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REVIEW ARTICLE

PHYTOCHEMICAL AND ANTIOXIDANT SCREENING OF *AMOMUM SUBULATUM*, *ELETTARIA CARDAMOMUM*, *EMBLICA OFFICINALIS*, *ROSA DAMASCENE*, *SANTALUM ALBUM* AND *VALERIANA OFFICINALIS* AND THEIR EFFECT ON STOMACH, LIVER AND HEART

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ARTICLE DETAILS

ABSTRACT

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Plants and herbs are the mainstream of diverse traditional medicine system practiced throughout the whole population. Today, there is increasingly trend set the uses of natural plants for the various human ailments and wound healing as natural remedy. The crude drugs are derived from the whole plant or parts of the plants that are being used for tremendous diseases through the world without chances of serious adverse reaction as well as more efficacy and safety. The ethnomedicines are being indicated worldwide that consists of different phytochemical constituents like as alkaloids, saponin, phenols, tannins, flavonoids and carbohydrates so as to not only have biological, physiological and pharmacological activity but also have antioxidant activity for the treatment of stomach, cardiovascular and liver ailments.

KEYWORDS

Traditional medicine, crude drugs, natural remedy, phytochemical, stomach, cardiovascular and liver.

1. INTRODUCTION

Herbs and plants are the base of various traditional medication systems practiced all over the world. Whole plant or different parts of plants particularly the roots are major sources that directly provide crude drugs. A variety of conventional medication systems being used worldwide includes Indian medicinal system (consisted of two foremost branches, Unani and Ayurveda), ancient Chinese medicinal system and Amazonian ethnomedicine. These prescribing trends are based upon the use of herbal plants for treatment of ailments and healing. Unani medicines are being used by human for treatment of ailments from the time of ancient Greece [1]. Human beings have been used medicinal plants in curing various disorders and ailments because these plants seem to be less toxic and also have no significant side effects. Usage of natural plants or any part of plants and particularly certain herbs in the remedy of specific disorders or conditions is come under the category of ethnomedicines [2]. Phytochemicals are present in plants which are secondary metabolites such as phenols, alkaloids, steroids, flavonoids, glycosides, flavonoids, saponins, anthocyanins, coumarins and certain pigments [3]. Reactive oxygen species (ROS) are very reactive molecules due to existence of unpaired electron in their outermost shell. Reactive oxygen species (ROS) are generated in the living organism as a byproducts of regular cellular metabolic reactions. Physiologically reactive oxygen species (ROS) are produced in each cell at low concentration but if they are created at high concentration they can interact with essential cellular targets, including proteins, lipids and DNA, compromising cell viability and functions [4]. In this review paper the *Amomum subulatum*, *Elettaria cardamomum*, *Embllica officinalis*, *Rosa damascene*, *Santalum album* and *Valeriana officinalis* are to be reviewed for stomach, heart and liver ailment due to presence of bioactive compounds and also for investigation of phytochemical screening and ROS status.

2. REVIEW OF LITERATURE

2.1. *Amomum subulatum*

Amomum subulatum belongs to family of Zingiberaceae. It is an evergreen perennial herb which is indigenous to Himalayan region of India particularly Sikkim. Its common names are Badi Ilayachi or Large cardamom, Nepal cardamom and fruit of this plant being widely used all over the world as spice. Since 6th century *Amomum subulatum* was utilized in Ayurvedic medicines due to its astringent, stimulant, analgesic, hypolipidaemic, antioxidant, antiulcer, cardioprotective and antimicrobial potentials [5]. Large cardamom has been used as antihyperglycaemic, carminative, antiulcerogenic, antitussive, antibacterail and cardioprotective agent, to mitigate headache, bad breath, asthma, cough, liver diseases and anorexia [6]. A group researchers have stated that methanolic extract of *Amomum subulatum* have exhibited significant lipid lowering and antioxidant activities in rabbits [7]. It lowers the total low-density lipoproteins (LDL), triglyceride, phospholipid, cholesterol and lipid peroxidation while increases the high density lipoproteins (HDL) level of blood thus can be used as antihyperlipidemic agent [8]. *Amomum subulatum* have been reported as phytochemical qualitatively (Table 1), quantitatively (Table 2) and ROS (Table 3).

2.2. *Elettaria cardamomum*

Elettaria cardamomum has taken its place in the family Zingiberaceae. It is a persistent plant and its seeds are used as rich spice. *Elettaria cardamomum* is a herb native to Pakistan, India and Sri Lanka. It's commonly named as "Elaichi", Queen of spices and Small cardamom. Cardamom usually found in two key types "true or Green cardamom" that is *Elettaria cardamomum* and "Brown or Black cardamom" that is *Amomum subulatum*.

Table 1: Qualitative phytochemical screening of plants.

Plants	Type of extract	Alkaloids	Steroids	Terpenoid	Flavonoids	Phenols	Glycosides	Carbohydrates	Saponins	Tannins	Proteins	Coumarins	Anthocyanins	Reference
<i>Amomum subulatum</i>	Dichloromethane methanol	+			+		+	+	+	+				[9]
<i>Elettaria cardamomum</i>	Dichloromethane	+	+	+	-	+	+	+	-	+	+		+	[10]
<i>Emblic officinalis</i>	Ethanollic extract	+	+	+	-	+	-	+	+	+	-			[11]
<i>Rosa damascena</i>	Aqueous Extract	+	+	+	+		+	+		+	+	-		[12]
	Ethanollic extract	+	+	+	+	+	+	-		+	+	-		
<i>Santalum album</i>	Dichloromethane methanol	+	+	+	+	+			+		+		+	[13]
<i>Valeriana officinalis</i>	Methanol extract	+						-	-	+				[14]

+ve: Positive (Phytochemicals detected in extract)

-ve: Negative (Phytochemicals not detected in extract)

Table 2: Quantitative phytochemical analysis of plants.

Constituents	Type of extract	Assay values	References
1-Quantitative analysis of <i>Emblica officinalis</i>			
Flavonoids	Ethanollic (20g/360mL)	0.037±0.19 % w/v	[11]
	Ethanollic (80% w/v)	12.7% w/v	[15]
	Methanol (70% w/v)	176.00 ± 0.01 mg/mL	[16]
	Methanol (70% w/v)	26.55 ± 0.65% w/v	[17]
Alkaloids	Ethanollic (20g/360mL)	11.2±0.16 % w/v	[11]
Phenols	Ethanollic (20g/360mL)	0.23±0.03 % w/v	[11]
	Methanol (70% w/v)	215.60 ± 0.004 mg/mL	[16]
Methanol (70% w/v)		35.64 ± 1.1% w/v	[17]
Saponins	Ethanollic (20g/360mL)	0.23±0.03 % w/v	[11]
Tannins	Ethanollic (20g/360mL)	1.1±0.05 % w/v	[11]
2-Quantitative analysis of <i>Rosa damascene</i>			
Flavonoids	Ethanollic (80% w/v)	32% w/v	[15]
	Methanollic (20% w/v)	26.27±0.98 (mg/g of extract)	[17]
	Methanollic (80% w/v)	28.71±0.81 (mg /g of extract)	[18]
Phenols	Methanollic (20 % w/v)	53.25± 5.92 (mg/g of extract)	[17]
	Methanollic (80% w/v)	233.56±7.25 (mg/g of extract)	[18]
3-Quantitative analysis of <i>Valeriana officinalis</i>			
Alkaloids	Ethanollic (50 % w/v)	0.01 - 0.05% w/v	[19]
	Ethanollic (50 % w/v)	0.5% -2.0% w/v	[20]
4-Quantitative analysis of <i>Santalum album</i>			
Phenols	Methanollic (80% w/v)	18-190 mg g ⁻¹	[13]
Saponins	Methanollic (80% w/v)	9.4-43.6mg g ⁻¹	
Anthocyanins	Methanollic (80% w/v)	0.01-0.31 mg g ⁻¹	
Terpenoids	Methanollic (80% w/v)	17.3-51.4 mg g ⁻¹	
5-Quantitative analysis of <i>Amomum subulatum</i>			
Phenols	Methanollic (50% w/v)	0.00366% w/w	[5]
Flavonoids	Methanollic (50% w/v)	0.0361% w/w	
6-Quantitative analysis of <i>Elettaria cardamomum</i>			
Flavonoids contents	Methanollic (100%w/v)	3.59 mg /g dry extract	[21]
Phenolic contents	Methanollic (100%w/v)	15.67 mg /g dry extract	
Phenolic contents	Ethanollic (85%w/v)	84.19 ± 4.64 mg/100g dry extract	[22]

Table 3: Antioxidant analysis of the plants.

Plants	Lipid peroxidation	Total antioxidant capacity	Ferric ion reducing power	DPPH(2,2-diphenyl-1-picrylhydrazyl) assay	Vitamin C	References
<i>Amomum subulatum</i>	NR	NR	NR	8.25±2.0 µg/mL	NR	[6]
<i>Elettaria cardamomum</i>	NR	NR	42.4 % w/v	11% w/v	NR	[21]
<i>Emblica officinalis</i>	NR	4.10±0.17 mmol trolox equivalent/L	NR	1.43 ± 0.03 µg/mL	478.56 mg/100mL	[16, 23]
<i>Rosa damascena</i>	NR	NR	NR	77.02% w/v	NR	[18]
<i>Santalum album</i>	1.17±2 µg/ mL	61.2±5 µmol/g	025.5±43.5 µg/ mL	1.17±0.2 µg/ mL	NR	[13]
<i>Valeriana officinalis</i>	NR	NR	235.44 ± 5.18 µg/mL	493.4 ± 4.9µg/mL	NR	[24]

NR: Not Reported in Literature

Seeds of *Elettaria cardamomum* contain high percentage of volatile oil that is principally comprised of flavonoids and phenolic constituents. Other constituents of volatile oil of *Elettaria cardamomum* are proteins, starch, sterols and waxes [25]. By way of in vivo and in vitro methods it was demonstrated that the cardamom extract is effective in the treatment of diarrhea, constipation, colic distress and hypertension. Its crude extract also acts as diuretic, blood pressure lowering and sedative thus enabling this herb to be used in mitigation of epilepsy and hypertension. *Elettaria cardamomum* is used as analgesic, antispasmodic, anti-inflammatory, antioxidant, antimicrobial, anticonvulsant and sedative. Its volatile oil presented insecticidal activity for stored grain products, protective role in skin disorders, inhibitory effects on platelets aggregation and promising role in smoking cessation [25]. *Elettaria cardamomum* have been investigated as phytochemical qualitatively (Table 1), quantitatively (Table 2) and ROS (Table 3).

2.3. *Emblica officinalis*

Khan, have described that *Emblica officinalis* is enlisted as a fundamental plant in Indian indigenous scheme of medication. It belongs to family Euphorbiaceae [26]. It is generally named as Amla, Indian gooseberry or *Phyllanthus Emblica*. The species are native to India and also grow up in tropical and subtropical regions of Pakistan, Srilanka, Uzbekistan, South East, China, Asia and Malaysia. In Ayurveda system, fruits of *Emblica officinalis* are extensively utilized and assumed to augment resistance against ailments. In a study, stated that *Emblica officinalis* has valuable functions in treatment of cancer, liver, diabetes, ulcer, anemia, heart trouble and a variety of other ailments [27]. Correspondingly, *Emblica officinalis* is valuable as antipyretic, cytoprotective, antioxidant, gastroprotective, analgesic, immunomodulatory and antitussive agent. Besides these effects, Indian gooseberry was functional in memory enhancing, reducing cholesterol level, ophthalmic disorders, defusing snake venom and antimicrobial agent. Some researchers had found that its fruit juice was comprised of maximum concentration of vitamin C that was 478.56 mg/100 mL of the extract [23]. When its fruit was blended with other fruits for example *Pusa Navrang* grape juice, its level of vitamin C contents was enhanced.

A group researchers had evidenced that *Emblica officinalis* have presented significant broad spectrum antibacterial activity against *Escherichia coli*, *Staphylococcus aureus*, *Salmonella typhi* and *Bacillus* species [28]. While no activity against fungi was demonstrated. Mayachiew and Devahastin, had determined the antioxidant activity of ethanolic fruit extract of *Emblica officinalis* on the basis of coupled oxidation of linoleic acid and beta-

carotene and it was noticed to be 86.4% [29]. Goel and Bhattacharya, had accounted the effects of methanolic extract of *Emblica officinalis* on offensive factors of ulcer like acid-pepsin secretion and defensive factors like cellular mucus, mucin secretion, cell proliferation and cell shedding in order to determine the antiulcerogenic activity of plant [30]. Ulcers are principally caused by disproportion between defensive and offensive factors. A group researchers had stated that the methanolic extract of *Emblica officinalis* exhibited antiulcerative activity via minimizing offensive factors and by promoting defensive mucosal factors [31]. Fruit pulp of *Emblica officinalis* contained hydrolysable tannins, saponins and Emblicanin A&B which were accountable for gastro protective effects of Amlain ulcer [32]. Aguwa and Nwako, found that tannins had astringent and vasoconstrictive outcomes that lead to precipitation of proteins on the site of ulcerative lesions, formation of an impermeable protective layer over the lining and exertion of cytoprotective effect of Amla [33].

A group researcher has demonstrated that methanolic extract of fruits of *Emblica officinalis* reduces gastrointestinal motility and PGE2-mediated accumulation of intestinal fluid (enteropooling) which can be related to the presence of tannins in *Emblica officinalis* extract [34]. Long term administration of *Emblica officinalis* facilitated myocardial adjustment by boosting endogenous antioxidants and safe guard the rat hearts from oxidative stress coupled with ischemic-reperfusion injury [35]. Amla had been proven to be hepatoprotective against a wide variety of liver damaging agents for instance ethanol, paracetamol, heavy metals, carbon tetrachloride, hexachlorocyclohexane and antitubercular drugs. Regular intake of Amla is useful in mitigation of hyperlipidemia, hepatocytic carcinoma, metabolic disorders and hepatotoxicity consequential to iron excess. The hepatoprotective actions of Amla are mediated by its free radical capturing antioxidants, anti-inflammatory actions, regulation of the xenobiotic detoxification and lipid metabolism [36]. *Emblica officinalis* have been evaluated as phytochemical qualitatively (Table 1), quantitatively (Table 2) and ROS (Table 3).

2.4. *Rosa damascena*

In Iran *Rosa damascena* mill is locally recognized as Gole Mohammadi. Rosaceae family comprises of 200 species and *Rosa damascena* is one of the most pharmacologically useful species of Rosaceae family. *Rosa damascena* is an decorative plant and beside its refreshing effects, many pharmacological effects including anti-HIV, antibacterial, antitussive, antioxidant, hypnotic and antidiabetic effects have been reported for this plant [37]. Some researchers have illustrated that the medicinal functions of rosaceae were due to possession of phenolic compounds [38]. Phenolics hold plenty of pharmacological behaviors, such as anticancer, anti-inflammatory, antioxidants and antidepressant. Different products of *Rosa*

damascena all over the world includes rose oil, rose water, dried flowers and products comprising of ethanolic, hydrosol, chloroformic and aqueous extracts of flowers [39]. In a study, they have narrated that its foremost products are essential oil and rose water [40]. Its ethanolic and aqueous extracts have been scrutinized for analgesic activity, hypnotic activity, potentiation of heart rate and contractility, antitussive, antioxidant activity, anti-inflammatory and anti-diabetic activity effects. Its essential oils exhibit bronchodilatory, anticonvulsant and antioxidant action. A group scientist had proved that aqueous and ethanolic extracts of petals and rose oil demonstrated wide spectrum antibacterial action which was more detrimental towards gram-positive bacteria than gram-negative bacteria [41]. While antifungal activity of rose oil and extracts were also examined against mold and yeast with diameter of zones of inhibition ranged between 10.5 to 17.5mm produced by disc diffusion assay.

Other researchers have stated that *Rosa damascene* encloses numerous constituents such as glycosides, anthocyanins, terpenes and flavonoids [42]. The pharmacological effects of *Rosa damascena* are extensive. Most of the central nervous system (CNS) effects are hypnotic, anticonvulsant and analgesic. The antidiabetic, laxative, antimicrobial, antioxidant, anti-inflammatory and cardiovascular strengthening are further sound effects of this plant. Anti-diabetic effects of this plant may be facilitated by inhibition of α -glucosidase that decreased carbohydrate assimilation from the small intestine [43].

A group researchers had accounted antibacterial action of principle components of rose oil which was probably mediated by high phenylethyl alcohol content [44]. In addition, *Rosa damascena* extract was comprised of vitamin C which has anti-inflammatory and antioxidant effects. Moreover, its conventional actions are comprised of cure of chest and abdominal ache, moderate laxative, cardiotoxic, diminution of inflammation, cure of digestive and menstrual bleeding troubles. Rose oil is helpful in alleviation of depression, tension nervous and stress. Rose oil also facilitate the wound renovate, diminution of thirst, heal of chronic cough and health of skin [40]. *Rosa damascena* have been reviewed as phytochemical qualitatively (Table 1), quantitatively (Table 2) and ROS (Table 3).

2.5. *Santalum album*

Santalum album is indigenous to South India mainly Coorg, Chennai and Mysore. *Santalum album* belongs to family Santalaceae. Arabic name of this herb is Khushb Sandal and its Urdu name is Sandal Safaid or Chandan Safaid. Sandalwood oil is used primarily as coolant, sedative, astringent, disinfectant in bronchial and genitourinary tracts expectorant, stimulant and diuretic. Sandalwood oil masks the odour of sweat so widely used in cologne manufacturing industry [45]. Burdock and Carabin, have reported that in human occasional events of allergic reactions are reported in the literature due to sandalwood oil [46]. Despite of limited knowledge of toxicity studies of sandalwood oil, it is extensively used orally for its pharmacological actions.

Sindhu and his colleagues have stated that *Santalum album* bark have potentials to inhibit insect growth [45]. Sandalwood oil and aqueous extract of bark powder dried by air (25-1000 $\mu\text{g/mL}$ in phosphate buffer) had presented significant antimicrobial actions against *Staphylococcus aureus* and other virulent microbial species. Antiviral activity of sandalwood oil has also been evidenced as antiviral agent against *Herpes Simplex Virus*. Sandalwood oil has also shown significant antioxidant activity. Oil of *Santalum album* is used as anti-septic, astringent and anti-bacterial while its wood is used as anti-pyretic, astringent, anti-nauseant, anti-inflammatory, blood purifier, cardiotoxic, carminative, expectorant, laxative, sedative, disinfectant, diuretic and to produce cooling effect. *Santalum album* have been studied as phytochemical qualitatively (Table 1), quantitatively (Table 2) and ROS (Table 3).

2.6. *Valeriana officinalis*

Dried roots of the *Valeriana officinalis* had been used as herbal medicine since the time of ancient Greece and Rome. *Valeriana officinalis* belongs to family valerianaceae. The plants of valerianaceae family are widespread. Its common name is Indian valerian or Valerian. Geographically *Valeriana officinalis* is dispersed in regions of Western Himalayas, Kashmir, Afghanistan and Pakistan. Its pharmacological actions were defined as anti-anxiety, sedative and as a cure for insomnia [19]. Scientist had analyzed that the extract of root and rhizomes of *Valeriana officinalis* contains 0.2 - 2.8% of sesquiterpenes of volatile essential oil which mainly contains valerenic acid, isovaleric, valeric, valeranal, valeranone and other terpenes [47]. Patocka and Jakl, had described that its root extract was comprised of alkaloids 0.01- 0.05% w/v, volatile essential oil 0.2 - 02.8%

and iridoid valepotriates 0.5% -2.0%. Major alkaloids of *Valeriana officinalis* are valeranine, alpha-methyl pyrrolketone, chatinine and skyanthine [19]. On the other hand, its extracts holded 0.5% -2.0% of Iridoid valepotriates and it also contained triterpenes, lignans and flavonoids (Table 2) [20]. Dugaheh had also analyzed *Valeriana officinalis* and reported that 0.020 to 0.075% of valeric acid was found in dried extract of *Valeriana officinalis* [48].

A study has reported that *Valeriana officinalis* consist of essential oils which are responsible for its wide spectrum antibacterial action [24]. The essential oils also presented reasonable antifungal actions against *Candida albicans* growth. Patocka and Jakl, reported that *Valeriana officinalis* commonly known for its beneficial effects as an anti-anxiety and sedative drug in traditional system of medication [19]. Its dried root is utilized mainly for its hypnotic and sedative actions in patients with insomnia and anxiety when administered for long periods. *Valeriana officinalis* extracts interrelate with the GABA, adenosine, barbiturate and benzodiazepine receptors in order to produce hypnotic effects. Valerian is a harmless herbal way for the management of gentle insomnia. Other folk uses of Valerian are found as treatment of gastrointestinal pain and spastic colitis. Valerian also exhibits coronary dilating and antiarrhythmic effects. Murti have narrated that antiarrhythmic and coronary artery dilatating effects of valerian extract in mice, rabbits and cat might be due to valepotriates [20]. Valepotriates protects the emergence of acute coronary insufficiency via a short-term raise of blood flow to coronary artery and exert reasonable positive inotropic and negative chronotropic effects. In addition to these, *Valeriana officinalis* conventionally are used in the cure of gastrointestinal spasms. As Valerian tastes bitter and bitters have traditionally been used to improve digestion and appetite. *Valeriana officinalis* have been evaluated as phytochemical qualitatively (Table 1), quantitatively (Table 2) and ROS (Table 3).

3. CONCLUSION

Herbal natural medicinal plants are being used tremendously throughout the entire world since they are on the lower price, more efficacy and minor side effects. Plants consist of phytochemical constituents as flavonoids and phenols etc that fulfill the human needs. Therefore, natural plants are being used tremendously by peoples than the allopathic medicines because plants having such type of components which act as antioxidant activity and act as an excellent tonic for stomach, liver and heart.

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