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Research Article

ESTIMATION OF PRIMARY AND SECONDARY METABOLITES FROM LEAVES OF THREE MEDICINAL PLANTS

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ABSTRACT
Medicinal plants areimportant source of life saving drugs for majority of the world population. The study includes phytochemical screening and quantification of primary and secondary metabolites like chlorophyll, carbohydrates, protein, phenol, starch and ascorbic acid fromleaves extract of selected plants namely: *Chenopodium album, Moringa oleifera and Terminalia arjuna.* The highest amount of protein (75.46 µg/ml) was observed in *T. arjuna*, ascorbic acid (38.02 mg/g dw), starch (5.12 mg/g dw), phenols (22.55 mg/g dw) and chlorophyll (14.75 mg/g dw) was observed in leaves of *C. album*.
Keywords: Primary metabolites, Protein, Chlorophyll, Ascorbic acid, medicinal plants, *Moringa oleifera, Chenopodium album, Terminalia arjuna.*

INTRODUCTION

Since ancient times, about 80 % of individuals use traditional medicine, which has chemical compounds derived from medicinal plants. These compounds are classified into primary and secondary metabolites[1]. Primary metabolites are essentially required for growth and development of plants such as sugars, proteins, lipids and starch whereas chlorophyll, amino acids, nucleotides and carbohydrates have a key role in metabolic processes such as photosynthesis, respiration and nutrient assimilation. Secondary metabolites are not involved directly and they have been worked as biocatalysts which are synthesized during secondary metabolism of plants and are potential sources of drugs. The most important secondary metabolites are saponin, alkaloids, tannins, flavonoids and cardiac glycosides[2]. Phytochemical screening is the technique to identify these compounds present in the plant extracts derived from any part of the plants like bark, leaves, flowers, seeds, etc. The use of plant extracts and phytochemicals, both with known antimicrobial properties, can be of great significance in therapeutic treatments. In the last few years, a number of studies have been conducted in different countries to prove such efficiency[3-5]. Many plants such as *Nerium indicum*, *Gloriosa superba*[6], *Ricinus communis* and *Euphorbia hitra*[7], *Pongamia pinnata*[8], *Svensonia hyderobadensis*[9] and *Melothria maderaspatana*[10], *Cichorium intybus*[11], *Eclipta alba*[12], *Morinda citrifolia*[12], *Mangifera indica*[13], *Cissus populnea*[14] and *Bauhinia tomentosa*[15] have been evaluated for their composition of primary metabolites and secondary metabolites for their medicinal values. In the present study investigations have been made to identify the medicinal properties of three plants: *Chenopodium album, Moringa oleifera* and *Terminalia arjuna* and their Qualitative phytochemical screening and estimation of primary and secondary metabolites will help to understand a variety of chemical compounds produced by plants and quantification of those metabolites will help to extract, purify and identify the bioactive compounds.

MATERIALS AND METHODS

Medicinal plants

The medicinal plants under study were selected on the basis of review and ethno pharmacologic effects. Leaves of the following plants viz. *Chenopodium album, Moringa olerifera* and *Terminalia arjuna* were screened for the study.

Phytochemical Screening of extracts

Phytochemical analysis for qualitative detection of alkaloids, flavonoids, phenols and tannins, steroids, saponins and cardiac glycosides was performed on the extracts as described by Trease and Evans[16].

Quantitative Estimation of Primary and Secondary Metabolites

Quantification of primary and secondary metabolites was carried out by the following methods of carbohydrates[17], chlorophylls[18], proteins[19], total phenols[20] and ascorbic acid[21].

RESULTS AND DISCUSSION

Phytochemical analysis is of paramount importance in identifying new source of therapeutically and industrially valuable compounds having medicinal plants have been chemically investigated[22]. In the present investigation primary and secondary metabolites were qualitatively and quantitatively analyzed in the three medicinal plants namely: *Chenopodium album, Moringa oleifera and Terminalia arjuna*. The results are presented in Table 1 and 2. In the present study the extract of *T. arjuna* showed maximum number of plant constitutents such as flavonoids, phenol, tannins, steroids, glycosides, alkaloids and saponins, *M. oleifera* showed good presence of flavonoids and tannins whereas tannin was not found in *C. album* (Table 1). Our results were in agreement with findings of [23,24]. The medicinal value of plants lies in some chemical substances that have definite physiological functions in the human body. Different phytochemicals have been found to possess a wide range of medicinal properties, which may help in protection against various diseases. For example, alkaloids protect against chronic diseases; saponins protect against

hypercholesterolemia and steroids and triterpenoids show the analgesic properties. The quantitative estimation of primary and secondary metabolites reveals various chemical constituents present in the plant (Table 2). Chlorophyll is the most indispensable class of primary compounds as they are the only substances that capture sunlight and make it available to plant system for its cultivation on photosynthesis[25]. The chlorophyll content of *C. album, M. oleifera* and *T. arjuna* is 14.75 mg/g, 14.32 mg/g and 13.49 mg/g respectively. Ascorbic acid content was found high in *C. album* (38.02 mg/g dw) as it is not only an important antioxidant, it also appears to link flowering time, developmental senescence, programmed cell death and responses to pathogens through a complex signal transduction network[26,27]. The extract of *C. album* showed higher level of phenols (22.55 mg/gdw) followed by *T. arjuna* and *M. oleifera*. The higher amount of phenol is important in regulation of plant growth, development and disease resistance and it also possess various biochemical activities such as antioxidant, anti mutagenic, anti carcinogenic as well as ability to modify the gene expression[28]. Carbohydrate content was found high in *M. oleifera* (6.11 mg/g dw). Proteins are the primary components of living organisms. The presence of higher protein levels in the plants increase food value or that a protein base bioactive compound could also be isolated in future[29]. Protein content was found high in *T. arjuna* (75.46 µg/ml) followed by *M. oleifera* (54.65 µg/ml) and *C. album* (36.36 µg/ml). The same type of phytochemical screening of primary and secondary metabolites was reported earlier by many workers. The present investigation showed significant variation in the contents like phenol, flavonoids and tannin when compared to above mentioned reports. These variations are due to number of environmental factors such as climate, altitude, rainfall etc. as mentioned by[30].

Table 1: Preliminary phytochemical screening of crude extract of *Chenopodium album, Moringa oleifera* and *Terminalia arjuna* leaves

Group	Test	*Chenopodium album*	*Moringa oleifera*	*Terminalia arjuna*
Phenols	Lead acetate test	+	+	+
Alkaloids	Wagner's test	+	+	+++
Flavonoids	Shinoda test	+	++	++
Steroids	Salkowski's test	+	+	+++
Tannins	Ferric chloride test	-	++	++
Saponin	Frothing test	-	+	-
Cardiac glycosides	Keller-kiliani test	+	+	++

Table 2: Estimation of primary and secondary metabolites in leaves of Chenopodium *album, Moringa oleifera* and *Terminalia arjuna*

S. No	Primary Metabolites	*Chenopodium album*	*Moringa oleifera*	*Terminalia arjuna*
1	Carbohydrates (mg/g dw)	5.65	6.11	5.07
2	Chlorophyll (mg/g)	14.75233	14.32403	13.49101
3	Protein (µg/ml)	36.36	54.65	75.46
4	Phenols (mg/g dw)	22.55	20.82	21.32
5	Starch (mg/g dw)	5.12	4.58	4.92
6	Ascorbic acid (mg/g dw)	38.02	35.26	37.98

CONCLUSION

In the present study, the selected three plants have the potential to act as a source of useful drugs because they are the source of primary and secondary metabolites such aschlorophyll, protein, lipids, phenols, flavonoids and tannin. As medicinal plants play an important role in curing various diseases and antimicrobial, anticancer, antipyretic, astringent, antiviral activities of these plants are due to these compounds. Analysis of these metabolites is necessary for knowing the nutritional potential as well as helpful in manufacturing new drugs.

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