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Phytochemical study of acetone solvent extract of *Coriander sativum*

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Abstract

Coriander, scientifically named as *Coriander sativum* is a commonly used spice in cooked foods and also is an important medicinal herb. It is also known as “Dhanya” in Pakistan. Coriander contains different secondary metabolites (phytochemicals) which are very significant in coriander defense mechanisms and gives the stimulant, carminative, laxative, diuretic and antipyretic characteristics to coriander. Therefore it is a valuable herb which is being majorly used in pharmaceutical industries worldwide due to its medicinal properties. Thus it has become an important drug to treat allergies, vomiting, cough, pain, hay fever, diabetes, urethritis, cystitis, cancer, cardiovascular, gastrointestinal, urinary tract and respiratory disorders. Considering the emerging applications of *Coriander Sativum* in the field of medicine; the aim of the study was to determine the presence of different phytochemicals and their concentration in acetone extract of coriander for its physical and morphological evaluation. Phytochemical study was carried out on dried coriander seeds obtained from a local market. In this study, acetone solvent extract was used for phytochemical screening of coriander and different tests were performed on this extract. This study was carried out in a biochemistry laboratory of Lahore, Pakistan, in November, 2018. The results of this analysis indicated that flavonoids (NaOH Test) were present in very high concentration, tannins (Ferric Solution Test), quinines (HCI Test), terpenoids (Salkowski Test) and cardiac glycosides (Killer killiani test) were present in low concentration in extract, whereas alkaloids (Wagner’s Test), phenols (FeCl₂ Test), phlobatannins (Precipitate Test) and carbohydrates (Molisch’s Test) were found to be present in least concentrations. Absence of oxalates (Ethanoic Acid Glacial Test), saponins (Foam test) and proteins (Ninhydrin Test) was observed in acetone extract. Due to the presence of these secondary metabolites, coriander stands as a prospective herb for anticancer, antibacterial, antiviral and antifungal therapy.

Keywords: *Coriander sativum*, acetone solvent, phytochemical analysis, secondary metabolites, medical herb

Introduction

The scientific name of coriander is *Coriandrum sativum*. It belongs to the family of Apiaceae. It has originated from Mediterranean regions and now commercially cultivated in Asia, Europe and Africa (Ahmed *et al.*, 2018) [1]. Its plant grows up to 50 cm tall. Its leaves vary in shape from broad to slender, soft and feathery (Kumar *et al.*, 2014) [4]. It is normally cultivated in summer or winter as an annual herb (Patel and Vakilwala, 2016) [5]. In Pakistani native language, it is known as “Dhanya”. Different regions have different native names of coriander as Arab parsley, cilantrillo, cilantro, Mexican parsley, Chinese parsley, and Yuen sai (Pathak *et al.*, 2011) [6]. It is a very miraculous medical herb and commonly used as a spice (Ahmed *et al.*, 2018) [1]. *C. sativum* also contains fatty oils and essential oils. Dried and ripe fruits of coriander have essential oil weight varying from 0.03% to 2.6%. The weight of essential oil content of ripe and dried fruits of *C. sativum* vary between 0.03% and 2.6% whereas fatty oil content of fruit varies from 9.9% to 27.7%. The volatile oil content is about 8% (Ahmed *et al.*, 2018) [1]. It is used as a flavoring agent in home cooked food and also a food preserver (Shrivastava, 2017) [7].

All parts of coriander are edible but its fresh leaves seeds are used to garnish food. It is a major ingredient of Pakistani cuisine. Various species of coriander contain nutritional constituents as water, carbohydrates, protein, fat, sodium, calcium, iron, phosphorus, vitamin A and food energy. It also contains phytochemical constituents as tannins, flavonoids, saponins, alkaloids, sterol, terpenoids, and carbohydrates (Patel and Vakilwala, 2016) [5].

Besides the nutritional value, it has lots of benefits as an herbal medicine. It is a source of various drugs in local Pakistani pharmacology. Its fruit is an aphrodisiac stimulant, diuretic, laxative, antipyretic, stomachic and treats vomiting, indigestion, urethritis, urinary tract infections, rash, cystitis, sore throat, urticarial, cough, hay fever, diabetes, amoebic dysentery,

dizziness, allergies, biliousness and bronchitis (Ahmed *et al.*, 2018; Pathak *et al.*, 2011) ^[1, 6]. Juice of fresh coriander leaves is helpful in overcoming the deficiencies of iron and vitamin A (Bhat *et al.*, 2014) ^[2]. Its higher quantity can cause narcotic effect (Singh *et al.*, 2015) ^[8].

“Phyto” is actually a Greek word used for plants. Phytochemicals are non-nutritive chemicals of plant which play a major role in plant defense mechanism. Phytochemical analysis shows that antimicrobial plants have various bioactive secondary metabolites like alkaloids, terpenes, tannins, saponins and flavonoids. Flavonoids and alkaloids have anticancer, antibacterial and antiviral. Other secondary metabolites are phenolic and polyphenolic compounds. It has been reported that these plant-derived chemical products act as disease control agents (Kumar *et al.*, 2014) ^[4]. They have no toxic effects for humans and environment. The present report provides the study of phytochemical screening of dry powdered coriander.

Materials and Methods

Collection of Plant Material

Dried coriander seeds were taken from a local market of Lahore, Punjab, Pakistan.

Preparation of Plant Extract

Seeds of *Coriandrum sativum* were taken and grinded to make powder in a mortar and pestle. This powder was dried completely to remove moisture. Then 10g of *Coriandrum sativum* powder was weighed and mixed with 50 ml of acetone in a beaker and covered it with an aluminium foil. This mixture was put in several Eppendorf and centrifuged at 200 rpm for 20 minutes. After centrifugation the supernatant was collected in a separate falcon tube. This supernatant was filtered using a filter paper to remove any impurities. Then the tests were performed using this sample.

Materials

Various materials like Wagner’s reagent, Molisch reagent, conc. H₂SO₄ sulfuric acid, glacial acetic acid, ferric chloride solution, 20% sodium hydroxide, 5% ferric chloride, 1% aqueous hydrochloric acid HCl, ninhydrin solution, acetic anhydride, 10% alcoholic ferric chloride, conc. HCL, ethanoic acid glacial, chloroform were used in the study.

Phytochemical Screening

The phytochemical tests were performed for alkaloids, oxalates, tannins, quinones, saponins, cardiac glycosides, terpenoids, phlobatannins, carbohydrates, and proteins (Ugochukwu, *et al.*, 2013). All these tests were performed in just one day. This phytochemical analysis was performed at the biochemistry laboratory of Kinnaird College for Women University, Lahore, Pakistan in November, 2018.

Test for Cardiac Glycosides

Killer killiani test

In a test tube, 2ml of sample extract was mixed with 2ml of glacial acetic acid. Then to this mixture a drop of solution of ferric chloride was added. 1ml of conc. H₂SO₄ was then added. After adding all the reagents, there was formation of brown ring or a greenish ring at the interface showed the presence of cardiac glycosides.

Test for Alkaloids

Wagner’s Test

3 to 5 drops of Wagner’s reagent were mixed with a sample fraction and reddish brown precipitates were formed indicated the existence of alkaloids.

Test for Oxalates

Ethanoic Acid Glacial Test

1ml of sample was mixed with few drops of the ethanoic acid glacial. There was formation of greenish black colorations that indicated the existence of oxalates.

Tests for Flavonoids

NaOH Test

1ml of sample was mixed with some drops of the 20% sodium hydroxide NaOH solution. On mixing, strong yellow color appears that becomes colorless when diluted HCl was added to it. It showed the existence of flavonoids.

Test for Phenols

FeCl₂ Test

5% aqueous ferric chloride solution was mixed with sample fraction and perceived for the development of the deep blue or the black color.

Test for Tannins

Ferric Solution Test

10% alcoholic ferric solution was mixed with 1ml of sample and perceived for the development of greenish or blue color solution.

Test for Phlobatannins

Precipitate Test

1ml of plant extract was taken in a test tube. Added 1ml of 1% of aqueous hydrochloric acid. Then, heated the prepared solution via flame/burner. Deposition of small red precipitate indicated the presence of phlobatannins.

Test for Saponins

Foam Test

1ml of plant extract was taken in a test tube. Added 6ml of water in that test tube. The prepared solution was shaken vigorously. Formation of persistent foam in tube indicated presence of saponins in the solution.

Test for Amino acids & Proteins

Ninhydrin Test

The 1ml of plant extract in a test tube. Added 2-4 drops of Ninhydrin solution in tube. Placed it in a boiling water bath for 2-3 minutes. Formation of purple color indicated presence of proteins in the solution.

Test for Quinines

HCl Test

The 1ml of plant extract was taken. Added 2ml of concentrated hydrochloric acid (conc. HCL). Formation of yellow color indicated presence of quinine.

Test for Carbohydrates

Molisch’s Test

The 1ml of plant extract was taken in a test tube. Added just a few drops of Molisch’s reagent. Then, added 1ml of concentrated sulfuric acid (conc. H₂SO₄). Allowed the solution to stand for a few minutes. Then, diluted the solution by 5ml of distilled water. Formation of red/dull violet at the interphase of two layers indicated presence of carbohydrates.

Test for Terpenoids

Salkowski Test

The 1ml of plant extract in a test tube was taken. Added 2ml chloroform in that extract. Along that, added carefully 3ml of

concentrated sulfuric acid (conc.H₂SO₄) for formation of a layer. Formation of reddish brown color indicated presence of terpenoids.

Results and Discussion

Phytochemical screening of *Coriander sativum* with acetone solvent extract

Table 1: Phytochemical screening of *Coriander sativum*

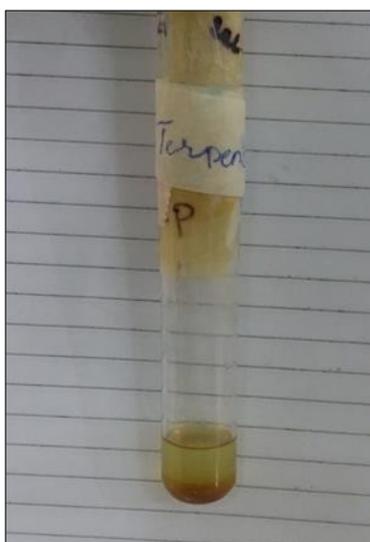
Compound test and Reagent	Acetone
Cardiac glycoside (Killer killiani test)	++
Alkaloid (Wagner's Test)	+
Oxalate (Ethanoic Acid Glacial Test)	-
Flavonoid (NaOH Test)	+++
Phenol (FeCl ₂)	+
Tannin (Ferric chloride Test)	++
Phlobatannin (Precipitate Test)	+
Saponin (Foam Test)	-
Protein (Ninhydrin Test)	-
Quinine (HCl Test)	++
Carbohydrates (Molisch's Test)	+
Terpenoids (Salkowaski Test)	++

+++ = very high concentration; ++ = high concentration; + = low concentration; - = absent

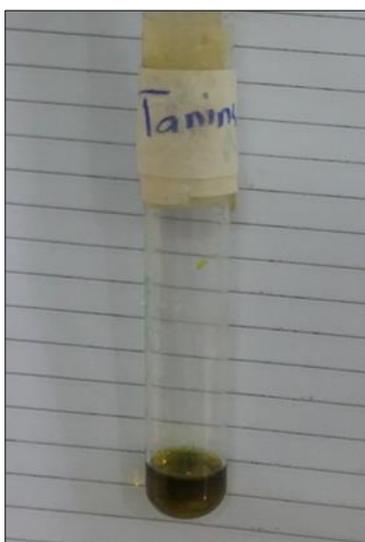
The table shows the phytochemical analysis of *Coriander sativum* with acetone as a solvent.

This preliminary phytochemical screening indicates that flavonoids are present in very high concentration in seeds, cardiac glycosides, tannins, quinines and terpenoids are less

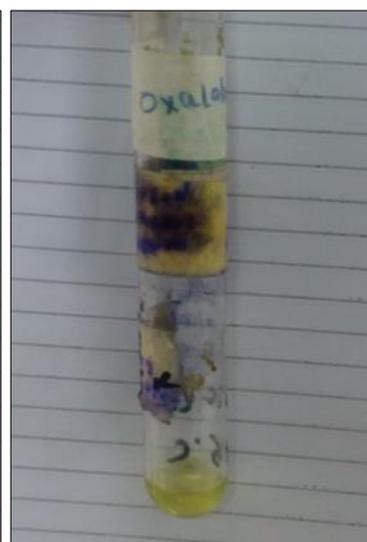
concentrated than flavonoids. Alkaloids, phenols, phlobatannins and carbohydrates are present in very low concentrations, whereas oxalates, saponins and quinines are absent at all.



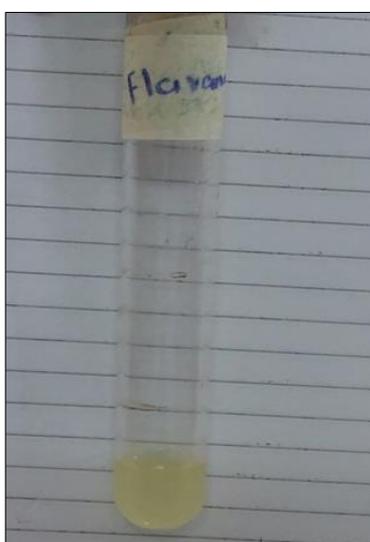
Test for Terpenes



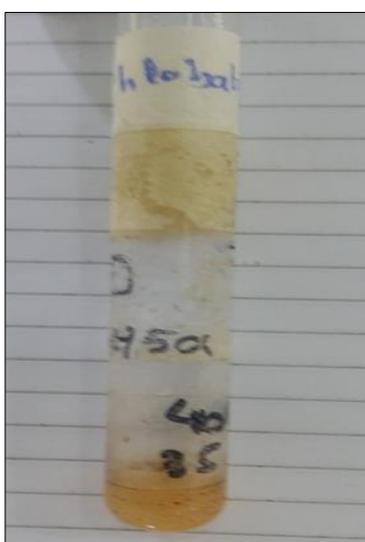
Test for Tanins



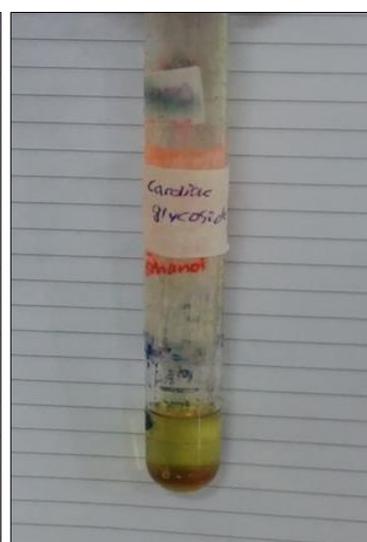
Test for Oxalates



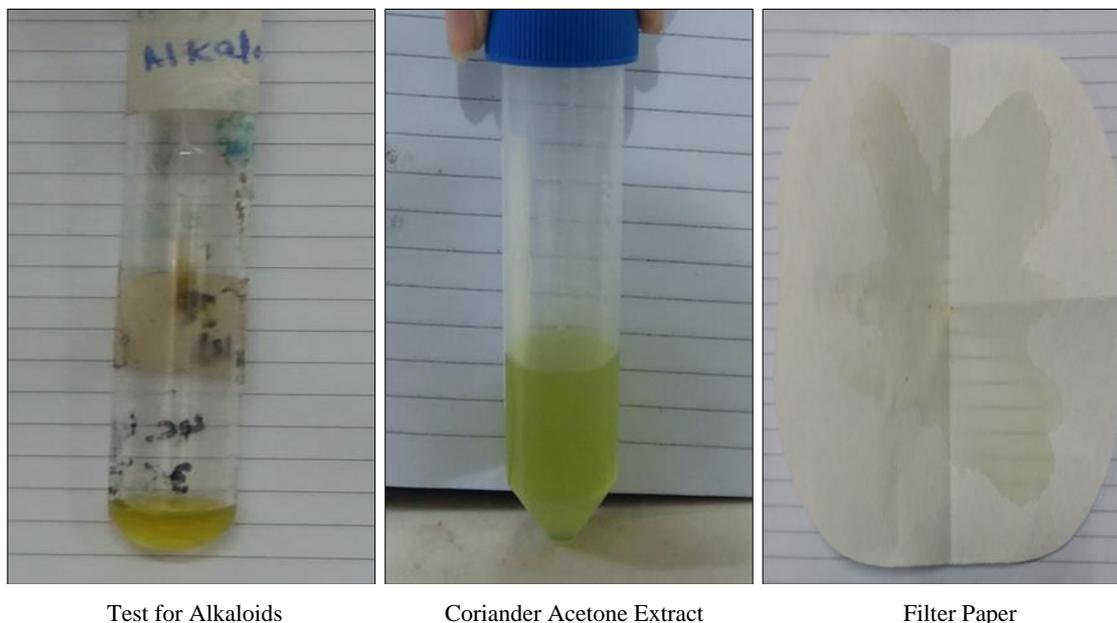
Test for Flavonoids



Test for Phlobatannins



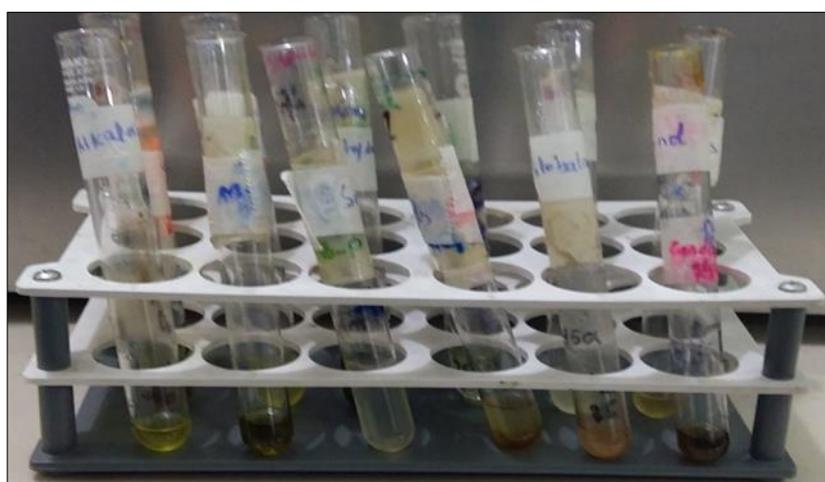
Test for Cardiac Glycosides



Test for Alkaloids

Coriander Acetone Extract

Filter Paper



All Phytochemical Tests

Fig 1

Kothandaraman *et al* (2016) [3] had worked on the phytochemical screening of *Coriander sativum* by using acetone extract and indicated the presence of flavonoids (NaOH test) and phenolic compounds. Similarly, Patel and Vakilwala (2016) [5] also performed the phytochemical screening of acetone extract of coriander and reported the presence of alkaloids, tannins (Ferric chloride test) and carbohydrates (Molisch's test).

Conclusion

The presence of these phytochemicals in *Coriander sativum* designates it as a source of antioxidants used in pharmaceutical industry as a therapeutic action. This makes coriander to be used in clinical laboratories where it prevents or delays the spoilage of food. This research will be beneficial for pharmaceutical professionals to design new drugs and it will allow researchers to go for further interesting studies in future.

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