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Phytochemical Investigation of Medicinal Plants of Kalrayan Hills, Villupuram District

Ramesh P[1], and Subramani A[2]

[1]Research and Development Center, Bharathiyar University, Coimbatore, Tamil Nadu, India

[2]Department of Botany A.A.Govt Arts College.Villupuram, Tamil Nadu, India

ABSTRACT

Medicinal plants make many chemical compounds for biological functions including defense against bacteria, fungi and viruses. The phytochemicals on the human body in exactly the same way as pharmaceutical drugs, herbal medicines can be beneficial and have harmful side effects just like conventional drugs. In the present investigation suggested that the analysis of qualitative and quantitative phytochemicals of medicinal plants with aqueous and methanol solvent extract were performed and the medicinal plant was collected from kalrayan hills, Villupuram district, Tamilnadu. The selected medicinal plants such as *Acalypha indica, Chloroxylon swietenia, Cipadessa baccifer*a, *Eupatorium odoratum, Dodoniea viscose, Glycosmis pentaphylla, Mallotus philippensis, Mukia madasapatana, Ocimum gratisimum, Stachyarpheta jamaicenis, Solanum trilobatum,* and *Vitex trifolia* were investigated and analysis of phytochemicals like alkaloids, flavonoids, phenols,reducing sugar saponnins, steroids, terpenoids, and triterpenoids represented in various aspects of strongly presented and some of the phytochmicals also observed. The quantitative phytochemicals such as alkaloids, flavonoids, reducing sugar, saponins, steroids, terpenoids, and triterpenoids were performed from the twelve medicinal plants. Among the twelve medicinal plants, the *Eupatorium odoratum* was excellent indicative of phytochemicals in qualitatively as well as quantitatively recorded when compared with other medicinal plants with aqueous extract. The medicinal plants are used for discovering and screening of the phytochemical constituents which are very helpful for the preparation of new drugs.

Keywords : phytochemicals, medicinal plants, Kalrayan hills

I. INTRODUCTION

The medicinal plants are useful for healing as well as for curing of human diseases because of the presence of phytochemical constituents Nostro *et al.,* (2000). Phytochemicals are naturally occurring in the medicinal plants, leaves, vegetables and roots that have defense mechanism and protect from various diseases. Phytochemicals are primary and secondary compounds. Chlorophyll, proteins and common sugars are included in primary constituents and secondary compounds have terpenoids, alkaloids and phenolic compounds Krishnaiah *et al.,* (2007). Terpenoids exhibit various important pharmacological activities i.e., anti inflammatory, anticancer, antimalarial, inhibition of cholesterol synthesis, antiviral and antimicrobial activities by Mahato and Sen (1997). Terpenoids are very important in attracting useful mites and consume the herbivorous insects by Kappers *et al.,* (2005). Alkaloids are used as anaesthetic agents and are found in medicinal plants by Herouart *et al.,* (1988). Phytochemicals are the chemicals produces by various parts of the plants. These bioactive constituents of plants are steroids, terpenoids, carotenoids, flavanoids, alkaloids, tannins, and glycosides were reported from the medicinal plants.

These compounds have various activities such as antimicrobial have been reported to exhibit hemolytic and foaming activity reported by Feroz *et al.,* (1993).

II. MATERIALS AND METHODS

Collection of plant materials

The medicinal plantswere collected from the Kalrayan hills, Villupuram District, Tamil Nadu

Authentication of plant materials

The plant material was authenticated by the Rapinet Herbarium, St. Joseph's College, Tiruchirappalli, Tamil Nadu.

Preparation of medicinal plantpower

The collected plant samples were air dried. After air dried the samples was ground in grinding machine made for the laboratory. Exposure direct sunlight and avoided to prevent the loss of active components. These powdered materials were used for further analysis

Preparation of plant extract

Phytochemical test were carried out on the basis of aqueous and methanol solvent The extract of medicinal plants using standard procedures for determination the phytochemical constituents as described by Sofowara (1993) Treas and Evans (1989)

Qualitative phytochemical analysis(Harborne, 1973)

Preliminary phytochemical analysis was carried out for the extract as per standard methods described by Brain and Turner (1975) and Evans (1996)

Detection of alkaloids

Extracts were dissolved individually in dilute hydrochloric acid and filtered. The filtrates were used to test the presence of alkaloids.

Detection of flavonoids

Two ml of extract was taken a 10 ml test tube and added few drops of 1% ammonia solution. Change the yellow colouration was observed indicating the presence of flavonoids.

Detection of steroids

Two ml of acetic anhydride was added to five gram of the plant extracts, each with two ml of H_2SO_4. The colour was changed from violet to blue or green in some samples indicate that the presence of steroids.

Detection of terpenoids

Salkowski s test

Five gram of of the plant leaf extract was mixed with two ml of chloroform and concentrated H_2SO_4 (3ml) was carefully added to form a layer. An appearance of reddish brown colour in the inner face was indicated that the presence of terpenoids.

Detection of phenols

Lead acetate test:

Ten gram plant leaf extracts was treated with few drops of lead acetate solution. Formation of yellow colour precipitate indicated that the presence of phenol.

Detection of saponins

Twoml of plant extract was added in 5ml of distilled water in a water bath next shaken in vigorously for a stable persistent forth appears 2ml of extract with few drops of olive oil and shaken vigorously then observed for the formation of emulsion.

Detection of tannins

A small quantity of plant leaf extract was mixed with water and heated on a water bath. The mixture was filtered and ferric chloride was added to the filtrate. A dark green colour was formed. It indicated that the presence of tannins.

Detection of protein

Biuret test:

Five mg of plant leaf extract with equal volume of 40% NaOH solution and two drops of one percent copper sulphate solution was added. The appearance of violet colour indicates that the presence of protein.

Detection of triterpenoids

The substance was warmed with tin and thionyl chloride. Pink colour indicated the presence of triterpenoids.

Detection of Reducing sugar

Fehling's test:

The extract treated with Fehling's reagent A and B. The appearance of reddish brown colour precipitate indicated the presence of reducing sugar.

Quantitative phytochemical analysis

Estimation of alkaloids

Alkaloid determination by using Five gram of the plant leaf sample was weighed into a 250 ml beaker and 200 ml of 10% acetic acid in ethanol was added and its covered and allowed to stand for 4 h. It was filtered and the extract was concentrated on a water bath to one quarter of the original volume. Concentrated NH_4OH was added by drop wise to the extract until the precipitation was completed. The whole solution was allowed to settle and the precipitate was collected and washed with dilute NH_4OH and then filtered. The residue is the alkaloids which was dried and weighed.

Estimation of flavonoids

Five grams of plant leaf sample was repeatedly extracted with 100ml of 80% aqueous and methanol at room temperature. The mixture was filtered through a Whatman No1 filter paper into a pre-weighed 250ml beaker. The filtrates was transferred into a water bath and allowed to evaporate to dryness and weighed.

Estimation of tannins

Five hundred milligram of theplant leaf samples was weighed into a 50 ml plastic bottle. 50 ml of acetone solvent was added and shaken for 1 h in a mechanical shaker. This was filtered into a 50 ml volumetric flask and made up to the mark. Then 5 ml of the filtered was pipette out into a test tube and mixed with 2 ml of 0.1M $Fecl_3$ in 0.1 N HCL and 0.008 M potassium ferrocyanide. The absorbance was measured at 120 nm with in 10 mm.

Estimation of total phenols

The fat free sample was boiled with 50 ml of ether for the extraction of the phenolic component for 15 min. Five ml of the extract was pipette out into a 50 ml flask, then 10 ml of distilled water was added. Two ml of NH_4OH solution and 5 ml of concentrated amyl alcohol were also added. The samples were made up to mark and left to react for 30 min for colour development. This was read at 500nm.

Estimation of saponins

Test extract were dissolved in 80% methanol, 2ml of Vanilin in ethanol was added, mixed well and the 2ml of 72% sulphuric acid solution was added, mixed well and heated on a water bath at 600 c for 10min and the absorbance was measured at 544nm against reagent blank.

Estimation of steroids

One ml of test extract of steroid solution was transferred into 10 ml volumetric flasks. Sulphuric acid (4N, 2ml) and iron (III) chloride (0.5% w/v, 2 ml), were added, followed by potassium hexacyanoferrate (III) solution (0.5% w/v, 0.5 ml). The mixture was heated in a water-bath maintained at 70±20 C for 30 minutes with occasional shaking and diluted to the mark with distilled water. The absorbance was measured at 780 nm against the reagent blank.

III. RESULTS AND DISCUSSION

The content of primary and secondary phytochemicals that the variation in the contents like alkaloids, flavonoids, phenol, carbohydrate and other constituents. These variations are due to number of environmental factors such as climate, altitude, rainfall etc. as mentioned (Kokate *et al.,* 2004). The phytochemical screening of flowers and flower buds are not been reported earlier although flower and flower bids of also help in abortion and leucorrhea (Anba zhakan *et al.,* 2007).

In the present investigation suggested that the medicinal plants of *Acalypha indica* was alkaloids, flavonoids, saponins, terpenoids, and triterpenoids with aqueous extract in qualitatively investigated. In the plant of *Chloroxylon swieteneia* was reducing sugar, saponins, steroids, terpenoids and triterpenoids represented in aqueous extract. In the plant *Cipadessa baccifera* has flavonoids, saponins, and triterpenoids recording in the same solvents. The medicinal plant of *Eupatorium odoratum* was alkaloids, flavonoids, phenols, reducing sugar, saponins, steroids, terpenoids, and triterpenoids represented from the aqueous extract whereas *Dodoniea viscose* was saponins, terpenoids, and triterpenoids recording with respective plants. The plant *Glycosmis pentaphylla* was alkaloids, strongly flavonoids, saponins, steroids, terpenoids, and triterpenoids recorded. The *Mallotus philippensis* was alkaloids, flavonoids, saponins, terpenoids, and triterpenoids were represented from the plant. In the lord Siva plant of *Ocimum gratisimum* was only there compounds such as saponins, trepenoids, and triterpenoids, with aqueous solvent extracted and represented. The *Stachyarpheta jamaicenis* plant contain alkaloids, flavonoids, reducing sugar, saponins, terpenoids, and triterpenoids were analysed. In the case of saponins, steroids, terpenoids were estimated and some of the phytochemicals strongly represented. The plant *Vitex trifolia* alkaloids, phenols, reducing sugar, saponins, and terpenoids was represented. (Table – 1).

The phytochemical analysis clearly indicated the presence of wide range of potential bioactive compounds in various polar solvents. The qualitative phytochemical analysis showed the presence of alkaloids, carbohydrate, cardiac glycosides, flavonoids, glycosides, phenols, phytosterol, saponin and tannin in appreciable amount by Saranya and Uma Gowrie (2016).

According to the hexane extract of qualitative phytochemical compounds from medicine plants of Kalrayan hills, Villupuram district were investigated. In the plant *Acalypha indica* was alkaloids, saponnins, steroids, terpenoids and triterpenoids recorded respectively. whereas *Chloroxylon swietenia* was saponins, terpenoids and triterpenoids estimated with respective plants. The medicinal plant *Cipadessa baccifera* was flavonoids, saponins, steroids, terpenoids, and triterpenoids performed with methanolic extract respectively. The plant *Dodoniea viscosa* was flavonoids and steroid reported only selective phytochemical compounds recorded respectively. The methanolic extract of *Mallotus philippensis* has flavonoids, terpenoids, and triterpenoids estimated in qualitatively. whereas *Mukia madasapalana* also cantain flavonoids, from extract of medicinal plants. The *Ocimum gratisimum* was alkaloids, flavonoids, saponins, steroids, and terpenoids represented respectively. The medicinal plant of *Stachyarphetaja maicenis* was alkaloids flavonoids, saponnins, terpenoids and triterpenoids analysed with respective solvents. In the case of *Solanum trilobatum* was alkaloids, flavonoids, reducing sugar, saponnins, terpenoids and triterpenoids recorded respectively. whereas *Vitex trifolia* was alkaloids, saponnins, and terpenoids recorded in qualitatively from the medicinal plants (Table – 2).

The phytochemical experiments may chemical constituents in the plant material, inducing their quantitative estimation and locating the origin of pharmacologically active chemical compound. Qualitative analysis of phytochemical compounds like saponins, tannins, flavonoids, terpenoids, phenols, coumarins, Di-terpenes, quinones, cardiac glycosides, quinones and phlobatannins were examined in the ethanolic extracts of flowers and leaves of *Hypericum perforatum* L. employing standard methodology were followed. In ethanolic extracts of flowers of *Hypericum perforatum* L. tested were positive. In ethanolic extracts of leaves of *Hypericum perforatum* L. The resultsfound that most of the biologically active phytochemicals were presented in the ethanolic extracts of flowers and leaves of *Hypericum perforatum L.* Asgharian and Ojani S (2017).

Isolation and characterization of pharmacologically active compounds from medicinal plants continue today non-infectious ailments (Mukhtar *et al.,* 2008). Many of the compounds exhibited potent biological activity extended to be present in plants at low concentration levels (Douglas kinghorn *et al.,* 2011). Medicinal plants remain an important source of new drugs, new drug leads, and New Chemical Entities (NCEs) (Douglas kinghorn, 2005). This indicates the chemical potential of the extract to facilitate the process of chemical isolation ad supported by previous studies (Douglas kinghorn, 2005 and Muthaura *et al.,* 2011). It has been reported that many medicinal plants are rich in flavonoids, tannins, and terpenoids (Lewis and Ausubel, 2006), (Swetha venpoosa *et al.,* 2013), (Viajayalakshmi 2013), these secondary plant metabolites exert a wide range of biological activities on physiological systems (Olagunju *et al.,* 2006). The results of preliminary phytochemical screening showed the presence of flavonoids, phenolic groups, steroids and terpenoids in all the extract of leaves and stem. Flavonoids are reported to possess antioxidant, antiproliferative, antitumor, antiinflammatory, proapoptotic activities with molecular targets have been identified (Williams *et al.,* 2004; Taylor and Grotewold, 2005). The health promoting effects of flavonoids may relate to interactions with key enzymes, signaling cascades involving cytokines and transcription factors, or antioxidant systems (Polya, 2003). Phenolic compounds have also been known as have shown medicinal activity as well as exhibiting physiological functions. It was reported that compounds such radical scavenging effects of most plants (Omale and Okafor, 2007). Due to the presence of these many compounds the extracts possess the medicinal potential to develop novel therapeutic agents.

The ethanolic extracted yield of *D. fortunei* rhizomes (9.31%) showed the highest value following by the yields of *B. pinnatum* whole plant (5.19%), *D. ovata* barks (4.38%) and *wallichii* barks (1.98%) successively Samell *et al.,* (2018)

The aqueous extract of medicinal plants showed the presence of terpenoids in *Piper nigrum* leaves but it is not seen in the *Piper nigrum* roots. Tannins are only detected in *Carica papaya* leaves and it is not seen in *Carica papaya* roots. Quinones showed the best result in *Agave americana* root aq. extract. All the three medicinal plants have the presence of alkaloids in their aqueous root extract. Sugar, proteins, flavonoids are found in abundant amount and detected in all the three medicinal plants by Pallavi Singh *et al.,(*2018).

The analysis of quantitative phytochemical compounds from the medicinal plants with aqueous extract was performed The phytochemicals such as alkaloids, flavonoids, saponin, terpenoids and triterpenoids was 0.32, 0.42, 0.48, 0.58 and 0.64mg/ml recorded from the *Acalypha indica* plant *Chloroxylon swietenia* have the minimum yield of reducing sugar, saponins, steroids, terpenoids and triterpenoids estimated qualitatively. The *Cipadessa bacifora* was flavonoids, saponins and triterpenoids was 0.46, 0.69 and 0.80 mg/ml recorded respectively whereas *Eupatorium odoratum* results of quantitative analysis

of major groups of phytochemical constituents in the medicinal plants. The highest yield of alkaloids, flavonoids, phenols, reducing sugars, saponin, steroids, terpenoids and triterpenoids was 0.52, 0.54, 0.59, 0.64, 0.70, 0.74, 0.82 and 0.89 mg/ml estimated respectively. *Eupatorium odoratum* as a good source of biological activities because of the presence of bioactive components. In the case of *Dodoniea viscose* have saponins and terpenoids was 0.62 and 0.74 mg/ml. represented respectively.

The medicinal plants *Glycosins pentaphylla* contains five phytoconsititents such as alkaloids (0.26 mg/ml), flavonoids (0.37 mg/ml), saponins (0.54 mg/ml), terpenoids (0.68 mg/ml) and triterpenoids (0.74 mg/ml) represented respectively. The phytochemicals of *Mallotus philippensis* wasalkaloids, flavonoids, saponins and terpenoids was 0.20, 0.32, 0.56 and 0.68 mg/ml recorded and *Mukia madaspalana* was 0.36, 0.48, 0.62, 0.69, 0.72 and 0.76 mg/ml with flavonoids, phenols, sapnoin, steroids, terpenoids and triterpenoids estimated respectively. The *Ocium gratisimum* was saponins (0.58 mg/ml), terpenoids 0.57 mg/ml and triterpenoids (0.69 mg/ml) recorded respectively. The moderate amount of phytochemical like alkaloids (0.22mg/ml), flavonoids (0.29 mg/ml), reducing sugar (0.43 mg/ml), saponins (0.47 mg/ml), terpenoids (0.62 mg/ml) and triterpenoids (0.74 mg/ml) recorded from *Stachyarphetaja maicenis* medicinal plants (Table 3 and Fig.1 and 2). whereas *Solanum trilobatum* was minimizing amount of phytoconstituents of alkaloids, flavonoids, saponins steroid and terpenoids was 0.27, 0.38, 0.64, 0.69 and 0.72 mg/ml recorded respectively. Finally *Vitex trifolia* was alkaloids (0.20 mg/ml), phenol (0.34 mg/ml) reducing sugar (0.46 mg/ml) saponins (0.54 mg/ml) and terpenoids (0.75 mg/ml) represented respectively.

IV.CONCLUSION

The concluded that the twelve medicinal plants are the source of the phytochemicals like alkaloids, flavonoids, saponnin, terpenoid, steroids, triterpenoids, phlobatannins, and reducing sugars were represented medicinal plants play a vital role in preventing various diseases. The antidiuretic, anti inflammatory, antianalgesic, anticancer, antiviral, antimalarial, antibacterial, and antifungal activities of the medicinal plants are due to the presence of the above mentioned secondary metabolites. Medicinal plants are used for discovering and screening of the phytochemical constitusents which are very helpful for the manufacturing of new drugs. The previous phytochemical analysis and present studied showed nearly the similar results due to the excellent quantity of presence of the phytochemical constituents recorded. The phytochemicals analysis of the medicinal plants are also important and have commercial interest in both research institutes and pharmaccuticals companies for the manufacturing of the new drugs for treatment of various diseases. Thus we hope that the important phytocemical properties identified by our study in the local plant of *Eupatorium odoratum* will be helpful in the copping different diseases of this particular region.

Table 1: Qualitative analysis of phytochemical compounds of medicinal plants with aqueous extract

Medicinal Plants	Phytochemical compounds							
	Alkaloids	Flavonoids	Phenols	Reducing sugar	Saponins	Steroids	Terpenoids	Triterpenoids
Acalypha indica	+	+	-	-	+	-	+	+
Chloroxylon swietenia	-	-	-	+	+	-	+	+

Cipadessa baccifera	-	+	-	-	+	-	-	+
Eupatorium odoratum	+	+	+	+	+	+	+	+
Dodoniea viscose	-	-	-	-	+	-	+	-
Glycosmis pentaphylla	+	++	-	-	+	-	+	+
Mallotus philippensis	+	+	-	-	+	-	+	-
Mukia madasapalana	-	+	-	-	+	+	+	+
Ocimum gratisimum	-	-	-	-	+	-	+	+
Stachyarpheta jamaicenis	+	+	-	-	+	-	+	+
Solanum trilobatum	+	+	-	-	+	+	++	-
Vitex trifolia	+	-	-	-	+	-	+	-

+ - present. (-) – Absent

Table 2 : Analysis of qualitative phytochemical compounds of medicinal plants with hexane extract kalrayan hills, Villupuram district.

Medicinal Plants	Phytochemical compounds							
	Alkaloids	Flavonoids	Phenols	Reducing sugar	Saponins	Steroids	Terpenoids	Tritrpenoids
Acalypha indica	+	-	-	-	+	+	+	+
Chloroxylon swietenia	-	-	-	-	+	-	+	-
Cipadessa baccifera	+	+	-	-	+	+	+	+
Dodoniea viscose	-	+	-	-	-	+	-	-
Eupatorium odoratum	+	+	+	+	+	+	+	+
Glycosmis pentaphylla	-	+	-	-	+	+	+	+
Mallotus philippensis	+	+	-	-	-	-	+	+
Mukia madasapalana	-	+	-	-	-	-	+	+
Ocimum gratisimum	+	+	-	-	+	+	+	-
Stachyarphetajamaicenis	+	+	-	-	+	-	+	+
Solanum trilobatum	+	+	-	+	+	-	+	+
Vitex trifolia	+	-	-	-	+	-	+	-

+ - present. (-) – Absent

Table 2: Analysis of quantitative phytochemical compounds of medicinal plants with aqueous extract Kalrayan hills, Villupuram district

Medicinal plants	Phytochemical compounds(Quantity (mg / ml)							
	Alkaloids	Flavonoids	Phenols	Reducing sugar	Saponins	Steroids	Terpenoids	Tritrpenoids
Acalypha indica	0.32	0.42	-	-	0.48	-	0.58	0.64
Chloroxylon swietenia	-	-	-	0.49	0.54	-	0.63	0.69
Cipadessa baccifera	-	0.46	-	-	0.69	-	-	0.80
Eupatorium odoratum	0.52	0.54	0.59	0.64	0.70	0.74	0.82	0.89
Dodoniea viscose	-	-	-	-	0.62	-	0.74	-
Glycosmis pentaphylla	0.26	0.37	-	-	0.54	-	0.68	0.74
Mallotus philippensis	0.20	0.32	-	-	0.56	-	0.68	-
Mukia madasapalana	-	0.36	0.48	-	0.62	0.69	0.72	0.76
Ocimum gratisimum	-	-	-	-	0.58	-	0.57	0.69
Stachyarphetaja maicenis	0.22	0.29	-	0.43	0.49	-	0.62	0.74
Solanum trilobatum	0.27	0.38	-	-	0.64	0.69	0.72	-
Vitex trifolia	0.20	-	0.38	0.46	0.54	-	0.75	-

Fig 1: Quantitative analysis of phytochemical compounds of medicinal plants with aqueous extract

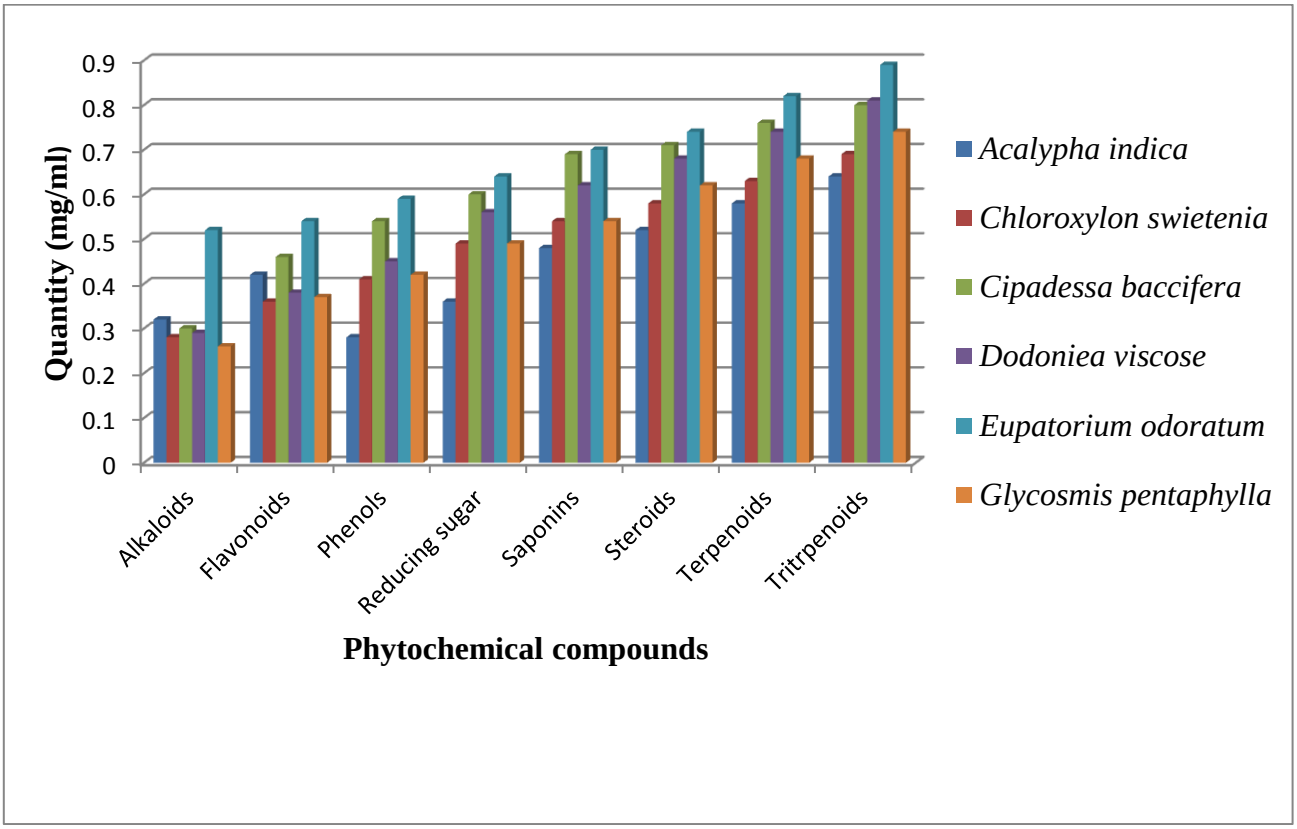
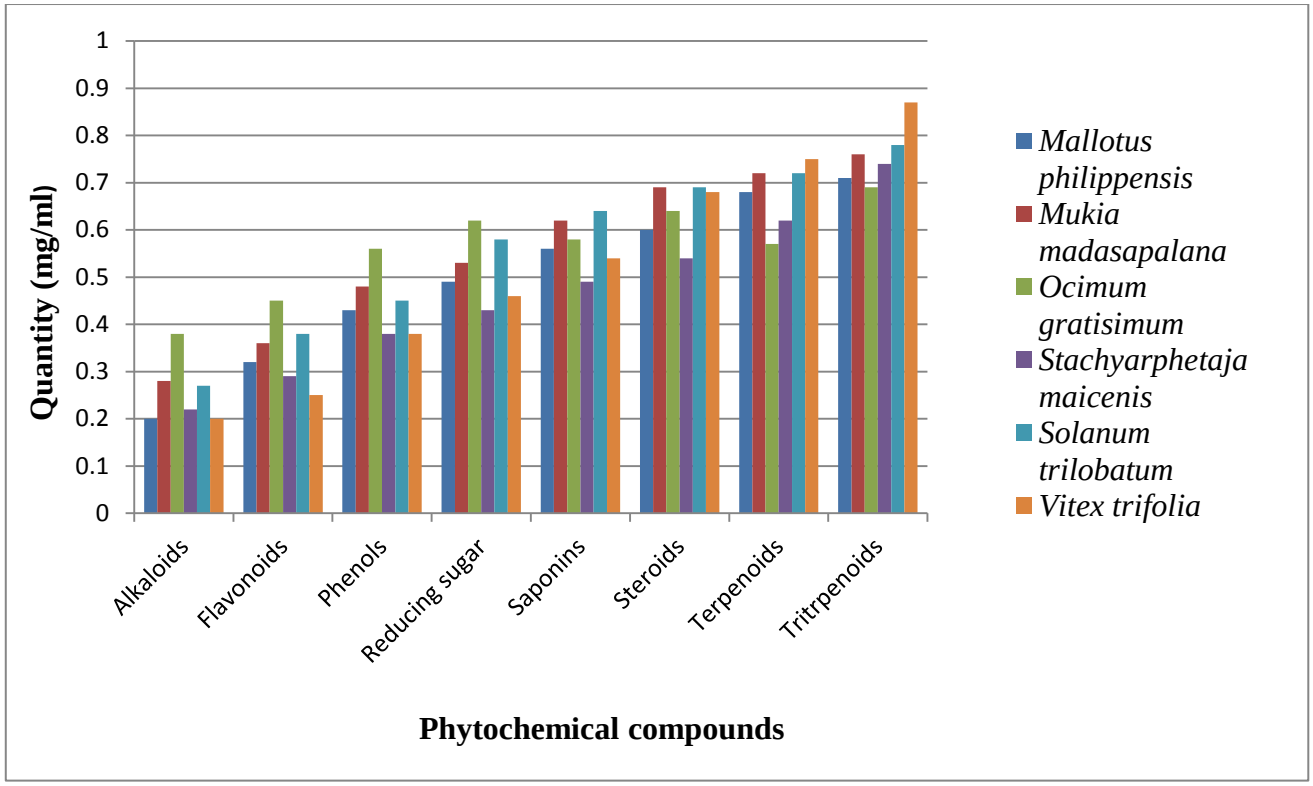


Fig 2: Quantitative analysis of phytochemical compounds of medicinal plants with aqueous extract



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