Biolife 2(4):1191-1198
AN INTERNATIONAL QUARTERLY JOURNAL OF BIOLOGY & LIFE SCIENCES
ISSN (online): 2320-4257
www.biolifejournals.com
BIOLIFE REVIEW ARTICLE

A REVIEW ON MEDICINAL PLANTS FOR THE MANAGEMENT OF OSTEOPOROSIS

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ABSTRACT

From ancient times many medicinal herbs have been reported in literature to treat osteoporosis. Natural Products are also a part of our everyday life. Right from the inception, India has a rich heritage of usage of Ayurvedic & Herbal medicines Herbal have just recently started rising on the horizon of alternative system of medicine. Ayurveda and Herbal were being practiced and used all over the world for many years but have only recently started getting legal acceptance in many countries in the world as alternative system of medicine. India is called "Botanical Garden of the world" as it is the largest producer of medicinal herbs. Out of more than 25000 plants of medicinal value, only 10 % are used for their medicinal value. Around 1800 species are systematically documented in the codified Indian systems of medicine. These herbal products are preventive, protective, nutritive and curative. This Review is made to list out the Medicinal plants, which have been reported to have Anti osteoporotic activity against various animal models.

Key words: Osteoporosis, Medicinal plants, Overeictomized rat model, Glucocorticoid induced Osteoporosis and in vitro methods.

INTRODUCTION

Osteoporosis, a silent epidemic has become a major health hazard in recent years. It is a major growing health problem for elderly women associated with ovarian hormone deficiency following menopause and is by and far the most common cause of age related bone loss in women. According to the WHO "Osteoporosis is a disease characterized by low bone mass and microarchitectural deterioration of bone tissues, leading to enhanced fragility and consequent increase in fracture risk that results in fractures with minimal trauma".

There is imbalance between bone formation (osteoblastic activity) and bone resorption process (osteoclastic activity) due to various causes such as deficiency of estrogen hormone as in post menopausal osteoporosis, aging and oxidative stress.

As a living tissue, bone is always in state of remodeling. This process replaces old and weak bone tissue by fresh and hard bone tissue. Following types of cells govern the process of remodeling.

(1) Osteoclast that resorbs the bone matrix and degrades the bone tissue by synthesizing digestive enzymes.
(2) Osteoblast that forms the bone tissue by synthesizing collagen matrix, which become hardened by process of calcification.
(3) Osteocytes are found embedded into the collagen matrix. When osteoblasts become trapped in the matrix they secrets, they become osteocytes.

Remodeling occurs as a delicate balance between bone resorption by osteoclasts and bone formation by osteoblasts. Imbalance between the activities of these cells leads to various diseased conditions (Yan Zhang et al., 2007).

Herbal medicines are being used by about 80% of the world population primarily in the developing countries for primary health care. They have stood the test of time for their safety, efficacy, cultural acceptability and lesser side effects.

Table-1: Medicinal Plants With their Botanical Name and Chemical Constituents for Osteoporosis

Sl. NO	Common Name	Biological Name & Family	Chemical Constituent	Effective against	Reference
1.	Ox nee	*Achyranthusbidentata* (Amaranthaceae)	rutin, saponins, achyranthine, caffeic acid, oleanolic acid, inokosterone, ecdysterone, rubrosterone	Ovariectomized rat model	Rong et al., 2011
2.	Bui	*Allophylusserratus* (Sapindaceae)	Flavonoids, tannins, Fatty acids	In vitro chick fetal bone assay	Manmeet k et al., 2010
3.	Leek	*Allium porrum* (Amaryllidaceae)	diallyl disulfide, diallyl trisulfide, diallyl tetrasulfide), flavonoids, vitamin C, and carotenoids	Ethanol induced osteoporosis	Siham M. et al., 2013
4.	Jevel orchids	*Anoectochilusformosanus* (Orchidaceae)	Kinsenoside, Flavonoids	Ovariectomized rat model	Shih CC et al., 2001
5.	Haung qi	*Astragalusmembranaceous* (Fabaceae)	Cycloastragenol, Triterpenoids, Isoflavone	Ovariectomized rat model	LiuXP et al., 2005
6.	Sappanligum	*Caesalpiniasappan* (Fabaceae)	Triterpenoids, flavonoids, oxygen heterocycles, Brazilin	In vitro osteoblast cell proliferation	Subehan et al., 2013
7.	Safflower	*Carthamustinctorius* (Asteraceae)	Flavonoids, Fixed oil, Kinobean A	Ovariectomized rat model	Alam et al., 2006
8.	Tea	*Camellia sinensis* (Theaceae)	Polyphenols and flavonoids	Ovariectomized rat model	Das et al., 2004
9.	Foetid bugbane	*Cimciferafoetida* (Ranunculaceae)	Cimcifoetisides a & B, Triterpenoids	Ovariectomized rat model	Li et al., 2005
10.	Black cohosh	*Cimciferaracemosa* (Ranunculaceae)	Flavonoids, Triterpenoids, glycosides and aromatic acids	Ovariectomized rat model	Nisslein T et al., 2003
11.	Hadjod	*Cissusquadrangularis* (Vitaceae)	Steroids, Alkaloids, Calcium	Ovariectomized rat model	Shirwaike r et al., 2003
12.	Guggul	*Commiphoramukul* (Burseraceae)	guggulsterones E and Z, guggulsterol-I, II, III, cholesterol, sesamin and camphorene.	Ovariectomized rat model	Saleemull a k et al., 2012
13.	Dogwoods	*Cornusofficinalis* (Cornaceae)	Oleanic acid, ursolic acid, gallotannins	Ovariectomized rat model	Chen et al., 2003
14.	Turmeric	*Curcuma aromatica (Zingiberaceae)*	curdione, neocurdione, curcumol, tetramethylpyrazine, 9-oxo-neoprocurcumenol, curcumin	Ovariectomized rat model	Rangrez et al., 2011
15.	Purple yam	Dioscoreaalata	1- feruloglycerol, anthocyanins, diosgenin, tocopherol, ipomeanol, sinapic acid.	Ovariectomized rat model	Hsiao LC et al., 2008

S. N.	Common Name	Biological Name & Family	Chemical Constituent	Effective against	Reference
16.	Basket ferns	*Drynariaerhizome* (Polypodiaceae)	Phloroglucinol, chlorogenic acid, syringicacid, quercetin dehydrate, luteolin and emodin	In vitro osteoblast cell proliferation	Suk NK et al., 2014
17.	Siberian Ginseng	*Eleutherococcussenticosus* (Araliaceae)	Amyloid β (Aβ), and eleutheroside B	Ovariectomized rat model	Dong WL et al., 2013
18.	Amla	*Emblicaofficinalis* (Phyllanthaceae)	Flavone, gallic acid, ellagic acid, linolenic, linoleic, oleic, stearic acids.	Ovariectomized rat model	Srinivasa R et al., 2013
19.	Herbaepimedi	*Epimediumbreuicorium* (Berberidaceae)	Flavonoids, sterols, fatty acids	Ovariectomized rat model	Xie F et al., 2005
20.	Indian coral tree	*Erythrinavariegate* (Leguminoseae)	Isoflavonoids, sphaerobioside, drientanol B	Ovariectomized rat model	Wong et al., 2007
21.	Tongkatali	*Eurycomalongifolia* (Simaroubaceae)	Eurycomanone, eurycomalactone	Orchidectomy rat model	Nadia ME et al., 2012
22.	Glossy Privet Fruit	*Fructusligustri* (Oleaceae)	Oleanolic acid, luteoline, D-glucoside, quercitrin, sitosterol	Ovariectomized rat model	Ko et al., 2010
23.	Soy bean	*Glycinemax* (Fabaceae)	Isoflavonoids, genislein, daidzein	Human adult	Potter et al., 1998.
24.	Maca	*Lepidiummeyenii* (Brassicaceae)	Alkaloids, steroids, macamides	Ovariectomized rat model	Yong zhong et al., 2006
25.	Cheese fruit	*Morindacitrifolia* (Rubiaceae)	americanin A, narcissoside, asperuloside, asperulosidic acid, borreriagenin, citrifolinin B	Ovariectomized rat model	Shirwaiker et al., 2011
26.	Indian mulberry	*Morindaofficinalis* (Rubiaceae)	Morindin, vitamin C, Anthroquinones, terpenoids	Ovariectomized rat model	Nan li et al., 2009
27.	Drumstick tree	*Moringaoliefera* (Moringaceae)	pterygospermin, moringine, moringininespirochin, behenic acid, moringic acid, niazinin A & B, niazimicin, steroids.	In vitro osteoblastic cell proliferation	Chirag P et al., 2013
28.	Fennel flower	*Nigellasativa* (Ranunculaceae)	*n*-nonane, dihydrocarvone, citronellyl acetate, aromadendrene, davanone, 8-heptadecene, dihydrofarnesyl acetate and pimaradiene	Diabetes induced osteoporosis in female rats	Rukshar A et al., 2013
29.	Onobrychis	*Onobrychisebenoids* (Leguminoseae)	Arylobenzofuransand isoflavonoids	Ovariectomized rat model	Dontas et al., 2006
30.	Ginseng	*Panaxginseng (Araliaceae)*	Ginsenosides, polysaccharides, polyacetylenes, peptides, and amino acids	Inflammation induced osteoporosis in ovariectomized rat model	Avsar U et al., 2013
31.	Chaphlu	*Pipersarmentosum* (Piperaceae)	Ellitorine, guineensine, brachystamide B, sarmentine, brachyamide	Glucocorticoid induced osteoporosis in adrenalectomized rats	Ima NS et al., 2012
32.	Mushroom	*Pleurotuseryngii* (Pleurotaceae)	Polysaccharides, voluatoxin, gonaderic acid	Ovariectomized rat model	Kim et al., 2006
33.	False Ashoka	*Polyalthialongifolia* (Annonaceae)	Steroids, flavonoids, alkaloids, phenols, tannins	Dexamethasone induced osteoporosis in rats	Pawar etal., 2012

S. N.	Common Name	Biological Name & Family	Chemical Constituent	Effective against	Reference
34.	Bawachi	*Psoraleacorylifolia* (Fabaceae)	Furanocoumarins, flavonoids(neobavaisoflavone, isobavachalcone, bavachalcone, bavachinin, bavachin), terpenoids	Ovariectomized rat model	Tsai MH et al., 2007
35.	Soft bollygum	*LitseaGlutinosa (Lauraceae*	Oliec acid, tricosene, Eicosane, phytoestrogens	Ovariectomized rat model	Rangrez et al., 2011
36.	Ge gen	*Puerariaeradix* (Leguminoseae)	Isoflavone, daidzin, daidzein	Ovariectomized mice model	Wang XX et al., 2003
37.	Pomegranate	*Punicagranatum* (Lythraceae)	Ellagic acid, Gallic acid, punicalin, punicalagin	Ovariectomized rat model	Mori et al., 2004
38.	Skullcaps	*Radixscutellarie* (Lamiaceae)	Flavonoids, baicalein, wogonin, wogonoside	Density and Microarchitecture of long bones in Tail Suspended rat model	Chen RL et al., 2013
39.	Chinese foxglove	*Rehmanniaglutinosa* (Scrophulariaceae)	Steroids, narcarotenoids, remophilanetriol	Ovariectomized rat model	Oh et al., 2003
40.	Indian madder	*Rubiacordifolia* (Rubiaceae)	Rubiadin, anthroquinones, flavonoids, rubiprasins, triterpenoids	Ovariectomized rat model	Kasaki et al., 2012
41.	Red sage	*Salviamiltorrhiza* (Lamiaceae)	Dihydrotanshinone, tashinone I and II A	Ovariectomized rat model	Chae et al., 2004
42.	Black elder	*Sambucusnigra* (Caprofoliaceae)	α-amyrenone, α-amyrin, betulin, oleanolic acid, beta-sitosterol12, nigrin b, a lectin similar to ricin	Diabetes induced osteoporosis in female rats	Laurentia B et al., 2012
43.	Jiegu mu	*Sambucuswilliamsii* (Caprofoliaceae)	Steroids, triterpenoids, phenolic acid	Ovariectomized rat model	Yao et al., 2005
44.	Stonecrops	*Sedumsarmentosum* (Crassulaceae)	Sedridine, sedamine, sedinone, isopelletierine	Ovariectomized rat model	Kim WH et al., 2004
45.	Japanese pagoda tree	*Sophorajaponica* (Leguminosae)	Isoflavonoids, triterpenoids	Ovariectomized rat model	Wang et al., 2006
46.	Arjuna	*Terminaliaarjuna* (Combretaceae)	Tannins, triterpenoidsaponins (arjunic acid, arjunolic acid, arjungenin and arjunic acid), flavonoids, gallic acid, ellagic acid and phytosterols.	Ovariectomized rat model	Rangrez et al., 2011
47.	Red clover	*Trifoliumpratense* (Fabaceae)	Isoflavonoids like biochatmin-A and genistein	Ovariectomized rat model	Circosta et al., 2007
48.	Wheat	*Triticumaestivum* (Gramineae)	Vitamins (A, C, and E), Bioflavonoids, Iron, minerals (calcium and magnesium) and 17 amino acid	Glucocorticoid induced osteoporosis in rats	David B et al., 2013
49.	Pilabhangara	*Wedeliacalendaceae* (Asteraceae)	Isoflavonoids, wedelolactone	Ovariectomized rat model	Shirwaiker et al., 2003
50.	Ashwagandha	*Withaniasomnifera* (Apocynaceae)	Withanine, withananine, pseudo-withanine, tropine, pseudo-tropine, choline, cuscohygrine, isopelletierine, withanolides, withaferin A	Calcium deficient ovariectomized rat model	Prabhakara et al., 2010
51.	Ginger	*Zingiberofficinale* (Zingiberaceae)	Zingiberene, β- bisabolene, α-farnesne, β-sesquiphellandrene, α-curcumene, gingerol and shogao	Ovariectomized rat model	Mohamed LC et al., 2013

The chemical constituents present in them are a part of the physiological functions of living flora and hence they are believed to have better compatibility with the human body. Ancient literature also mentions herbal medicines for age related diseases namely memory loss, osteoporosis, diabetic wounds, immune and Liver disorders, etc. for which no modern medicine or only palliative therapy is available. These drugs are made from renewable resources of raw materials by ecofriendly processes and will bring economic prosperity to the masses growing these raw materials. (Reddy NP et al., 2004).

In this Review, an attempt is made to explore the possibility of using medicinal plants for the osteoporosis.

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DOI: https://dx.doi.org/10.5281/zenodo.7233836
Received: 7 October 2014;
Accepted; 20 November 2014;
Available online : 8 December 2014

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