Bioscience Discovery, 5(1):85-96, Jan. 2014

ISSN: 2229-3469 (Print); ISSN: 2231-024X (Online)
Received: 10-11-2013, Revised: 21-12-2013, Accepted: 30-12-2013

Review Article

Preliminary phytochemical studies of select members of the family Annonaceae for bioactive constituents

Florence AR[1], Joselin J[1], Shynin Brintha TS[1], Sukumaran S[2] and Jeeva S[1]

[1]Department of Botany, Scott Christian College (Autonomous), Nagercoil – 629 003, Tamilnadu, India.
[2]Department of Botany, Nesamony Memorial Christian College, Marthandam – 629 165, Tamilnadu, India.
solomonjeeva@gmail.com

ABSTRACT

The present study was undertaken to assess the phytochemical constituents present in the leaf extract of some members of the family Annonaceae. Leaf extracts were prepared from the organic solvents extracts and phytochemical screening was performed using the standard methodsgiven by Harborne. Phytochemical screening of the plants showed the presence of alkaloids, carbohydrates, coumarins, flavonoids, glycosides, phenolic compounds, phytosterols, proteins, quinones, saponins, steroids and terpenoids. The constituents reported from the present study gives further idea for detailed studies on clinical and therapeutic aspects.

Key words: Annonaceae, Leaf extract, Phytochemical constituents, Phytochemical screening.

INTRODUCTION

Nature has been a source of medical agents for thousands of years and the use of plants for prevention and treatment of various health ailments has been in practice from time immemorial. It is estimated that about 25% of drugs prescribed are derived from plants. In recent years, secondary metabolites previously with unknown pharmacological activities have been extensively investigated as a source of medicinal agents (Devi *et al*., 2012; Tresina *et al*., 2012; Vasantha *et al*., 2012; Lalitharani *et al*., 2013; Sheela and Uthayakumari, 2013).

Annonaceae, the custard apple family with about 2500 species and more than 130 genera is a family of flowering plants consisting of trees, shrubs or rarely lianas (Slik, 2003; PIER, 2008). Biologically active components of the family showed interesting biological properties like anti-HIV, anti-cancer effects (De Quan, 1999), insecticidal properties (Ashok Kumar *et al*., 2010) and useful cytotoxic compounds (Kingston, 1992).

Annona muricata L. locally called"Seemai Mundhiri"is a small upright evergreen tropical fruit tree. It is commonly called Soursop or Apre. It is grown mainly for fruits. *Annona muricata* leaves contain several groups of substances called annonaceous acetogenins. The leaves of *Annona muricata* have astringent, anti-plasmodic and gastric properties (Khan *et al*., 1997), parasiticidal, anti-diarrhoeal, rheumatological and anti-neuralgic properties (Glaye *et al*., 1998). It is also used to treat diabetes (Adewole and Ojewole, 2006), jaundice (Mshana, 2000) and kidney ailments (Duke, 1970). Methanolic extract of *Annona muricata* leaves have antibacterial activity against some strains of *E. coli* (Chukwuka *et al*., 2011). An important chemical compound annonacin is found in *Annona muricata* seeds (Lannuzel *et al*., 2003). *Annona reticulata* Linn. a tall deciduous tree, with many branches, bearing nutritious fruits is a highly medicinal plant used for the treatment of epilepsy, constipation, cardiac problems, worm infestation, antibacterial infection, dysentery, fever, dysuria, hemorrhage and ulcer (Nadkarni, 2000).

Ripe fruit is sweet, cooling, good tonic and sedative. It enriches the blood, increases muscular strength, lesions burning sensation, tendency to biliousness and vomiting. Leaf can be used for destroying lice (Morton, 1987). The leaves are used as anthelmintic, styptic and insecticide and the chemical compound acetogenins present in the leaves are responsible for specific cytotoxic to certain human tumors (Xu *et al*., 1992). The bark is a powerful astringent and is used as antidysentric and vermifuge. Root bark and stem of this plant possess isoquinoline alkaloids (Nadkarni, 2002). Phytochemical constituents from the plant are anonaine, roemerine, norcorydiene, corydine, norisocorydine, carvone, linalool, samoquasine A, squamocin-I, squamocin-B, squamocenin, motrilin, kaurenoic acid, phenolic and nonphenolic alkaloids, two crystalline alkaloids – muricine, muricinine, (2,4-cis and trans)-squamolinone, (2, 4-cis and trans)-9-oxoasimicinone, bullacin Betc.(Li *et al*., 1990; Chopra *et al*., 2002).

Annona squamosa Linn. is a small semi-deciduous tree, with mainly fruits consuming plant and distributed throughout India. It is known as Custard apple in English and "Sitapazham" in Tamil. The plant is a reservoir of special substances like alkaloids, glycosides, resins, volatile oils, gums and tannins etc. in organs viz., leaves, roots, seeds, bark etc.(Himesh *et al*., 2011). The plant is traditionally used for the treatment of cardiac diseases, diabetes, hyperthyroidism (Sunanda and Anand, 2003) and cancer (Bhakuni *et al*., 1969). Every parts of *A*. *squamosa* have various medicinal property proved by many research works (Hertog *et al*., 1992). The crushed leaves are used to treat hysteria, gastric hyper acidity, fainting spells, ulcer and wounds. The bark is used as powerful astringent and to stop diarrhea in children and adults. The fruits act as good tonic, expectorant, blood increasing agent, increases muscular strength, sedative to heart, relieves vomiting and also as a hair tonic. The powder of seeds and leaves are used for prevention of lice (Asolkar, 1992; Kiritikar and Basu, 1993). Roots are treated for spinal diseases and also used as drastic purgative (Varadharajan *et al*., 2012).

Artabotrys hexapetalus (Linn.f.) Bhandari is a medium sized woody climber and ornamental lianas, producing extremely fragrant flowers and the flower oil is used in perfumes. This species is native to India. It is used in traditional Chinese medicine for the treatment of malaria (Li *et al*., 1997), scrofula (Li and Yu, 1998) and anti-implantation or anti-fertility activity (Johri *et al*., 2009). The bioactive principles of the plant are steroids, terpenoids, saponins and leucoanthocyanin (Savithramma *et al*., 2011) bisabolane, guiane sesquiterpenes, steroids, aporphine tetrahydroherberine alkaloids and long chain hydrocarbons (Ho-Fai and Geoffre, 2002).

Polyalthia longifolia (Sonn.) Thwaites commonly known as "Ashoka tree"is a tall, handsome, evergreen, pyramid like tree, growing up to 12m height, commonly planted due to its effectiveness in alleviating noise pollution and also for ornamental purposes (Sastri, 1969). The genus *Polyalthia* is considered as medicinal importance because of the presence of clerodane diterpenoids and alkaloids in various parts of the plant (Wu, 1989). This plant is used to treat fever, gonorrhoea, uterus ailment, leucorrhoea and menorrhagia (Raghunathan and Mitra, 1982; Kirtikar and Basu, 1998; Singh and Pandey, 1998) skin diseases, diabetes, hypertension and helminthiasis (Kirtikar and Basu, 1995). Bark decoction is used to cure mouth ulcers (Garg and Jain, 1999) and also proved for its antifungal, anthelmintic (Padmaja *et al*., 1993), antibacterial and antioxidant properties (Subramanya *et al*., 2012).

Uvaria narum (Dunal) Wall.is a large woody stellately pubescent, straggling shrub and is distributed in foot hills of Western Ghats. Generally the plant contains acetogenins including stereoisomer (Padmaja *et al*., 2002) and the bark contains squamocin-28-one, panacilin, Uvariamicin-I, II, III (Hishama *et al*., 1990; Hishama *et al*., 1991). The presence of phenols and tannins in the plant has been attributed to its various medicinal properties. It is commonly used in ethnomedicine for the treatment of eczema, pityriasis, constipation, low back ache, jaundice and fever (Subramanya *et al*., 2011). Roots and leaves are used in the treatment of intermittent fever, biliousness jaundice, bowel diseases and rheumatic affections and decoction of roots is given to the women to control the fits at the time of delivery (Khare, 2007).

Xylopia parvifolia (A.Rich.) Benth.is a tall tree distributed in East and Central Africa. In South India, the plant is reported only from the Western Ghats of Tamilnadu (Ramamurthy, 1983) and Kerala (Mitra, 1997).

Alkaloids were isolated from chloroform and methanol extracts of the stem bark of *Xylopia parvifolia* (Puvanendran *et al*., 2010).The genus *Xylopia* have yielded products such as alkaloids, flavonoids, lignoids, terpenoids, acetogenins and amides (Moreria *et al*., 2005). Phenolic compounds present in the plant have high levels of antioxidant activities (Rice-Evens *et al*., 1996).

Root decoction was taken by the coastal people for the treatment of stomach disorders and root pieces are inserted into nostrils to get relief from headache and the bark is used for analgesic and antispasmodic purposes (Nishiyama *et al*., 2006).

Keeping the therapeutic uses of these plants in view, the present study was aimed to determine the secondary metabolites present in the select members of the family Annonaceae.

MATERIALS AND METHODS

EXTRACTION OF PLANT MATERIAL

Healthy, fresh and disease free leaves were collected from Scott Christian College Campus, Nagercoil, Kanyakumari District, Tamilnadu, India. The plants were identified by using the campus flora (Brintha, 2012) and counterchecked with the specimens available in the college herbarium. The leaves were shade dried and powdered using mixer grinder.10 gm of dried powder was macerated with 100 ml of aqueous, petroleum ether, chloroform, ethanol and acetone in a conical flask and shaken at room temperature for 24 hours and filtered through Whatman No.1 filter paper. The concentrated crude extracts were taken and subjected to qualitative photochemical analysis by using the standard methods given by Harborne (1998).

RESULTS

All the leaf extracts were subjected to phytochemical screening and the results were tabulated in table1. Qualitative analysis of the leaf extracts of *Annona squamosa*, *A*. *reticulata*, *A*. *muricata*, *Polyalthia longifolia*, *Uvaria narum* and *Xylopia parvifolia* showed the presence of various phytochemicals. Aqueous extract of *Annona muricata*, showed the presence of phytosterols, coumarins, carbohydrates, glycosides, steroids and terpenoids. Carbohydrates, glycosides, phytosterols and proteins were reported in petroleum ether extract. Chloroform extract showed the availability of coumarins, glycosides, phytosterols and steroids. Ethanol extracts showed the presence of glycosides, phytosterols and steroids. Flavonoids, coumarins, phytosterols and steroids were found in acetone extracts whereas alkaloids, phenols, quinones and saponins were absent in all extracts.

Aqueous extract of *Annona reticulata* showed the presence of alkaloids, phenols, phytosterols, carbohydrates, glycosides and proteins. Phytosterols, alkaloids and glycosides were found in petroleum ether extract. Chloroform extract revealed the presence of carbohydrates, phytosterols, glycosides and proteins. Ethanol extract showed the presence of phytosterols, phenols, proteins, steroids and saponins whereas acetone extract showed the presence of alkaloids, coumarins, phytosterols, phenols, saponins and steroids. Flavonoids, terpenoids and quinones were absent in all the extracts.

Annona squamosa contained a variety of constituents such as alkaloids, carbohydrates, flavonoids, glycosides, phytosterols, proteins, saponins, steroids and terpenoids. Aqueous extract of the leaves showed secondary metabolites like alkaloids, proteins, flavonoids, glycosides, steroids and terpenoids. Chloroform extract showed the presence of carbohydrates, phytosterols and glycosides. Ethanol extract revealed the presence of phytosterols, carbohydrates and saponins. Acetone extract showed the presence of phytosterols and carbohydrates. Proteins are found only in petroleum ether extract. Quinones were found to be absent in all the extracts.

Aqueous extract of *Artabotrys hexapetalus* revealed the presence of alkaloids, carbohydrates, flavonoids, glycosides, phenols, phytosterols, proteins, quinones, steroids and terpenoids. Flavonoids, phenols, phytosterols, steroids and terpenoids were noticed in petroleum ether extract. Chloroform extract showed the presence of alkaloids, carbohydrates, coumarins, glycosides and phenols. Ethanol extract showed the availability of carbohydrates, coumarins, phenols and quinones. Acetone extracts showed the presence of alkaloids, coumarins, phenols and steroids whereas saponins are absent in all extracts.

In *Polyalthia longifolia*, aqueous extract showed the presence of alkaloids, flavonoids, phenols, phytosterols, steroids and terpenoids. Petroleum ether extract showed the presence of carbohydrates, coumarins, glycosides, phytosterols, steroids and terpenoids. Chloroform extracts showed the presence of carbohydrates, glycosides, phenols, phytosterols and steroids. Alkaloids, glycosides, phenols, phytosterols, proteins, steroids and terpenoids were noticed in ethanol extracts. Acetone extract showed the presence of alkaloids, carbohydrates, phenols, proteins and steroids whereas quinones and saponins were absent in all the extracts.

Uvaria narum depicted the presence of flavonoids, phenols, phytosterols, alkaloids, carbohydrates, coumarins, quinones, steroids and terpenoids in aqueous extracts. Coumarins, flavonoids, phytosterols, proteins, quinones, steroids and terpenoids were reported in petroleum ether extracts. Chloroform extracts showed the presence of carbohydrates, coumarins, phenols, phytosterols, proteins, steroids and terpenoids. Ethanol extract showed the presence of alkaloids, carbohydrates, glycosides, phytosterols, steroids and terpenoids whereas acetone extract showed the presence of carbohydrates, phenols, phytosterols, glycosides, terpenoids and alkaloids. Coumarins were found to be absent in all the extracts.

The aqueous extract of *Xylopia parvifolia* showed the presence of flavonoids, coumarins, phytosterols, proteins, quinones, steroids and terpenoids. Petroleum ether extract showed the presence of phytosterols, alkaloids, glycosides, phenols, proteins, saponins, steroids and terpenoids. Chloroform extract showed the presence of carbohydrates, glycosides, phenols, phytosterols and terpenoids. Ethanol extracts showed the presence of alkaloids, glycosides, phenols, phytosterols and terpenoids whereas acetone extract showed the presence of alkaloids, phenols, proteins, terpenoids and phytosterols.

DISCUSSION

Plants used in traditional medicine contain a wide range of bioactive substances that can be used to treat infectious diseases (Balakumar *et al*., 2011; Florence *et al*., 2012; Joselin *et al*., 2012, 2013; Rajan *et al*., 2011). The most important of these biologically active ingredients are alkaloids, flavonoids, steroids, glycosides, terpenoids, etc. (Mithraja *et al*., 2012a; Mithraja *et al*., 2012b; Mithraja *et al*., 2012c; Kiruba *et al*., 2012; Sukumaran *et al*., 2012). Plants belonging to the family Annonaceae are a rich source of bioactive substances. Most of the studies demonstrate the importance of secondary metabolites in drug discovery. The use of phytoconstituents as drug therapy to treat major ailments has proved clinically effective and less toxic than the existing drugs. *Annona muricata* contained the bioactive principles like carbohydrates, coumarins, glycosides, phytosterols, proteins, saponins, steroids and flavonoids. Pathak *et al*.(2010) reported secondary metabolites like carbohydrates, cardiac glycosides, steroids and tannins from the aqueous and methanol leaf extracts. *Annona muricata* plant seeds contained the important compound annonacin which is a neurotoxin and seems to be the cause of neurodegenerative diseases. Consumption of this plant cured upto 70% parkinsonian conditions of Guadeloupe people due to the presence of compound annonacin(Lannuzel *et al*., 2006; Lefebvre and Elbaz, 1999). Plant based antimicrobials have enormous therapeutic potential as they can serve the purpose with lesser side effects that are often associated with synthetic antimicrobials (Iwu *et al*., 1999). Aqueous and methanol extracts of *A*. *muricata* leaves showed antibacterial activity against *Staphylococcus aureus*, *Proteus vulgaris*, *Klebsiella pneumonia* and *Bacillus subtilis*. The plant is used as traditional food and "Natural Medicines" and the plant leaves are used in the treatment of various bacterial infectious diseases like pneumonia, diarrhea, urinary infection and some skin diseases (Rojas *et al*., 2003). The aqueous extract of the leaves contained saponins, condensed tannins, glycosides and trace amounts of flavonoids contribute immensely to the bioactivity of *A. muricata* included antioxidant activity (Adewole and Ojewole, 2009), hepatoprotective effect (Arthur *et al*., 2011) and antibacterial agent (Chukwuka *et al*.,2011).

Annona reticulata showed the presence of various phytoconstituents like alkaloids, carbohydrates, coumarins, flavonoids, glycosides, phytosterols, proteins, saponins and steroids. Similar studies conducted by Zaman and Pathak (2012) in *Annona reticulata* leaves showed the presence of phytoconstituents such as alkaloids, aminocides, carbohydrates, fats and oil, flavonoids, glycosides, proteins, steroids, saponins and

Table 1. Preliminary phytochemical screening of Annonaceae leaf extracts

Annona muricata	Phytochemical compounds											
	Alkaloids	Carbohydrates	Coumarins	Flavonoids	Glycosides	Phenols	Phytosterols	Proteins	Quinones	Saponins	Sterols	Terpenoids
Aqueous	-	+	++	.	+	-	++	-	-	-	++	+
P. ether	-	++	-	-	++	--	++	+	-	-	-	-
Chloroform	-	-	++	-	++	-	+++	-	-	-	+++	-
Ethanol	-	-	-	-	+++	-	++	-	-	--	++	-
Acetone	-	-	+	-	-	-	+++	-	-	-	+++	-
Annona reticulata												
Aqueous	+++	-	-	-	-	+++	++	-	-	-	+	-
P. ether	++	-	-	-	+	-	+++	-	-	-	-	-
Chloroform	-	+++	-	-	++	-	+++	+	-	-	-	-
Ethanol	-	-	-	-	-	++	+++	++	-	+	++	-
Acetone	+++	-	+++	-	-	+	++	-	-	+	+	-
Annona squamosa												
Aqueous	+++	-	-	+	+	-	-	+++	-	-	+	+
P. ether	-	-	-	-	-	-	-	+	-	-	-	-
Chloroform	-	+++	-	-	+	-	+++	-	-	-	-	-
Ethanol	-	+	-	-	-	-	+++	-	-	+	-	-
Acetone	-	+	-	-	-	-	+++	-	-	-	-	-
Artabotrys hexapetalus												
Aqueous	+	+	-	+	+	++	++	+	+++	_	+	+
P. ether	-	-	-	++	-	+	++	-	-	-	+	+
Chloroform	+	+++	+++	-	+	+	-	-	-	-	-	-
Ethanol	-	+	+	-	-	++	-	-	+	-	-	-
Acetone	++	-	+	-	-	++	-	-	-	-	+	-
Polyalthia longifolia												
Aqueous	+++	-	-	+++	-	+++	+++	-	-	--	+++	+
P. ether	-	++	+	-	++	-	++	-	-	-	+++	++
Chloroform	-	+++	-	+++	++	+++	++	-	-	-	+	-
Ethanol	+++	-	-	-	+	+++	+	+++	-	-	+++	++
Acetone	+++	+	-	-	-	++	-	+	-	-	+	-
Uvaria narum												
Aqueous	+	+	++	+++	-	+++	-	+++	++	-	+	++
P. ether	-	-	+	++	-	-	++	++	+	-	+	-
Chloroform	-	++	++	-	-	+++	++	++	-	-	+++	++
Ethanol	++	++	-	-	+++	-	++	-	-	-	++	+++
Acetone	+	+++	-	-	++	+++	++	++	-	-	-	++
Xylopia parvifolia												
aqueous	+	-	+++	+++	-	+	++	++	++	-	+++	+
P. ether	++	-	-	-	++	++	+++	+	-	+	+++	++
Chloroform	-	+++	-	-	+	+	+	-	-	-	-	++
Ethanol	++	-	-	-	++	++	+++	++	-	-	+++	+
Acetone	+++	-	-	-	-	+++	+	+++	-	-	-	++

Abbreviations: (-) absent; (+) low; (++) average; (+++)High

terpenoids whereas the stem bark revealed the presence of alkaloids, fats and oil, steroids, lignin, tannins, phenolic compounds and terpenes. Similarly the aqueous extract showed the presence of tannins, carbohydrates, flavonoids and proteins (Clarke, 1975). Suresh *et al*. (2011) reported alkaloids, acetogenins, carbohydrates, proteins and flavonoids from the ethanolic extract of *Annona reticulata* roots. The root possesses a selective antipyroliferative effect because it contains acetogenins (Coothankandaswamy *et al*., 2010; Pardhasarathi *et al*., 2005) and alkaloids (Chougule *et al*., 2010) and also used as a chemopreventive agent in cancer therapy (Cassady *et al*., 2008). Recent reports revealed that acetogenins and alkaloids present in the ethanolic extract of the plant have selective cytotoxicity (Xu *et al*., 1992).

In the present study, the leaf of *Annona squamosa* has been reported to contain alkaloids, carbohydrates, phytosterols, proteins, flavonoids, glycosides, steroids and terpenoids. In recent years, organic chemists and biochemists reported bioactive compounds with wide range of bioactivity (Leboeuf *et al*., 1982). This species has alkaloids such as glaucin, annonaine, aporphine and benzoquinazoline in different parts of the plant (Bhaumik *et al*., 1979; Morita *et al*., 2000). These compounds have antitumor, antifeedal, insecticidal and immunosuppressant properties. Ethanolic extract of leaves contain essential oils, terpenes and alkaloids. These bioactive principles have insecticidal activity against *Sitophilus oryzae* (Ashok Kumar *et al*., 2010) and flavonoids from this plant is responsible for free radical scavenging activity (Kalsi, 2002). Varatharajan *et al*. (2012) proved that terpenoids increase blood flow to the brain, improve memory in people with mild dementia and also used to treat cancer and inflammatory diseases. He also proved that anti cancer activity may be due to the presence of glycosidic compounds. Phenolic compounds which act as antioxidants play an important role in the prevention of cancer, cardiovascular and neurodegenerative diseases (Losso *et al*., 2007). It also have anti inflammatory effect, anti viral (Li *et al*., 2004) and antibacterial activity (Akiyama *et al*., 2001). Chloroform extract of the plant contain an active compound annotemoyin, and also flavonoids isolated from aqueous extract of the plant posses antimicrobial activity (Padhy *et al*., 2011). Raj Sobiya *et al*.(2009) denoted that the ethanolic extract of leaves and stem is reported to have anti cancer activity and antiulcer activity (Rajesh *et al*., 2002). Root and bark contain essential oil and the seeds showed compounds such as Annotemoyin-1, Annotomoyin-2, squamocin, cholesterol and glucopyranoside that are responsible for antimicrobial and cytotoxic activities (Rakesh and Mahendra, 2009).

Aqueous, chloroform, petroleum ether, ethanol and acetone leaf extracts of *Artabotrys hexapetalus* contain alkaloids, carbohydrates, coumarins, flavonoids, glycosides, phenols, phytosterols, quinones, steroids, terpenes and proteins. Similar works on hydroalcoholic extract of *Artabotrys hexapetalus* leaves possess secondary metabolites such as alkaloids, carbohydrates, flavonoids, glycosides, phytosterols, terpenes, proteins, phenols and saponins (Karthik *et al*., 2012). Due to the presence of these active principles, the plant possess anti-fertility activity. Phenolic constituents are responsible for the scavenging ability due to their hydroxyl group. Aqueous and methanol extracts of the flowers have antioxidant and free radical scavenging property and the aqueous extract have antimicrobial activity against gram negative bacteria (*Escherichia coli* and *Salmonella typhi*) and also effective against fungi (*Candida albicans* and *Aspergillus niger*) due to the presence of phenolic content (Manjula *et al*., 2011).

Leaf extracts of *Polyalthia longifolia* contain the phytoconstituents such as steroids, alkaloids, phytosterols, phenols, glycosides, flavonoids and coumarins. Kavitha *et al*. (2011) reported phytochemicals such as alkaloids, steroids, tannins, phenols and flavonoids in all the extracts (hexane, ethyl acetate, acetone, ethyl alcohol and methyl alcohol). Ethyl acetate extract of *Polyalthia longfolia* showed the presence of carbohydrates, glycosides, tannins, flavonoids, oils and fats, aminoacids and steroids (Pradhan *et al*., 2011). Flavonoids are the group of polyphenolic compounds which influence the radical scavenging inhibition of hydrolytic and oxidative enzymes. The phenols, tannins, flavonoids and alkaloids are complex moieties present in *Polyalthia longifolia* seed extracts, which showed higher potentialities towards antioxidant properties.

Presence of flavonoids and tannins in *Polyalthia longifolia* are responsible for antibacterial activity against the bacterial strains *Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa* and *Bacillus cereus* (Kokate *et al*., 2006). Ethanolic extract of the plant produced anti-ulcerogenic effects possessing antisecretory, cytoprotective and proton pump inhibition mechanism due to the presence of alkaloids and terpenoids (Malairajan *et al*., 2008). This plant mainly contains diterpenoids (Phadnis *et al*., 1988) alkaloids, tannins and mucilage. Clerodane-type diterpenoids have antifeedant properties (Hara *et al*., 1995) and diterpene isolated from the hexane extract of the seeds have antibacterial and antifungal properties (Marthanda *et al*., 2005).

The crude leaf extracts of *Uvaria narum* showed the presence of alkaloids, carbohydrates, coumarins, glycosides, flavonoids, phytosterols, phenols, proteins, quinones, steroids and terpenoids. Similar studies were conducted by Reddy *et al.* (2012) in methanolic leaf extract which contain phenols, saponins, glycosides and steroids. The presence of these phytoconstituents in the plant has been attributed to its various medicinal properties (Cowan,1999). In the present study steroids are present in all extracts except acetone. Previous research report denoted that steroids are also present in all extracts like methanol, ethyl acetate, chloroform and petroleum ether. In *Uvaria narum*, steroids are known to be important for their cardiotonic activities and also possess insecticidal and antimicrobial properties (Shyamala *et al*., 2010). Subramanya *et al*. (2012) conducted a study on the root extracts of *Uvaria narum* which could be medicinally employed as free radical scavenger, antibacterial and antioxidant properties and the roots have been proved for its antifungal, antibacterial, antioxidant properties, anthelmintic (Padmaja and Thankamany,1993) and also possess hepatoprotective potential (Karan *et al*.,1999).

The plant *Xylopia parvifolia* possess alkaloids, phenols, phytosterols and terpenoids in all extracts. Other compounds are present in trace amounts. Saponins were completely absent in *Xylopia parvifolia*. Kuate *et al*. (2011) proved that seed extracts of *Xylopia parvifolia* have antioxidant activity by ABTS and DPPH scavenging activity, reducing activity, metal chelating activity, nitric oxide and lipid peroxidation activity. Rice-Evans *et al*. (1996) reported that many of the phenolic compounds contains high level of antioxidant activity. Chromatographic technique yielded six alkaloids from the chloroform and methanolic extracts of stem bark. The chloroform extract yielded Oxopurpurine (Sonnet and Jacobson 1971); O-Methylmoschatoline (Harrigan *et al*., 1980); Laudanidine (Blanchfield *et al*., 2003) methanolic extract yielded Discretine (Hocquemillar, 1984); Nordicentrine (Likhitwitayawuid, 1993) and Dehydrocorytenchine (Jossang, 1991). *X. parvifolia* could be a good source of natural antioxidant due to the presence of phenolic compounds (Silva *et al*., 2007). These natural antioxidants not only protect food lipids from oxidation, but also provide health benefits associated with preventing damages due to biological degeneration (Shahidi and Sundara, 2008; Hu and kitts, 2005). Its spices possess several medicinal properties such as anti-diabetic (Srinivasan, 2005) ability to stimulant digestion (Patel and Srinivasan, 2004), antioxidant property and anti-inflammatory potential due to the presence of phenolics, flavonoids and phenyl propanoids (Scalbert and Williamson, 2000).

CONCLUSION

Secondary metabolites of medicinal plants are widely used in traditional medicines. In the present study, most of the biologically active phytochemicals are present in the aqueous, petroleum ether, chloroform, ethanol and acetone extracts of the leaves. The extracts of leaves were subjected to preliminary phytochemical tests and the results indicated the presence of carbohydrates, alkaloids, glycosides, phenols, steroids, terpenoids, phytosterols, coumarins, quinones, proteins, flavonoids and saponins in various members of the family Annonaceae. Further studies are needed to isolate the active components, which can be used for the welfare of the mankind.

LITERATURE CITED

Adewole SO and Ojewole JAO, 2006. Immunohistological and Biochemical effects of *Annona muricata* Linn. (Annonaceae) leaf aqueous extract in pancreatic β–cells of streptozotocin treated diabetic rats. *Pharmacologyonline*, **2**: 335-355.

Adewole SO and Ojewole JAO, 2009. Protective effects of *Annona muricata* Linn.(Annonaceae) leaf aqueous extract on serum liquid profiles and oxidative stress in hepatocytes of streptozotocin-

treated diabetic rats. *African Journal of Traditional CAM*., **6**(1): 30 – 41.

Akiyama H, Kazuyasu F, Yamasaki O, Oono T and Iwatsuki K, 2001. Antibacterial action of several tannins against *Staphylococcus aureus*. *Journal of Antimicrobial Chemotheraphy,* **48**: 487-491.

Arthur FKN, Woode E, Terlabi O and Larbie C, 2011. Evaluation of acute and subchronic toxicity of *Annona muricata* Linn.aqueous extract in animals. *European Journal of Experimental Biology*, **1**(4): 115-124.

Kumar AJ, Rekha T, Devi SS, Kannan M, Jaswanth A and Gopal V, 2010. Insecticidal activity of ethanolic extract of leaves of *Annona squamosa*. *Journal of Chemical and Pharmaceutical Research*, **2**(5): 177-180.

Asolkar LV, Kakkar KK and Chakre OJ, 1992. Second supplement to Glossary of Indian Medicinal Plants with active principle. Publication and Information Directorate, New Delhi **1**: 72-73.

Balakumar S, Rajan S, Thirunalasundari T and Jeeva S, 2011. Antifungal activity of *Aegle marmelos* (L.) Correa (Rutaceae) leaf extract on dermatophytes. *Asian Pacific Journal of Tropical Biomedicine*, **1**: 309-312.

Bhakuni DS, Dhar MM, Dhavan BN and Mehrotra BB, 1969. Screening of Indian Medicinal Plants for biological activity. Part II. *Indian Journal of Experimental Biol*ogy, **7**: 250-262.

Bhaumik PK, Juneau JP, Bhacca NS and Muharjee B, 1979. Alkaloid from leaves of *Annona squamosa* L. *Phytochemistry,* **18**: 1584-1586.

Blanchfield JT, Sands DPA, Kennard CHL, Byriel KA and Kitching W, 2003. Characterisation of alkaloids from some Australian *Stephania* (Menispermaceae) species.*Phytochemistry*, **63**(6): 711-720.

Brintha TSS, 2012. Flora of Scott Christian College Campus, M.Phil., Thesis, Department of Botany, Scott Christian College (Autonomous), Nagercoil, Tamilnadu, India.

Lefebvre CD and Elbaz A, 1999. "Possible relation of atypical Parkinsonism in the French West Indies with consumption of tropical plants: a case-control study". *Lancet,* **354** (9175): 281–286.

Cassady JM, Baird WM and Chang CJ, 2008. Natural products as a source of potential cancer chemotherapeutic and chemopreventive agents.*Molecular Cancer Therapeutics*, **7**: 2662-2671.

Chang FR, Wei JL, Teng CM and Wu YC, 1998. Antiplatelet aggregation constituents from *Annona purpurea*. *Journal of Natural Products*, **61**(12): 1457-1461.

Chopra RN, Nayar SL and Chopra IC, 2002. Glossary of Indian medicinal plants. National Institute of Science Communication.6th reprinted edition. Publications and information Directorate, CSIR, New Delhi, India.Pp. 20.

Chougule M, Patel AR, Sachdeva P, Jackson T and Singh M, 2010. Anticancer activity of Noscapine an Opoid alkaloid in combination with csplatin in Human non-small cell lung cancer, 6: 2.

Chukwuka KS, Ikheloa JO, Okonko IO, Moody JO and Mankinde TA, 2011. The antimicrobial activities of some medicinal plants on *Escherichia coli* as an agent of diarrhea in livestock. *Advances in Applied Science Research*, **2** (4): 37-48.

Clarke EG, 1975. Isolation and identification of drugs. London: Pharmaceuticals Press, **2**: 905.

Coothankandaswamy V, Liu Y, Mao SC, Morgan JB, Mahdi F and Jekabsons MB, 2010. The alternate medicine PawPaw and its acetogenins constituents suppress tumour angiogenesis via the HIF-1/VEGF pathway. *Journal of Natural Products*, **73**: 956-961.

Cowan MW 1999. Effective Plant Products as Antimicrobial Agents. *Clinical Microbiology Review*, **12**: 564 – 583.

De Quan YU, 1999. Recent works on anti tumor constituent from Annonaceae plants in China. *Pure and Applied Chemistry*, **71**(6): 1119-1122.

Devi KV, Shanmugasundaram R and Mohan VR, 2012. GC-MS Analysis of ethanol extract of *Entada pursaetha* DC seed. *Bioscience discovery*, **3**(1): 30-33.

Duke JA, 1970. Ethnobotanical observation on the Choco Indians. *Economic Botany*, **24** (3): 344-366.

Florence AR, Joselin J and Jeeva S, 2012. Intra-specific variation of bioactive principles in select members of the genus *Clerodendrum* L. *Journal of Chemical and Pharmaceutical Research*, **4**(11): 4908-4914.

Garg SC and Jain R, 1999. Antifungal activity of *Luvunga scunbens* against some Kerainophilic fungi. *Indian drugs*, **36**(4): 265-266.

Gleye C, Duret P, Laurens A, Hocquenniller R, Laprevote O and Cave A, 1998. Cis-Monotetrahydrofuran acetogenins from the roots of *Annona muricata*. *Journal of natural products*, **61**(5): 576-579.

Hara N, Hitomi A, Hara FN and Hitomi FN, 1995. Clerodane and ent-halimane diterpenes from *Polyalthia longifolia*. *Phytochemistry,* 38: 189.

Harborne JB, 1998. In: Phytochemical methods, In: A guide to modern techniques of plant analysis. 3rd ed. Chapman and Hall, London Pp. 235.

Harrigan GG, Gunatilaka AAL, Kingston DGI, Chan GW and Johnson RK, 1994. Isolation of bioactive and other Oxoaporphine alkaloids from two Annonaceous plants *Xylopia aethiopica* and *Miliusa banacea*. *Journal of Natural Products*, **57**(1): 68-73.

Hertog MGL, Hollman PCH and Venema DP, 1992. Optimization of a quantitative HPLC determination of potentially anticarcinogenic flavonoids in vegetable and fruits. *Journal of Agriculture and Food Chemistry*, **40**: 1591-1598.

Himesh S, Sarvesh S, Sharan PS, Mishra L and Singhai AK, 2011. Preliminary Phytochemical Screening and HPLC Analysis of Flavonoid from methanolic extract of leaves of *Annona squamosa*. *International Research Journal of Pharmacy*, **2**(5): 242-246.

Hishama A, Pieters LAC, Claeys, Esmansa E, Dommisse R and Viletinck A, 1990. "Uvarimicin-1'11 and111: Three novel acetogenins from *Uvaria narum*" *Tetrahedron letters*, **31**(32): 4649-4652.

Hishama A, Pieters LAC, Claeys, Esmansa E, Dommisse R and Viletinck AJ, 1991. "Squamocin-28-one and Panacilin, two Acetogenins from "*Uvaria narum*". *Phytochemistry*, **30**(2): 545-548.

Hocqumillar R, Debitus C, Roblot F, Cave A and Jacquemin H, 1984. Alkaloids des *Annonaceous*, XLV111. Alkaloids des ecorces de *Guatteria discolor*. *Journal of natural products*, **47**(2): 353-362.

Ho-Fai W and Geoffrey DB, 2002. *β*-methoxy-g-methylene-α,β-unsaturated-g-butyrolactones from *Artabotrys hexapetalus*. *Phytochemistry*, **59**: 99-109.

Hu C and Kitts DD, 2005. Dandelion (*Taraxacum officinale*) flower extract suppresses both reactive oxygen species and nitric oxide and prevents lipid oxidation *in vitro*. *Phytomedicine*, **12**: 1588-1597.

ICUC 2002. edition, Publications and Information Directorate, CSIR, New Delhi **20**(5).

International Organization for Plant Information (IOPI) 2008. "Plant Name Details Annonaceae *Annona muricata* L." *International Plant Names Index*.

Iwu MW, Duncan AR and Okunji CO 1999. New antimicrobials of plant origin. In: Janick J. ed. Perspectives on New Crops and New Uses. *Alexandria, VA: ASHS Press*, 457-462.

Joselin J, Shynin Brintha TS,Florence AR and Jeeva S, 2013. Phytochemical evaluation of Bignoniaceae flowers. *Journal of Chemical and Pharmaceutical Research*, **5**(4): 106-111.

Joselin J,Brintha TSS,Florence AR and Jeeva S, 2012. Screening of select ornamental flowers of the family Apocynaceae for phytochemical constituents. *Asian Pacific Journal of Tropical Disease*, **2**: S260-S264.

Johri PK, Divya T and Reeta J, 2009. Screening of some indigenous medicinal plants for anti-implantation/Ant-fertility activity in female albino rats. *Biochemical and Cellular Archieves*, **9**(2): 175-178.

Jossang A, Leboeuf M, Cave A and Pusset J, 1991. Alkaloids des Annoceous 96 dehydroxylopine et dehydrocorytenchine, nouveaux alkaloids isoquinoleiques isoles de *Xylopia viellardi*. *Journal of natural products*, **54**(2): 466-472.

Kalsi PS, 2002. In: Spectroscopy of organic compounds, 5th ed. Newage Publisher, Mumbai Pp. 88.

Karan M, Vasist K and Handa S, 1999. Antihepatotoxic Activity of Swerita Chirata on Carbon Tetrachloride Induced Hepatotoxicity in rats". *Phytotheraphy Research*, **18**: 24-30.

Karthik YP, Swamy VBM and VishwanathKM, 2012. Evaluation of Anti-fertility Activities of Leaves of *Artabotrys hexapetalus* (Linn.F). *Research Journal of Pharmaceutical, Biological and Chemical Sciences*, **3**(2): 1121-1134.

Kavitha MS, Rasika CT, Swathi D, Nirmala DR and Rajashree KV, 2011. Preliminary phytochemical analysis of *Polyalthia longifolia* seeds. *International Journal of Pharmacy and Pharmaceutical Sciences*, **4**(1): 450-451.

Khan MR, Kornine K and Omoloso AD, 1997. Antibacterial activity of some Annonaceae.Part 1. *Fitoterapia*, **69**(4): 367-369.

Khare CP, 2007. "Indian medicinal plants", An illustrated Dictionary, Springer Science, New Delhi, Pp. 688-689.

Kingston D, 1992. Taxol and other anticancer agents from plants. In: *New Drugs from Natural Source,* Pp. 101-119.

Kiritikar KR and Basu BD, 1993. Indian medicinal plants. 2nd ed. Dehradun: Industrial Books Distributer, Pp. 1: 66.

Kiritikar KR and Basu BD, 1998. Indian medicinal plants. Dehradun: Industrial Books Distributer, **2**: 72.

Kirtikar KR and Basu BD, 1995. Indian Medicinal Plants. Dehradun: Industrial Books Distributer, Pp. 1830-1832.

Kiruba S, Mahesh M, Miller Paul Z and Jeeva S, 2011. Preliminary phytochemical screening of the pericarp of *Crataeva magna*(Lour.) DC.- a medicinal tree. *Asian Pacific Journal of Tropical Biomedicine*, **2**: S129-S130.

Kokate CK, Purohit AP and Gokhale SB, 2006. Practical Pharmacognosy, 4th ed. Vallabh Prakashan Publishers, New Delhi, Pp. 107-108.

Kuate D, Etoundi BCO, Soukantaua YB, Ngondi GL and Oben JE, 2011. Comparative study of the antioxidant, free radical scavenging activity and human LDL oxidation inhibition of three extracts from seeds of a Cameroonian spice, *Xylopia parviflora* (A. Rich.)Benth.(Annonaceae). *International Journal of Biomedical and Pharmaceutical Sciences*, **5**(1): 18-32.

Lalitharani S, Kalpanadevi V and Mohan VR, 2013. Pharmacognostic studies on the spine of *Zanthoxylum*

rhetsa (Roxb.) Dc. *Bioscience Discovery*, **4**(1): 05-11.

Lannuzel A, Höglinger GU, Champy P, Michel PP, Hirsch EC and Ruberg M, 2003. The mitochondrial complex inhibitor annonacin is toxic to mesencephalic dopaminergic neurons by impairment of energy metabolism". *Neuroscience*, **121**(2): 287–296.

Lannuzel A, Höglinger GU, Champy P, Michel PP, Hirsch EC and Ruberg M, 2006. "Is atypical parkinsonism in the Caribbean caused by the consumption of Annonaceae?".*Journal of Neural Transmission*, **70** (70): 153–157.

Leboeuf MA, Cave FK, Bhaumik R and Mukerjee B, 1982. The phytochemistry of Annonaceae. *Phytochemistry*, **21**: 2783-2813.

Li XH, Hui, YH and Rupprecht JK, 1990. Bullatatacin, bullatacinone, and squamone: a new acetogenin from the bark of *Annona squamosa*. *Journal of Natural Products*, **53**: 81–86.

Li H, Jiang Y and Chen F, 2004. Seperation methods for *Scutellaria bacalensis* active components. *Journal of Chromatography*, **812**: 277-290.

Li TM, Li WK and Yu JG, 1997. Flavonoids from *Artabotrys hexapetalus*. *Phytochemistry*, **45**: 831-833.

Li TM and Yu JG, 1998. Study on Chemical constituents of leaves from *Artabotrys hexapetalous*. *Phytochemistry*, **33**: 591-596.

Likhitwitayawuid K, Angerhofer CK, Chai H, Pezzuto JM, Cordell GA and Ruangrungsi N, 1993. Cytotoxic and antimalarial alkaloids from the tubers of *Stephania pierrei*. *Journal of Natural Products,* **56**(9): 1468-1478.

Losso JN, Shahidi FD and Bagchi, 2007. Anti-angiogenic functional and medicinal foods. Boca Raton, FL: Taylor & Francis

Malairajan P, Gopalakrishnan G, Narasimhan S and Veni K, 2008. Evaluation of anti-ulcer activity of *Polyalthia longifolia* (Sonn.)Thwaites in experimental animals. *Indian Journal of Pharmacology*, **40**: 126–128.

Manjula M, Kumuda KV, Anitha S and Shashidhara S, 2011. Antioxidant and antimicrobial activities of various extracts of *Artabotrys hexapetalous* flowers. *International Journal of Pharmaceutical Sciences*, **2**(3): S42- S50.

Marthanda MM, Subramanyam M, Hima BM and Annapurna J, 2005. Antimicrobial activity of clerodane diterpenoids from *Polyalthia longifolia* seeds. *Fitoterapia*, **76**: 336–339.

Mithraja MJ, Irudayaraj V, Kiruba S and Jeeva S, 2012. Antibacterial efficacy of *Drynaria quercifolia* (L.) J. Smith (Polypodiaceae) against clinically isolated urinary tract pathogens. *Asian Pacific Journal of Tropical Biomedicine*, **2**(S1): S131-S135.

Mithraja MJ, Johnson M, Mahesh M, Miller Paul Z and Jeeva S, 2012. Chemical diversity analysis on some selected medicinally important pteridophytes of Western Ghats, India. *Asian Pacific Journal of Tropical Biomedicine*, **2**(S1): S34-S39.

Mithraja MJ, Johnson M, Mahesh M, Miller Paul Z and Jeeva S, 2012. Interspecific variation studies on the Phyto-constituents of *Christella* and *Adiantum* using phytochemical methods. *Asian Pacific Journal of Tropical Biomedicine*, **2**(S1): S40-S45.

Mitra D, Sharma BD, Balakrishnan NP, Rao RR and Hajra PK, 1997. Annonaceae. *Flora of India*. *Botanical Survey of India, Calcutta*, **1**: 202-307.

Moreira IC, Lago JHG and Rogue NF, 2005. Sesquiterpenes, diterpenes, steroids and alkaloids from branches of *Xylopia brasiliensis* Spreng (Annonaceae).*Biochemical Systematic and Ecology*, **33**(9): 948-951.

Morita H, Sato Y, Chan KL, Choo CY, Itokawa H Takeya K, Kobayashi J and Samoquasine A, 2000., A Benzoquinazoline alkaloid from the seeds of *Annona squamosa*. *Journal of Natural Products*, **63**(12): 1707-1708.

Morton J, 1987. Sugar apple. *Fruits Warm Climate,* Pp.69–72.

Mshana NR, Abbiw DK, Addae-Mensah I, Adjanouhoun E, Ahyi MRA, Ekpere JA, Enow-Orock EG, Gbile ZO, Noamesi GK, Odei MA, Odunlami H, Oteng-Yeboah AA, Sarpong K, Sofowora A and Tackie AN, 2000. Traditional medicine and Pharmacopoeia, Contribution to the revision of ethnobotanical and floristic studies in Ghana.*OAU/STRC* technical report, Pp. 67.

Nadkarni AK, 2000. In Indian Materia Medica I, Popular Prakasan Ltd., Mumbai, India Pp. 116.

Nadkarni KM, 2002. Indian Materia Medica, Popular Prakashan Ltd., Mumbai, India, **1**: 115–116.

Nishiyama Y, Moriyasu M, Ichimaru M, Iwasa K, Kato A, Mathenge SG, Mutiso PBC and Juma FD, 2006. Secondary and tertiary isoquinoline alkaloids from *Xylopia parviflora*. *Phytochemistry*, **67**: 2671-2675.

Pacific island Ecosystems at Risk (PIER), 1970. Result set for: Annonaceae: *Annona muricata*". PIER species lists. United States Geological Survey & United States Forest Service. Archieved from the original on 12 may 2008-04-18. "Stone, Benjamin C. *The Flora of Guam. Micronesica*, **6**: 1-659.

Padhi LP, Panda SK, Satapathy SN and Dutta SK, 2011. *In vitro* evaluation of antibacterial potential of *Annona squamosa* Linn.and *Annona reticulata* L. from Similipal Biosphere Reserve, Orissa, India". *Journal of Agricultural Technology*, **7**(1): 133-142.

Padmaja V, Thankamany V and Hisham A, 2002. Antibacterial, antifungal and anthelmintic activities of

root barks of *Uvaria hookeri* and *Uvaria narum*. *Journal of Pharmacology*, **40**: 181-186.**Padmaja V, Thankamany V and Hishama A, 1993.** Antibacterial, antifungal and anthelmintic activities of root barks of *Uvaria hookeri* and *Uvaria narum*. *Journal of Ethnopharmacology*, **40**(3): 181- 186.

Pardhasaradhi BV, Reddy M, Ali AM, Kumari AL and Khar A, 2005. Different cytotoxic effects of *Annona squamosa* seed extracts on human tumour cell lines: Role of reactive oxygen species and glutathione. *Journal of Biosciences*, **30**: 237-244.

Patel K and Srinivasan K, 2004. Digestive stimulant action of spices: a myth or reality? *Indian Journal of Medical Research,* **119**: 167-179.

Pathak P, Saraswathy A and Savai J, 2010. *In vitro* antimicrobial activity and phytochemical analysis of the leaves of *Annona muricata. I. J. Pharm. Res. & Development*, **2**(5): 1-6.

Peri C and Pompei C, 1971. Estimation of different phenolic groups in vegetable extracts. *Phytochemistry*, **10**: 2187-2189.

Phadnis AP, Patwardhan SA and Dhanehwar NN, 1988. Clerodane diterpenoids from *Polyalthia longifolia. Phytochemistry*, **27**: 2899.

Pradhan P, Jhajharia M, Chulet R and Yagnik D, 2011. Preliminary studies on effect of biodiversity on activity of *Polyalthia longifolia. Pharmacologyonline*, **2**: 11-15.

Puvanendran S, Manoranjan T, Wickramasinghe A, Karunaratne DN, Kumar V, VijesundaraS, Carr G, Andersen R and Karunaratne V, 2010. Alkaloids from *Xylopia parvifolia* and *Xylopia nigricans* (Annonaceae). *Journal of the National Science Foundation* Sri Lanka, **38**(1): 75-76.

Raghunathan K and Mitra MK, 1982. Pharmacognosy of Indigenous Drugs. *Central Council for Research in Ayurveda and Siddha*, **2**: 127.

Sobiya RD, Vennila Jannet J, Aiyavu C and Paneerselvam, 2009. "The hepatoprotective effect of alcoholic extract of *Annona squamosa* leaves on experimentally induced liver injury in swiss albino mice". *International Journal of Integrative Biology,* **5**(3): 182-186.

Rajan S, Thirunalasundari T and Jeeva S, 2011. Anti-enteric bacterial activity and phytochemical analysis of the seed kernel extract of *Mangifera indica* Linnaeus against *Shigella dysenteriae* (Shiga,corrig.) Castellani and Chalmers. *Asian Pacific Journal of TropicalBiomedicine*, **4**: 294-300.

Rajesh V, Perumal P and Vamsi B, 2011. Anti ulcer activity of ethanolic extract of *Annona squamosa* leaves. *International Journal of Pharmaceutical Research and Development*, **4**(1): 162-167.

Rakesh R and Mahendra S, 2009. Coumarinolignans from the seeds of *Annona squamosa* Linn. E- *Journal of Chemistry*, **6**(2): 518-522.

Ramamurthy K. Nair NC and Henry AN, 1983. Annonaceae. Series1: Analysis, Botanical Survey of India, Coimbatore. *Flora of Tamil Nadu, India,* **1**: 3-7.

Reddy LJ, Jose B, Jalli RD and Gopu S, 2012. Evaluation of antibacterial and DPPH radical scavenging activities of the leaf essential oil & leaf extracts of *Uvaria narum* (Dunal) Wall. *International Journal of Research in Pure and Applied Microbiology*, **2**(2): 13-19.

Rice-Evens CA, Miller NJ and Paganga G, 1997. Antioxidants properties of phenolic compounds. *Trends in Plant Science*, **2**: 152-159.

Rice-Evens CA, Miller NJ and Paganga G, 1996. Structure-antioxidant activity relationships of flavonoids and phenolic acids. *Free Radical Biology and Medicine*, **20**: 933-956.

Rojas R, Bustamante B and Bauer J, 2003. Antimicrobial activity of selected Peruvian medicinal plants. *Journal of Ethnopharmacology,* **88**: 199-204.

Sastri BN, 1969. The Wealth of India Raw Materials. Publication and information directorate. CSIR; New Delhi.

Savithramma N, Linga Rao M and Suhrulatha D, 2011. Screening of Medicinal Plants for Secondary Metabolites. *Middle-East Journal of Scientific Research*, **8**(3): 579-584.

Scalbert A and Williamson G, 2000. Dietary intake and bioavailability of polyphenols. *The Journal of Nutrition*, **130**: 2073-2085.

Shahidi F, 2008. Antioxidants extraction, identification, application and efficacy measurement. *Electronic Journal of Environmental, Agricultural and Chemistry*, **7**: 3325-3330.

Sheela D and Uthayakumari, F 2013. GC-MS Analysis of bioactive constituents from coastal sand dune taxon *Sesuvium portulacastrum* (L.). *Bioscience Discovery,* **4**(1): 47-53.

Shyamala SG and Vasantha K, 2010. Phytochemical screening and antibacterial activity of *Syzygiumcumini* (L.) (Myrtaceae) leaves extracts. *International Journal of Pharmacy and Technological Research*, **2**: 1569-1573.

Silva EM, Souza JNS, Rogez H, Rees JF and Larondelle Y, 2007. Antioxidant activities and polyphenolic contents of fifteen selected plant species from the Amazonian region. *Food Chemistry*, **101**: 1012-1021.

Singh V and Pandey RP, 1998. Ethanobotany of Rajasthan. Scientific Publishers, **5**: 175.

Slik IWF, Poulsen AD, Ashton PS, Cannon CH, Eichhorn KAO, Kartawinata K, Lanniari I, Nagamasu H, Nakagawa M, Van Nieuwstadt MGL, Payne J,

Saridan A, Sidiyasa K, VerburgRW, Webb CO and Wilkie P, 2003. A floristic analysis of the lowland dipterocarp forests of Borneo. *Journal of Biogeography*, **30**: 1517–1531.**Sonnet PE and Jacobson M,1971.** Tumour inhibitors 11: cytotoxic alkaloids from *Annona purpurea*. *Journal of Pharmaceutical Sciences*, **60**(8): 1254-1256.

Srinivasan K, 2005. Role of species beyond food flavouring: Nutraceuticals with multiple health effects. *Food Review International*, **21**: 167-188.

Subramanya P, Ashalatha M, Prajna PS, Yende A and Bhat R, 2012. "Evaluation of Antibacterial and Antioxidant Properties of *Uvaria narum* (Dunal) wall". *International Research Journal of Pharmacy*, **2**(5): 142-144.

Subramanya P, Ashalatha M, Prajna PS, Yende A and Bhatt R, 2012. Evaluation of antibacterial and antioxidant properties of *Uvaria narum* (Dunal) Wall. *International Research Journal of Pharm*acy, **2**: 142-144.

Sukumaran S, Mahesh M and Jeeva S, 2012. Bioactive constituents of oak leaf fern - *Tectaria zeylanica* (Houtt.) Sledge from southern Western Ghats. *Asian Pacific journal of tropical Biomedicine*, **2**(S1): S64-S66.

Sunanda P and Anand K, 2003. Possible amelioration of hyperthyroidism by the leaf extract of *Annona squamosa* L. *Current Science*, **19**: 1402 1404.

Suresh HM, Sivakumar B, Hemalatha K, Heroor SS, Huger DS and Sambasiva Rao KRS, 2011. *In vitro* antiproliferative activity of *Annona reticulata* roots on human cancer cell lines. *Pharmacognosy*, **3**(1): 9-12.

Suresh K, Mamoharan S, Panjamurthy K and Kavitak, 2011. "Chemopreventive and anti-lipidperoxidative efficiency of *Annona squamos*a bark extract". *Pakistan Journal of Biological Sciences*, **9**(4): 2600-2605.

Tresina PS, Kala SMJ and Mohan VR, 2012. HPTLC finger print analysis of phytocompounds and *In Vitro* antioxidant activity of *Eugenia floccose* Bedd. *Bioscience Discovery*, **3**(3): 296-311.

Varadharajan V, Janarthanan UK and Krishnamurthy V, 2012. Physicochemical, Phytochemical screening and profiling of secondary metabolites of *Annona squamosa* leaf extract. *World Journal of Pharmaceutical Research*, **1**(4): 1143-1164.

Vasantha K, Priyavardhini S, Soris TP, MohanVR, 2012. Phytochemical analysis and antibacterial activity of *Kedrostis foetidissima* (Jacq.)Cogn. *Bioscience Discovery*, **3**(1): 06-16.

WHO, IUCN, WWF, 1993. Guidelines on the Conservation of Medicinal Plants, IUCN Gland, Switzerland. **1**: 4–6.

Wijeratne EMK, Hatanaka Y, Kikuchi T, Tezuka Y and Gunatilaka AAL, 1996. A dioxoaporphine and other alkaloids of two Annonaceous plants of Sri Lanka. *Phytochemistry*, **42**(6): 1703-1706.

Wu YC, Duth CY, Wang SK, Chen KS and Yang TH, 1989. Two new natural azofluorene alkaloids and cytotoxic aporphine alkaloids from *Polyalthia longifolia*. *Journal of Natural Products*, **53**: 1327-1331.

Wu YC, 1989. Two new natural Azafluorene alkaloids and cytotoxic aporphine alkaloids from *Polyalthia longifolia*. *Journal of Natural Products*, **29**: 463.

Xu L, Sun N and Kong J, 1992. Alkaloids of *Annona reticulata* L. Zhonqquo Zhong Yao Zazhi, **17**: 295-296.

Zaman K and Pathak K, 2012. Pharmacognostical and phytochemical studies on the leaf and stem bark of *Annona reticulata* Linn. *Journal of Pharmacognosy and Phytochemistry*, **1**(5): 1-8.

How to Cite this Article:

Florence AR, Joselin J, Shynin Brintha TS, Sukumaran S and Jeeva S, 2014. Preliminary phytochemical studies of select members of the family Annonaceae for bioactive constituents. *Biosci. Disc.,* **5**(1):85-96.