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PHYTOCHEMICAL SCREENING OF A FEW MEDICINAL PLANTS FROM WESTERN GHATS IN TAMILNADU

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ABSTRACT

Traditional medicinal plants such as Aegle marmelos, Cardiospermum halicacabum, Solanum surattense,Citrullus colocynthis and Centella asiatica were collected from Manjuvilai village near Kalakkad in Western Ghats. The powdered plants parts were subjected to phytochemical screening using five solvents viz., aqueous, ethanol, ethyl acetate, methanol and chloroform. Result showed the presence of phytochemicals such as alkaloids, flavonoids, tannins, terpenoids, steroids, saponnins, glycosides, anthraquinones, phlobatannins, proteins, carbohydrates, and reducing sugars in various solvents of the extract. These phytochemicals were abundant in methanol followed by ethanol and ethyl acetate extracts. The present study proved that the solvent extracts of the samples contain medicinally important bioactive compounds and this justifies that these plant species as traditional medicine for the treatment of various diseases.

KEY WORDS: *Phytochemicals, Solvent, Traditional Medicine.*

INTRODUCTION

Medicinal plants have been used as an exemplary source for centuries as an alternative remedy for treating human disease because they contain numerous active constituents of immense therapeutic value (Pandey et al., 2016). During the last few decades there has been an increase in the study of medicinal plants and their ancestral systems. The medicinal values of the plants are due to the presence of some secondary metabolites. The most important of these bioactive constituents are alkaloids, tannins, flavonoids and phenolic compounds (Arunachalam and Aiswarya, 2010). According to World Health Organization (1994) from 119 plant-derived pharmaceutical medicines, about 74% are used in modern medicine in ways that correlate directly with their traditional uses as plant medicine (Saha et al., 2013). The biosynthesis of secondary metabolites varies among plants, even in different organs of plants and it depends on the environmental factors.

Aegle marmelos (L). belonging to Rutaceae contains oxazoline, coumarins and alkaloids. It is used as antidiarrheal, antidysentric, bronchitis and antimalarial drugs. Cardiospermum halicacabum Linn. (Sapindaceae) is a herbaceous climber found throughout the plains of India. It contains alcohols, phenols, alkanes, esters and is used as analgesic, anti-inflammatory and vaso-depressant activities (Jayadevi et al., 2013). Citrullus colocynthis Scarol. is a member of Cucurbitaceae, a perennial creeping herb (Nora et al., 2015) and it contains aminoacids, alkaloid, saponins, glycosides, tannins, phenolics, steroids, terpenoids, flavonoids (Esmail, 2016). Solanum surattense Burm. of Solanaceae is a perennial herbaceous weed which contains alkaloids, steroids, saponins, flavonoids, glycosides, fatty acids etc. (Reddy et al., 2014). This medicinal plant is used as antihelmintic, bronchitis, asthma, piles and as a laxative (Thakur and Pendyala,

2016). Centella asiatica Linn. is a prostrate stoloniferous plant belonging to Apiaceae family . It is effectively being used in the treatment of fever, jaundice, dysentery, mental illness, eczema due to the presence of triterpenoids, asiatiaside, brachmoside, asiatic acid, centellulose, centelloside, brahmic acid and malecassoside (Chaintanya et al., 2011).

MATERIALS AND METHODS

For preliminary phytochemical activity, five samples such as Aegle marmelos, Cardiospermum halicacabum, Solanum surattense, Citrullus coloynthis and Centella asiatica were collected from various places of Manjuvilai Village near Kalakkad in the Western Ghats region in Tirunelveli district of Tamil Nadu. The samples were washed with ordinary water and rinsed with distilled water. It was shade dried and then ground with mortar and pestle into coarse powder and packed in an airtight plastic container for further analysis.

SAMPLE PREPARATION

Sample after powdering was subjected to soxhlet extraction. About 5gm of the sample powder was weighed and extracted using successive solvent method in aqueous extract, ethanol, ethyl acetate, chloroform and methanol extract. The extracts were labelled accordingly cooled and stored in a desiccative for further phytochemical analysis.

PRELIMINARY SCREENING

The samples were chemically tested for phytochemical constituents like alkaloids. flavonoids, terpenoids, steroids, saponins, tannins, glycosides, reducing sugars, phlobatannins, anthraquinones, proteins, carbohydrates using standard procedures recommended by Brain and Turner 1975; Ansari, 2006; Kokate, 1994 ; Mukkerjee P.K., 2002 and Harbone, 1984.

RESULT AND DISCUSSION

Preliminary phytochemical screening was carried out in five samples using aqueous, ethanol, ethyl acetate, chloroform and methanol extract to investigate the presence of medicinally important phytochemicals in the samples. Table-1 reveals the phytochemical profile of Aegle marmelos which showed the presence of flavonoids, steroids and phenols present in moderate levels and alkaloids, terpenoids, saponins, tannins, glycosides, proteins and carbohydrate at low levels, while reducing sugars, phlobatannins and anthraquinones could not be detected in aqueous extract. In the ethanol extract, the constituents such as alkaloids, flavonoids, terpenoids, steroids, tannins, phenols, protein and carbohydrate were expressed in moderate levels while saponins, reducing sugars and glycosides were seen in low levels and phlobatannins and anthraquinones could not be detected (Table-1). The ethyl acetate extract of this plant showed tannins at high levels, whereas terpenoids, proteins and carbohydrates were revealed in moderate levels, while alkaloids, flavonoids, steroids, reducing sugars, glycosides and phenols were shown at low levels and saponins, phlobatannins and anthraquinones could not be found. Alkaloids, flavonoids, terpenoids, steroids, phenols, proteins and carbohydrates were expressed in moderate levels in the chloroform extract, whereas saponins, tannins, reducing sugars, phlobatannins and glycosides were seen in low levels and anthraquinone could not be traced out. High levels of terpenoids, tannins, proteins and carbohydrate were seen in the methanol extract. While alkaloids, flavonoids, steroids, and phenols were expressed in moderate levels in the methanol extract whereas saponins and reducing sugars at low levels, whereas phlobatannins, anthraquinones and glycosides could not be observed (Table-1).

Table 1: Showing Phytochemical Profile of various extracts of Aegle marmelos

Test Name	Aqueous	Ethanol	Ethyl acetate	Chloroform	Methanol
Alkaloids	-	+	+	+	++
Flavonoids	-	+	+	+	++
Terpenoids	+	++	++	++	+++
Steroids	++	++	+	++	++
Saponins	++	-	-	-	-
Tannins	-	+	+++	+	+++
Reducing Sugars	+	+	+	+	+
Phlobatannins	-	-	-	-	-
Anthraquinones	-	-	-	-	-
Glycosides	-	+	+	-	-
Phenols	-	+	+	+	++
Protein	++	++	++	++	+++
Carbohydrate	+	+	++	+	+++

Note: +++ denotes high; ++ denotes moderate; + denotes low; - denotes absence.

In Cardiospermum halicacabum, the result from its aqueous extract showed flavonoids in moderate level, but saponins, tannins, anthraquinones, protein and carbohydrates were found in low levels (Table-2). Alkaloids, terpenoids, steroids, reducing sugars, phlobatannins and phenols could not be observed. Ethanol extract of the plant showed steroids at high levels whereas terpenoids and phenols were expressed in moderate level and alkaloids, glycosides, proteins, carbohydrates were observed in low level but flavonoids, saponins, tannins, reducing sugars, phlobatannins and anthraquinones could not be found (Table 2). In ethyl acetate extract, tannins were found in high levels, while terpenoids, phenols and carbohydrates at moderate level whereas alkaloids, steroids, glycosides and proteins was detected in low levels. Flavonoids, saponins, reducing sugars, phlobatannins and anthraquinones were not visualized. Chloroform extract revealed that terpenoids and steroids in high intensity, whereas glycocides and phenols were observed in moderate level, alkaloids and carbohydrates were shown in low levels and flavonoids, saponins, tannins, reducing sugars, phlobatannins, anthraquinones and proteins could not be observed. Methanol extract revealed the presence of terpenoids and carbohydrates in high level, whereas the alkaloids, flavonoids, steroids, tannins, glycosides and phenols were expressed at moderate level, protein content was in low level, but saponins, reducing sugars, phlobatanins, anthraquinones could not be detected (Table-2).

Table 2: Phytochemical screening of Cardiospermum halicacabum of various extracts

Test Name	Aqueous	Ethanol	Ethyl acetate	Chloroform	Methanol
Alkaloids	-	+	+	+	++
Flavonoids	+	-	-	-	++
Terpenoids	-	++	++	+++	+++
Steroids	-	+++	+	+++	++
Saponins	+	-	-	-	-
Tannins	+	-	+++	-	++
Reducing Sugars	-	-	-	-	-
Phlobatannins	-	-	-	-	-
Anthraquinones	+	-	-	-	-
Glycosides	+	+++	+	++	+
Phenols	-	++	++	++	++
Protein	+	+	+	-	+
Carbohydrate	+	+	++	+	+++

Note: +++ denotes high; ++ denotes moderate; + denotes low; - denotes absence.

In Citrullus colocynthis flavonoids, steroids, phenols were found at moderate level in the aqueous extract, whereas alkaloids, terpenoids, saponins, tannins, glycosides, proteins and carbohydrates were expressed in low levels but reducing sugars, phlobatannins and anthraquinones could not be detected . The ethanol extract showed flavonoids, steroids and glycosides in high intensity, whereas proteins and carbohydrates in moderate levels (Table-3). However, alkaloids terpenoides, saponins, tannins and phenols were found in low levels, but reducing sugar, phlobatannins and anthraquinones could not be detected. Alkaloids, flavonoids and steroids were found in higher levels whereas tannins and glycosides were observed in moderate levels in the ethyl acetate extract of the plant. Terpenoids, saponins, phenols, proteins and carbohydrates were in low levels, and reducing sugars, phlobatannins and anthraquinones could not be detected. Chloroform extract showed that flavonoids, steroids and glycosides were observed at high level whereas alkaloids, terpenoids, saponins, tannins, phenols, proteins and carbohydrates in low levels, but reducing sugars, phlobatannins, and anthraquinones could not be detected. In methanol extract, flavonoids, steroids and phenols were expressed in high level and alkaloids, terpenoids, tannins, glycosides, proteins and carbohydrates were observed in moderate level but saponins were observed in low level and reducing sugars, phlobatannins and anthraquinones could not be observed (Table-3).

Table 3: Showing phytochemical screening of Citrullus colocynthis of various extracts

Test Name	Aqueous	Ethanol	Ethyl acetate	Chloroform	Methanol
Alkaloids	-	+	+++	+	++
Flavonoids	++	+++	+++	+++	+++
Terpenoids	-	+	+	+	++
Steroids	-	+++	+++	+++	+++
Saponins	--	+	+	+	+
Tannins	-		+++		++
Reducing Sugars	-	-	-	-	-
Phlobatannins	-	-	-	-	-
Anthraquinones	-	-	-	-	-
Glycosides	-	+++	+++	+++	+
Phenols	++	+	+	+	+++
Protein	-	-	-	-	-
Carbohydrate	-	-	-	-	-

Note: +++ denotes high; ++ denotes moderate; + denotes low; - denotes absence.

In the aqueous extract of Solanum surattense, steroids were found in moderate level whereas alkaloids, flavonoids, terpenoids, saponins, tannins, glycosides, proteins and carbohydrates were expressed in low levels but reducing sugars, phlobatannins, anthraquinones and phenols could not be found (Table-4). Ethanol extract of this plant terpenoids and glycosides were seen in moderate level but alkaloids, flavonoids, steroids, saponins, tannins, phlobatannins, phenols, protein and carbohydrates were found in low levels whereas reducing sugars and anthraquinones could not be observed. Flavonoids and tannins were expressed in the highest level in the of ethyl acetate, whereas alkaloids, terpenoids, steroids, phlobatannins, glycosides and phenols were expressed in low level but saponins, reducing sugars, anthraquinones, protein and carbohydrates could not be traced. Chloroform extract of the plant showed alkaloids and terpenoids were expressed in high level whereas flavonoids, steroids, tannins, phlobatannins, glycosides, phenols, proteins and carbohydrares were observed in the low levels (Table-4). However, saponins, reducing sugars and anthraquinones could not be detected. The methanol extract, alkaloids, terpenoids, and phenols were found in the very high levels but flavonoids, tannins and carbohydrates were expressed in moderate levels and steroids, phlobatannins, glycosides, proteins were seen in low levels and saponins, reducing sugars and anthraquinones could not be found (Table-4).

Table 4: Showing phytochemical screening of Solanum surattense of various extracts

ame	Aqueous	Ethanol	Ethyl acetate	Chloroform	Methanol
Alkaloids	+	+	+	+++	+++
Flavonoids	+	+	+++	+	++
Terpenoids	+	++	+	+++	+++
Steroids	++	+	+	+	+
Saponins	+	+	-	-	-
Tannins	+	+	+++	+	++
Reducing Sugars	-	-	-	-	-
Phlobatannins	-	+	+	+	+
Anthraquinones	-	-	-	-	-
Glycosides	+	++	+	+	+
Phenols	-	+	+	+	+++
Protein	+	+	-	+	+
Carbohydrate	+	+	-	+	++

Note: +++ denotes high; ++ denotes moderate; + denotes low; - denotes absence.

In Centella asiatica the result of aqueous extract revealed that flavonoids, terpenoids and tannins were expressed in moderate level whereas alkaloids, phenols, proteins and carbohydrates were found in lowest levels but steroids, saponins, reducing sugars phlobatannins, anthraquinones, and glycosides could not be detected. In ethanol extract, flavonoids, terpenoids and glycosides were found in highest level whereas alkaloids, tannins, phenols, proteins and carbohydrates were observed in low level and steroids, saponins, reducing sugars, phlobatannins and anthraquinones were not detected. In the case of ethyl acetate the presence of flavonoids, tannins and glycosides were expressed in high level (Table-5) whereas alkaloids, terpenoids, phenols, proteins and carbohydrates were found in low level but terpenoids, steroids, saponins, reducing sugars, phlobatannins and anthraquinons could not be traced. In chloroform extract terpenoids were expressed in high level whereas steroids, glycosides and proteins were expressed in moderate level and alkaloids, flavonoids, tannins, phenol and carbohydrates were shown in low level but saponins, reducing sugars phlobatannins and anthraquinons could not be found. In the methanol extract alkaloids, terpenoids and phenols were expressed in high level whereas flavonoides, steroids, tannins, glycosides, proteins and carbohydrates were found in moderate level and saponins, reducing sugars, phlobatannins and anthraquinones could not be observed.

Table 5: Phytochemical screening of Centella asiatica of various extracts

Test Name	Aqueous	Ethanol	Ethyl acetate	Chloroform	Methanol
Alkaloids	+	+	+	+	+++
Flavonoids	++	+++	+++	+	++
Terpenoids	++	+++	-	+++	+++
Steroids	-	-	-	++	++
Saponins	-	-	-	-	-
Tannins	++	+	+++	+	++
Reducing Sugars	-	-	-	-	-
Phlobatannins	-	-	-	-	-
Anthraquinones	-	-	-	-	-
Glycosides	-	+++	+++	++	++
Phenols	+	+	+	+	+++
Protein	+	+	+	++	++
Carbohydrate	+	+	+	+	++

Note: +++ denotes high; ++ denotes moderate; + denotes low; - denotes absence.

The result indicated that the samples from various sites revealed the presence of various phytoconstituents in five different extracts. Out of these five solvents used for extraction, methanol extract was found the most suitable in which maximum phytoconstituents could be eluted. The presence of major constituents like alkaloids, flavonoids, terpenoids, steroids, saponins, tannins, reducing sugars, phlobatannins, anthraquinones, glycosides, phenols, proteins and carbohydrates in various extract of samples such as Aegle marmelos, Cardiospermum halicacabum, Citrullus colocynthis, Solanum surattense and Centella asiatica can be correlated with the medicinal potential of the plant.

DISCUSSION

This study has revealed the presence of phytochemicals which is considered as active potential chemical constituents. Important medicinal constituents such as alkaloids, flavonoids, terpenoids, tannins, proteins and carbohydrates were present in the sample. The result showed that all the five samples are rich in various phytoconstituents. The presence of terpenoids, tannins, proteins and carbohydrates in high levels while alkaloids, flavonoids, steroids, saponins, phenols at moderate levels could be observed in this work. Phenolic compounds are used against burns as they precipitate the proteins of exposed tissue to form a protective covering. They are used as healing agents in inflammations, burns piles and as antidote (Khanna and Kannabiran, 2007). Terpenoids are used as antiseptic and antihelmintic (Riyanto and Mustaba, 2000). Chloroform and ethanol extract showed the presence of alkaloids, phenols, flavonoids, terpenoids, carbohydratyes, glycosides, phlobatannins, protein, saponins, steroids (Siddique et al., 2010; Sridhar et al., 2013; George et al., 2017). The present study also revealed the presence of alkaloids, flavonoids, terpenoids, steroids, saponins, phenols, proteins and carbohydrates. The findings of this investigation agree with (Murti et al., 2011) that Cardiospermum halicacabum has terpenoids, glycosides, and carbohydrates. Alkaloids, flavonoids, steroids, tannins, glycosides, phenols in various extracts of Citrullus colocynthis as observed by (Nora et al., 2015) which coincide with the present work. The present study verified the traditional use of Cardiospermum halicacabum as herbal medicine due to its rich source of phytochemicals and also agrees with (Annadurai et al., 2013). The presence of phytochemicals such as alkaloids, flavonoids, terpenoids and saponins in Aegle marmelos suggests its medicinal importance which has been brought out by Singh and Singh, 2016. In different solvent extracts of Solanum surrattense alkaloids, flavonoids, terpenoids, tannins, phenols and carbohydrates could be detected (Sahila Devi et al., 2006) in their work in Solanum surrattense found out the presence of similar phytochemicals. The presence of alkaloids, flavonoids, terpenoids, alkaloids, flavonoids, phenols, glycosides which are well known to possess various pharmacological properties in Centella asiatica supports the findings of Akiayama et al. (2001).

Among the five different solvents used methanol extracted more phytochemicals in the selected plants followed by ethanol, ethyl acetate, chloroform and aqueous extracts respectively this is due to the fact that polarity of the solvent increases from methanol to water (Abbasi et al., 2008). The presence of more levels of tannins, phenols, flavonoids in the experimental samples suggest that these plants are producing more of these chemical constituents in methanol due to its high polar nature (Uma Devi and Lawrence, 2014). The present study clearly indicated that compounds like alkaloids, flavonoids, terpenoids and saponins which are the active principles present in the five selected plants account which gives the medicinal importance, can be converted into potential drugs to combat situations faced by humanity in the present day of multi-resistant microorganisms and thereby cure almost all common human ailments.

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