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PHYTOCHMICAL COMPOSITION AND ANTIOXIDANT ACTIVITY OF *Coriandrum Sativum* OF BUNDELKHAND REGION

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ABSTRACT

Aim: *Coriander (Coriandrum sativum) belonging to the family of Apiaceae is an important spice crop in India which is normally cultivated in winter (rabi) season. It is native to South Europe and the Mediterranean region and is extensively grown in many countries. Seeds are used in pastry, cookies, cakes, soups, sausage, pickles, curries, in preparation of curry powder. The seeds are also used in medicine as a carminative, refrigerant, diuretic and aphrodisiac. It is used in the preparation of many household medicines to cure bed cold, seasonal fever, nausea, vomiting and stomach disorder. Therefore, the aim of the present study was to investigate the phytochemical constituents present in leaves of coriander.* ***Materials and Methods:*** *The leaves of coriander were collected from the local market, Jhansi. Leaves was washed up with tap water and finally with distilled water and were air dried at room temperature and crushed. Aqueous and methanolic extraction was carried out for the study of secondary metabolites. TLC and antioxidant activity was evaluated.* ***Results:*** *The aqueous and methanolic extraction of Coriandrum sativum leaves were screened for the presence of various phytochemicals by standard procedures. Alkaloids, reducing sugar, Flavonoids, glycosides, tannins, phenolic compounds, saponins, amino acids and proteins were detected to be present in the leaves of Coriandrum sativum. TLC of the extract shows various spots. Further, we observed antioxidant activity.* ***Conclusion:*** *The presence of phytochemicals in the extract varies with different solvents i.e aqueous and methanolic. The present study showed that Coriandrum sativum has antioxidant potential. Therefore, the present study validates the traditional use of coriander has been credited with medicinal properties.*

KEY WORDS

Antioxidant potential, Coriander, Phytochemicals, phenolic compounds.

INTRODUCTION

Herbs and spices are the most important part of human diet. In addition to boosting flavor, these are also known for their preservative and medicinal value, which forms one of the oldest sciences. It is only in recent years that modern science has started paying attention to the properties of spices. Due to the side effects of conventional medicine, the use of natural products as an alternative way in healing of various diseases has been reported in the last few decades [1].

The World Health Organization (WHO) estimated that more than 4 billion inhabitants of the world rely mainly on traditional medicine for health care needs. A major part of traditional medicine involves the use of plant extracts and their derived active principles [2]. So, there is an urgent need for the isolation and identification of

bioactive compounds from the medicinal plants [3]. India has rich in medicinal plants flora of more than 7500 species. Of these, 4635 species are used commercially on large scale. Over 50% of all modern clinical drugs are of natural product origin and plays an important role for the drug development in the pharmaceutical industry. Phytochemical compounds are found in plants that are not required for normal functioning of the body, but it has a beneficial effect on health and plays an active role in amelioration of diseases. This is due to increased awareness of the limited ability of synthetic pharmaceutical products to control major diseases and the need to discover new molecular structures from the plant kingdom [4].

In Indian and Central Asian recipes, coriander leaves are used in large quantities. The dry fruits are known as coriander seeds. The seeds have a lemony citrus flavor when crushed, due to terpenes linalool and pinene. The roasted coriander seeds are called as dhana dal used as snacks. It is the main ingredient of the two south Indian dishes includes *sambhar* and *rasam*. In Russia and Central Europe, coriander seed is an occasional ingredient in rye bread. The seeds are used in brewing of beer, particularly in Belgian wheat beers [5].

The plant *Coriandrum sativum* (L), belonging to the family Apiaceae, locally known as Dhania', is a medicinal herb. Coriander, also known as cilantro, cilantrillo, Arab parsley, Chinese parsley, Mexican parsley, Dhanya and Yuen sai [6,7]. Its use is recommended in urethritis, cystitis, urinary tract infection, urticaria, rash, burns, sore throat, vomiting, indigestion, nosebleed, cough, allergies, hay fever, dizziness and amoebic dysentery. All parts of the plant are edible, but the fresh leaves and the dried seeds are the most common parts used in cooking. In the Indian traditional medicine, coriander is used in the disorders of digestive, respiratory and urinary systems, as it has diaphoretic, diuretic, carminative and stimulant activity [8-10]. In Iranian traditional medicine, Coriander has been indicated for a number of medical problems such as dyspeptic complaints, loss of appetite, convulsion, insomnia and anxiety [9-12]. Pharmacological studies have demonstrated the Hypoglycemic [13], Hypolipidemic [14, 15] Antimutagenic [16], Antihypertensive [17], Antioxidant [18], Antimicrobial [19] and postcoital antifertility [20] activity of Coriander sativum. It has also been used in heavy metal detoxification [21]. Thus, the present study was designed to investigate phytochemical constituents, bioactive component and antioxidant activity.

MATERIALS AND METHODS:

Collection of Plant Materials

Leaves of *Coriandrum sativum* was collected in the month of January from local market of Jhansi (U.P). Firstly, the collected plant material was washed with tap water for 3-4 times and then with de-ionized water for two times. After washing, it was kept in the dark for drying at room temperature and under the constant observation to avoid any contamination. After drying, it was crushed with the help of electric grinder. Powdered sample was stored for further use.

Extraction Procedure

Extraction was done by two methods i.e. Aqueous and Methanolic extraction.

Aqueous Extract

Different concentration of dry powder i.e. 5gm and 10 gm was taken in conical flasks having equal amount (100ml) of de-ionized water. Both the flasks were heated at 90°C in water bath for 1 hour. After 1 hour flasks were taken out from water bath and kept at room temperature for cooling purpose. Then the extract was filtered with the help of filter paper and stored at 4°C.

Methanolic Extract

The powdered material was extracted with absolute 80% methanol using Soxhlet apparatus. Different concentration of plant material and solvent were taken. After filling the soxhlet apparatus with plant material and solvent it was run at 60-80°C until it gets colorless and continuously flow of water to cool down the condenser. Finally, the extract was collected in air tight bottles and stored at 4°C.

Phytochemical Analysis

Detailed phytochemical analysis was carried out for all the extracts as described elsewhere [22] with some of modifications**.**

Thin layer chromatography

Each of the extracts was to begin with, checked by thin layer chromatography (TLC) on analytical plates over silica gel-G of 0.2 mm thickness. These plates were developed in Butanol: Acetic acid: Water having a ratio of 2:1:1. The developed TLC plates were air dried followed by hot air oven for 20 minutes. Freshly prepared 0.2 % ninhydrin solution was used to detect the bands on the TLC plates.

The movement of the spots were expressed by its retention factor (Rf).

$$Rf = \frac{\text{Distance traveled by solute}}{\text{Distance traveled by solvent}}$$

Antioxidant activity

The total antioxidant capacity of the methanol extract of different parts of *Coriandrum sativum* were evaluated by the phosphomolybdenum reduction assay method according to the procedure described by Prieto *et al*. [23]. The assay is based on the reduction of Mo (VI) to Mo (V) by the methanol extract of different part of garlic and subsequent formation of green phosphate/Mo (V) complex at acid pH. One mL of various concentrations (3- µg/mL) of the extract was combined with 1 mL of reagent solution (0.6M sulfuric acid, 28 mM sodium phosphate and 4 mM ammonium molybdate) and incubated at 95°C for 90 min. BHT was used as a standard. A typical blank solution contained 3 ml of the reaction mixture and the appropriate volume of the same solvent used for the samples/standard. The absorbance of the reaction mixture was measured at 695 nm using a spectrophotometer.

RESULTS:

The preliminary Phytochemical analysis aqueous & methanolic extract of *Coriandrum sativum* reveals the presence various of secondary metabolites (Table-1). Different phytochemical tests were performed for the qualitative detection of secondary metabolites and the presence or absence of the phytochemical constituents depends on the test applied. Mayer's test, Hager's & Wagner's test shows presence of alkaloids in all the extract. Molisch's test and Barfoed's test were used for detection of carbohydrate and both tests show absence of carbohydrate. Fehling's and Benedict's test shows positive for both extract. Both tests were used for the detection of reducing sugar. Test for flavonoids included alkaline reagent, lead acetae and ammonia test. Ammonia test shows absence of this metabolite in all extracts while flavaonoids was detected by alkaline reagent and lead acetate in aquous extraction. Borntragers' test shows absence of glycosides while Legal's and 10% NaOH test shows its presence in aquous extraction. Cardiac glycosides was absent all the extracts. All the tests for Tannin and phenol shows positive results with few exceptions. Froth test for saponin and ninhydrin test for protein shows positive results. Terpenoids are absent while steroids are present. Further, we also observed the antioxidant activities in all the extracts.

Thin layer chromatography of the methnolic extract of coriander leaves shows 6 spots having Rf values 0.2, 0.304, 0.434, 0.565, 0.652, 0.721 respectively. Aqueous extract of 10 gm of coriander leaves shows 4 spots having Rf values 0.130, 0.460, 0.565, 0.608, respectively. In the aq extract of 5gm of coriander leaves, 4 spots are present having Rf values 0.130, 0.434, 0.478, 0.565 respectively.

Table- 1: Phytochemicals analysis of aqueous and methanolic extracts of *Coriander sativum L*. leaves.

S.No	PHYTOCHEMICAL TEST	Coriander Leaves Extracts		
		Aqueous extract		Methanolic extract
		5gm	10gm	
1	Test for alkaloids			
	(a) Mayer's test	+ve	+ve	+ve
	(b) Wagner' test	+ve	+ve	+ve
	(c) Hager's test	+ve	+ve	+ve
2	Test for carbohydrate			
	(a) Molisch test	-ve	-ve	-ve
	(b) Barfoed's test	-ve	-ve	-ve
3	TEST FOR REDUCING SUGAR			
	(a)Fehling's test	+ve	+ve	+ve
	(b)Benedict's test	+ve	+ve	+ve
4	TEST FOR FLAVONOIDS			
	(a)Alkaline reagent	+ve	+ve	+ve
	(b)Lead acetate	+ve	+ve	+ve
	(c)Ammonia test	-ve	-ve	-ve
5	TEST OF GLYCOSIDES			
	(a)Borntrager test	-ve	-ve	-ve
	(b)Legal's test	+ve	+ve	+ve
	(c)10% NaOH test	+ve	+ve	-ve
6	TEST OF CARDIAC GLYCOSIDES			
	(a)Keller killani test	-ve	-ve	-ve
7	TANNIN AND PHENOLIC TEST			
	(a)Ferric chloride test	+ve	+ve	+ve
	(b)Lead acetate test	+ve	+ ve	+ve
	(c)Dilute iodine test	+ve	+ve	-ve
	(d)Ferric chloride 10%	+ve	+ve	+ve
	(e) Hydrolysable tannins	+ ve	+ ve	- ve
8	TEST FOR SAPONIN			
	(a)Froth test	+ve	+ve	+ve
9	AMINO AND PROTEIN			
	(a)Ninhydrin test	+ve	+ve	+ve
	(b)Biuret test	-ve	-ve	-ve
10	(a)Test for terpenoids	-ve	-ve	-ve
	(b) Test for steroid	+ve	+ve	+ve

(+) indicates presence while, (–) indicates the absence of the components.

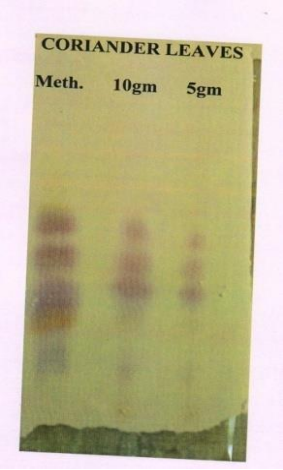

Fig. 1: TLC Plate showing different solvent extract of leaves of *Coriander sativum*

DISCUSSION:

Phytochemicals are bioactive compounds found in plants that work with nutrients and dietary fibers to protect human against diseases. They are non-nutritive compounds (secondary metabolites) that contribute to flavour and colour. Many phytochemicals have antioxidant activity and reduce the risk of many diseases. Reactive oxygen species (ROS) have been implicated in many diseases and in the aging process. These free radicals, which cause tissue damage via oxidative stress, are usually generated by aerobic respiration, inflammation, and lipid peroxidation. Antioxidant systems minimize or prevent deleterious effects of the ROS [24]. Due to the medicinal values of garlic, it is important to determine some of the phytochemicals presents. The medicinal value of the plants lies in bioactive phytochemical constituents that produce definite physiological action on the human body [25].

Preliminary phytochemical screening of the of *Coriandrum sativum* leaf revealed the presence of various bioactive components like Carbohydrate, glycoside, flavonoid, alkaloids, tanins and steroids (Table 1). Most of the plant derived drugs of our present world are alkaloid containing. Alkaloids have remarkable physiologic and pharmacologic properties like stimulant, spasmolytic, vasodilator, anti-asthmatic, anti-arrhythmic etc. *Coriandrum sativum* showed positive results in case of presence of alkaloid. It is established that anthraquinone and related glycosides exert their action by increasing the tone of the smooth muscle. As *C. sativum* showed positive results for both glycoside & tannins, it is quite obvious that it has pronounced astringent and antimicrobial properties. Moreover, *C. sativum* also showed positive results for saponin and steroids. So, Cilantro has a very high potential for various medicinal value propositions.

Phenolic compounds and flavonoids have been reported to be associated with antioxidative action in biological systems, acting as scavengers of singlet oxygen and free radicals [25]. Paul et al [26] reported that the total antioxidant capacity of the fractions shows promising outcome and expressed as the number of equivalents of ascorbic acid. The phosphomolybdenum method, used, is based on the reduction of Mo (VI) to Mo (V) by the antioxidant compound and the formation of a green phosphate/Mo (V) complex with a maximal absorption at 695 nm. The antioxidant activity of the three extractions of *C. sativum*, as measured by several *in vitro* tests, was found to correlate with total phenol and total flavonoid contents [26]. Further, several reports have conclusively shown close relationship between total phenolic content and antioxidative activity of the fruits and vegetables [27]. However, the observed antioxidant action correlates more with total flavonoid contents of the fractions than with their total phenol contents [26]. The plant was reported to contain several phytochemical constituents most notably alkaloids, flavonoids and sterols [28, 29]. Preliminary phytochemical screening revealed the presence of alkaloids, flavonoids and steroids. Flavonoids, anthocyanins, carotenoids, and vitamins are compounds with free radical scavenging properties. Polyphenols and particularly flavonoids derivatives behave as reducing agents, mostly donating hydrogen and quenching singlet oxygen. They seem to have additive effects on endogenous scavenging compounds [30]. Flavonoids are versatile bioactive secondary metabolites present in almost all plant species. Most representative family members include flavones, flavanes, flavonols, catechins, and anthocyanidins. Their antioxidant potential toward ROS depends on structural characteristics such as the number and substitution pattern of hydroxyl groups and the extent at which these groups are glycosilated [31]. Flavonoids show a wide range of biological activities such as inhibition of cell-proliferation, induction of apoptosis, inhibition of enzymes and other antibacterial and antioxidant effects [32, 33]. The flavonoids content of the different extracts was also found to be quite high for a mixture of solvents. All these phytochemicals possess good antioxidant activities and has been reported to exhibit multiple biological effects including anti-inflammatory and antitumor activities.

There were different bands and spots observed in aqueous and methanolic extract. Aqueous extraction of coriander leaves shows four spots whereas methanolic extraction shows six spots. Therefore, it may be concluded that solvent used for extraction influences the presence or absence of bioactive components. Further, beside this concentration of plant used for extraction also influences the results.

Preliminary phytochemical analysis of different extracts of *C. sativum* revealed the presence of alkaloids, flavonoids, and tannins. These results expose that the

plant has quite a number of chemical constituents, which may be responsible for the many pharmacological actions. Although their specific roles were not investigated in this study, it has been reported that most active principles in plants are frequently flavonoids, and tannins. Valko *et al.,*[24] reported that one of the most actively studied properties of phenolic compounds in general and flavonoids in particular are their ability of conferring protection against oxidative stress. Thus, in this study, the presence of flavonoids and phenolic compounds in the leaves extract could be considered responsible for conferring antioxidant ability.

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