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Comparison of qualitative phytochemical analysis of *Amaranthus polygonoides* L. and *Amaranthus viridis* L

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Abstract

In the present study, the ethanolic and aqueous extracts of the entire plants of *Amaranthus polygonoides* and *Amaranthus viridis* was preliminarily screened for their phytochemicals. The results of qualitative analysis revealed that they contain mostly tannins, saponins, alkaloids, steroids, terpenoids, proteins, cardioglycosides and phenols. Moderately ethanol extracts possess more constituents than aqueous extracts in both the test plants. In the chemical test results ethanol extracts of *Amaranthus viridis* contain more number of phytochemicals qualitatively and where as *Amaranthus polygonoides* shows low number of secondary metabolites.

Keywords: viridis, polygonoides, phyto, ethanol, alkaloid, phenols

1. Introduction

Traditional medicine system has gained global importance. Hence, a thorough knowledge of their organic constituents and trace element contents is essential for formulating safe and effective medications (Salahuddin *et al.*, 1988; Choudhari *et al.*, 1988 and Cohen *et al.*, 1991) [1-3]. From over 3, 00,000 species of higher plants which occur in nature, only about 2 percent have been screened so far. India is a country rich in indigenous herbal resources which grow on their varied topography and under changing agro climatic conditions permitting the growth of almost 20,000 plant species, of which about 2,500 are of medicinal value (Jain, 1991) [4].

The plant kingdom represents a treasure trove of structurally diverse bioactive molecules, which are referred to as secondary metabolites and are biosynthesized by plants. These bioactive molecules may be therapeutically active or inactive (Iyengar, 1995) [5]. The most important bioactive constituents of the plants are alkaloids, tannins, flavonoids and phenolic compounds. The beneficial physiological and therapeutic effects of plant materials typically result from the combinations of these secondary products present in the plant. Plants secondary metabolites have recently been referred to as phytochemicals. In fact, the term "phyto" comes from the Greek word for "plant." Phytochemicals are organic, non-nutritive, naturally occurring chemicals found in plant which provides health benefits for humans further than those attributed to macronutrients and micronutrients (Hasler *et al.*, 1999) [6]. They protect plants from disease and damage and contribute color, aroma and flavor. In general, the plant chemicals protect plant cells from environmental hazards such as pollution, stress, drought, UV exposure and pathogenic attack (Gibson *et al.*, 1998 and Mathai, 2000) [7, 8]. Recently, it is clearly known that they have roles in the protection of human health, when their dietary intake is significant. More than 4,000 phytochemicals have been cataloged (American Cancer Society, 2000) [9] and are classified by protective function, physical characteristics and chemical characteristics and about 150 phytochemicals have been studied in detail (Ross *et al.*, 1996) [10]. In wide-ranging dietary phytochemicals are found in fruits, vegetables, legumes, whole grains, nuts, seeds, fungi, herbs and spices (Smith and Grivetti, 1994) [11].

It is believed that the phytochemicals may be effective in combating or preventing disease due to their antioxidant effect. These secondary plant metabolites have biological properties such as antimicrobial effect, modulation of detoxification enzymes, stimulation of the immune system, decrease of platelet aggregation and modulation of hormone metabolism and anticancer property.

Antioxidants protect other molecules (*in vivo*) from oxidation when they are exposed to free radicals and reactive oxygen species which have been implicated in the aetiology of many diseases and in food deterioration and spoilage (Farombi, 2000 and Koleva *et al.*, 2000) [12, 13].

The phytochemical interaction and trace components may alter the drug response in ways that cannot currently be replicated with a combination of few curative active ingredients (Fabricant and Daniel, 2001) [14]. Pharmaceutical researchers recognize the concept of drug synergism but note that clinical trials may be used to investigate the efficacy of a particular herbal preparation, provided the formulation of that herb is consistent (Izhaki Ido and Emodin, 2002) [15]. In recent years, phytochemicals previously with unknown pharmacological activities, have been extensively investigated as a source of medicinal agents which would further be valuable in discovering the actual value of folkloric remedies. (Iyengar, 1995; Zheng and Wang, 2001; Mojab *et al.*, 2003; Cai *et al.*, 2003 and Krishnaraju *et al.*, 2005) [5, 16-19]. There is evidence that using some alternative medicines especially those evolving herbs, metals, minerals or other materials involves potentially serious risks including toxicity (Panchabhai *et al.*, 2008) [20]. With the development of natural product chemistry, the potential of chemotaxonomy is now being increasingly obvious. If we can come back to our nature, culture and tradition on use of medicinal plants it can bring up a bright and healthy new generation (Kirtikar and Basu 1918) [21].

With this connection, the present study has selected two medicinal plants *Amaranthus polygonoides* L. and *Amaranthus viridis* L. to screen the phytochemicals.

2. Materials and Methods

2.1 Collection of Plant materials

The entire plants parts of *Amaranthus polygonoides* L. and *Amaranthus viridis* L. were collected from Erode district, Tamil Nadu, India and were authenticated and deposited at the PG and Research Department of Botany, Vellalar College for Women, Erode (Tamil Nadu), India. Fresh plants were collected and air-dried at room temperature and then homogenized to obtain coarse powder. The powdered test plants was extracted (Mukherjee, 2002) [22] with the solvent ethanol by hot extraction using soxhlet apparatus, collected and stored in a vial for further analysis.

2.2 Preparation of plant extracts

2.2.1 Hot water extraction

5gm of dried finely powdered plant materials was taken in a beaker and 200ml of distilled water was added. The mixture washed on a hot plate with continuous stirring at 30°- 40°C for 20 minutes. Then the water extract was filtered through filter paper and the filtrate was used for the phytochemical analysis. The water extract was kept in refrigerator when not in use.

2.2.2 Solvent extraction

Crude plant extracts was prepared by Soxhlet extraction method. About 20gm of powdered plant material was uniformly packed into a thimble and extracted with 250ml of ethanol solvent separately. The process of extraction continues for 24 hours or till the solvent in siphon tube of an extractor become colorless. After that the extract was taken in a beaker and kept on hot plate and heated at 30-40°C till all the solvent got evaporated. Dried extract was kept in

refrigerator at 4 °C for their future use in phytochemical analysis.

2.3 Phytochemical Analysis

2.3.1 Qualitative Phytochemical analysis

Phytochemicals are naturally occurring and biologically active plant compounds that have potential disease inhibiting capabilities. Plants are endowed with various phytochemical screening of proteins, alkaloids, terpenoids, tannins, flavonoids, saponins, steroids, cardiac glycosides and quinine present in the powder entire plants parts of *Amaranthus polygonoides* and *Amaranthus viridis* in ethanol and water extracts were carried out the following standard procedure of Harborne 1973 [23], Edeoga *et al.*, 2005 [24].

2.3.1.1 Tests for Proteins

1 ml of sample was taken, to that few drops of Bradford reagent was added and observed for blue colour development.

2.3.1.2 Test for Tannins

1 ml of sample was taken; to that few drops of 0.1% ferric chloride was added and observed for blue / black colourization / brownish green.

2.3.1.3 Test for Flavonoids

1 ml of sample was taken, to that concentrated HCL and magnesium chloride was added and observed for pink tomato red colour.

2.3.1.4 Test for Alkaloids

1 ml of sample was taken, to that few drops of dragandoff reagent was added and observed for orange red colour.

2.3.1.5 Test for Steroids

1 ml of sample was taken; to that 10% concentrated H₂SO₄ was added and observed for green colour.

2.3.1.6 Test for Saponins

1 ml of sample was taken, to that 2 ml of H₂O (shaken vigorously) was added and observed for foaming appearance.

2.3.1.7 Test for Quinones

1 ml of sample was taken, to that aqueous ammonia (shaking) was added and observed for change in colour of aqueous layer (pink, red or violet).

2.3.1.8 Tests for Terpenoids

1 ml of sample was taken; 2 ml of chloroform and concentrated H₂SO₄ was added and observed for reddish brown ring colour.

2.3.1.9 Test for Cardiac Glycosides

1 ml extract and glacial acetic acid 0.4 ml and ferric chloride solution and conc. H₂SO₄ and observed for brown ring colour.

3. Result and Discussion

The phytochemical screening of ethanol and aqueous extracts of entire plant parts of *Amaranthus polygonoides* and *Amaranthus viridis* were subjected to qualitative phytochemical screening. Table 1 and 2 indicates the presence of tannins, phenols, alkaloids, steroids, saponins

and proteins while flavonoids, terpenoids, quinine and cardiac glycosides were absent in *Amaranthus polygonoides* in ethanol extract only tannin, saponin present in aqueous extract. In *Amaranthus viridis* alkaloides, proteins, tannins, phenols, saponin, and cardioglycosides were present but flavonoides, quinone, terpenoides were absent. Moderately ethanol extracts possess more constituents than aqueous extracts in both the test plants. In the chemical test results ethanol extracts of *Amaranthus viridis* contain more number of phytochemicals qualitatively and where as *Amaranthus polygonoides* shows low number of secondary metabolites. Both ethanol and aqueous extracts exhibited the presence or absence of phytochemical constituents are displayed in (+) or (-) symbol.

Table 1: Preliminary Phytochemical screening of *Amaranthus polygonoides* Linn.

S. No	Phyto compounds	Ethanol extract	Aqueous extract
1.	Tanins	+	+
2.	Phenols	+	-
3.	Saponin	+	+
4.	Flavonoids	-	-
5.	Alkaloids	+	-
6.	Proteins	+	-
7.	Steroid	+	-
8.	Quinones	-	-
9.	Terpenoid	-	-
10	Cardio glycosides	-	-

(+*) indicates presence; while (-*) stands for absence.

Table 2: Preliminary Phytochemical screening of *Amaranthus viridis* Linn.

S. No.	Phytocompounds	Ethanol extract	Aqueous extract
1.	Tanins	+	+
2.	Phenols	+	+
3.	Saponin	+	+
4.	Flavonoids	-	-
5.	Alkaloids	-	-
6.	Proteins	+	+
7.	Steroid	+	-
8.	quinones	-	-
9.	terpenoid	-	-
10	Cardio glycosides	-	+

(+*) indicates presence; while (-*) stands for absence.

Similarly Farhana and Sahera (2016) [25] reported that the leaf extract of *Murraya koenigii*, *Punica granatum*, *Jatropha curcas*, *Lawsonia inermis*, *Capsicum annum*, *Syzygium cumini* were investigated for its phytochemical analysis. Qualitative phytochemical analysis of these plants confirm the various secondary metabolites like saponins, terpenoids, steroids, anthocyanins, tannis, flavonoids and alkaloids. Therefore these secondary metabolites had played fundamental role in controlling the vegetable diseases due to their antioxidant activities. This study provides the information for preventing the plant diseases at affordable cost and eco-friendly. Salem Mohamed *et al.*, (2016) [26] proved that quantities analysis of ethanolic extract of leaves of *Ephedra altissima* had significant amount of chemical compounds 87% moreover the aqueous crude extract were moderate 82% and the Chloroform 79% and acetone extracts 77% were lowliest. Medicinal plants are major remedy for a variety of diseases and have been used since time immemorial. *Phytolacca dodecandra* L 'Herit (Endod: Amharic) is an African soapberry that grows as shrub or

climber native to Ethiopia and Eritrea. The aim of the present study was to screen the various phytochemicals from the benzene, CCl₄, hexane, and aqueous extracts of leaves, fruits and stem of *P. dodecandra*. All solvent extracts were investigated to qualitative preliminary phytochemical screening using prescribed methods by Kumar *et al.*, (2016) [27]. The results showed that the plant has various secondary metabolites like alkaloids, protein and amino acids, saponins, flavonoids, terpenoids and total phenols and tannins. The phytochemicals generated data from the four different extracts of *P. dodecandra* may be used as tools for quality control of drugs in the future, for the healing of a diversity of disease conditions.

Rajani *et al.*, (2017) [28] identified that the phytochemicals are the most important sources for the treatment of common diseases. The present investigation deals with the qualitative phytochemical analysis of leaves of ten medicinal plants. These are *Bauhinia variegata* Linn. (Caesalpinaceae), *Calotropis procera* (Ait.) R.Br. (Asclepiadaceae), *Catharanthus roseus* (Linn.) Don. (Apocynaceae), *Lantana camara* (Linn.) Var. (Verbenaceae), *Mangifera indica* Linn. (Anacardiaceae), *Moringa oleifera* Lamk. (Moringaceae), *Ocimum sanctum* Linn. (Lamiaceae), *Pithecellobium dulce* (Roxb) Benth. (Mimosaceae), *Solanum nigrum* Linn. (Solanaceae), *Tinospora cordifolia* (Willd.) Mier. ex Hook. f. and Th. (Menispermaceae). Methonolic extracts of powder of leaves were screened for qualitative determination of different phytochemicals like alkaloids, carbohydrates, glycosides, phytosterols, flavonoids, protein and amino acid, diterpenes, phenols and tannin. All plant materials were collected from Shivpuri district (M.P.)

4. Conclusion

Plant-derived substances have become of great interest owing to their versatile applications. Use of herbal medicine for the treatment of diseases and infections is as old as mankind. Plants are endowed with various phytochemical molecules such as vitamins, terpenoids, phenolic acids, lignins, stilbenes, tannins, flavonoids, quinones, coumarins, alkaloids, amines, betalains, and other metabolites, which are rich in antioxidant activity. According to the World Health Organization the use traditional medicine has proven to be efficacious and safe. The ingestion of natural antioxidants has been associated with reduced risks and in recent years, there has been a worldwide trend towards the use of the natural phytochemicals present in berry crops, teas, herbs, oilseeds, beans, fruits and vegetables. In order to promote the use of herbal medicines and the determination of their potentials, the scientific studies of medicinal plants should be more intensified especially those used as folk medicines and as traditional medicine.

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