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Research Article

QUANTITATIVE ANALYSIS OF BIOACTIVE COMPOUNDS FROM *TAGETES ERECTA* (LINN.)

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ABSTRACT

Objectives: This study investigates the quantitative analysis of the major phytoconstituents of *Tagetes erecta* (Linn.) and proves their therapeutic value as medicines in both leaf and flower extracts.

Methods: The various bioactive compounds were quantitatively analyzed as per standard methods.

Results: The present study registered carbohydrates, coumarine, alkaloids, and quinone which are of medicinal importance. During the study, quinone recorded the highest amount of phytocomponents in both the leaf and flower samples.

Conclusion: The significant result of the present study revealed that the flower extract exhibited more amounts of phytochemicals than the others, and this could be exploded for potential drug development in future.

Keywords: Phytoconstituents, Coumarine, Alkaloids, Quinone, Extraction, Solvents.

INTRODUCTION

Ever since Rig-Veda, various parts of plant sources were used as nutraceuticals, food supplements, traditional medicines, the major constituent in modern medicines and Ayurveda [1,2]. Attention on the use and research of medicinal plant constituents has increased all over the world from traditional to modern and even in the industrial sectors [3-6]. India is known for its vast diversity of plants species and currently about 2500 medicinal plants are used in various sectors of manufacturing industries [7,8] and there are many natural sources yet to be explored [9,10]. It is also evident that over 6000 plant species of India are said to have high therapeutic value, and they represent about 75% of third world countries [11,12]. Recently, because of the reduced risk, the bioactive compounds of plant sources such as *Embelia ribes*, *Phyllanthus emblica*, *Terminalia chebula*, *Eugenia iniflora*, and *Morinda citrifolia*, got focused attention as non-nutrient potentially bioactive compounds [13]. Among the plant secondary metabolites flavonoid constitute the major component, and they are found in all parts [14]. They are classified into six structural categories and contain 5000 different flavonoids [15-18]. *Hibiscus sabdariffa* extract revealed two classes of flavonoids such as flavonols (gossypetin) and anthocyanin [19,20]. The parts of *P. emblica* (Phyllanthaceae) are an important source with high amount of calcium, vitamin A, carotene, thiamine, niacin, minerals, amino acids, etc. [21-23]. *In vitro* evidences with leaf extract of *P. emblica* proved to be anti-neutrophilic and antiplatelet properties [24,25].

The extract of *Albizia lebbeck* (Shirish) has been proved to be very effective against inflammatory pathologies such as asthma, arthritis, burns [26], antihistaminic [27], and saponin is claimed to be very effective against Alzheimer's and Parkinson's diseases [28]. *E. ribes* dried fruits contains 2,5-dihydroxy-3-undecyl-2-5-cyclohexadiene-1,4-benzo-quinone (Embelin) which forms the major constituents of the commercialized "Vidanga" drug which has wide clinical applications over cancer, diabetes, fertility, etc. from the ancient times [29,30]. *Alternanthera brasiliana* (Amaranthaceae) contains flavonoids as 3-0-robinobioside derivatives of kaempferol and quercetin which is widely used in Brazilian medicines [31,32]. With this background of investigations, an attempt has been made to investigate the quantitative analysis of flower and leaf extract of *Tagetes erecta* (Linn.). Qualitatively, the various parts of the target plant were investigated [33,34] and the various constituents were separated by column chromatography [35] and proved that the target plant is of high therapeutic value.

METHODS

Estimation of coumarin

1 g of each sample (leaf and flower) was mixed 5 ml of methanol, and the samples were spotted on the thin layer chromatographic plate as per standard method. The spots were observed at 254 nm and the zone were cut and dissolved in 2 ml methanol, and the solution was read at 365 nm and compared with standard solutions [36].

Estimation of quinone

Chromatographic system

Liquid chromatographic system is equipped with a 275 nm detector with 5 mm × 15 cm column at the flow rate of 11 minutes retention time at 35°C [37].

Sample preparation

5 g of samples were mixed with dehydrated alcohol, and the samples were subjected to run in the methanol and dehydrated alcohol mobile phase.

Estimation of alkaloids

Chromatographic system

The liquid chromatographic system is equipped with a 275 nm detector with 5 mm × 15 cm column at the flow rate of 1.8 ml/minutes retention time at 35°C [37].

Sample preparation

5 g of samples were mixed with 150 ml methanol and the samples were subjected to run in potassium phosphate, distilled water and suitable mobile phase.

Estimation of carbohydrates (Antrone method [38])

The flower and leaf samples were ground with distilled water and the particulate matter were removed by centrifugation followed by filtering

through nylon mesh. A series of standard carbohydrate solutions were prepared, and a standard graph was obtained for calculation. Reading of absorbance was taken at 630 nm. The unknown samples (flower and leaf) were prepared, and the concentration of carbohydrates was determined through standard graph.

RESULTS AND DISCUSSION

The dried and powered flower and leaf samples of *T. erecta* L. were subjected to quantitative analysis for alkaloids, quinones, coumarins, and carbohydrates as per standard procedures [36-38]. In the present investigation, alkaloid concentration in the flower extract was 3.11 mg/g and 12.3 mg/g in leaf extract. A reddish brown color formation with potassium bismuth iodide indicates the presence of alkaloids in *T. chebula* [1] and these alkaloids serve as antioxidants, antibacterial, antifungal, and antiviral [39]. Various parts (leaf, flower, stem, and seed) of *Mimosa hamate* revealed the presence of alkaloids in both ethanolic and methanolic extracts [9]. Alkaloids are effective against chronic diseases, and they are reducing headaches associated with hypertension [40] and their antimicrobial activity was due to the inhibition of alkaloid was 2.05 mg/g in *E. iniflora* (L.) leaves [11]. During the present investigation with *T. erecta* (L.), the quinone was quantitatively estimated and was found 36.6 mg/g in flower extract and 33.4 mg/g in the leaf extract and also reported that they are vital for good health and has high therapeutic value [41].

The other secondary metabolite which was extracted during the study was coumarine which are used as traces in medicines. The flower extract did not registered but about 2.55 mg/g was recorded in the case of leaf extract of *T. erecta* (L.) They are proved to be useful in pharmaceutical industries as effective nutraceuticals [42]. The presence of carbohydrate was proved quantitatively, and it was found 16.3 µg/g in the flower extract and 11.8 µg/g in the leaf extract. The presence of carbohydrate was proved qualitatively in *M. hamate* [9] and the total carbohydrate recorded in *Eugenia unifera* was 1.14 mg/g [11] and these plants were used as artificial sweetener and also proved to support the body in the rebuilding [43]. The qualitative and quantitative analysis of phytoconstituents of *M. citrifolia* fruit revealed different phytochemicals such as alkaloids, carbohydrates, proteins, phenols, flavonoids, glycosides, saponins, anthraquinones, and tannins and quantitatively the amount of carbohydrate was 11.32 g/100 g which was the highest recorded constituents than other phytochemicals [2]. The plant constituents of various family groups have proved to be highly beneficial and possess significant antimicrobial and are effective antioxidant properties [44-46]. However, further studies are needed to isolate, purify for authentication to be utilized as an industrial drug formulation.

CONCLUSION

Further research and the accumulation of knowledge on the extraction of individual phytoconstituents and further research validation and characterization with the help of advanced technologies will pave a way for an effective plant derived drugs.

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