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Estimation of Flavonoids in the Amranthus viridis linn A Review

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Abstract: *Amaranthus Viridis, is traditionally used for treatment of constipation, inflammation, eczema, bronchitis, anaemia, leprosy. Flavonoids are a group of polyphenolic compounds, which are widely distributed throughout the plant kingdom. Flavonoids like Rutin and Quercetin possess many biochemical effects like inhibition of enzymes, regulatory role on different hormones and pharmacological activities like antimicrobial, antioxidant, and anticancer, antihepatotoxic, protection of cardio vascular system. An HPLC method was developed for the estimation of rutin and quercetin from methanol herbal extract of Amaranthus viridis. Flavonoids like Rutin and quercetin possess many biochemical effects like inhibition of enzymes, regulatory role on different hormones and pharmacological activities like antimicrobial, antioxidant, and anticancer, antihepatotoxic, protection of cardio vascular system.*

Keywords: Amranthus viridis, Rutin, Quercetin, Pharmacological activities.

I. INTRODUCTION

In the recent decades, the necessity of herbal medicines is increased in traditional and modern medicine. Herbs, from starting raw material to finished products are considered as Herbal medicine. Since raw materials influences over the quality, efficacy and safety of finished herbal preparations, standardization of raw materials is required. *Amaranthus viridis* belongs to family amaranthus. *Amaranthus Viridis* , belongs to family Amaranthaceae and is traditionally used for treatment of constipation, inflammation, eczema, bronchitis, anaemia, and leprosy (Kirtikar, and Basu, 1987, Sivarajan and Balachandran. 1994, Anonymous, 1996). Flavonoids are a group of polyphenolic compounds, which are widely distributed throughout the plant kingdom. To date about 300 varieties of flavonoids are known (Anonymous, 1996). Many have low toxicity in mammals and some of them are widely used in medicine for maintenance of capillary integrity (Kuhnau, 1976). Rutin, 5,7,3,4 tetrahydroxy flavonol -3-rhamnoglucoside and quercetin 5, 7, 3, 4, - tetrahydroxy flavonol are exhibits anti-inflammatory, antihepatotoxic (Cesarone, 1992), antiulcer (Clack et al., 1950), antiallergic, antiviral actions and some of them provides protection against cardiovascular. Both rutin and quercetin possess antioxidant activity and reduce low density lipoproteins (LDL) oxidation quercetin in combination with other flavonoids, are inhibiting a number of enzymes like bradykinin (Bamard et al., (1993), tyrosine kinase (Hur, et al., (1994), and 5-nucleotidase activity (Beladi, et al., 1987). Rutin and quercetin have shown regulatory activity of hormones like affect the transport, metabolism and action of thyroid hormones.

1.1 Global Description

Amaranthus viridis is a cosmopolitan species in the botonical family amaranthaceae and is commonly known as slender amaranth or green amaranth. *Amaranthus viridis* is an annual herb with an upright, light green stem that grows to about 60-80 cm in height. Numerous branches emerge from the base, and the leaves are ovate, 3-6 cm long, 2-4 cm wide, with long petioles of about 5 cm.

1.2 Leaves

Leaves are simple, alternate, long -petiolated. The lamina is first elliptic and later ovate. The top of lamina is deeply emarginated. The extremity of the central nerve forms a mucro. The lower side is generally purple.

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Table No.1: Scientific classification of Rutin and Quercetin

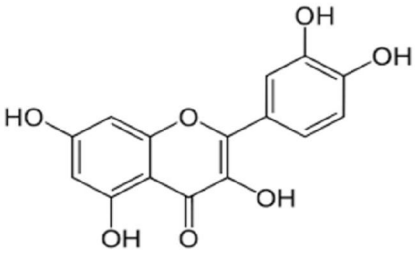
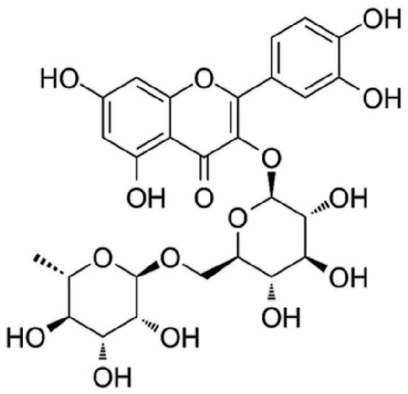
Kingdom	Plantae
Subkingdoms	Tracheobionta
Supervision	Spermatophyta
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Caryophyllidae
Order	Caryophyllales
Family	Amaranthaceae
Genus	Amaranthus
Species	Viridis

Flavonoids present in Amaranthus viridis leaves

1. Quercitin
2. Rutin

A method modified by Ahmed was used to determine the TFC of the seed extracts. To the extract, 0.5 mL of 5% sodium nitrite was added and mixed thoroughly. After 5 min of incubation, 1.5 mL of 10% aluminum chloride solution was added. It was allowed to stay for 6 min after which 2 mL of 1 M sodium hydroxide was added and made up to 10 mL with de-ionized distilled water. The absorbance was measured at 510 nm with a UV–visible spectrophotometer (INESA 752 N, England) in comparison with standards prepared from a known concentration of rutin whose R2 value was 0.9882. The result was expressed as mg rutin equivalents/g extract.

Table 2: Drug profile of Rutin and Quercetin

Parameter	Quercitin	Rutin
Structure		
Molecular formula	$C_{15}H_{10}O_7$	$C_{27}H_{30}O_{16}$
Synonyms	meletin, sophoretin	rutoside, sophorin
Molecular weight	302.23	610.521 gm. Mol -1

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1.3 Pharmacological Action of Rutin

A. Central nervous system (CNS)

1) Prevention of neuroinflammation

Rutin has demonstrated the neuroprotective effect on brain ischemia. Administration of rutin caused attenuation of 'ischemic neural apoptosis' due to the embarrassment of p53 expression and lipid peroxidation along with increment in 'endogenous antioxidant defense enzymes' (Khan et al., 2009). It has been found to be useful in hypoxic, glutamate and oxidative stress (Pu et al., 2007). Reduction of 'neuroinflammation' in rat model of 'sporadic dementia of Alzheimer type' (Javed et al., 2012) and neuroprotective effects in 'dexamethasone-treated mice' (Tongjaroenbuangam et al., 2011) were observed on rutin administration.

2) Sedative activity

CNS and behavioral activity of rutin were on hole board, thiopental-induced sleeping time and locomotor activity tests in mice. Rutin, given by intraperitoneal route caused a depressant action on the CNS. Research confirmed the CNS depressant activity of rutin was unlikely due to the involvement of GABA-A receptor.

3) Anticonvulsant activity

Anticonvulsant activity Rutin also possesses anticonvulsant activity and seems to be safe for patients with epilepsy as it does not alter the activity of any of the administered antiepileptic drugs nor demonstrates any adverse effects.

B. Endocrine system

1) Antidiadiabetic activity

Streptozotocin is a toxic chemical known to deplete levels of insulin by destroying pancreatic islets. Streptozotocin selectively assaults pancreatic β-cells by generating free radicals of oxygen and nitrogen monoxide along with reducing levels of NAD and NADP.

2) Anti -hypercholesterolemic effect

Rutin is a 'selective and non-toxic modulator' of hypercholesterolemia. In a study conducted on diet-induced hypercholesterolemic Golden Syrian hamster model, rutin significantly reduced plasma triglyceride levels in experimental animals (Kanashiro et al., 2009). Along with this, rutin also caused a decrement in levels of total cholesterol and HDL cholesterol.

C. Cardiovascular system

1) Hypertension

Buckwheat, a rich source of rutin is found to prevent oxidative damage in 'aortic endothelial cells' by lowering nitrotyrosine immunoreactivity. Germinated extract of buckwheat demonstrated antihypertensive effect and possibly shelter 'arterial endothelial cells' by detrimental effects of oxidative stress (Kim et al., 2009). Reduction in oxidative stress due to rutin, when administered by oral route, is the key reason for the restoration of 'impaired baroreflex sensitivity' and 'vascular reactivity' in hypertensive rats.

2) Blood Coagulation

Blood coagulation Chan et al. (2009) attempted to study effects of the rutin on the anticoagulant activity of oral warfarin and the protein binding along with pharmacokinetics of its enantiomers in rats. Rutin enhanced the in vitro serum protein binding of S- and R-warfarin. Rutin treatment significantly decreased the elimination half-life of S-warfarin by 37% as a result of the 69% increase in unbound clearance of the S-enantiomer.

D. Gastrointestinal system

1) Antiulcer effect

A peptic ulcer is infirmity that influences the A peptic ulcer is infirmity that influences the substantial population in the world. Ulcers are observed when disparity occurs among 'aggressive' and 'protective' factors at the luminal surface of

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the gastric epithelium. HCl, pepsins, nonsteroidal anti-inflammatory drugs, Helicobacter pylori, bile acids, ischemia, hypoxia, smoking, alcohol, etc. include dynamic features whereas defensive factors comprise of bicarbonate, a mucus layer, mucosal blood flow, PGs and growth factors population in the world. Ulcers are observed when disparity occurs among 'aggressive' and 'protective' factors at the luminal surface of the gastric epithelium. HCl, pepsins, nonsteroidal anti-inflammatory drugs, Helicobacter pylori, bile acids, ischemia, hypoxia, smoking, alcohol, etc. include dynamic features whereas defensive factors comprise of bicarbonate, a mucus layer, mucosal blood flow, PGs and growth factors.

1.4 Pharmacological Action of Quercitin

A. Antioxidant activity

Interestingly, the beneficial effects of quercetin have been attributed to its antioxidant activity. Quercetin is a large class of flavonoids, consisting of five classes of hydroxyl groups, 3, 5, 7, 3, and 4' of the basic flavonol skeleton. Some of these classes of hydroxyls are glycosylated to different quercetin glycosides and form the major quercetin derivatives.

B. Antiviral activity

Quercetin has shown antiviral activity towards a wide range of viruses. For instance, quercetin has been documented for its efficacy against the human T-lymphotropic virus 1, as well as the Japanese encephalitis virus (JEV) caused by Japanese encephalitis, the mosquito-borne disease.

C. Antimicrobial Activity

Quercetin has exhibited potent bacteriostatic activity against different strains of bacteria, such as Salmonella enterica serotype Typhimurium, Pseudomonas aeruginosa, P. fluorescens, Helicobacter pylori, Staphylococcus epidermidis, S. aureus, Yersinia enterocolitica, Micrococcus luteus, Campylobacter jejuni, and Escherichia coli, which have been more effective against Gram-positive than Gram-negative bacteria.

D. Antiprotozoal Activity

Several reports have demonstrated the growth inhibitory effects of quercetin against various protozoan parasites, namely Toxoplasma, Babesia, Theileria, Trypanosoma, and Leishmania. Interestingly, quercetin is well-known for its growth inhibitory efficacy against Trypanosoma brucei rhodesiense, T. brucei brucei, T. cruzi, and Leishmania donovani parasites in vitro and in vivo.

E. Anti - inflammatory effect of Quercitin

Quercetin has been shown to be a long-lasting anti-inflammatory agent with good anti-inflammatory activity. Several in vitro studies have shown that quercetin prevents the development of lipopolysaccharide (LPS)-mediated tumor necrosis factor-α (TNF-α) in macrophages and the development of IL-8 induced LPS in lung A549 cells.

II. SUMMARY

Amaranthus Viridis, belongs to family Amaranthaceae and is traditionally used for treatment of constipation, inflammation, eczema, bronchitis, anaemia, and leprosy. Flavonoids like Rutin and quercetin possess many pharmacological activities like antimicrobial, antioxidant, and anticancer, antihepatotoxic, protection of cardio vascular system. Rutin and quercetin have shown regulatory activity of hormones like affect the transport, metabolism and action of thyroid hormones.

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