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Evaluation of preliminary phytochemical screening of five important medicinal plants in euphorbiaceae family

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Abstract
Plants are important source of traditional medicinal system for their preventive and curative potential of human disease. Phytochemicals, which are plant-derived compounds, have recently attracted a lot of attention due to their wide range of applications. Phytochemical screening is a vital process in detecting bioactive principles found in a medicinal plant, and it may lead to the development of new drugs. The main aim of this study, is to screen the phytoconstituents from Euphorbiaceae family medicinal plants such as *Acalypa indica*, *Croton sparsiflorus*, *Euphorbia hirta*, *Tragia involucrata* and *Phyllanthus amarus*. The presence of alkaloids, flavonoids, terpenoids, steroids, tannins, phenols, saponins, protein, amino acid, and carbohydrate was detected using a standard procedure for phytochemical screening. The therapeutic potential of these plants is linked to the presence of certain compounds. More research on these plants is needed to assess their pharmacological potentials, isolate, describe, and understand the structures of the bioactive chemicals that are responsible for their actions and other medicinal properties.

Keywords: Phytochemicals, secondary metabolites, *Acalypa indica, Croton sparsiflorus, Euphorbia hirta, Tragia involucrata. and Phyllanthus amarus.*

Introduction

Nowadays, there has been a resurgence of interest in the study and application of traditional medicine in various regions of the world. As a result, governments also have sought collaboration in discovering and incorporating safe positive aspects of traditional medicine into their national health systems (Kumari *et al.*, 2017) [9]. Herbal plants are an important source of powerful inhibitors that can provide 100 percent cures for so many varieties of ailments (Kadali *et al.*, 2016) [5]. On the basis of various disease healing capacity, the medicinal plants have a predominant role in Siddha, Ayurveda, and the Unani system of medicine. Recent animal experimental researches reveal the traditional healing system as a plant source of drugs without harmful effects on the human body (Kadali and Sandeep, 2015) [6]. Primary metabolites like amino acids, glucosides, proteins, and lipids are involved in cellular activities. secondary metabolites like alkaloids, flavonoids, terpenoids, steroids and saponins are produced in response to stress and have a more complex structure (Keeling and Bohlmann, 2006) [8]. Phytochemical screening is serve as the imperative part towards the drug discovery. Phytochemicals present in plants, such as steroids, glycosides, flavonoids, alkaloids, amino acids, saponins, tannins, and etc, provide a huge source of novel and promising medications (Akindele and Adeyemi, 2007; Saswade, 2019) [1, 18]. Basically, the phytoconstituents are evolved from all parts of the plant body including root, stem, leaf, bark and seed (Charles *et al*., 2013; Nandagoapalan *et al.*, 2016) [12, 20]. The bioactive compounds serve protection against various diseases and stress conditions (Thilagavathi *et al.*, 2015) [21]. The interaction amongst phytochemicals and the plant's bioactive mechanism is important to understand for the production of molecules with particular activities to treat lot of disease and protracted disease (Pandey *et al.*, 2013) [15]. Euphorbiaceae is the very largest family in all the higher plants, with around 8000 species and 300 genera (Neeraj and Lal, 2019) [13]. Secondary metabolites, which are biosynthetically produced from primary metabolites and are a significant source of many nutrients, are plentiful in plants belonging to the Euphorbiaceae family (Al-Snafi, 2017) [2]. The present study aimed to investigate the phytochemical screening of petroleum ether, chloroform and methanolic leaf extract of *Acalypa indica*, *Croton sparciflorus*, *Euphorbia hirta*, *Phyllanthus amarus* and *Tragia involucrata*.

Materials and Methods

Sample collection and Preparation

The healthy and fresh leaves of *Acalypa indica*, *Croton sparciflorus*, *Euphorbia hirta*, *Phyllanthus amarus* and *Tragia involucrata* were collected from open fields of Cauvery River Bank and surroundings of Kumbakonam city, Tamil Nadu, India. The plants were identified botanically and the herbarium stored to Government Arts College (Autonomous), Kumbakonam. The leaves were dried for 10 days under shade conditions and ground well.

Preparation of Extraction

The leaf powder were soaked in conical flasks containing selected solvents such as methanol, chloroform and petroleum ether. The conical flask were kept under rotary

shaker upto 72 hours at normal room temperature. Thereafter, the extracts were filtered by Whatman No. 1 filter paper. The filtrate were allowed to air dry upto evaporate the solvents. Moreover, extracts were mixed with distilled water for the further analysis

Screening of preliminary phytochemical

Test for Alkaloids

To 5 ml of crude extract was added with 1% HCl, 3-5 drops of Mayer's reagent and Dragendorff's reagent. The alkaloids are confirmed by the organic precipitate formation.

Test for Flavonoids

The extract was added to 5 ml of dilute NH3 solution and then added to concentrated H2SO4 solution. Finally, the yellow coloration confirms the presence of flavonoids.

Test for Terpenoids

To 5 ml of test extract was mix with 4 ml of chloroform and 3 ml of con. sulfuric acid. The dark red color layer formation confirmed the terpenoids.

Test for Steroids

In 2 ml of acetic anhydride solution was mix to 500 mg of extract with 2-4 ml of H2SO4. The steroids were confirmed by violet color change to blue.

Test for Tannins

To 5 ml of plant extract were added to 3 ml of 1% lead acetate solution. After gentle shaking, the yellow color precipitation confirms the presence of tannins.

Test for Phenols

To 5 ml of extract were added with aqueous 5% FeCl3 and formation of dark blue or black color indicates the positive of phenols.

Test for Saponins

To 5 ml of extract and 10-15 ml of distilled water was shake in a test tube upto 10 minutes. The saponins are confirmed by the formation of honeycomb structure.

Test for Proteins

In 2 ml of extract were mixed with 2 or 3 drops 1% CuSO4 solution and 1 ml of 40% NaOH solution. Finally, the violet color indicates the protein confirmation.

Test for Amino acids

In 2 ml extract were added in 2-3 ml of ninhydrin reagent and it was kept in water bath upto 20 minutes. Thereafter, turned purple color was confirms the amino acid.

Test for Carbohydrates

Two milliliters of extract and 2 drops of Molisch's reagent were added and agitate well after that 2 ml of concentrated H2SO4 was added by slowly in the test tube. The carbohydrates may confirm by the red based violet ring and formation of two layers.

Results and Discussion

The phytochemical screening of petroleum ether, chloroform and methanolic extract of five important medicinal plants namely *A. indica, C. sparsiflorus, E. hirta, P. amarus* and *T. involucrata* belongs to the family of Euphorbiaceae. The presence of alkaloids, flavonoids, terpenoids, steroids, tannins, phenols, saponins, protein, amino acid and carbohydrate was determined (Table 1). The alkaloids are present in all the extract of all plants except methanolic extract of *A. indica*, petroleum ether extract of *C. sparsiflorus* and petroleum ether and chloroform extract of *P. amarus*. Similar results were found in *A. indica* (Nandagoapalan *et al*., 2016) [12], *Croton bonplandianus* (Bhavana *et al.*, 2020) [3] and *P. amarus* (Oluboyo *et al.*, 2016) [14]. Alkaloids have great potential to antimicrobial, anti-malarial and anti-inflammatory activities (Marella *et al.*, 2013) [10]. The flavonoids are present in all the extract of all plants except petroleum ether while chloroform extract of *T. involucrata*. The flavonoids are large group of phenolic compounds it occurring naturally and found in leaf, sem, root, flowers, bark and etc. (Samanta *et al.*, 2011) [16]. The flavonoids play a vital role of inflammation, anti-allergies, antiulcer, free radicals, antioxidant and free radical scavenger (Kanakis *et al.*, 2005) [7]. Terpenoids present all the three extract of *P. amarus* and *T. involucrata* and chloroform and methanolic extract of *A. indica*, *E. hirta* and methanolic extract of *C. sparsiflorus.* Terpenoids are plants synthesized small molecular products and are widespread group of natural products (Visweswari *et al.*, 2013) [22]. Nandagoapalan *et al*. (2016) [12] reported that the *P. amarus* have terpenoids. Steroids present in all the extract of *T. involucrata* and petroleum ether and methanolic extract of *A. indica, C. sparsiflorus* and *P. amarus* and methanolic extract of *E. hirta*. The steroids compounds are used to stress relive, decrease cholesterol level, induce immune system and increase memory power (Sharma *et al.*, 2011) [19]. Tannins are present in all the extract of *C. sparsiflorus* and *E. hirta*, chloroform and methanolic extract of *A. indica*, petroleum ether and methanolic extract of *P. amarus* and methonolic extract of *T. involucrata*. Phenols present in all the extract of extract of *C. sparsiflorus* and *E. hirta*, chloroform and methanolic extract of *A. indica,* chloroform extract of *P. amarus* and methanolic extract of *T. involucrata.* Phenols are antiseptic bioactive substances with a strong potential for reducing oxidative stress in cells (Michalak, 2006) [11]. Saponins are found in methanolic extract of all the five plants and chloroform extract of *A. indica* and *T. involucrata* and petroleum ether extract of *C. sparsiflorus* and *P. amarus.* These saponins served as natural antibiotics and heterogeneous group of natural products occur in many medicinal plants (Santhi *et al.*, 2011) [17]. Proteins are present in all the three extract of *T. involucrata,* chloroform and methanolic extract of *C. sparsiflorus*, petroleum ether and chloroform extract of *E. hirta*. Amino acids found in chloroform extract of *A. indica* and *P. amarus*, methanolic extract of *C. sparsiflorus* and *E. hirta*, petroleum ether and chloroform extract of *T. involucrata.* The similar results were found in chloroform, methanol and aqueous extract of *Acacia Arabica* (Deshmukh and Theng, 2018) [4]. Carbohydrates are present in methanol and chloroform extract of *A. indica* and *E. hirta*, petroleum ether and methanolic extract of *C. sparsiflorus* and *T. involucrata* and chloroform extract of *P. amarus.* Deshmukh and Theng (2018) [4] reported that the carbohydrates are present in methanolic bark extract of *Acacia Arabica*.

Table 1: Preliminary phytochemical screening of different leaf extract of five important medicinal plants

S. No	Phytochemicals	*A. indica*			*C. sparsiflorus*			*E. hirta*			*P. amarus*			*T. involucrata*		
		PE	C	M	PE	C	M	PE	C	M	PE	C	M	PE	C	M
1	Alkaloids	+	+	-	-	+	+	+	+	+	-	-	+	+	+	+
2	Flavanoids	-	+	+	-	+	+	+	+	+	-	+	+	-	-	+
3	Terpenoids	-	+	+	-	-	+	-	+	+	+	+	+	+	+	+
4	Steroids	+	-	+	+	-	+	-	-	+	+	-	+	+	+	+
5	Tannin	-	+	+	+	+	+	+	+	+	+	-	+	-	-	+
6	Phenols	-	+	+	+	+	+	+	+	+	-	+	-	-	-	+
7	Saponin	-	+	+	+	-	+	-	-	+	+	-	+	-	+	+
8	Proteins	-	-	-	-	+	+	+	+	-	-	-	-	+	+	+
9	Amino acids	-	+	-	-	-	+	-	-	+	-	+	-	+	+	-
10	Carbohydrates	-	+	+	+	-	+	-	+	+	-	+	-	+	-	+
11	Cholesterol	+	-	-	-	+	-	+	+	-	+	-	+	+	+	-

(+: Presence; -: Absence) (PE: Petroleum Ether; C: Chloroform; M: Methanol)

Conclusion

The phytochemical substances derived from medicinal plants have the potential to be valuable treatments for improving human health. Phytochemical studies are increasingly being used as a first step in the search for effective medications. Using chromatographic and spectroscopic methods, the current work leads to future research in the separation and identification of the active compound from the selected plants.

Conflict of Interest

The authors have no conflicts of interest regarding this investigation.

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