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EFFECT OF CENTELLA ASIATICA, ECLIPTA PROSTRATA ANDOXALIS CORNICULATA ON CARDIOVASCULAR DISEASES

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Abstract

Cardiovascular diseases are the most leading problem of today's world. There are many plants that are used for the prevention and cure of cardiovascular diseases. Due to a recent rise in cardiovascular diseases, the medicines made from plants have achieved a great interest. These plants have great positive impact to reduce cardiac diseases. The aim of this review is to provide information about three plants that are very helpful for the prevention and cure of cardiovascular diseases. The review paper highlights the effect of *Centellaasiatica, Ecliptaprostrata, Oxalis corniculata*on cardiovascular diseases.

Key Words: Cardiac, Diseases,Heart, Medicinal, Plants.

Introduction

The heart conditions that include structural problems, diseased vessels and blood clots are known as cardiovascular diseases (CVD's). They include heart attack, stroke, peripheral artery disease, hypertension, congenital heart disease, rheumatic heart disease and heart failure [1,2]. Use of tobacco, unhealthy diet, suppressed level of LDL (low-density lipoprotein), lack of physical activities, excessive use of alcohol, hypertension, diabetes etc. are the main cause of stroke and heart attack [1]. In medicines, more than 60 to 70% contribution is made by herbs [3, 4, 5]. These are used for prevention and cure of cardiovascular diseases. These plants are also very helpful to provide strength to the muscles of the heart. Herbal medicines have a respected history and have a valuable place in the treatment of CVD [6]. Plants are a very rich source of bioactive compounds such as vitamins, macro elements, micro elements, glycoside, alkaloids, essential oils, flavonoids, tanning, phenol, organic acids and saponins[7]. The traditional herbs become a main stream in scientific researches and are showing their importance in the prevention and treatment of diseases [8]. The herbal remedies are viewed by the patients as being natural and safe [1]. In this review, we will discuss the effect of *Centellaasiatica, Ecliptaprostrata, Oxalis corniculata*on cardiovascular diseases.

Centellaasiatica

Common name: Gotu kola

Classification

Kingdom: Plantae

Division: Magnoliophyta

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Class: Magnoliopsida

Order: Apiales

Family: Apiaceae

Genus*: Centella*

species*: asiatica*

Part used: leaf, whole plant.

Botanical description of the plant

The common name of *Centellaasiatica* is Gotu kola. It is a perennial herb of the family Apiaceae[9]. The plant of Gotu kola is a native of wetlands in Caucasus, west pacific, tropical and subtropical world to Newzealand[10], [11], [12]. The herb is used as a vegetable as well as for medicinal purposes [9].

The stem is creeping stolon, slender. Colour of stem is green to reddish-green. It connect the

Fig. 1*Centellaasiatica*

plants with each other [9]. The apices are rounded, texture is smooth with netted veins. The rootstock grows vertically downwards. It consists of rhizomes. The colour of roots is creamish. Roots are covered with root hairs [9].

Chemical constitution of *Centellaasiatica*

The plant of *Centellaasiatica* consists of pentacyclictriterpenoids, including Asiatic acid, asiaticoside, brahmic acid (also known as madecassic acid) and brahmoside. The other included constituents are centelloside, centellose and mademacssoside[13], [11, 14]. Asiatic acid, madecassoside and asiaticoside form the main constituents. These are responsible for the medicinal value devious from being rich in terpenoids and flavonoids [15], [16]. The term Centella was given for the production of different constituents of secondary metabolites that is mainly consists of pentacuclictriterpenoidsaponins[15], [17]. In the essential oil of Gotu kola, P-Cymene-(44%) is found along with other volatile compounds on the analysis with GC-MS (gas chromatography- mass spectrometry) [18]. From the aerial part of Gotu kola, Centellicin, Centellin and Asiatic acid were isolated. The structures of these compounds were determined

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by using 2D nuclear magnetic resonance techniques [15]. Using high performance liquid chromatography madecassoside, madecassic acid, asiaticoside, and Asiatic acid are identified from plant extract and are found in significant amount [19], [15]. An estimation of triterpenoidsshowed that the highest siaticoside content that is 6.42%in the sample of leaf is collected in Mangoro region [15], [20]. New triterpene and saponin, 2 alpha,3 beta,23-trihydroxyurs-20-en-28oic acid O-alpha-l-rhamnopyranosyl ester and 2 alpha,3 beta,23 trihydroxyurs-20-en-28-oic acid have been obtained from the aerial parts of the*Centellaasiatica*.There structures had been determined by using spectral method [15], [21].

Role of *Centellaasiatica* in prevention of cardiovascular diseases

When the heart is not capable to provide proper amount of blood to meet the requirement of body, the cardiac failure occurs. Cardiomyopathy and Myocardial ischemia are the conditions that commonly lead to cardiac hypertrophy. Hypertrophy is a compensatory mechanism that develops in cardiac failure. It also causes sudden death [22]. In vitro, the Asiatic acid present in *Centellaasiatica*, prevents cardiomycytehypertropic responses that are induced by TGF-Beta1 [23], also inhibits the cardiomycyte hypertrophic response that is stimute by lL-1beta [22], [24], depress the angiotensionll – induced hypertrophy of cardiac myocytes and the deposition of the collagen in cardiac fibroblasts [22], [25]. It also protects H9c2 rat cardiomyocytes from deprivation of oxygen-glucose/ reoxygenation injury[26]. In vivo, Asiatic acid prevent cardiac hypertrophy and fibrosis in the pressure overload- induced mice [22], [25], improve the functions of heart, inhibit the cardiac hypertrophy and also remodelling of left ventricle that is followed by coronary artery ligation that induce myocardial infarction [27]. Madecassoside present in *Centellaasiatica*decrease ischemia-reperfusion injury that induce myocardial infarction [28].Atherosclerosis is a chronic inflammatory disease [22], [29]. It is an underlying pathology of coronary heart disease. 3,5-di-O-caffeoylquinic acid have antithrombotic effects and have inhibitory effect on reactivity of platelets [22], [30]. A clinical study shows that standardized extract of leaf stabilizes the plaque density in carotid and femoral arteries [22], [31].The total triterpenic fraction prevent the atherosclerosis plaque progression [22], [31]. It has been investigated in the past decade that the hypertension play a major role as a risk factor of cardiovascular diseases and the association of hypertension and cardiovascular diseases is now well established.

Wang et. al., 2018[32] demonstrated the Prophylactic effects of asiaticoside , where intragastric administration of asiaticoside at a daily doses of 50 mg/kg for 4 weeks reduced elevated mean pulmonary artery pressure, cardiac hypertrophy and pulmonary vascular remodeling in hypoxia-induced pulmonary hypertension.

Ecliptaprostrata

Common name: False daisy, Bhringraj

Classification

Kingdom: Plantae

Division: Tracheophyta

Class: Magnoliopsida

Order: Asterales

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Family: Asteraceae

Genus :Eclipta

Species: prostrata

Part used: whole plant

Botanical description

Ecliptaprostrata is an annual plant. It is branched and may be erect or prostate. The plant is 20 - 90 cm tall. The leaves are opposite, sharp at base, remotely serrated, sharply pointed, 4 - 13 X 0.8 - 2 cm., the bottom is sessile or petiolate[11].Terminal capitula and axilla are some to many, hemispherical in shape heterogamous and upto 1cm wide. The length of stem is upto 7cm. The herb bracts are acute, ovate and pubescent in appearance. It is 6mm long. The receptive scales are ciliated at the base, rigid, perfect florets, ray florets pistillate, with 4 to 5-fid corolla, white, whole or bifid. The anthers are present in an apical direction. They are blunt, slightly slack. The achenes of triangular ray floret, form 4- cornered florets, all are tubular, downy, black, exceptional for some apical feathers, truncate depressions are present on apex, with 1-3 mm. marginal teeth, that are about 3mm long and are slightly striped [33].

Fig. 2*Ecliptaprostrata*

Chemical constitution of *Ecliptaprostrata*

Eclipta prostrate consists of a wide range of active phytoconstituents that includes triterpenesaponins, coumestan derivatives, triterpenes, steroidal saponins, steroids, steroidal alkaloids, phenolic acids, thiophene derivatives, flavonoids and many other compounds. The chemical analysis are mostly reported from whole plant or the aerial parts [34].

Role of *Ecliptaprostrata* in prevention of Cardiovascular diseases

The phenolic compounds present in *Ecliptaprostrata* decreases the risk of chronic deseases such as development of arteriosclerosis and cardiovascular diseases [35].

The cardiac glycosides present in *Ecliptaprostrata* helps in the treatment of congestive cardiovascular failure (heart failure). It treats this by its direct action that increases the force of myocardial contraction. It also acts directly on the smooth muscles [35].

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Moreover, in an experiment, male rats fed a diet of 50 mg, or 100 mg of the freeze-dried fraction of *Ecliptaprostrata* per kilogram of feed for 6 weeks shown a significantly decrease in serum triacylglycerol, total cholesterol, and cholesterol-low density lipoprotein levels [36].

Oxalis corniculata

Common name: Oxalis

Classification

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida

Order: Oxalidales

Family: Oxalidaceae

Genus: *Oxalis*

Species: *corniculata*

Part used: stem and leaves

Botanical description

The plant is bushy in nature. The top portion is erect, weakly smooth or bushy. They are branched from bottom and rooted at nodes [37].The leaves are trifoliate, heart shaped and thin. The leaves are arranged alternatively along the stem and the venation of leaflets is reticulate[37]. The stem is slender in shape and is covered by short, soft hairs. The length of internode is 5 to 9cm. The taste is sour and the smell is acidic [37], [38]. The roots are thin, branched, dark brownish in colour, soft, without odour and taste [39]. The width of flowers is 6-12 cm. and 5 yellow petals are present. The fruit is a capsule, cylindrical, length- 1-1.5 cm, pointed and ridged. Seeds are oval, rounded, flattened, basally pointed, light brown in colour and have a surface ridged. It also has stolons[37], [40].

Fig. 16 Oxalis

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Chemical composition of *Oxalis corniculata*

In previous studies, there are various types of phytochemical components that have been isolated such as flavonoids, tannins, steroids, polyphenols, alkaloids, fatty acids, volatile oil, glycosides etc. Presence of essential fatty acids such as linoleic acid, palmitic acid, linolenic acid, oleic acid and stearic acid is detected in it from earlier studies. The leaves of plant are huge source of vitexine-2-0-beta-D-glucopyrunoside and vitexine. Proteins, carbohydrates, amino acids, calcium and fiber are found in methanolic and ethanolic extracts[41],. The stem and leaves are the source of citric acid and tartaric acid. The stem also contains malic acid. It is rich in oxalates and the stem and leaves has acidic taste due to acidic phytocompounds presence [41], [34], [25].

Role of oxalis in prevention of cardiovascular diseases

The protective potential of extract against isoproterenol induced myocardial infarction in rats was seen bySrikanth et. al. in 2012[42].Myocardial infarction is induced by isoproterenol at the interval of 24 hours for two days. Extract was given as pre-treatment for 30 days to rats orally. It significantly reduced the concentration of CPK, serum total cholesterol, LDH, LDL cholesterol and triglycerides[42].

Conclusion

Till now, many researches were made by the researchers. Many plants are discovered with their effect on cardiovascular diseases. In this review paper, we discuss the effect of *Centellaasiatica, Ecliptaprostrata, Oxalis corniculataLin* on cardiovascular diseases. Still more research is needed on these plants so that more herbal medicines and treatments should be invented for prevention and cure of cardiovascular diseases.

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