Review on Some Malaysian Traditional Medicinal Plants with Therapeutic Properties

Ali Alsarhan[1], Naznin Sultana[1,*], Ahed Al-Khatib[2] and Mohammed Rafiq Abdul Kadir[1]

[1]*Department of Clinical Science, Faculty of Biosciences and Medical Engineering, Universiti Teknologi Malaysia, 81310 UTM Skudai, Johor, Malaysia*

[2]*Forensic Medicine and Toxicology Dept-Faculty of Medicine-Jordan, University of Science and Technology-Jordan*

Abstract: There are many medicinal plants that have been used for thousands of years. These plants can now be found in herbal products and as part of the traditional Malaysian health care system because of their therapeutic efficacy. This paper discusses the use of ten medicinal plants in the traditional medicinal system of Malaysia and related scientific studies on their Pharmaceutical properties, which demonstrate their traditional uses. The plants viewed are *Amaranthus spinosus* L., *Arundina graminifolia* (D.Don) Hochr., *Callicarpa arborea* Roxb., *Carica papaya* L., *Citrus grandis* L., *Coleus amboinicus* Lour., *Curcuma domestica* Valeton., *Psidium guajava* L., *Garcinia atroviridis* Griff. ex T. Anders., and *Zingiber officinale* Rosc. All the plants mentioned in this paper have therapeutic properties, which explains and validates their uses in traditional medicine. .

Keywords: Traditional medicine, Antioxidants, Food, Free radicals, Malaysia.

1. INTRODUCTION

All through human history, people have used different materials from nature to cure their ailments and enhance their health [1]. For thousands of years, nature has been the source of medicine, and a large number of modern drugs have been isolated from the natural sources used in traditional medicine [2]. Worldwide, medicinal plants have become mainstream in the latter part of the 20th century. This is due partly to widespread acceptance of the importance of traditional and indigenous remedies, and the integration of derivatives from natural sources in pharmaceutical products [3-5]. Moreover, the importance of medicinal plants has increased because of the increasing need to make health care affordable as well as the belief that natural remedies are reliable and more effective than conventional drugs [6-8].

Over the years, medicinal folklore has proved to be priceless compared to current drug screening. Several significant modern drugs such as digitoxin, reserpine, tubocurarine, ephedrine, ergometrine, atropine, vinblastine and aspirin had their origins in traditional folk medicines [2, 9]. Approximately 119 compounds that have been used as single structure medical agents are currently derived from plants, about 77% of these medicinal plants were found by screening plants based on their ethnomedical uses and the resulting compounds have been employed in situations that approximate traditional uses [2, 10].

The use of traditional medicinal plants in most developing countries is the normative basis for the conservation of good health [11]. An increased reliance on the use of medicinal plants in industrialized societies can be attributed to the extraction and development of a number of drugs and chemotherapeutics from plants, as well as herbal remedies commonly used in rural areas [12]. In industrial societies, herbal remedies have become more common in the treatment of minor ailments, due to increasing of cost of maintaining personal health [13].

The major established categories of traditional medicine are from Asia, especially those from India (Aryuvedic, Unani, Siddha), China (Wu-Hsing) and Japan (Kampo), even today they still following the concepts of the diagnosis and remedy have been known for thousands of years [14-16]. The treatments are mostly a mix of plants but they may occasionally contain animal parts or minerals and they are formulated to realize an expected therapeutic goal. They are usually regarded as "drugs", in these traditions and it is not rare to find a plant component that work synergistically to enhance the therapeutic value or other characteristics of the remedy [7].

2. MEDICINAL PLANTS USED IN MALAYSIAN TRADITIONAL SYSTEM

Thousands of years ago, Malaysia had an extensive variety of plant species and traditional medical

*Address correspondence to this author at the Department of Clinical Science, Faculty of Biosciences and Medical Engineering, Universiti Teknologi Malaysia, 81310 UTM Skudai, Johor, Malaysia; Tel: + 6- 07-5536496;
Fax: +6- 07-5536222; E-mail: naznin@biomedical.utm.my

ISSN: 1814-8085 / E-ISSN: 1927-5129/14

systems. More than 1300 medicinal plant species have been recorded in Peninsular Malaysia alone [17]. Although Malaysian traditional medicine is derived from the Unani systems of medicine, which is turn had Hellenic roots, the Malaysian system has been affected by Indonesian, Chinese, Indian, and Orang Asli traditional practices [18]. In the Malaysian medicine system, herbal products form an important component. In 1999, medical and aromatic plants were estimated to have a value of RM 4.6 billion in the Malaysian herbal product market with an annual projected growth rate of 15-20% [19, 20]. Approximately 7,411 plant species (excluding Bryophyta, Algae and Fungi) have been identified in Sabah and about 80% of the indigenous plants were used by local communities. In addition, about 1,200 were used statewide for medicinal purposes [21, 22].

Several studies have indicated that free radicals contribute to increase various ailments such as hemorrhagic trauma, arthritis, senility, atherosclerosis, ischemia, Alzheimer, Parkinson's illness, gastrointestinal disturbances, tumor promotion, and carcinogenesis [23]. Antioxidants are molecules that play a significant role in preventing or delaying degenerative diseases that are the result of the oxidative damage of living cells caused by free radicals [24]. Over the years, artificial antioxidants such as butylated hydroxytoluene (BHT), butylated hydroxyanisole (BHA), tert-butylhydroquinone (TBHQ) and propyl gallate (PG) have been tested for probable toxicity and there are extensive studies on antioxidants polyphenolic extracts from natural plant materials to replace artificial antioxidants [25].

Malaysian plants are widely valued for their aromas and tastes and many of these plants are medicinal and used to treat various human illnesses. Studies have shown that several plants in Malaysia are poisonous to animals and humans because of the presence of specific components. Screening botanical extracts for potential toxins is a significant step in assessing their appropriateness for the market [25, 26].

The active oxygen and free radicals contributed in the pathogenesis of specific human ailments, as well as aging, cancer and atherosclerosis [27]. Active oxygen and free radicals, such as superoxide anion ($O^{\bullet -}_2$), hydrogen peroxide (H_2O_2) and hydroxyl (OH^-), are formed continuously in human body through natural metabolic actions. Their actions can be dissenting through a balanced organization of antioxidant defenses, including antioxidant synthesis and enzymes. A breach in this equilibrium causes oxidative strain, which may lead to cell damage and death [28]. As a result, a great deal of attention has been focused on the use of antioxidants, particularly natural antioxidants, to prevent lipid peroxidation, or to protect against free radical harm [29]. Foods rich in antioxidants playing a critical role in avoiding heart disease, vascular tumors and neurological diseases [30-32].

Recently, interest has grown in discovering antioxidants derived from plant sources to replace artificial antioxidants. Natural antioxidants are seen as being safer and more desirable than their synthetic counterparts because they occur in plant foods, data from scientific reports and laboratory studies indicate that plants contain a large variety of phytochemicals that have antioxidant activities [33].

Antioxidants are naturally present in in many different parts of a plant (flowers, stems, barks, pods,

Table 1: Medicinal Plants Used in Traditional Malaysian Systems

No	Scientific Name, Family	Local Name	Traditional Uses
1	*Amaranthus spinosus* L. (Amaranthaceae)	Bayam berduri	Gastric
2	*Arundina graminifolia* (D.Don) Hochr. (Orchidaceae)	Ubi bemban	Gastric
3	*Callicarpa arborea* Roxb. (Verbenaceae)	Tambang besi	Flatulence and gastric
4	*Carica papaya* L. (Caricaceae)	Betik	Gastric
5	*Citrus grandis* L. Osbeck (Rutaceae)	Limau besar	Gastric
6	*Coleus amboinicus* Lour. (Lamiaceae)	Hati-hati	Constipation
7	*Curcuma domestica* Valeton (Zingiberaceae)	Kunyit (turmeric)	Gastric and bloating
8	*Psidium guajava* L. (Myrtaceae)	Jambu batu	Diarrhea and stomach ache
9	*Garcinia atroviridis* Griff. ex T. Anders (Clusiaceae)	asam gelugor	Gastric
10	*Zingiber officinale* Rosc. (Zingiberaceae)	Halia	Gastric and flatulence

leaves, fruits, roots, wood, seeds, and pollens), characteristic composites with antioxidant actions contain vitamins, phenolic compounds and carotenoids. Thus, recommendations were made to increase consumption of vegetables and fruits rich in nutrients that work to reduce the danger of chronic disease [34-37].

3. LIST OF SOME MEDICINAL PLANTS USED IN MALAYSIAN TRADITIONAL SYSTEM

A review of the studies related to medicinal plants in Malaysia yeild a list of ten most important antioxidant plants. A list of plants used in Malaysian traditional has been summarized in Table **1**.

3.1. *Amaranthus spinosus* L.

The aqueous extract of *Amaranthus spinosus* revealed a remarkable immunostimulating action [38]. The stem extract had antimalarial actions [39] and the ethanolic extract of the whole plants showed hepatoprotective activity [40]. A vegetable with a high percent of antioxidant compounds [41] and high nutritional values because it is high in protein, fiber and essential amino acids, particularly lysine. *Amaranthus spinosus* L a very good remedy to combat the impact of air pollution [42].

The betalains in the stem of *Amaranthus spinosus* L include amaranthin, isoamaranthine, hydroxycinnamates, rutin, quercetin and kaempferol glycosides [43]. It has also contains amaranthoside, a lignan glycoside; amaricin, a coumaroyl adenosine, stigmasterol glycoside, and betaines such as glycinebetaine and trigonelline [44]. Betalains are well-known anti-oxidants, anti-cancer, antiviral and anthelmintic agents [39, 43, 45-47] (Figure **1**).

Figure 1: *Amaranthus spinosus* L. (http://luirig.altervista.org/flora/taxa/index1.php?scientific-name=amaranthus+spinosus).

3.2. *Arundina graminifolia* (D.Don) Hochr.

Arundina graminifolia (D. Don.) Hochr. is an evergreen terrestrial orchid known commonly as "bamboo orchid." It typically grows in the plains and mountains of Chittagong, Sylhet and northwestern India. It can be found in the Himalayas of Nepal, Sri Lanka, Thailand, Laos, Cambodia, Vietnam, southern China, Japan, Taiwan, Malaysia, and Java. The flower is attractive and blooms for about one and a half months. It is also used as a cut flower for ornamental purposes. Unfortunately, because it has been ruthlessly harvested and its habitats destroyed, the bamboo orchid is now a rare orchid species in Bangladesh [48]. For protection from extinction, and to meet the increased demand for cultivation of flowers, it is important to develop techniques for the rapid deployment of this type [48]. *Arundina graminifolia* is anti-bacterial and a decoction of its roots has been used to ease body aches [49] (Figure **2**).

Figure 2: *Arundina graminifolia* (D.Don) Hochr. (http://www.nationaalherbarium.nl/pubs/orchidweb/genera/arundina/arundina.htm).

3.3. *Callicarpa arborea* Roxb.

Callicarpa arborea is prevalent in Nepal, Bhutan, India, Sri Lanka, Bangladesh, Burma, China, Indochina, Malaysia, Singapore, Indonesia, the Philippines, New Guinea, and all but the eastern region of Thailand [50]. The bark is crushed and the resulting liquid is consumed to treat stomach pain, dysentery and vomiting. The juice from the bark is an effective hemostatic for the treatment of cuts [51]. The *Callicarpa* has a rich history of ethnobotanical usage, mainly in Asia ,several species of the genus *Callicarpa* have recognized ethnobotanical uses as traditional and ethnomedicines and as fish poisons. For example, *C.*

arborea Roxb. has been used in India to treat skin disease [52].

The leaves and bark of *Callicarpa arborea* are used for the treatment of rheumatism and skin diseases, and the juice from the fruit reduces fever [53]. According to the literature, *Callicarpa arborea* contains β-sitosterol, β-amyrin, lupeol, epilupeol, ursolic acid, oleanolic acid, L (+)-α-amino-β-(p-methoxyphenyl)- propionic acid, masnilic acid, betulinic acid and baurerol [54] (Figure **3**).

Figure 3: Callicarpa arborea Rox. (http://www.efloras.org/florataxon.aspx?flora_id=110&taxon_id=200019235).

3.4. *Carica papaya* L.

In addition to growing in Malaysia, papaya is also grown in India, Sri Lanka, and Thailand [55]. Usually the ripe flesh of the papaya is used to make sauce, pickled or preserved as marmalade or jam. Papaya juice is high in vitamins A and C (ascorbic acid), and is regarded as a "health food." The antioxidant levels and activities of the seeds of guava, papaya and mango are high and the seeds could be used commercially as a food or as a source of nutraceuticals in the future [56].

The plants used in tropical diets include fruits and vegetables. Occasionally these foods are also used as therapeutic treatments because of their medicinal properties. For instance, papaya fruit contains immune-stimulating and antioxidant agents [57, 58], the seeds and the latex are used in the treatment of gastrointestinal nematode infections and have an anthelmintic activity [59]. The immature fruit and seeds have a bacteriostatic activity on human intestinal pathogens [60]. The leaves of the papaya have been used to relieve the symptoms of asthma, as a vermifuge, a remedy for gastric diseases, amoebic dysentery, and fever. The methanolic leaf extract causes vasodilatation and has antioxidant effects, both important components for reducing cardiovascular problems [61]. The aqueous extract has been shown to support the healing processes of burns in rats [62, 63] (Figure **4**).

Figure 4: *Carica papaya* L.

3.5. *Citrus grandis* L. Osbeck.

Citrus grandis (L.) Osbeck or *Citrus maxima* (J. Burm.) is also known as pomelo or shaddock. *C. decumna* L is considered to be an ancient species [64]. It is part of the family Rutaceae, sub-family Aurantioidae, clan Citreae and sub-clan Citrinae [65], which suggests that it is indigenous to Thailand and Malaysia, [66] . Southern China has been proposed as its place of origin with Thailand, Malaysia, Indonesia, the Philippines and Japan as secondary centers.

Researchers believed that it originated in South East Asia where it extended to China, the Indian subcontinent, and Iran. It was introduced to the West Indies (Barbados) and the Dutch East Indies (Indonesia) in the 17th century by Captain Shaddock, and thus it was given his name. In Asia it is grown in household gardens for its fruit. *Citrus grandis* is unknown in the wild [67].

Citrus fruits are rich sources of natural antioxidants. The primary source of energy is not an the antioxidant vitamin C or higher amount of dietary fiber, but other antioxidant compounds [68]. In Asian countries, citrus fruits, such as lime (*Citrus microcarpa* and *Citrus*

aurantifolia), lemon (*Citrus limon*), and pummelo (*Citrus grandis*) are commonly available and regularly consumed as fruit, whole fruit juices, and as preserved snacks. The pummelo, the biggest of all citrus fruits, has a place at the mid-autumn Moon Festival observed by Chinese families. Traditionally, people eat white pummelo through this festival. Recently, red pummelo has been cultivated on a large scale and promoted in southern Taiwan. The red pummelo may have more antioxidant compounds than the white variety because of the presence of antioxidant lycopene, carotenoid, and anthocyanins in orange and red colored fruits (Moro, Tarocco, and Sanguinello varieties) [69]. However, the properties and antioxidant potential of red pummelo has not been reported [70] (Figure **5**).

Figure 5: *Citrus grandis* L.

3.6. *Coleus amboinicus* Lour.

Coleus amboinicus Lour, also known as (*Plectranthus amboinicu, Coleus aromaticus*, and *Plectranthus aromaticus* (Benth.)) Roxb are members of the Lamiaceae (Labiatae) family and have many common names: country borage, Cuban oregano, Indian borage, French thyme, Spanish thyme, Mexican mint and soup mint. *Plectranthus* contains more than 300 species, which are commonly used to treat skin ailments, digestive issues and respiratory illnesses [71, 72]. Previous pharmacological studies have indicated that *Coleus amboinicus* has anti-epileptic, antioxidants and antimicrobial activities [73, 74]. The leaves of these species contain essential oils, flavonoids, terpens derivatives, and cinnamic. These phytocompounds have anti-inflammatory and chemotherapy effects [74-76].

In Brazil, especially in the north-eastern region, The use of *Coleus amboinicus* is a widespread practice and this plant is used as a crude extracts or as an infusion to treat many ailments including inflammations [77] and cancer. Investigating the anti-inflammatory and anti-tumor activities of *Coleus amboinicus* may determine if its traditional medical uses are supported by its pharmacological effects [74] (Figure **6**).

Figure 6: *Coleus amboinicus* Lour. (http://www.uphcm.edu.vn/caythuoc/index.php?q=node/41).

3.7. *Curcuma domestica* Valeton

The traditional organization of Indian medication, Ayurveda, is interested with the avoidance, diagnosis and treat of illness. Ayurveda uses the rhizomes and vegetation of different types belonging to the Zingiberaceae family, particularly those of *Curcuma longa* Linn. (Syn.*Curcuma domestica* Valeton). *Curcuma longa* is commonly identified as Turmeric, in English, or Haldi, in Indian. *C. longa* is one of the better known medicinal herbal attributed with adaptogenic, anti-pressure, anti-fatigue, and antioxidant properties [78]

Turmeric have vital oils, primarily terpenoids (such as turmerones, atlantones and zingiberene) and flavonoids such as curcuminoids, (as well as curcumin). In the 1970's, researchers discovered that curcumin have neuro-protective properties that helped with the amyloid pathology of Alzheimer's illness, opposed to-carcinogenic, and anti-HIV-1 activities. A great deal of data has been gathered that supports Turmeric's anti-inflammatory, anti-tumor, and reno and cardio-protective activities as well as acknowledging its lipid lowering potential [79, 80] (Figure **7**).

Figure 7: *Curcuma domestica* Valeton.

3.8. *Psidium guajava* Linn

The *Psidium guajava* Linn. (Myrtaceae) is widespread and grows as shrub or small tree reaching 15m. In Asia and Africa, *Psidium guajava* is used to prevent and treat scurvy [81, 82]. In mice and humans the juice from Guava fruit has a hypoglycemic activity [83]. In Bolivia and Egypt, guava leaves have been employed as a remedy for illnesses including cough and pulmonary ailments [84]. Young guava leaves are used in India to treat cough [85]. In China, the people used guava leaves against inflammatory with hemostatic agent [86]. *P. guajava* is also used to treat vomiting and diarrhea and its leaves were used in the treatment of cholera [81, 82].

Alcohol, chloroform and water extracts of young guava leaves are useful against both *Shigella* spp. and *Vibrio* spp of *Aeromonas hydrophila*, [87]. The water extract of desiccated guava leaves possesses bactericidal action that is effective versus *Staphylococcus aureus*, *Sarcina lutea* and *Mycobacterium phlei* [88]. However, the ethanol extract of dried guava leaves was ineffective against 8 microbial strains secluded from faeces of people with contagious diarrhea [82, 87, 89].

Recently, an infusion of dried guava fruit and leaves has become popular as a drink in Taiwan [30]. Moreover, a guava infusion is more effective against low blood sugar levels if the guava tree was the host to a parasite known as African Mistletoe (*Loranthus bengwensis* L.) [90]. The guava leaf extract has anti-diarrheal [91] antipyretic [92], antimicrobial [82] and bio-antimutagenic [93] properties this extract may play an essential role in preventing oxidative stress that contributes to the development of diabetes and cancer (Figure **8**).

Figure 8: *Psidium guajava* L.

3.9. *Garcinia atroviridis* Griff. ex T. Anders.

Garcinia atroviridis Griff. ex T. Anders (Guttiferae) is also known as ‘asam gelugor’ in Malaysia. This plant grows abundantly in the Malay Peninsula and it is valued for its medium sized fruit. It is a common crop, especially in the Northern regions and it is important both economically and medically to the area. Dried slices of the fruits are known as ‘asam keping’ and are used commercially as a popular spice in curries, fish dressings and also as a sour relish [94, 95]. The young leaves have culinary uses and are used as a traditional vegetable [96]. On the east coast of Peninsular Malaysia, fresh fish is steamed with the leaves of *Garcinia atroviridis* to keep it fresh. In traditional medicine, *G. atroviridis* has been used as a post-partum medication and to remedy earache, dandruff, cough, and stomach pains associated with pregnancy [94, 97].

Plants from the genus *Garcinia*, especially *Garcinia kola* and *Garcinia mangostana* are widely mentioned as containing a variety of biological actions such as, anti-HIV, antimicrobial, antihepatotoxic, antioxidant, anti-inflammatory, and antiulcerogenic actions. However, only a few of these studies included *G. atroviridis* [98].

The antimicrobial effectively of *G. atroviridis* has been found to be an important source of antibacterial, anti-nematodes, antitumor, and antiviral components

[98]. Plants from the genus *Garcinia* contain xanthones, benzophenones and bioflavonoids and it has been reported that atroviridin, garcinia acid (identical to synthetic (-)-hydroxycitric acid) and its g-lactone components can be isolated. These plants also contain hydroxycut acid, is a successful preventer of lip- genesis with profitable and medical usage [94, 97, 98] (Figure **9**).

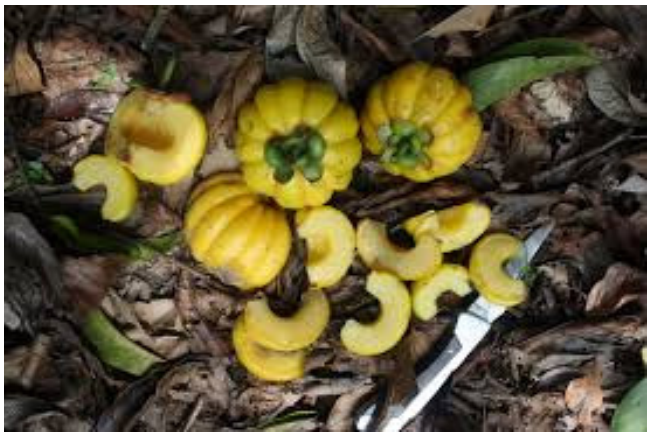

Figure 9: *Garcinia atroviridis* Griff. ex T. (https://www.flickr.com/photos/adaduitokla/7653337948//).

3.10. *Zingiber officinale* Rosc

The family Zingiberaceae are well known for their medicinal value and are widely distributed throughout equatorial regions, especially in Southeast Asia. The family is a significant natural resource that supplies several useful products including food, spices, medicines, dyes, perfumes and cosmetics [99]. *Zingiber officinale* is a traditional medicinal herbs that have been used for more than 2000 years by Polynesians to enhance overall health and as a remedy for diabetes, high blood pressure, cancer, and several other ailments [100]. *Zingiber officinale* has a number of antioxidant constituents including beta-carotene, ascorbic acid, terpenoids, alkaloids, and polyphenols such as flavonoids, flavones glycosides, and rutin [101]. Simple to cultivate, *Zingiber officinale,* with its wide range of antioxidants, can be a primary source for natural, phytochemical antioxidants [102]. Although different extracts are derived from ginger, it is the CO_2 extracts that contain the most polyphenol materials that have a structure that resembles the structure its rhizomes [103, 104].

Ground ginger is frequently used because it exhibits antioxidant abilities [101]. Earlier studies on the antioxidant properties of different species of ginger species looked only at the rhizomes [100, 105-107], which have tyrosinase inhibiting properties [108]. More recently, skin-lightening cosmetics have been developed from the rhizomes of ginger [109].

While the leaves have been employed as a flavouring and in traditional medicine, research regarding their antioxidant and tyrosinase inhibiting properties is lacking. *Zingiber officinale* with its extensive range of antioxidants has the potential as an easy to cultivate supply of natural, phytochemical antioxidants [100] (Figure **10**).

Figure 10: *Zingiber officinale* Rosc.

4. CONCLUSION

Several Malaysian plants display therapeutic properties because they contain compounds with antioxidant principles that play in a synergistic manner with other compounds In Malaysia, research has been directed to identify antioxidant compounds with limited toxicity. In this study, antioxidants represent an important means to discover probable and therapeutically beneficial molecules. The phytochemical analysis of different extracts revealed many compounds including phenolic acid, flavonoids, tyrosinase, curcumin, ascorbate, carotenoids, and polyphenols, which have been shown to have strong antioxidant properties.

ACKNOWLEDGEMENTS

This work was supported by a UTM research grant GUP Tier 1(Vote: 03H13), FRGS (vote: 4F126), Ministry of Higher Education (MOHE) and RMC.

REFERENCES

[1] Lev E, Amar Z. Ethnopharmacological survey of traditional drugs sold in Israel at the end of the 20th century. Journal of Ethnopharmacology 2000; 72(1): 191-205. http://dx.doi.org/10.1016/S0378-8741(00)00230-0

[2] Ghorbani A, Naghibi F, Mosaddegh M. Ethnobotany, Ethnopharmacology and drug discovery. Iranian J Pharm Sci 2006; 2: 109-18.

[3] De Smet P. The role of plant-derived drugs and herbal medicines in healthcare. Drugs 1997; 54(6): 801-40. http://dx.doi.org/10.2165/00003495-199754060-00003

[4] Dukes M. Drugs used in non-orthodox medicine. Side Effects of Drugs Annual 1992; 16: 545-50. http://dx.doi.org/10.1016/S0378-6080(05)80530-6

[5] Winslow LC, Kroll DJ. Herbs as medicines. Archives of Internal Medicine 1998; 158(20): 2192-9. http://dx.doi.org/10.1001/archinte.158.20.2192

[6] Bateman J, Chapman R, Simpson D. Possible toxicity of herbal remedies. Scottish Medical Journal 1998; 43(1): 7.

[7] Elvin-Lewis M. Should we be concerned about herbal remedies. Journal of Ethnopharmacology 2001; 75(2): 141-64. http://dx.doi.org/10.1016/S0378-8741(00)00394-9

[8] Murphy JM. Preoperative considerations with herbal medicines. AORN 1999; 69(1): 173-83. http://dx.doi.org/10.1016/S0001-2092(06)62767-1

[9] Anyinam C. Ecology and ethnomedicine: Exploring links between current environmental crisis and indigenous medical practices. Social Science & Medicine 1995; 40(3): 321-9. http://dx.doi.org/10.1016/0277-9536(94)E0098-D

[10] Cordell GA. Biodiversity and drug discovery--a symbiotic relationship. Phytochemistry 2000; 55(6): 463-80. http://dx.doi.org/10.1016/S0031-9422(00)00230-2

[11] UNESCO. Culture and Health, Orientation Texts -World Decade for Cultural Development 1988 - 1997, Document CLT/DEC/PRO - 1996, Paris, France, pgs. 129 1996.

[12] UNESCO. FIT/504-RAF-48 Terminal Report: Promotion of Ethnobotany and the Sustainable Use of Plant Resources in Africa, pgs. 60, Paris,1998 1998.

[13] Hoareau L, DaSilva EJ. Medicinal plants: a re-emerging health aid. Electronic Journal of Biotechnology 1999; 2(2): 3-4.

[14] Kanba S, Yamada K, Mizushima H, Asai M. Use of herbal medicine for treating psychiatric disorders in Japan. Psychiatry Clin Neurosci 1998; 52 Suppl: S331-3. http://dx.doi.org/10.1111/j.1440-1819.1998.tb03260.x

[15] Vogel H. Similarities between various systems of traditional medicine. Considerations for the future of ethnopharmacology. Journal of Ethnopharmacology 1991; 35(2): 179-90. http://dx.doi.org/10.1016/0378-8741(91)90071-K

[16] Wong AHC, Smith M, Boon HS. Herbal remedies in psychiatric practice. Archives of General Psychiatry 1998; 55(11): 1033. http://dx.doi.org/10.1001/archpsyc.55.11.1033

[17] Burkill IH. dictionnary of the economic products of the Malay peninsula: Ministry of agriculture (Malaysia). Crown Agents for the Colonies. London 1935; p. 839.

[18] Zakaria M, Mohd MA. Traditional Malay Medicinal Plants.: Penerbit Fajar Bakti, Sdn. Bhd., Kuala Lumpur 1994.

[19] Jamal JA. Malay traditional medicine. Tech Monitor (Special Feature: traditional Medicine: S & T Advancement) 2006; pp. 37-49.

[20] Khatun MA, Harun-Or-Rashid M, Rahmatullah M. Scientific Validation of Eight Medicinal Plants Used in Traditional Medicinal Systems of Malaysia: a Review. American-Eurasian Journal of Sustainable Agriculture 2011; 5(1): 67-75.

[21] Kulip J. An ethnobotanical survey of medicinal and other useful plants of Muruts in Sabah, Malaysia. Telopea 2003; 10(1): 81-98.

[22] Kulip J, Lam NF, Manshoor N, Julius A, Said IM, Gisil J, *et al*. Medicinal plants in Maliau Basin, Sabah, Malaysia. Journal Of Tropical Biology And Conservation 2010; 6: 21-33.

[23] Bagchi D, Bagchi M, Stohs SJ, Das DK, Ray SD, Kuszynski CA, *et al*. Free radicals and grape seed proanthocyanidin extract: importance in human health and disease prevention. Toxicology 2000; 148(2-3): 187-97. http://dx.doi.org/10.1016/S0300-483X(00)00210-9

[24] Jaitak V, Sharma K, Kalia K, Kumar N, H.P.Singh, Kaul VK, *et al*. Antioxidant activity of Potentilla fulgens: An alpine plant of western Himalaya. Journal of Food Composition and Analysis 2010; 23(2): 142-7. http://dx.doi.org/10.1016/j.jfca.2009.02.013

[25] Qader SW, Abdulla MA, Chua LS, Najim N, Zain MM, Hamdan S. Antioxidant, total phenolic content and cytotoxicity evaluation of selected Malaysian plants. Molecules 2011; 16(4): 3433-43. http://dx.doi.org/10.3390/molecules16043433

[26] Orech F, Akenga T, Ochora J, Friis H, Aagaard-Hansen J. Potential toxicity of some traditional leafy vegetables consumed in Nyangoma Division, Western Kenya. Afr J Food Nutr Sc (AJFAND) 2005; 5: 1-13 Back to cited text no 2005; 19.

[27] Moskovitz J, Yim MB, Chock PB. Free radicals and disease. Archives of Biochemistry and Biophysics 2002; 397(2): 354-9. http://dx.doi.org/10.1006/abbi.2001.2692

[28] Gutteridge J, Halliwell B. Free radicals in biology and medicine. Oxford University Press, New York 1999.

[29] Vendemiale G, Grattagliano I, Altomare E. An update on the role of free radicals and antioxidant defense in human disease. International Journal Of Clinical & Laboratory Research 1999; 29(2): 49-55. http://dx.doi.org/10.1007/s005990050063

[30] Chen HY, Yen GC. Antioxidant activity and free radical-scavenging capacity of extracts from guava (< i> Psidium guajava</i> L.) leaves. Food Chemistry 2007; 101(2): 686-94. http://dx.doi.org/10.1016/j.foodchem.2006.02.047

[31] Di MV, Esposito E. Biochemical and therapeutic effects of antioxidants in the treatment of Alzheimers disease, Parkinsons disease, and amyotrophic lateral sclerosis. Current Drug Targets-CNS &# 38; Neurological Disorders 2003; 2(2): 95-107. http://dx.doi.org/10.2174/1568007033482959

[32] Kris-Etherton PM, Hecker KD, Bonanome A, Coval SM, Binkoski AE, Hilpert KF, *et al*. Bioactive compounds in foods: their role in the prevention of cardiovascular disease and cancer. The American Journal Of Medicine 2002; 113(9): 71-88. http://dx.doi.org/10.1016/S0002-9343(01)00995-0

[33] Chanwitheesuk A, Teerawutgulrag A, Rakariyatham N. Screening of antioxidant activity and antioxidant compounds of some edible plants of Thailand. Food Chemistry 2005; 92(3): 491-7. http://dx.doi.org/10.1016/j.foodchem.2004.07.035

[34] Klipstein-Grobusch K, Launer LJ, Geleijnse J, Boeing H, Hofman A, Witteman J. Serum carotenoids and atherosclerosis: The Rotterdam Study. Atherosclerosis 2000; 148(1): 49-56. http://dx.doi.org/10.1016/S0021-9150(99)00221-X

[35] Moeller SM, Jacques PF, Blumberg JB. The potential role of dietary xanthophylls in cataract and age-related macular degeneration. Journal of the American College of Nutrition 2000; 19(suppl 5): 522S-7S. http://dx.doi.org/10.1080/07315724.2000.10718975

[36] Morris MC, Beckett LA, Scherr PA, Hebert LE, Bennett DA, Field TS, *et al*. Vitamin E and vitamin C supplement use and risk of incident Alzheimer disease. Alzheimer Dis Assoc Disord 1998 Sep; 12(3): 121-6. http://dx.doi.org/10.1097/00002093-199809000-00001

[37] Slattery ML, Benson J, Curtin K, Ma KN, Schaeffer D, Potter JD. Carotenoids and colon cancer1. The American Journal Of Clinical Nutrition 2000; 71(2): 575-82.

[38] Lin B-F, Chiang B-L, Lin J-Y. Amaranthus spinosus water extract directly stimulates proliferation of B lymphocytes *in vitro*. International Immunopharmacology 2005; 5(4): 711-22. http://dx.doi.org/10.1016/j.intimp.2004.12.001

[39] Hilou A, Nacoulma OG, Guiguemde TR. *In vivo* antimalarial activities of extracts from Amaranthus spinosus L. and Boerhaavia erecta L. in mice. Journal of Ethnopharmacology 2006; 103(2): 236-40. http://dx.doi.org/10.1016/j.jep.2005.08.006

[40] !!! INVALID CITATION !!!.

[41] Odhav B, Beekrum S, Akula U, Baijnath H. Preliminary assessment of nutritional value of traditional leafy vegetables in KwaZulu-Natal, South Africa. Journal of Food Composition and Analysis 2007; 20(5): 430-5. http://dx.doi.org/10.1016/j.jfca.2006.04.015

[42] Zeashan H, Amresh G, Rao CV, Singh S. Antinociceptive activity of Amaranthus spinosus in experimental animals. Journal of Ethnopharmacology 2009; 122(3): 492-6. http://dx.doi.org/10.1016/j.jep.2009.01.031

[43] Ashok Kumar BS, Lakshman K, Nandeesh R, Arun Kumar PA, Manoj B, Kumar V, *et al*. *In vitro* alpha-amylase inhibition and *in vivo* antioxidant potential of Amaranthus spinosus in alloxan-induced oxidative stress in diabetic rats. Saudi Journal of Biological Sciences 2011; 18(1): 1-5. http://dx.doi.org/10.1016/j.sjbs.2010.08.002

[44] Blunden G, Yang M-h, Janicsák G, Máthé I, Carabot-Cuervo A. Betaine distribution in the Amaranthaceae. Biochemical Systematics and Ecology 1999; 27(1): 87-92. http://dx.doi.org/10.1016/S0305-1978(98)00072-6

[45] Rastogi RP, Mehrotra BN. Compendium of Indian Medicinal Plants: CDRI and NISCAIR, Lucknow; 1999.

[46] Srinivasan K, Muruganandan S, Lal J, Chandra S, Tandan S, Raviprakash V, *et al*. Antinociceptive and antipyretic activities of Pongamia pinnata leaves. Phytotherapy Research 2003; 17(3): 259-64. http://dx.doi.org/10.1002/ptr.1126

[47] Stintzing FC, Kammerer D, Schieber A, Adama H, Nacoulma OG, Carle R. Betacyanins and phenolic compounds from Amaranthus spinosus L. and Boerhavia erecta L. Zeitschrift fur Naturforschung C 2004; 59(1/2): 1-8.

[48] Bhadra S, Bhowmik T. Axenic germination of seeds and rhizome-based micropropagation of an orchid Arundina graminifolia (D. Don.) Hochr. Bangladesh Journal of Botany 2005; 34: 59-64.

[49] Hossain MM. Therapeutic orchids: traditional uses and recent advances — An overview. Fitoterapia 2011; 82(2): 102-40. http://dx.doi.org/10.1016/j.fitote.2010.09.007

[50] Leeratiwong C, Chantaranothai P, Paton A. notes on the genus Callicarpa L.(Lamiaceae) in Thailand. Thai Forest Bulletin (Botany) 2007; 35: 73-9.

[51] Rai PK, Lalramnghinglova H. Ethnomedicinal plant resources of Mizoram, India: Implication of traditional knowledge in health care system. Ethnobotanical Leaflets 2010; 2010(3): 6.

[52] Sen M PB. Chemical investigation of the bark of *Callicarpa arborea* (Verbenaceae). J Indian Chem Soc 1974; 51: 903.

[53] Subansiri AP. Bull. Bot. Surv. India Vol. 26, Nos. 1 & 2: pp. 26-37, 1984. Bulletin 1982; 26: 26.

[54] Kar PK, Lingadurai S, Nath LK, Nanda B. Evaluatio Of Wou D-Heali G Activity Of Leaves Of Urtica Parviflora Roxb Ad Callicarpa Arborea Roxb I Rats 2009.

[55] John S, James H. Functional foods from fruit and fruit products. In: Asian Functional Foods. John S, Chi-Tang H & Shahidi F (eds). CRC Press, Taylor & Francis Group 2005.

[56] Norshazila S, Zahir I, Suleiman K, Aisyah M, Rahim K. Antioxidant levels and activities of selected seeds of Malaysian tropical fruits. Malaysian Journal of Nutrition 2010; 16(1): 149-59.

[57] Aruoma OI, Colognato R, Fontana I, Gartlon J, Migliore L, Koike K, *et al*. Molecular effects of fermented papaya preparation on oxidative damage, MAP Kinase activation and modulation of the benzo [a] pyrene mediated genotoxicity. Biofactors 2006; 26(2): 147-59. http://dx.doi.org/10.1002/biof.5520260205

[58] Mehdipour S, Yasa N, Dehghan G, Khorasani R, Mohammadirad A, Rahimi R, *et al*. Antioxidant potentials of Iranian Carica papaya juice *in vitro* and *in vivo* are comparable to α-tocopherol. Phytotherapy Research 2006; 20(7): 591-4. http://dx.doi.org/10.1002/ptr.1932

[59] Stepek G, Behnke JM, Buttle DJ, Duce IR. Natural plant cysteine proteinases as anthelmintics? Trends in Parasitology 2004; 20(7): 322-7. http://dx.doi.org/10.1016/j.pt.2004.05.003

[60] Osato JA, Santiago LA, Remo GM, Cuadra MS, Mori A. Antimicrobial and antioxidant activities of unripe papaya. Life Sciences 1993; 53(17): 1383-9. http://dx.doi.org/10.1016/0024-3205(93)90599-X

[61] Runnie I, Salleh MN, Mohamed S, Head RJ, Abeywardena MY. Vasorelaxation induced by common edible tropical plant extracts in isolated rat aorta and mesenteric vascular bed. Journal of Ethnopharmacology 2004; 92(2): 311-6. http://dx.doi.org/10.1016/j.jep.2004.03.019

[62] Mahmood A, Sidik K, Salmah I. Wound healing activity of Carica papaya L. aqueous leaf extract in rats. International Journal of Molecular Medicine and Advance Sciences 2005; 1(4): 398-401.

[63] Canini A, Alesiani D, D'Arcangelo G, Tagliatesta P. Gas chromatography-mass spectrometry analysis of phenolic compounds from Carica papaya L. leaf. Journal of Food Composition and Analysis 2007; 20(7): 584-90. http://dx.doi.org/10.1016/j.jfca.2007.03.009

[64] Scora RW. On the history and origin of citrus. Bulletin of the Torrey Botanical Club 1975: 369-75. http://dx.doi.org/10.2307/2484763

[65] Purseglove J. Tropical Crops. Dicotyledons Volume 1 and 2. Longmans 1968.

[66] Ye MY. Study on the diverse centre of origin of pummelo germplasm. China Citrus 1997; 26(1): 3-5.

[67] Paudyal KP, Haq N. Variation of pomelo (Citrus grandis (L.) Osbeck) in Nepal and participatory selection of strains for further improvement. Agroforestry Systems 2008; 72(3): 195-204. http://dx.doi.org/10.1007/s10457-007-9088-z

[68] Gorinstein S, Martin-Belloso O, Park YS, Haruenkit R, Lojek A, Cíz M, *et al*. Comparison of some biochemical characteristics of different citrus fruits. Food Chemistry 2001; 74(3): 309-15. http://dx.doi.org/10.1016/S0308-8146(01)00157-1

[69] Proteggente AR, Saija A, De Pasquale A, Rice-Evans CA. The compositional characterisation and antioxidant activity of fresh juices from sicilian sweet orange (Citrus sinensis L. Osbeck) varieties. Free Radical Research 2003; 37(6): 681-7. http://dx.doi.org/10.1080/1071576031000083198

[70] Tsai HL, Chang SKC, Chang SJ. Antioxidant content and free radical scavenging ability of fresh red pummelo [Citrus grandis (L.) Osbeck] juice and freeze-dried products. Journal of Agricultural And Food Chemistry 2007; 55(8): 2867-72. http://dx.doi.org/10.1021/jf0633847

[71] Murthy PS, Ramalakshmi K, Srinivas P. Fungitoxic activity of Indian borage (Plectranthus amboinicus) volatiles. Food Chemistry 2009; 114(3): 1014-8. http://dx.doi.org/10.1016/j.foodchem.2008.10.064

[72] Alasbahi R, Safiyeva S, Craker L. Antimicrobial activity of some Yemeni medicinal plants. Journal of Herbs, Spices & Medicinal Plants 1999; 6(3): 75-83. http://dx.doi.org/10.1300/J044v06n03_07

[73] França F, Lago EL, Marsden PD. Plants used in the treatment of leishmanial ulcers due to Leishmania (Vannia) braziliensis in an endemic area of Bahia, Brazil. Revista da Sociedade Brasileira de Medicina Tropical 1996; 29(3): 229-32. http://dx.doi.org/10.1590/S0037-86821996000300002

[74] Gurgel APAD, da Silva JG, Grangeiro ARS, Oliveira DC, Lima CMP, da Silva ACP, *et al*. *In vivo* study of the anti-inflammatory and antitumor activities of leaves from Plectranthus amboinicus (Lour.) Spreng (Lamiaceae). Journal of Ethnopharmacology 2009; 125(2): 361-3. http://dx.doi.org/10.1016/j.jep.2009.07.006

[75] Akagi K, Hirose M, Hoshiya T, Mizoguchi Y, Ito N, Shirai T. Modulating effects of ellagic acid, vanillin and quercetin in a rat medium term multi-organ carcinogenesis model. Cancer Letters 1995; 94(1): 113-21. http://dx.doi.org/10.1016/0304-3835(95)03833-I

[76] Taraphdar AK, Roy M, Bhattacharya R. Natural products as inducers of apoptosis: Implication for cancer therapy and prevention. Current Science-Bangalore- 2001; 80(11): 1387-96.

[77] Lorenzi H, Matos FJA. Plantas medicinais no Brasil: nativas e exóticas: Instituto Plantarum Nova Odessa; 2002.

[78] Ammon H, Anazodo M 1992. Curcumin: A potent inhibitor of leukotriene B4 formation in rat peritoneal polymorphonuclear neutrophils (PMNL). Planta Medica. 58: 226. Ammon, HPT, Safayhi, H., Mack, T. and Sabieraj, J 1993. Mechanism of. Medica 1992; 57: 1-7.

[79] Nirmala C, Puvanakrishnan R. Protective role of curcumin against isoproterenol induced myocardial infarction in rats. Molecular and Cellular Biochemistry 1996; 159(2): 85-93. http://dx.doi.org/10.1007/BF00420910

[80] Shoskes DA. Effect of Bioflavonoids Quercetin and Curcumin on Ischemic Renal Injury: A New Class of Renoprotective Agents1. Transplantation 1998; 66(2): 147. http://dx.doi.org/10.1097/00007890-199807270-00001

[81] Watt JM, Branehwizk MG. The Medicinal and Poisonous Plants of Southern and Eastern Africa. E & S Livingstone, London 1969; pp. 789-799.

[82] Jaiarj P, Khoohaswan P, Wongkrajang Y, Peungvicha P, Suriyawong P, Sumal Saraya M, *et al*. Anticough and antimicrobial activities of< i> Psidium guajava</i> Linn. leaf extract. Journal of Ethnopharmacology 1999; 67(2): 203-12. http://dx.doi.org/10.1016/S0378-8741(99)00022-7

[83] Cheng JT, Yang RS. Hypoglycemic effect of guava juice in mice and human subjects American Journal of Clinical Medicine 1983; 11 (1-4): 74-6.

[84] Batick MJ. Ethnobotany of palms in the neotropics. In: Prance, G.T., Kallunki, J.A. (Eds.), Advances in Economic Botany: Ethnobotany in the Neotropics. New York Botanical Garden, New York 1984; pp. 9-23.

[85] Khan MIH, Ahmad, J. A pharmacognostic study of Psidium guajava L. International Journal of Crude Drug Research 1985; 23(2): 95-103.

[86] Hon-Ning L. Chinese Medicinal Herbs of Hong Kong, vol. 2. Hang Chiewing Sa Kwang, Hong, Kong 1988; pp. 104-105.

[87] Chulasiri M, Suthienkul O, Pavaro C, Wongkrajang Y. Herbal extracts for diarrheal treatment: antibacterial activity *in vitro*. Journal of Public Health 1986; 16(1): 21-35.

[88] Malcolm SA, Sofowora EA. Antimicrobial activity of selected Nigerian folk remedies and their constituent plants. Lloydia 1969; 32: 512-517.

[89] Gritsanapan W, Chulasiri M. A preliminary study of antidiarrheal plants: I. antibacterial activity. Mahidol University Journal of Pharmaceutical Sciences 1983; 10(4): 19-23.

[90] Obatomi DK, Bikomo EO, Temple VJ. Anti-diabetic properties of the African mistletoe in streptozotocin-induced diabetic rats. Journal of Ethnopharmacology 1994; 43: 13-17. http://dx.doi.org/10.1016/0378-8741(94)90111-2

[91] Lutterodt GD. Inhibition of gastrointestinal release of acetylcholine by quercetin as a possible mode of action of Psidium guajava leaf extracts in the treatment of acute diarrhoeal disease. Journal of Ethnopharmacology 1989; 25: 235-247. http://dx.doi.org/10.1016/0378-8741(89)90030-5

[92] Olajide OA, Awe SO, Makinde JM. Pharmacological studies on the leaf of Psidium guajava. Fitoterapia 1999; 70: 25-31. http://dx.doi.org/10.1016/S0367-326X(98)00010-0

[93] Matsuo T, Hanamure N, Shimoi K, Nakamura Y, Tomita I. Identification of (+)-gallocatechin as a bio-antimutagenic compound in Psidium guava leaves. Phytochemistry 1994; 36: 1027-1029. http://dx.doi.org/10.1016/S0031-9422(00)90484-9

[94] Burkill IH. A Dictionary of the Economic Products of hhe Malay Peninsula. Crown Agent, London 1966.

[95] Corner EJ. Wayside Tress of Malaya. Malayan Nature Society, Kuala Lumpur 1988.

[96] Mackeen MM, Ali AM, El-Sharkawy SH, Salleh KM, Lajis NH, Kawazu K. Antimicrobial and cytotoxic properties of some Malaysian traditional vegetables (ulam). International Journal of Pharmacognosy 1997a; 35: 174-178. http://dx.doi.org/10.1076/phbi.35.3.174.13294

[97] Grosvenor PW, Gothard PK, McWilliam NC, Supriono AG, DO. Medicinal plants from Riau province, Sumatra, Indonesia. Part 1: uses. Journal of Ethnopharmacology 1995a; 45: 75-95. http://dx.doi.org/10.1016/0378-8741(94)01209-I

[98] Mackeen M, Ali A, Lajis N, Kawazu K, Hassan Z, Amran M, *et al*. Antimicrobial, antioxidant, antitumour-promoting and cytotoxic activities of different plant part extracts of< i> Garcinia atroviridis</i> Griff. ex T. Anders. Journal of Ethnopharmacology 2000; 72(3): 395-402. http://dx.doi.org/10.1016/S0378-8741(00)00245-2

[99] Jantan IB, Yassin MSM, Chin CB, Chen LL, Sim NL. Antifungal activity of the essential oils of nine Zingiberaceae species. Pharmaceutical Biology 2003; 41: 392-397. http://dx.doi.org/10.1076/phbi.41.5.392.15941

[100] Ghasemzadeh A, Jaafar HZE, Rahmat A. Antioxidant activities, total phenolics and flavonoids content in two varieties of Malaysia young ginger (Zingiber officinale Roscoe). Molecules 2010; 15(6): 4324-33. http://dx.doi.org/10.3390/molecules15064324

[101] Aruoma OI, Spencer JP, Warren D, Jenner P, Butler J, Halliwell B. Characterization of food antioxidants, illustrated using commercial garlic and ginger preparations. Food Chemistry 1997; 60: 49-156. http://dx.doi.org/10.1016/S0308-8146(95)00254-5

[102] Kikuzaki H, Nakatani N. Antioxidant effect of some ginger constituents. J Food Sci 1993; 578: 1407-1410. http://dx.doi.org/10.1111/j.1365-2621.1993.tb06194.x

[103] Chen C, Kuo M, Wu C, Ho C. Pungent compounds of ginger (Zingiber officinale (L) Rosc) extracted by liquid carbon dioxide. J Agr Food Chem 1986; 34: 477-480. http://dx.doi.org/10.1021/jf00069a027

[104] Ramanthan L, Das NP. Effect of natural copper chelating compounds on the pro-oxidant activity of ascorbic acid in

steam-cooked ground fish. Inter J Food Sci Technol 1993; 28: 279-288. http://dx.doi.org/10.1111/j.1365-2621.1993.tb01273.x

[105] Ying WM, West BJ, Jensen CJ, Nowicki D, Chen S, Palu AK, *et al*. *Morinda citrifolia* (noni): a literature review and recent advances in noni research. Acta Pharmacol 2002; 23: 1127-1141.

[106] Walton NJ, Brown DE. Chemicals from Plants: Perspectives on Plant Secondary Products; Imperial College press: London, UK 1999.

[107] Mccall MR, Frei B. Can antioxidant vitamins materially reduce oxidative damage in humans?. Free Radical Biol. Med 1999; 26: 1034-1053. http://dx.doi.org/10.1016/S0891-5849(98)00302-5

[108] Lee KT, Kim BJ, Kim JH, Heo MY, Kim HP. Biological screening of 100 plant extracts for cosmetic use (I): Inhibitory activities of tyrosinase and DOPA auto-oxidation. Inter J Cosmet Sci 1997; 19: 291-298. http://dx.doi.org/10.1111/j.1467-2494.1997.tb00193.x

[109] Rehman ZU, Salariya AM, Habib F. Antioxidant activity of ginger extract in sunflower oil. J Sci Food Agr 2003; 83: 624-629. http://dx.doi.org/10.1002/jsfa.1318

Received on 10-02-2014 Accepted on 14-04-2014 Published on 21-04-2014

http://dx.doi.org/10.6000/1927-5129.2014.10.20