### 2.1. Preparation of plant material

The three parts (leave, stems and grains) of *Solanum nigrum* L. were collected in October 2017 from Debila (EL Oued). This plant was identified by the Boutanist Halis Youssef (Biology Department, University of El Oued, Algeria). They were cleaned from insects, coarse parts and gravel. Then, they were divided into small parts to facilitate drying. They were stirred twice a day without exposure to the sun for a long time. After drying step, all parts were crushing separately into powder to prevent it from being rotten [6,7].

### 2. 2. Preparation of Extracts

3gms of each powder (leaves, stems and grains) were macerated separately in flasks with 50 ml of each solvent (Ethanol, Distilled water, Chloroform, Petroleum ether). These flasks were allowed to stand for 2 hours and filtered using Watmann No.1 filter paper. The filtrates obtained were used for the screening of secondary metabolites following standard procedures with some modifications [8-11].

### 2. 3. Phytochemical analysis

#### Tests for Alkaloids

**Mayer's test:** 1ml of each extract was added with a few drops of Mayer's reagent (5g of KI

and 1.36g of  $\text{HgCl}_2$  were dissolved in 100 ml of Distilled water). Formation of yellowish white color precipitate is a sign of the presence of alkaloids.

**Wagner's test:** 1ml of each extract was mixed with equal volumes of Wagner's reagent (2g of KI and 1.27g of  $\text{I}_2$  were dissolved in 100 ml of Distilled water). Formation of red brown precipitate indicates the presence of alkaloids.

**$\text{FeCl}_3$  test:** 1ml of each extract was added to a few drops of ferric chloride solution. Deposition of yellow precipitate indicates the presence of alkaloids.

#### **Tests for Flavonoids:**

**Shinoda's test:** 1ml of each extract was added to a little of magnesium and a few drops of concentration chlorohydrate acid were carefully along the walls of the tube. Appearance of red color indicates the presence of flavonoids.

**NaOH test:** 1ml of each extract was put in test tube and added to sodium hydroxide solution. The change of the color of extract to yellow indicates the presence of flavonoids.

#### **Tests for Tannins:**

0.5 ml of each extract was mixed with 1 ml of Distilled water then treated with few drops of  $\text{FeCl}_3$ . Formation of green precipitate indicates the presence of tannins.

#### **Test for Coumarins:**

2 ml of each extract was taken in separate tubes added to 3 ml sodium hydroxide solution NaOH (10%); the appearance of yellow color indicates the presence of coumarins.

#### **Test for sterols and triterpenoids:**

**Salkowski test:** 1 ml of each extract was added to 5ml of chloroform. 1ml of concentrate  $\text{H}_2\text{SO}_4$  was added to the mixture carefully along the walls of the tube. The formation of scarlet red color in the lower layer indicates the presence of sterols.

**Liebermann-Burchard test:** 1 ml of each extract was added to a few drops of acetic anhydride solution, and a few drops of concentrate  $\text{H}_2\text{SO}_4$  were added carefully along the walls of the test tube. Formation of red brown ring indicates the presence of triterpenoids. The appearance of green color indicates the presence of sterols.

#### **Test for Saponins**

5ml of each extract is taken in a test tube and shaken vigorously to obtain a stable froth. To

this frothing solution, 5-6 drops of oil was added. Formation of an emulsion indicates the presence of saponins.

### 3. RESULTS AND DISCUSSION

Preliminary phytochemical screening test results are shown in the tables below: One of the essential aims of a phytochemical test is to detect the different families of secondary metabolites existing in the studied part of the plant by qualitative characterization reactions [13]. Qualitative phytochemistry based on color reactions or precipitation by specific chemical reagents performed on the extracts [14].

#### 3.1. Extracts of leaves

The Table 1 shows test results on preliminary phytochemical screening of leaves extracts of *Solanum nigrum L.*, the analysis revealed the presence of flavonoids, sterols in all extracts, alkaloids and coumarins are present in ethanol and distilled water extract, tanins are absent only in petroleum ether extract, saponins are present only in chloroform extract and triterpanoids are absent in all extracts.

**Table 1.** Preliminary Phytochemical Results of leaves

Extracts		Ethanol extract	Distilled water extract	Chloroform extract	Petroleum ether extract
Phytochemical test					
Tests for Flavonoids	Mayer's test	+	+	-	+
	Wagner's test	++	-	+	+++
	FeCl <sub>3</sub> test	+	-	-	++
Tests for Alkaloids	Shinoda's test	-	++	-	-

		NaOH test	+	+	-	-
<b>Tests for Tannins</b>			+++	+	+	-
<b>Test for Coumarins</b>			+	+	-	-
<b>Test for Sterols and Triterpenoids</b>	Sterols	Salkowski Test	+++	+	-	+
	Sterols	Liebermann-Burchard test	+	-	+	+
	<b>Triterpenoids</b>		-	-	-	-
<b>Test for Saponins</b>			-	-	+++	-

(-) absent, (+) present, (++) medium present, (+++) strongly present.

### 3.2. Extracts of stems

The Table 2 displays the results of phytochemical analysis of stems extracts of *Solanum nigrum L.* which consists the presence of flavanoids in all the extracts except distilled water extract, the absence of alkaloids only in petroleum ether extract. Further the presence of tanins in ethanol and chloroform extract, the presence of coumarins in ethanol and distilled water extracts, sterols appeared in all extract, they are absent in chloroform extract, saponins are strongly present in chloroform extract and triterpanoids are just present in ethanol extract.

**Table2.** Preliminary Phytochemical Results of stems

Extracts		Ethanol extract	Distilled water extract	Chloroform extract	Petroleum Ether extract	
Phytochemical test						
Tests for Flavonoids	Mayer's test	+	-	-	-	
	Wagner's test	-	-	+	+	
	FeCl <sub>3</sub> test	-	-	-	-	
Tests for Alkaloids	Shinoda's test	-	-	-	-	
	NaOH test	+	++	+	-	
Tests for Tannins		+	-	+	-	
Test for Coumarins		+	+++	-	-	
Test for Sterols and Triterpenoids	Sterols	Salkowski Test	+	+	-	-
	Sterols	Liebermann-Burchard test	+	-	-	+
	Triterpenoids		+	-	-	-
Test for Saponins		-	-	+++	-	

(-) absent, (+) present, (++) medium present, (+++) strongly present.

### 3.3. Extracts of grains

Preliminary phytochemical results of grains extracts of *Solanum nigrum L.* Wich are represented on Table 3 shows the presence of flavanoids in all extracts, the absence of

alkaloids only in petroleum ether extract. Furthermore coumarins and tanins are just in ethanol and distilled water extracts, the sterols are absent just in distilled water extract, triterpanoids are present in ethanol and petroleum ether extract, saponins are disappeared in all extracts except the chloroform extract wich are strongly present.

**Table3.** Preliminary Phytochemical Results of grains

Extracts		Ethanol extract	Distilled water extract	Chloroform extract	Petroleum ether extract	
Phytochemical test						
Tests for Flavonoids	Mayer's test	++	++	-	-	
	Wagner's test	-	-	+++	+	
	FeCl <sub>3</sub> test	-	-	+	-	
Tests for Alkaloids	Shinoda's test	+	++	-	-	
	NaOH test	++	+	+++	-	
Tests for Tannins		++	++	-	-	
Test for Coumarins		++	++	-	-	
Test for Sterols and Triterpenoids	Sterols	Salkowski Test	+++	-	-	-
	Sterols	Liebermann -Burchard test	+++	-	+	++
	Triterpenoids		+++	-	-	++
Test for Saponins		-	-	+++	-	

(-) absent, (+) present, (++) medium present, (+++) strongly present.

The results of the phytochemical analysis carried out on the different solvents of different parts of *Solanum nigrum L.* They showed the presence of certain active compounds; alkaloids, flavonoids, terpenes, tannins, saponins, coumarins and sterols. These results are consistent with the literature [1, 15]. The various results in the above refer to selective solvents and may be due to the interaction of the phyto constituents with the solvent system and natural such as polarity. In this study *Solanum nigrum L.* contains different bioactive substances which have different pharmacological properties and which protect the plant against damage, hence *Solanum nigrum L.* plays a significant role as medicinal agent and natural source of active compounds for developed therapeutic section.

#### 4. CONCLUSION

Phytochemicals analysis results revealed that certain parts of *Solanum nigrum L.* gave a positive test for a presence or negative test for absence of secondary metabolites which includes alkaloids, saponins, tannins, Coumarins, Terpenoids, Flavonoids. Moreover, the chosen solvent system and the method for extraction may affect the quality and quantity of phytochemicals in the plant extracts, based on the results of the qualitative detection of parts of *Solanum nigrum L.*

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#### 6. REFERENCES

1. Djaafar, Z. and O.M. Ridha. Phytochemical study of selected medicinal plant, *Solanum Nigrum*, the Algerian Desert. International Letters of Chemistry, Physics and Astronomy, 2014, 1, 25-30.
2. Hostettmann, K., et al. Phytochemistry of plants used in traditional medicine, 1995.
3. Kiran, K.R., M. Rani, and A. Pal. Reclaiming degraded land in India through the cultivation of medicinal plants. Bot Res Int, 2009, 2, 174-181.



4. Savithramma, N., R. Linga, and G. Bhumi. Phytochemical screening of *Thespesia populnea* (L.) Soland and *Tridax procumbens* L. J. Chem. Pharm. Res, 2011, 3(5), 28-34.
5. Savithramma, N., L. Rao, and B. Prabha. Phytochemical studies of *Dysophylla myosuroides* (Roth.) Benth. In. Wall. and *Talinum cuneifolium* (Vahl.) Willd. Research Journal of Phytochemistry, 2011, 5(3), 163-169.
6. haykal , M.S., Omar .Abd alrazzaq ,O. Medicinal and aromatic plants, their chemicals, their production, and their benefits., in the knowledge facility in Alexandria (Egypt), 1993.
7. Ibrahim Saad, C. floral plants, Beirut, Lebanon: Dar al-Fikr al-Arabi, 1994, 462- 465.
8. Kokate, C., A. Purohit, and S. Gokhale. Pharmacognosy, Nirali Prakashan. Thirty, 2005, 201.
9. Evans, W. Trease and Evans pharmagnosy, WB Saunders Company Ltd, 2002.
10. Kokate, C., et al. Practical Pharmacognosy, Nirali prakashan, Pune, 1995.
11. De, S., Y. Dey, and A. Ghosh. Phytochemical investigation and chromatographic evaluation of the different extracts of tuber of *Amorphaphallus paeoniifolius* (Araceae). Int J Pharm Biol Res, 2010, 1(5), 150-7.
12. Archana, P., et al. Preliminary phytochemical screening from leaf and seed extracts of *Senna alata* L. Roxb-an ethno medicinal plant, Int. J. Pharm. Biol. Res., 2012, 3, 82-89.
13. Haoulia, A. Tests phytochimiques, dosage et recherche d'effet hémolytique des polyphénols totaux extraits de la partie aérienne d'*Ammoïdes verticillata*, 2015.
14. Behar, O., A. Khellaf, and K. Mohammedi. A review of studies on central receiver solar thermal power plants. Renewable and sustainable energy reviews, 2013, 23, 12-39.
15. Boruah, M., et al., Preparation and characterization of *Jatropha curcas* oil based alkyd resin suitable for surface coating. Progress in Organic Coatings. 2012, 74(3), 596-602.

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