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## MEDICINAL PLANTS WITH POTENT ANTIOXIDANT CONSTITUENTS

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### ABSTRACT

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Oxygen free radicals induce damage due to peroxidation to bio-membranes and also to DNA, which leads to tissue damage, thus cause occurrence of a number of diseases and biochemical disorders. Antioxidants neutralize the effect of free radicals through different ways and may prevent the body from various diseases. Antioxidants may play vital role in the metabolic disorders. India stands with highest percentage of people with diabetes, hypertension and cardiovascular disorders among the world. This may be due to life style, ethnicity, and improper food habits. Hence, the search for effective, non-toxic natural compounds with anti-oxidative potentials has been intensified in recent years. In the present review a brief account of research reports on plants constituents with antioxidant potential were summarised.

**INTRODUCTION:** Oxidative stress is main reason for various biochemical changes in the human system. Free radicals induce damage due to peroxidation and pathologies causes diabetes<sup>1</sup>, rheumatoid arthritis<sup>2</sup>, and neuro- degeneration in motor neuron diseases<sup>3</sup>. In many of these cases, it is unclear if oxidants trigger the disease, but in one case in which this link is particularly well-understood is the role of oxidative stress in cardiovascular disorders.

Low density lipoprotein oxidation appears to trigger the process of atherogenesis, which results in atherosclerosis, and finally cardiovascular disease<sup>4, 5</sup>. Oxidative damage in DNA can cause cancer. However, several antioxidant enzymes such as superoxide dismutase, catalase, glutathione peroxidase, glutathione reductase and glutathione S-transferase protect DNA from oxidative stress<sup>6</sup>.

A low calorie diet extends median and maximum lifespan in many animals. This effect may involve a reduction in oxidative stress. A review of experiments in mice conducted in 2009 indicated that almost all

manipulations of antioxidant systems had no effect on aging<sup>7</sup>. Diets high in fruit and vegetables, which are high in antioxidants, promote health and reduce the effects of aging, however antioxidant vitamin supplementation has no detectable effect on the aging process, so the effects of fruit and vegetables may be unrelated to their antioxidant contents<sup>8, 9</sup>. One reason for this might be the fact that consuming antioxidant molecules such as polyphenols and vitamin E will produce changes in other parts of metabolism, so it may be these other effects that are the real reason these compounds are important in human nutrition<sup>10</sup>.

**TABLE 1: MAIN CATEGORIES OF ANTI-OXIDANTS ARE;**

<b>Enzymes</b>	Superoxide dismutase, Catalase, Glutathione Peroxidase
<b>High Molecular Weight Compounds</b>	Albumin & Transferrin
<b>Low Molecular Weight Compounds</b>	
a. Lipid Soluble Antioxidants	Tocopherol, Quinines & bilirubin
b. Water Soluble Antioxidants	Ascorbic acid & Uric acid
<b>Minerals</b>	Zinc, Selenium, Copper & Manganese
<b>Vitamins</b>	Vitamin A, C & E

**Plants as Source of antioxidants:** Screening of plants is carried out by measuring the antioxidant activity through various *in vitro* models like DPPH, Nitric oxide, Hydrogen peroxide, Super oxide, FRAP assay and ABTS methods and *in vivo* models like murine model of

single oxygen-induced cerebral stroke, oxidative stress models, using rats or mice. An antioxidant is any substance that, When present at low concentrations significantly delays or prevents oxidation of cell content like Proteins, Lipids, carbohydrates and DNA.

**TABLE 2. ANTIOXIDANT CONSTITUENTS FROM PLANTS**

Plant Name	Plant Part/ Extract	Bio constituents	Ref No
<i>Broussonetia species</i>	fruits, bark, leaves, flowers	coumarins, polyphenols, alkaloids & flavonoids	11
<i>Terminalia sericea</i>	Bark	$\beta$ -sitosterol & beta-sitosterol-3-acetate	12
<i>Zataria multiflora</i>	Hydro alcoholic	Essential oils	13
<i>Camelia sinensis</i>	Hydro alcoholic	Flavonols	14
<i>Glycyrrhiza species</i>	Dried roots and rhizomes	Flavonoids	15
<i>Oroxylum indicum</i>	Bark	Baicalein	16
<i>Zingiber officinale</i>	Rhizomes	Cinnamic acid	16
<i>Olea europaea</i>	Leaves	Oleuropein	16
<i>Foeniculum vulgare</i>	Seeds	Rutin	16
<i>Alchornea glandulosa</i>	Leaves	Quercetin	16
<i>Tephrosia purpure</i>	Roots	Tephrosin	16
<i>Hylocereus undatus</i>	Flowers	Kaempferol, Quercetin & Isorhamnetin	17
<i>Piper krukoffii</i>	Leaves & Twigs	Myristicin, Apiole & Elemicin	18
<i>Allium sativum</i>	Leaves	Flavonoids & phenolics	19
<i>Croton zambesicus</i>	Leaves	Isovitexin & apigenin-6-C-glucoside	20
<i>Hippophae rhamnoides</i>	Leaves	Gallic acid, Myricetin & Isorhamnetin	21
<i>Hippophae rhamnoides</i>	Methanol	phenolic compounds, flavonoids	22
<i>Euryops arabicus</i>	Hepper & Wood	oxygenated sesquiterpenes, T-cadinol, spathulenol	23
<i>Laggera decurrens</i>	Hepper & Wood	Oxygenated monoterpenes	23
<i>Acacia nilotica</i>	Pods	Galocatechin derivatives	24
<i>Syzygium cumini</i>	Fruit	Flavanonols & proanthocyanidins	25
<i>Citrus fruits</i>	Peels, Rootstocks	Hesperidin & Narirutin flavonoids	26
<i>Psidium guajava</i>	Fruit	cinnamyl alcohol, ethyl benzoate	27
<i>Rosmarinus officinalis</i>	Leaves	Rosmarinic acid & carnolic acid	28
<i>Phyllanthus wightianus</i>	Whole Plant	Isomeric sterol mixture & fredilin	29
<i>Crocus sativus</i>	Stigma	Lauric acid & Hexadeconic acid	30
<i>Illicium verum</i>	Fruit	phenylpropanoids, lignans & flavonoids	31
<i>Polyalthia longifolia</i>	Leaves	Rutin, Quercetin	32
<i>Senecio scandens</i>	Whole Plant	senecainin A & 3-methoxyisonicotinic acid	33
<i>Rosmarinus officinalis</i>	Flowers	phenols and 1,8 cineole	34
<i>Achillea millefolium</i>	Methanol	Flavonol glycosides & Chlorogenic acids	35
<i>Lippia species</i>	Leaves	Flavonoids & Coumarins	36
<i>Juglans mandshurica</i>	Roots & Leaves	Tanins	37
<i>Rhododendron tomentosum</i>	Flowers	(+)-catechin, chlorogenic acid	38
<i>Crocus sativus</i>	Corms	Phenolic Compounds	39
<i>Convolvulus hystrix</i>	Ethyl acetate & Alcohol	Quercetin & quercetin 3-O-rutinoside	40
<i>Aloe herlana</i>	Latex	Anthrone (aloin) & chromone(7-O-methylaloesin A)	41
<i>Satureja Montana</i>	Aqueous, Alcohol	carvacrol & thymol	42
<i>Moringa oleifera</i>	Seeds	Kaempferol	43
<i>Cordia gillettii</i>	Leaves	terpene derivatives and non-terpene derivatives	44
<i>Nigella sativa</i>	Seeds	Quinine compounds	45
<i>Ficus callosa</i>	Leaves	Megastigmane glycoside, ficcalloside	46
<i>Ribes nigrum</i>	Fruits	flavonols, flavan-3-ols, and anthocyanins	47
<i>Gnaphalium affine</i>	Essential oils	Eugenol & linalool	48
<i>Petroselinum crispum</i>	Leaves	Catechin & gentisic acid	49
<i>Vaccinium corymbosum</i>	Berries	Isoorientin, Isovitexin	50
<i>Artemisia annua</i>	Fruit	Artemisinin	51
<i>Acacia confusa</i>	Fruit & Buds	Gallic acid, Myricitrin-3-rhamnoside	52

<i>Thymus caucasicus</i>	Aerial Parts	beta-fenchyl alcohol & Nerolidol	53
<i>Valeriana jatamansi</i>	Essential oils	Maaliol , patchouli alcohol	54
<i>Valencia Late</i>	Fruits of peels	Carotenoid & $\beta$ -Cryptoxanthin	55
<i>Coptis chinensis</i>	Roots, rhizomes	Monosaccharide	56
<i>Myrtus communis</i>	Berries	$\alpha$ -pinene, linalool & $\alpha$ -terpineol	57
<i>Olea europaea</i>	Leaves	oleuropein, luteolin-7-O-glucoside	58
<i>Micromeria Croatia</i>	Ethanol	phenolic acid, flavonoid and tannin	59
<i>Foeniculum vulgare</i>	Fruits	Estragole & Fenchone	60
<i>Ficus deltoidea</i>	Leaves	Flavan-3-ol monomers, proanthocyanidins	61
<i>Pimenta dioica</i>	Berry	Eugenol & caryophyllene	62
<i>Bombax malabaricum</i>	Flowers	Vicenin, linarin & saponarin	63
<i>Cynodon dactylon</i>	Leaves	Phenolic compounds	64
<i>Atriplex undulate</i>	Aerial Parts	p-acetanisole, $\beta$ -damascenone	65
<i>Vanda coerulea</i>	Stems	Imbricatin, Methoxycoelonin & Gigantol	66
<i>Sorbus aucuparia</i>	Berries	Anthocyanins, Flavonols, Tannins, and Phenolic acids	67
<i>Olea europaea</i>	Seeds	oil-hydroxytyrosol & oleuropein	68
<i>Allium sphaerocephalon</i>	Inflorescences	shyobunol, $\beta$ -caryophyllene & $\alpha$ -cadinol	69
<i>Pachysandra terminalis</i>	Aerial parts	p-hydroxybenzaldehyde & vanillin	70
<i>Cyperus longus</i>	Methanol	Luteolin ,Resveratrol & piceatannol	71
<i>Kalanchoe pinnata</i>	Leaves	quercetin 3-O- $\alpha$ -L-arabinopyranosyl - $\alpha$ -L-rhamnopyranoside & quercitrin,	72
<i>Zingiber officinale</i>	Rhizome	Quercetin, Rutin, Catechin, Epicatechin & Kaempferol	73
<i>Pachysandra terminalis</i>	Aerial parts	2-Phenylethyl-beta-D-glucopyranoside, (+)Pinoresinol-4'-O-beta-D-glucopyranoside & Pinoresinol	74
<i>Hippophae rhamnoides</i>	Leaves	quercetin-3-O-galactoside, quercetin-3-O-glucoside, kaempferol and isorhamnetin	75
<i>Ixora coccinea</i>	Leaves	Epicatechin, ProcyanidinA2 & cinnamtannin B-1	76
<i>Ficus carica</i>	Leaves, fruits and root barks	Umbelliferone , Caffeic acid	77
<i>Morus alba</i>			
<i>Origanum hypericifolium</i>	Essential oil	p-cymene, carvacrol and $\gamma$ -terpinene	78
<i>Gloiopeltis furcate</i>	Roots	Glutaric acid, succinic acid	79
<i>Cactus pear</i>	Fruits	ascorbic acid, flavonoids and betalains	80
<i>Klainedoxa gabonensi</i>	Stem bark	Ellagic acid, ellagic acid 3,3'-dimethylether & Gallic acid	81
<i>Bupleurum longiradiatum</i>	Roots	Thymol & Butylidene phthalide	82

**CONCLUSION:** Plants having vitamins (C, E, and Carotenoids), flavonoids (flavones, isoflavones, flavonones, anthocyanins and catechins), and polyphenols (ellagic acid, gallic acid and tannins) possess remarkable antioxidant activity. Antioxidant activity neither restricted to a particular part of the plant nor the specific families. It is reported that folic acid present in fruits, vegetables and orange juices may reduce hypo methylation of DNA, which is thought to initiate cancer. It is also found that the risk of cervical dysplasia is high in women with a low folic acid intake. Hence it can be concluded that in order to eliminate the free radical formed in human body people needs to consume diets high which are high in antioxidants, which promotes health and reduce the effects of aging.

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