INTERNATIONAL RESEARCH JOURNAL OF PHARMACY **ISSN 2230 – 8407**
Available online http://www.irjponline.com
Review Article

HYPERTENSION AND HERBAL PLANTS

Jawaid Talha*, Maddheshiya Priyanka, Awasthi Akanksha
Hygia Institute of Pharmaceutical Education and Research, Lucknow, India

Article Received on: 20/06/11 Revised on: 25/07/11 Approved for publication: 09/08/11

*Email: talhajawaid78@gmail.com

ABSTRACT
High blood pressure, termed "hypertension," is a condition that afflicts almost 1 billion people worldwide and is a leading cause of morbidity and mortality. More than 20% of Americans are hypertensive, and one-third of these Americans are not even aware they are hypertensive. Therefore, this disease is sometimes called the "silent killer." This disease is usually asymptomatic until the damaging effects of hypertension (such as stroke, myocardial infarction, renal dysfunction, visual problems, etc.) are observed. Hypertension is a major risk factor for coronary artery disease and "heart attacks," which may require coronary artery bypass surgery.
This study describes the antihypertensive activities present in herbal plants. Herbal medicine has made many contributions to commercial drug preparations manufactured today herbal medicine has been losing ground to new synthetic medicines touted by scientists and physicians to be more effective and reliable.
Keywords: Hypertension, Medicinal plants, Antihypertensive herbal plants.

INTRODUCTION

Cardiovascular disease (CVD) is the leading cause of death worldwide. Hypertension is the most common cardiovascular disease and a major public health problem in both developed and developing countries. The disease affects both sexes and more and more patients are turning up at younger ages. Hypertension is the leading member of the group of so called “non-communicable diseases” (NCD) and a leading Contributory cause of death worldwide.[4] It is believed that hypertension contributes about 57 per cent towards all deaths from strokes and 24 per cent towards all deaths from coronary artery disease.

Hypertension is reported to be the fourth contributor to premature death in developed countries and the seventh in developing countries. High blood pressure is the most common and responds well to lifestyle changes, such as losing weight, dietary changes, exercise, and stress reduction. Natural treatment of essential hypertension can bring blood pressure values into the normal range; however, if lifestyle changes are not maintained, hypertension will probably return. Secondary hypertension has an organic cause (i.e., kidney disease, pregnancy) and must be evaluated and monitored by a physician since the underlying cause must also be addressed. It often takes some time to find the best treatment for pulmonary hypertension.

CONCLUSION

Herbal medicines are being used by about 80% of the world population particularly in the developing countries for the primary health care. The natural products should be considered as the best in primary health care because of better cultural acceptability, safety, potent, inexpensive and lesser side effects. Several herbal medicines and supplements have been studied as potential therapeutic agents in the management of hypertension and its related complications.

PLANTS CONTAINING ANTIHYPERTINSIVE ACTIVITY

Plant name	Ayurvedic /common name	Part used	Antihypertensive & other beneficial effects	Reference
Carom capticum	Ajvan	Leaves	Antihypertensive, Antispasmodic	2
Oleo europaea	Olive tree	Leaves	Antihypertensive, Hypoglycemic, Antioxidant	3
Lepidium sativum	Garden cress	Leaves	Antihypertensive, Diuretic	4
Eucommia ulmoides	Eucommi Bark	Leaves	Antihypertensive	5
Laelia autumnalis	Autumn Flowering Laelia	Roots	Antihypertensive, Vasorelaxant	6
Tribulus terrestris	Tribulus	Leaves	Antihypertensive, Vasodilator	7

Mesona procumbens	Vanilla	Seed	Antihypertensive	8
Errachidia province	Errachidia	Leaves	Antihypertensive, Diabetes mellitus	9
Phyllanthus urinaria	Bhuiaonla	fruit, leaf, flower	Antihypertensive, Anti- inflammatory	10
Cuscuta japonica	Japanese dodder	Leaves	Antihypertensive	11
Agastache Mexicana	Mexican Giant Hyssop	Bark	Antihypertensive	12
Tropaeolum majus	Indian Cress	Seed, leaf, flower	Antihypertensive	13
Laelia anceps	The bull	Roots	Antihypertensive, Vasorelaxant	14
Cocos nucifera	Coconut palm	Seed	Antihypertensive, Vasorelaxant	15
Coriandrum sativum	Coriander	Fruit	Antihypertensive, Dyspepsia	16
Elettaria cardamomum	Cardamom	Fruit	Antihypertensive	17
Guazuma ulmifolia	Rudrakshi	Bark	Antihypertensive ,Vasorelaxant	18
Fritillaria ussuriensis maxim.	Spring wild flower	Bulb	Antihypertensive	19
Clerodendron trichotomum	Glory Tree	Stem	Antihypertensive	20
Tanacetum vulgare L.	Saunf	Leaf	Antihypertensive , Vasorelaxant	21
Aronia mitchurinii	Chokeberry	Fruit	Antihypertensive	22
Hibiscus sabdariffa	Jamaica sorrel	Leaves	Antihypertensive	23
Cecropia pachystachya	Ambay	Leaves	Antihypertensive	24
Borago officinalis	Borage	Leaves	Antihypertensive, Vasodilator	25
Loranthus ferrugineus	Benalu	Leaves	Antihypertensive, Vasodilator	26
Lepechinia caulescens	Pitcher Sage	Leaves	Antihypertensive	27
Periploca laevigata	Periploca laevigata	Bark, Roots	Antihypertensive	28
Leonurus cardiaca var	Guma	Aerial parts	Antihypertensive	29
Eugenia uniflora	Pinang	Leaves	Antihypertensive	30
Citrus limetta	sweet lemon	Fruit	Antihypertensive	31
Cirsium japonicum	Five flavour berry	whole plant	Antihypertensive, Hemorrhage	32
Averrhoa carambola	Starfrui	Leaves	Antihypertensive	33
Valeriana wallichii	Valerian Jatamansi	Rhizome	Antihypertensive	34
Allium sativum	Garlic	Fruit	Antihypertensive, Vasopressor	35
Astragalus complanatus	Gurmar	Seeds	Antihypertensive	36
Erythroxylum gonocladum		Aerial parts	Antihypertensive	37
Melothria maderaspatana	Melon-gubat	Leaves	Antihypertensive, Antioxidant	38
Sclerocarya birrea	Marula	Stem- bark	Antihypertensive, Vasorelaxant	39
Achillea millefolium	Plumajillo	Leaves	Antihypertensive	40
Phyllanthus acidus	Rai awla	Leaves	Antihypertensive	41
Panax ginseng	Ninjin	Roots	Antihypertensive, Immunomodulator	42
Geum japonicum	Daikon-sou	Leaves	Antihypertensive, Vasorelaxant	43
Cudrania tricuspidata	Mandarin melon berry	Leaves	Antihypertensive, Renal dysfunction	44
Graptopetalum paraguayense	Ghost Plant	Leaves	Antihypertensive	45
Echinodorus grandiflorus	Corazón	Leaves	Antihypertensive ,Anti-inflammatory	46
Antrodia camphorata	Niuchangchih	Fruiting bodies	Antihypertensive ,Liver disease	47
Polyalthia longifolia	Ashoka	Bark, Root	Antihypertensive	48
Jatropha gossypiifolia L.	Red physic nut	Leaves	Antihypertensive, Vasorelaxant	49
Solanum torvum	Susumber	Fruits	Antihypertensive, Cardiac hypertrophy	50
Globimetula cupulata	Guinea-bissau balanta	Leaves	Antihypertensive , Hypoglycemic	51

Crocus sativus	Saffron	Stigma	Antihypertensive	52
Momordica charantia	Bitter Melon	Whole plant	Antihypertensive, Diabetes	53
Harpephyllum caffrum Bernh	Wild plum	stem, bark	Antihypertensive, Diabetes	54
Salvia cinnabarina	Galeotti	Leaves	Antihypertensive	55
Catharanthus roseus	Vinca rosea	Leaves	Antihypertensive, Hypolipidemic	56
Ulmus macrocarpa	Large-fruited Elm	Root bark	Antihypertensive, Vasorelaxant	57
Saururus chinensis	San bai cao	Root	Antihypertensive , Vasorelaxant	58
Retama raetam Forssk	White Weeping Broom	Leaves	Antihypertensive , Diuretic	59
Passiflora edulis rind	Passion Fruit	Leaves	Antihypertensive, Vasodilator	60
Opuntia dillenii cladodes	Sweet Prickly Pear	Leaves	Antihypertensive	61
Pleurotus nebrodensis	White Ferula Mushroom	Fruits	Antihypertensive	62
Nigella sativa	Black cumin	Seeds	Antihypertensive	63
Gynura procumbens	Akar Sebiak	Leaves	Antihypertensive	64
Raphanus sativus	Radish	Leaves	Antihypertensive ,Vasodilator	65
Mammea africana	African apple	Stem- bark	Antihypertensive ,Vasodilator	66
Coscinium fenestratum	Gaertn	Leaves	Antihypertensive, Vasorelaxant	67
Calycotome villosa	Spiny Broom	Leaves	Antihypertensive ,Vasorelaxant	68
Buddleja crispa	Himalayan Butterfly Bush	Leaves	Antihypertensive, Antispasmodic	69
Ekebergia capensis	Dog plum	Leaves	Antihypertensive	70
Persea americana Mill	Avocado	Leaves	Antihypertensive, Cardiac dysfunctions	71
Ficus exasperate	Brahma's Banyan	Leaves	Antihypertensive, Anti-ulcer	72
Jacaranda mimosaefolia	Jacaranda	Leaves	Antihypertensive ,Hypothermic	73
Artemisia herba alba	Armoise blanche	Leaves	Antihypertensive	74
Hyptis fruticosa	Alecrim-de-tabuleiro	Leaves	Antihypertensive	75
Gastrodia elata Blume	Rhizoma Gastrodia Elatae	Rhizome	Antihypertensive	76

REFERENCES

1. Benowitz N.L, Katzung BG, editor, Antihypertensive agents. Basic & Clinical Pharmacology, 2001; 155-80.
2. Gilani AH, Jabeen Q, Ghayur MN, Janbaz KH, Akhtar MS: Studies on the Antihypertensive, Antispasmodic, Bronchodilator and Hepatoprotective activities of the *Carum copticum* seed extract. Journal of Ethnopharmacology 2005,98:127-135.
3. Somova LI, Shode FO, Ramnanan P, Nadar A: Antihypertensive, Antiatherosclerotic and Antioxidant activity of triterpenoids isolated from *Olea europaea*, subspecies africana leaves. Journal of Ethnopharmacology, 2003 ;84:299-305.
4. Maghrani M, Zeggwagh N-A, Michel J-B, Eddouks M: Antihypertensive effect of *Lepidium sativum l*. In spontaneously hypertensive rats. Journal of Ethnopharmacology, 2005 ;100: 193-197.
5. Kwan C-Y, Chen C-X, Deyama T, Nishibe S: Endothelium-dependent Vasorelaxant effects of the aqueous extracts of the *Eucommia ulmoides oliv*. Leaf and bark: Implications on their antihypertensive action. Vascular Pharmacology, 2003;40: 229-235
6. Vergara-Galicia J, Ortiz-Andrade R, Castillo-España P, Ibarra-Barajas M, Gallardo-Ortiz I, Villalobos-Molina R *et al*: Antihypertensive and Vasorelaxant activities of *Laelia autumnali*s are mainly through calcium channel blockade. Vascular Pharmacology, 2008; 49: 26-31.
7. Yeh C-T, Huang W-H, Yen G-C: Antihypertensive effects of *Hsian-tsao* and its active compound in spontaneously hypertensive rats. The Journal of Nutritional Biochemistry 2009; 20: 866-875.
8. Sharifi AM, Darabi R, Akbarloo N: Study of Antihypertensive mechanism of *Tribulus terrestris* in 2k1c hypertensive rats: Role of tissue ace activity. Life Sciences, 2003; 73: 2963-2971.
9. Yeh C-T, Huang W-H, Yen G-C: Antihypertensive effects of *Hsian-tsao* and its active compound in spontaneously hypertensive rats. The Journal of Nutritional Biochemistry 2009; 20: 866-875.
10. Tahraoui A, El-Hilaly J, Israili ZH, Lyoussi B: Ethnopharmacological survey of plants used in the traditional treatment of Hypertension and Diabetes in south-eastern morocco (errachidia province). Journal of Ethnopharmacology, 2007;110: 105-117.
11. Lin S-Y, Wang C-C, Lu Y-L, Wu W-C, Hou W-C: Antioxidant, Anti-semicarbazide-sensitive amie oxidase, and Anti-hypertensive activities of geraniin isolated from *Phyllanthus urinaria*. Food and Chemical Toxicology, 2008; 46: 2485-249.2
12. Oh H, Kang D-G, Lee S, Lee H-S: Angiotensin converting enzyme inhibitors from *Cuscuta japonica choisy*. Journal of Ethnopharmacology, 2002; 83: 105-108.
13. Hernández-Abreu O, Castillo-España P, León-Rivera I, Ibarra-Barajas M, Villalobos-Molina R, González-Christen J *et al*: Antihypertensive and Vasorelaxant effects of tilianin isolated from *Agastache mexicana* are mediated by no/cgmp pathway and potassium channel opening. Biochemical Pharmacology,2009;78: 54-61.
14. Gasparotto Junior A, Gasparotto FM, Lourenço ELB, Crestani S, Stefanello MEA, Salvador MJ *et al*: Antihypertensive effects

of isoquercitrin and extracts from *Tropaeolum majus l.*: Evidence for the inhibition of angiotensin converting enzyme. Journal of Ethnopharmacology,2011; 134: 363-372.
15. Vergara-Galicia J, Ortiz-Andrade R, Rivera-Leyva J, Castillo-España P, Villalobos-Molina R, Ibarra-Barajas M *et al*: Vasorelaxant and Antihypertensive effects of methanolic extract from roots of *Laelia anceps* are mediated by calcium-channel antagonism. Fitoterapia ,2010; 81: 350-357.
16. Bankar GR, Nayak PG, Bansal P, Paul P, Pai KSR, Singla RK *et al*: Vasorelaxant and Antihypertensive effect of *Cocos nucifera linn*. Endocarp on isolated rat thoracic aorta and doca salt-induced hypertensive rats. Journal of Ethnopharmacology,2011;134: 50-54.
17. Jabeen Q, Bashir S, Lyoussi B, Gilani AH: *Coriander* fruit exhibits gut modulatory, blood pressure lowering and diuretic activities. Journal of Ethnopharmacology, 2009 122: 123-130.
18. Gilani AH, Jabeen Q, Khan A-u, Shah AJ: Gut modulatory, Blood pressure lowering, Diuretic and Sedative activities of *cardamom*. Journal of Ethnopharmacology, 2008: 115: 463-472.
19. Magos GA, Mateos JC, Páez E, Fernández G, Lobato C, Márquez C *et al*: Hypotensive and Vasorelaxant effects of the procyanidin fraction from *Guazuma ulmifolia* bark in normotensive and hypertensive rats. Journal of Ethnopharmacology,2008; 117: 58-68.
20. Kang D-G, Oh H, Cho D-K, Kwon E-K, Han J-H, Lee H-S: Effects of bulb of *Fritillaria ussuriensis maxim*. On Angiotensin converting enzyme and vascular release of no/cgmp in rats. Journal of Ethnopharmacology, 2002; 81: 49-55.
21. Kang DG, Lee YS, Kim HJ, Lee YM, Lee HS: Angiotensin converting enzyme inhibitory phenylpropanoid glycosides from *Clerodendron trichotomum*. Journal of Ethnopharmacology, 2003;89: 151-154
22. Lahlou S, Tangi KC, Lyoussi B, Morel N: Vascular effects of *Tanacetum vulgare l*. Leaf extract: In vitro pharmacological study. Journal of Ethnopharmacology,2008; 120: 98-102.
23. Hellström JK, Shikov AN, Makarova MN, Pihlanto AM, Pozharitskaya ON *et al*: Blood pressure-lowering properties of chokeberry (*Aronia mitchurinii*, var. Viking). Journal of Functional Foods, 2010; 2: 163-169.
24. Ojeda D, Jiménez-Ferrer E, Zamilpa A, Herrera-Arellano A, Tortoriello J, Alvarez L: Inhibition of angiotensin convertin enzyme (ace) activity by the anthocyanins delphinidin- and cyanidin-3-o-sambubiosides from *Hibiscus sabdariffa*. Journal of Ethnopharmacology, 2010; 127: 7-10.
25. Consolini AE, Ragone MI, Migliori GN, Conforti P, Volonté MG: Cardiotonic and Sedative effects of *Cecropia pachystachya mart*. (ambay) on isolated rat hearts and conscious mice. Journal of Ethnopharmacology, 2006: 106: 90-96.
26. Gilani AH, Bashir S, Khan A-u: Pharmacological basis for the use of *Borago officinalis* in gastrointestinal, respiratory and cardiovascular disorders. Journal of Ethnopharmacology, 2007;114: 393-399.
27. Ameer OZ, Salman IM, Najim HS, Abdullah GZ, Abdulkarim MF, Yam MF *et al*: In vitro pharmacodynamic profile of *Loranthus ferrugineus*: Evidence for noncompetitive antagonism of norepinephrine-induced vascular contraction. Journal of Acupuncture and Meridian Studies, 2010; 3: 272-282
28. Aguirre-Crespo F, Vergara-Galicia J, Villalobos-Molina R, Javier López-Guerrero J, Navarrete-Vázquez G, Estrada-Soto S: Ursolic acid mediates the Vasorelaxant activity of *Lepechinia caulescens* via no release in isolated rat thoracic aorta. Life Sciences, 2006;79: 1062-1068.
29. Hajji M, Masmoudi O, Souissi N, Triki Y, Kammoun S, Nasri M: Chemical composition, angiotensin i-converting enzyme (ace) inhibitory, Antioxidant and Antimicrobial activities of the essential oil from *Periploca laevigata* root barks. Food Chemistry, 2010; 121: 724-731.
30. Milkowska-Leyck K, Filipek B, Strzelecka H: Pharmacological effects of lavandulifolioside from *Leonurus cardiaca*. Journal of Ethnopharmacology, 2002; 80: 85-90.
31. Consolini AE, Sarubbio MG: Pharmacological effects of *Eugenia uniflora* (myrtaceae) aqueous crude extract on rat's heart. Journal of Ethnopharmacology,2002); 81: 57-63.
32. Perez YY, Jimenez-Ferrer E, Alonso D, Botello-Amaro CA, Zamilpa A: *Citrus limetta* leaves extract antagonizes the hypertensive effect of angiotensin ii. Journal of Ethnopharmacology, 2010; 128: 611-614.
33. Kim E-Y, Jho H-K, Kim D-I, Rhyu MR: *Cirsium japonicum* elicits endothelium-dependent relaxation via histamine h1-receptor in rat thoracic aorta. Journal of Ethnopharmacology,2008; 116: 223-227.
34. Soncini R, Santiago MB, Orlandi L, Moraes GOI, Peloso ALM, dos Santos MH *et al*: Hypotensive effect of aqueous extract of *Averrhoa carambola l.* (oxalidaceae) in rats: An in vivo and in vitro approach. Journal of Ethnopharmacology , 2011; 133: 353-357.
35. Gilani AH, Khan A-u, Jabeen Q, Subhan F, Ghafar R: Antispasmodic and blood pressure lowering effects of *Valeriana wallichii* are mediated through k+ channel activation. Journal of Ethnopharmacology, 2005;100: 347-352.
36. Hosseini M, Shafiee SM, Baluchnejadmojarad T: *Garlic* extract reduces Serum angiotensin converting enzyme (ace) activity in nondiabetic and streptozotocin-diabetic rats. Pathophysiology,2007; 14: 109-112.
37. Xue B, Li J, Chai Q, Liu Z, Chen L: Effect of total flavonoid fraction of *Astragalus complanatus r.* Brown on angiotensin ii-induced portal-vein contraction in hypertensive rats. Phytomedicine, 2008; 15: 759-762.
38. Lucas-Filho MD, Silva GC, Cortes SF, Mares-Guia TR, Perpétua Ferraz V, Serra CP *et al*: ACE inhibition by astilbin isolated from *Erythroxylum gonocladum (Mart.*) O.E. Schulz. Phytomedicine, 2010; 17: 383-387.
39. Veeramani C, Aristatile B, Pushpavalli G, Pugalendi KV: Effects of *Melothria maderaspatana* leaf extract on antioxidant status in sham-operated and uninephrectomized doca-salt hypertensive rats. Saudi Journal of Biological Sciences, 2011;18:99-105.
40. Gondwe M, Kamadyaapa DR, Tufts M, Chuturgoon AA, Musabayane CT: *Sclerocarya birrea* [(a. Rich.) hochst.] [anacardiaceae] stem-bark ethanolic extract (sbe) modulates blood glucose, glomerular filtration rate (gfr) and mean arterial blood pressure (map) of stz-induced diabetic rats. Phytomedicine, 2008; 15:699-709.
41. de Souza P, Gasparotto Jr A, Crestani S, Stefanello MÉA, Marques MCA, Silva-Santos JEd, *et al*: Hypotensive mechanism of the extracts and artemetin isolated from *Achillea millefolium l.* (asteraceae) in rats. Phytomedicine In Press, Corrected Proof.
42. Xie Y-W, Xu H-X, Dong H, Fiscus RR, But PPH: Role of nitric oxide in the Vasorelaxant and Hypotensive effects of extracts and purified tannins from *Geum japonicum.* Journal of Ethnopharmacology, 2007;109:128-133
43. Persson IAL, Dong L, Persson K: Effect of *Panax ginseng* extract (g115) on angiotensin-converting enzyme (ace) activity

and nitric oxide (no) production. Journal of Ethnopharmacology, 2006;105:321-325.
44. Kang DG, Hur TY, Lee GM, Oh H, Kwon TO, Sohn EJ, Lee HS: Effects of *Cudrania tricuspidata* water extract on Blood pressure and Renal functions in no-dependent hypertension. Life Sciences, 2002; 70:2599-2609.
45. Chen S-J, Chang C-T, Chung Y-C, Chou S-T: Studies on the inhibitory effect of *Graptopetalum paraguayense e.* Walther extracts on the angiotensin converting enzyme. Food Chemistry, 2007;100 :1032-1036
46. Tibiriçá E, Almeida A, Caillleaux S, Pimenta D, Kaplan MA, Lessa MA *et al*: Pharmacological mechanisms involved in the Vasodilator effects of extracts from *Echinodorus grandiflorus*. Journal of Ethnopharmacology, 2007; 111:50-55.
47. Wang G-J, Tseng H-W, Chou C-J, Tsai T-H, Chen C-T, Lu M-K: The Vasorelaxation of *Antrodia camphorata mycelia:* Involvement of endothelial Ca^{2+} no-cgmp pathway. Life Sciences,2003; 73:2769-2783.
48. Saleem R, Ahmed M, Ahmed SI, Azeem M, Khan RA, Rasool N *et al*: Hypotensive activity and Toxicology of constituents from root bark of *Polyalthia longifolia* var. Pendula. Phytother Res, 2005; 19:881-884
49. Abreu IC, Marinho AS, Paes AM, Freire SM, Olea RS, Borges MO *et al*: Hypotensive and Vasorelaxant effects of ethanolic extract from *Jatropha gossypiifolia l.* In rats. Fitoterapia, 2003; 74:650-657.
50. Nguelefack TB, Mekhfi H, Dongmo AB, Dimo T, Watcho P, Zoheir J *et al*: Hypertensive effects of oral administration of the aqueous extract of *Solanum torvum* fruits in l-name treated rats: Evidence from in vivo and in vitro studies. Journal of Ethnopharmacology, 2009; 124:592-599.
51. Ojewole JA, Adewole SO: Hypoglycaemic and hsypotensive effects of *Globimetula cupulata* (dc) van tieghem (loranthaceae) aqueous leaf extract in rats. Cardiovasc J S Afr, 2007; 18:9-15.
52. Imenshahidi M, Hosseinzadeh H, Javadpour Y: Hypotensive effect of aqueous saffron extract *(crocus sativus l.)* and its constituents, safranal and crocin, in normotensive and hypertensive rats. Phytother Res, 2010; 24:990-994.
53. Ojewole JA, Adewole SO, Olayiwola G: Hypoglycaemic and Hypotensive effects of *Momordica charantia linn* (cucurbitaceae) whole-plant aqueous extract in rats. Cardiovasc J S Afr, 2006;17:227-232.
54. Ojewole JA: Hypoglycaemic and Hypotensive effects of *Harpephyllum caffrum bernh* ex cf krauss (anacardiaceae) stem-bark aqueous extract in rats. Cardiovasc J S Afr, 2006; 17:67-72.
55. Alfieri A, Maione F, Bisio A, Romussi G, Mascolo N, Cicala C: Effect of a diterpenoid from *salvia cinnabarina* on arterial blood pressure in rats. Phytother Res, 2007; 21:690-692
56. Ara N, Rashid M, Amran MS: Comparison of Hypotensive and Hypolipidemic effects of *Catharanthus roseus* leaves extract with atenolol on adrenaline induced hypertensive rats. Pak J Pharm Sci,2009; 22:267-271.
57. Oh KS, Ryu SY, Oh BK, Seo HW, Kim YS, Lee BH: Antihypertensive, Vasorelaxant, and Antioxidant effect of root bark of *Ulmus macrocarpa.* Biol Pharm Bull, 2008;31:2090-2096.
58. Ryu SY, Oh KS, Kim YS, Lee BH: Antihypertensive, Vasorelaxant and Inotropic effects of an ethanolic extract of the roots of *Saururus chinensis*. Journal of Ethnopharmacology, 2008;118:284-289.
59. Eddouks M, Maghrani M, Louedec L, Haloui M, Michel JB: Antihypertensive activity of the aqueous extract of *Retama raetam forssk*. Leaves in spontaneously hypertensive rats. J Herb Pharmacothe, 2007:7:65-77.
60. Ichimura T, Yamanaka A, Ichiba T, Toyokawa T, Kamada Y, Tamamura T *et al*: Antihypertensive effect of an extract of *Passiflora edulis rind* in spontaneously hypertensive rats. Biosci Biotechnol Biochem, 2006; 70:718-721.
61. Saleem R, Ahmad M, Azmat A, Ahmad SI, Faizi Z, Abidi L *et al*: Hypotensive activity, Toxicology and Histopathology of opuntioside-i and methanolic extract of *Opuntia dillenii.* Biol Pharm Bull, 2005;28:1844-1851.
62. Miyazawa N, Okazaki M, Ohga S: Antihypertensive effect of *Pleurotus nebrodensis* in spontaneously hypertensive rats. J Oleo Sci, 2008; 57:675-681.
63. Dehkordi FR, Kamkhah AF: Antihypertensive effect of *Nigella sativa* seed extract in patients with mild hypertension. Fundam Clin Pharmacol, 2008;22:447-452.
64. Hoe SZ, Kamaruddin MY, Lam SK: Inhibition of Angiotensin-converting enzyme activity by a partially purified fraction of *Gynura procumbens* in spontaneously hypertensive rats. Med Princ Pract, 2007;16:203-208.
65. Ghayur MN, Gilani AH: *Radish* seed extract mediates its cardiovascular inhibitory effects via muscarinic receptor activation. Fundam Clin Pharmacol, 2006);20:57-63.
66. Nguelefack-Mbuyo PE, Nguelefack TB, Dongmo AB, Afkir S, Azebaze AG, Dimo T *et al*: Anti-hypertensive effects of the methanol/methylene chloride stem bark extract of *Mammea africana* in l-name-induced hypertensive rats. Journal of Ethnopharmacology, 2008; 117:446-450
67. Wongcome T, Panthong A, Jesadanont S, Kanjanapothi D, Taesotikul T, Lertprasertsuke N: Hypotensive effect and toxicology of the extract from *Coscinium fenestratum* (gaertn.) colebr. Journal of Ethnopharmacology, 2007; 111:468-475.
68. Cherkaoui-Tangi K, Lachkar M, Wibo M, Morel N, Gilani AH, Lyoussi B: Pharmacological studies on Hypotensive, Diuretic and Vasodilator activities of chrysin glucoside from *Calycotome villosa* in rats. Phytother Res, 2008; 22:356-361
69. Gilani AH, Bukhari IA, Khan RA, Shah AJ, Ahmad I, Malik A: Presence of Blood-pressure lowering and spasmolytic constituents in *Buddleja crispa*. Phytother Res, 2009, 23:492-497.
70. Kamadyaapa DR, Gondwe MM, Moodley K, Ojewole JA, Musabayane CT: Cardiovascular effects of *Ekebergia capensis sparrm* (meliaceae) ethanolic leaf extract in experimental animal paradigms. Cardiovasc J Afr, 2009;20:162-167, 169
71. Ojewole JA, Kamadyaapa DR, Gondwe MM, Moodley K, Musabayane CT: Cardiovascular effects of *Persea americana mill* (lauraceae) (avocado) aqueous leaf extract in experimental animals. Cardiovasc J Afr, 2007;18:69-76.
72. Ayinde BA, Omogbai EK, Amaechina FC: Pharmacognosy and Hypotensive evaluation of *Ficus exasperata vahl* (moraceae) leaf. Acta Pol Pharm,2007; 64:543-546
73. Nicasio P, Meckes M: Hypotensive effect of the hydroalcoholic extract from *Jacaranda mimosaefolia* leaves in rats. Journal of Ethnopharmacology, 2005);97:301-304
74. Zeggwagh NA, Farid O, Michel JB, Eddouks M: Cardiovascular effect of *Artemisia herba alba* aqueous extract in spontaneously hypertensive rats. Methods Find Exp Clin Pharmacol,2008; 30:375-381
75. Santos MR, Carvalho AA, Medeiros IA, Alves PB, Marchioro M, Antoniolli AR: Cardiovascular effects of *Hyptis fruticosa* essential oil in rats. Fitoterapia,2007; 78:186-191.