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Qualitative phytochemical analysis of *Allium sativum* (Garlic) and *Curcuma longa* (Turmeric)

Iqra Nazir and Rikhi S Chauhan

Abstract
The present study involves the qualitative phytochemical analysis of two different medicinal plants: *Allium sativum* (Garlic) and *Curcuma longa* (Turmeric) locally available in Pantnagar, region of Uttarakhand. Garlic and turmeric are very renowned medicinal plants for their versatile pharmaceutical properties. Garlic benefits rank only second to turmeric benefits in the amount of research about these superfoods. Plants show medicinal properties as they contain phytochemical constituents. Phytochemical constituents are non nutritive plant chemical that have disease preventive properties. Isolation of bioactive compounds from the plants depends mainly upon the solvents which are used for extraction. In our study, we have used water and ethanol as solvents. The aqueous and ethanolic extract samples were used for the phytochemical analysis. These extracts were used for qualitative preliminary phytochemical analysis using standard chemical tests. The results from the present study indicates the presence of proteins, phlobutanin, ketones, phenolic compounds, cardiac glycosides flavonoids, alkaloids and tannins.

Keywords: Garlic, turmeric, phytochemical, alkaloids, tannins

1. Introduction
Phytobiotics can be defined as plant derived products added to feed in order to improve the performance of an animal. These are also called as herbal feed supplements and are natural sources of economical and risk-free chemicals. Herbal plant products have various qualities like growth promoting ability, appetite stimulation, enhance the immune system, anti-stress, anti-tumour, anti-parasitic, antimicrobial in aquaculture practices. Application of medicinal herbs in disease management is gaining success, because herbal treatment is cost effective, ecofriendly and has minimal side effects. Herbs have been widely used in veterinary and human medicine. Nowadays, herbs or herbal products also have a significant role in aquaculture. It is also reported that several chemical constituents inside the plants *viz*. alkaloids, flavonoids, steroids, phenols, resins, saponins etc. show property of antimicrobial activity, increased growth rate and enhanced non-specific immune parameters in fish [1].
Garlic (*Allium sativum*) is a species belonging to genus, *Allium*. It`s close relatives include onion, shallot and Chinese onion. Garlic is native to Central Asia and North eastern Iran. It was known to ancient Egyptians and has been used both as a food flavoring as well as traditional medicine. *Allium sativum* is a bulbous plant. It produces hermaphrodite flowers. In 2016, world production of garlic was 26.6 million tonnes, with China alone accounting for 80% of the total. India was the second largest producer with 5% of world production [2]. The 100 grams of garlic contains several nutrients in rich amounts (20% or more of the DV), including vitamins B6 and C, and the dietary minerals manganese and phosphorus. Garlic is particularly high in certain sulfur compounds that are believed to be responsible for its scent and taste, as well as its very positive effects on human health. Garlic benefits rank only second to turmeric benefits in the amount of research backing this superfood. Garlic has been widely recognized both as preventative and treatment agent for many cardiovascular and metabolic diseases including atherosclerosis, hyperlipidemia, thrombosis, hypertension and diabetes. It also helps to control high blood pressure. Garlic, *Allium sativum*, a commonly used spice and also have immune enhancing activities *viz*., promotion of lymphocyte synthesis, release of phagocytosis, cytokines and natural killer cell activity [3].
Turmeric (*Curcuma longa*) is a rhizomatous herbaceous perennial plant of the ginger family, Zingiberaceae. It is native in southeast India. It has been used for thousands of years in Indian Ayurvedic medicine. Components of turmeric are collectively termed as curcuminoids,

which mainly include curcumin (diferuloyl methane), demethoxycurcumin and bisdemethoxy-curcumin. But the major biologically active component of turmeric is curcumin, which is a yellow phytochemical, hydrophobic and polyphenolic compound [4]. Although curcumin has recently gained much attention for its therapeutic potentials in traditional Indian medicine for human uses due to its low toxicity and large biological activities but its pharmacological potential is still under investigation [5, 6]. It is also strongly alleged that turmeric can improve digestion and nutrient metabolism. The latter beneficial effects of turmeric are related to atsiri oil and curcumin content in turmeric

2. Materials and Methods

2.1 Collection of garlic, *Allium Sativum*

Garlic, *Allium sativum* bulbs were procured from the vegetable market of Pantnagar and initially dried properly under shade for 4-7 days. Again the garlic bulbs were allowed to dry at 60 °C for 8 days, in a dryer. After drying, cloves were grind to make powder with the help of a grinder and kept in dry and cool condition in refrigerator until further use for preparation of experimental diets.

2.2 Collection of turmeric, *Curcuma longa*

Powder of *Curcuma longa* was purchased from local market of Pantnagar. The powder was stored in the air tight containers for further use in the experiment.

2.3 Phytochemical analysis

The qualitative phytochemical analysis was carried out to detect the presence of different phytochemicals in garlic and turmeric powder. The procedures for the tests are as follows:

2.3.1 Test for tannins

0.5 g of dried garlic and turmeric powder respectively were taken in different test tubes. 20ml of distilled water was added and boiled in water bath at about 100 °C. The solution was filtered through Whatman No. 1 filter paper. After that add few drop of 0.1% ferric chloride ($FeCl_3$). Development of brownish green or blue black coloration was indication of positive result.

2.3.2 Test for Phenol [Ferric Chloride test]

Equal volume of garlic and turmeric extract were taken in different test tube and then 5% of ferric chloride was added in each test tube. The appearance of dark green or bluish green color indicated the presence of phenol.

2.3.3 Test for Saponin

2 g of dried garlic and turmeric powder were taken in different test tubes, then add 20ml of distilled water and boil it for 2 min in water bath at 100 °C. The solution was filtered through Whatman No. 1 filter paper and 10ml of filtrate was taken in another test tube. Add 5 ml of distilled water and shake vigorously. The presence of persistent froth was taken as positive result.

2.3.4 Test for Flavonoids

0.2 g of dried garlic and turmeric powder separately in different test tubes were dissolved in 1% sodium hydroxide (NaOH). 10% HCl was added and change in the color of solution to yellow indicated the presence of flavonoids.

2.3.5 Test for Cardiac Glycosides [Kellar-Kiliani test]

2 g of dried powder of garlic and turmeric were taken in different test tubes. 5 ml of distilled water was added in each test tube and then it was boiled for 2 min in water bath at 100 °C. The solution was filtered through Whatman No.1 filter paper. The 1ml of extract and 0.5 ml of glacial acetic acid was taken in another test tube. Few drops of 5% Ferric Chloride and few drops of conc. H_2SO_4 were added. The appearance of greenish blue color was indicated as the presence of cardiac glycosides.

2.3.6 Test for Steroids

2 g of dried powder of garlic and turmeric were taken in different test tubes and then boiled with 2 ml of distilled water in water bath at 100 °C for 2 min. The solution was filtered through Whatman No.1 filter paper. The 200 µl of extract and 10 volumes of chloroform and conc. H_2SO_4 were added carefully along the sides of test tubes. The change in color of lower layer to yellowish with green fluorescence and reddish upper layer indicated the presence of steroids.

2.3.7 Test for Alkaloids

1. **Wagner's test:** 200 µl of crude extract was taken in test tube. The few drops of Wagner's reagent were added to the inner side of test tube. A reddish brown precipitate was formed which confirmed the presence of alkaloids
2. **Mayer's and Wagner's test:** Equal amount of extract and 1% HCl were added and heated gently. Mayer's and Wagner's reagent were added to the mixture. Turbidity of the resulting precipitate was taken as evidence for the presence of alkaloids.
3. **Dragendorff test:** 0.2 g of dried garlic and turmeric powder were taken in different test tubes. Add 10 ml of methanol individually and after few minutes, it was filtered with Whatman filter paper no 1. The 2 ml of filtrate in 1 ml of 1% HCl was taken and steam heated the solution for 2 minutes. Again the solution was filtered and 1 ml of filtrate was taken. Six drops of Mayer's reagent/ Wagner's reagent/ Dragendorff reagent were added. The change in color of precipitate to orange red/ brownish red/ creamish showed the presence of alkaloids respectively.

2.3.8 Test for Reducing Sugar

1 ml of Fehling's solution A and B was added to aqueous extract of garlic and turmeric powder, respectively. The solution was boiled in water bath for 5 to 10 minutes. The presence of non reducing sugar was indicated by formation of brick red precipitation.

2.3.9 Test for phlobatannins

Add 1% aqueous hydrochloric acid to garlic and turmeric extract and each plant sample was then boiled with the help of Hot plate stirrer. Formation of red coloured precipitate confirmed a positive result.

3. Results and Discussion

3.1 Phytochemical analysis of Garlic

The results of the qualitative phytochemical analysis of garlic (Table 1) revealed that the aqeous and ethanolic extracts of garlic contain saponin, alkaloids, tannin, steroids, flavonoids, lipids, ketones and phlobutanin. The results of glycosides and reducing sugar were also found positive for ethanolic and water crude extract, respectively. Phytochemical analysis of this plant may be useful in developing new specialized drugs with more efficiency. *In-vitro* phytochemical analysis conducted by recorded presence of alkaloids, tannins, saponin

and flavonoid in aqueous and ethanolic extracts of six medicinal plants used by traditional healers [7]. An investigation on the dietary effect of garlic (*Allium sativum*) powder on growth, feed utilization and whole body composition of fingerlings of amur carp (*Cyprinus carpio haematopterus*) was carried out [8]. Fingerlings with an average weight of 16.11± 0.86g were distributed into four treatment groups T1, T2, T3and T4. The garlic powder (GP) was incorporated in to diets at the rate of 0.5% (GP 0.5), 1.0% (GP1.0) and 1.5% (GP1.5). GP was not added to the control diet (GP0). The results indicated that T4 (GP 1.5) was the best among the treatments. Nazir and Chauhan reported the presence of tannins, flavinoids, saponin etc. during the phytochemical analysis of *Tinospora cordifolia* and *Withania somnifera* [9].

Table 1: Phytochemical screening of Garlic (*Allium sativum*)

S. No.	Secondary Metabolites	Water	Ethanol
1	Saponin	+	+
2.	Alkaloids	+	+
3.	Phenolics	+	+
4.	Tannin	+	+
5.	Steroids	+	+
6.	Flavonoides	+	+
7.	Glycosides	+	+
8.	Reducing sugars	+	+
9.	Lipids	+	+
10.	Ketones	+	+
11.	Phlobutanin	+	+

3.2 Phytochemical analysis of Turmeric (*Curcuma longa*)

The results of phytochemical evaluation of turmeric rhizomes indicated the presence of carbohydrates, amino-acids, alkaloids, terpenoids and flavinoids (Table 2). Findings are similar to Sawant and Godghate [10]. The methanolic extract of the rhizomes of *Curcuma longa* was prepared and isolated carbohydrate, amino acids, steroid, flavonoid, alkaloid, tannin and saponin etc. [11]. Some authors have reported the presence of ten phytochemicals from the methanolic extract of *curcuma longa* [12]. From the aqeous extracts of turmeric, six phytochemicals were determined *viz* alkaloids, flavonoids, tannin, saponins, cardiac glycosides and phenol from aqueous extracts of turmeric [13].

Table 2: Phytochemical screening of Turmeric (*Curcuma longa*)

S. No.	Secondary Metabolites	Water	Ethanol
1	Saponin	_	+
2.	Alkaloids	+	+
3.	Phenolics	_	_
4.	Tannin	+	+
5.	Steroids	_	_
6.	Flavonoids	+	+
7.	Glycosides	+	+
8.	Carbohydrates	+	+
9.	Terpenoids	+	+
10.	Amino acid	+	_
11.	Phlobutanin	+	+

4. Conclusion

Phytochemical analysis were useful to detect the presence of the bioactive principle constituents in the plant which subsequently may lead to the discovery and development of medicinal drugs. From the present study, it can be concluded that the phytochemical analysis of *Allium sativum* and *Curcuma longa* indicated the presence of ketones, proteins, phenolic compounds, flavonoids, alkaloids, cardiac glycosides and tannins. Therefore, extracts from these two plants can be used as a good source for useful drugs and also for curing diseases without any side effects.

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