

## ANTIHYPERTENSIVE EFFECT OF SOME MEDICINAL PLANTS IN AYURVEDA: A REVIEW

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### ABSTRACT

The 21<sup>st</sup> century is described as the age of anxiety and stress. This day-to-day stress and strain affect organs in the body through several psychophysical mechanisms. This is leading to the incidence of various psychosomatic diseases, such as the cardiovascular disorder like hypertension is quite significant. Hypertension is a multifactorial disease suffered by many people today. Current conventional treatments have done little to reduce the number of patients with hypertension because they are highly expensive and are usually associated with many side effects. About 80% of the world population relies on the use of traditional medicine, which is predominantly based on plant material. The present review aims to compile data and discuss numerous medicinal plants in *Ayurveda* possessing antihypertensive activity with other activities too.

**Keywords:** Hypertension, Medicinal Plants, Traditional Medicine, Antihypertensive Activity.

### INTRODUCTION

Hypertension is a major risk factor for the development of cardiovascular disease and cerebrovascular disease, causing a high rate of mortality and morbidity. It mainly causes stroke and end-stage renal failure. It

is asymptomatic but produces dreadful effects on the body. Hypertension is defined as a condition in which the blood vessels have persistently raised pressure beyond 140/90 mm of hg. The previously known high

normal blood pressure is currently designated as Pre-hypertensive when the blood pressure is more than 120/80 mm of hg but less than 140/90 mm of hg. Blood pressure is the product of cardiac output and total peripheral vascular resistance.<sup>1</sup> Hypertension is mainly classified as either primary (essential) and secondary. Primary hypertension is a condition with no medical causes and about 90 to 95% of cases are termed primary hypertension. The factors that lead to the development of this disease, vary considerably from patient to patient. Although no direct cause has identified itself, there are many factors such as sedentary lifestyle, stress, visceral obesity, potassium deficiency (hypokalemia),<sup>2</sup> obesity,<sup>3</sup> salts (sodium) sensitivity,<sup>4</sup> alcohol intake,<sup>5</sup> and vitamin D deficiency that increase the risk of high developing hypertension.<sup>6</sup> The remaining 5 to 10% of cases, the cause of hypertension can be attributed to some underlying disease like Atherosclerosis, Acute nephritis etc. and is known as secondary hypertension. During 2015-2016, the prevalence of hypertension was 29.0% and the incidence increased with age viz. age group 18-39, 75% and 40-59, 33.2% and 60 above, 63.1%.<sup>7</sup> The prevalence of hypertension in the urban Indian population was estimated to be 40.8% and that of hypertension in the rural population was 17.9%.<sup>8</sup> Globally the overall prevalence of hypertension in adults aged 25 and above was around 40% in 2008.<sup>9</sup> Several physiological mechanisms are involved in the maintenance of normal blood pressure, and their derangement may play a part in the development of essential hypertension. A great many interrelated factors probably contribute to the raised blood pressure in hypertensive patients, and their relative roles may differ between individuals. Among the factors that have been intensively studied are salt intake, obesity and insulin resistance, the renin-angiotensin system, and the sympathetic nervous system. In the past few years, other factors have been evaluated, including genetics, endothelial dysfunction, low birth weight and intrauterine nutrition and neurovascular anomalies.<sup>10</sup> Hypertension is mainly a lifestyle caused multifactorial disease. The following factors can play a role in the pathophysiology of hypertension.

1. Balance between Cardiac output and Peripheral Resistance.
2. Renin Angiotensin system.
3. Autonomic Nervous system.
4. Endothelial dysfunction.
5. Vasoactive substances like bradykinin, endothelin.
6. Genetic factors.

#### **Ayurvedic Perspective of Hypertension-**

Although no direct reference of any disease with the name having comparable signs and symptoms of hypertension is found in *Ayurvedic* classics, a review of previous theoretical and clinical works on this topic point to a certain mode of involvement of *doshadushya* in the genesis of it. Most of the efforts show a prime role of *Vata* in association with *pitta* and *kapha*. There are different opinions regarding the *Ayurvedic* nomenclature of this clinical condition such as *Raktagatavata*, *Siragatavata*, *Avritavata* etc. *Acharya Charaka* has advised treating such a disease without nomenclature by judging the involvement of *doshadushya* only.<sup>11</sup>

#### **Medicinal Plants and their necessity-**

Many plants that are introduced in the *Ayurvedic* system of medicine have been employing for the treatment of many ailments for thousands of years. According to World Health Organisation, herbal medicines are being used by 80% of the world population primarily in developing countries for primary health care. Herbal medicines are considered Harmless, no, more side effects and fewer adverse effects. It is estimated that about 7,500 plants are used in local health traditions. Out of these, the real medicinal value of the 4,000 plants is little known hitherto unknown to the mainstream population. The classical system of medicine such as *Ayurveda*, *Siddha*, *Unani* and *Tibetan* use about 1,200 Plants. Therefore, fewer side effects, better compatibility and only available treatment for some diseases make the herbal medicines an ideal remedy for the treatment of such diseases,<sup>12</sup> and exploration of herbs that can be used for managing hypertension are of immense importance.

**Aim and Objectives-** To compile and evaluate the Antihypertensive effect of medicinal plants in the Modern scientific data and with *Ayurvedic* properties.

**MATERIALS AND METHODS-**

The study comprises of:

- a) Collection of literature in the Ancient Classical Texts, Scientific Journals, Research Papers,

PubMed, Reference books, World-wide accepted scientific databases, Dissertation etc. concerned with the concept.

- b) The Antihypertensive Drugs, Hypertension disease, Traditional Medicinal Plants, words were used to search in the Online Databases.

**Effective Medicinal Plants on Hypertension-**

Sl. No.	Botanical Name	Common Name	Family	Plant type	Part used	Chemical constituent	Mechanism of action	Formulation
1.	<i>Terminalia arjuna</i> Roxb.	<i>Arjuna</i>	<i>Combretaceae</i>	Tree	Bark	Tannins, triterpenoid saponins, flavonoids, gallic acid, ellagic acid, OPCs, phytosterols, calcium, magnesium, zinc and copper.	Vasorelaxation <sup>13</sup> and dose-dependent decrease in arterial BP as well as heart rate.	Bark extract
2.	<i>Convolvulus pluricaulis</i> Chois.	<i>Shankhapuspi</i>	<i>Convolvaceae</i>	Shrub	Whole plant	Convolvuline, convolidine, confoline, volatile oils, hydrocarbon, palmitic acid, linoleic acid, D-glucose, steroids-phytosterols.	Antidepressant activity <sup>14</sup> , anti-stress activity <sup>15</sup> , Cardioprotective, heart strengthener and control hypertension. <sup>16</sup>	Aqueous extract of the plant
3.	<i>Nordostachyus jatamansi</i> DC.	<i>Jatamansi</i>	<i>Valerianaceae</i>	Herb	Root	Ursolic acid, nardosinonediol, aristolen-9beta-ol, oleanolic acid, beta-sitosterol.	<i>Jatamansi</i> has hypnotic and CNS relaxant properties. <i>Jatamansi</i> have many properties hypolipidemic, antioxidant, sedative, tranquillizing, antihypertensive, antidepressant-like activity, hypotensive properties. <sup>17</sup>	Aqueous extract of roots
4.	<i>Withania somnifera</i> Dunal.	<i>Ashwagandha</i>	<i>Solanaceae</i>	Shrub	Root	Withanolides, hentriconance, phytosterol.	<i>Ashwagandha</i> contains chemicals that might help calm the brain and reduce lower blood pressure. The Hypotensive effect mainly due to autonomic ganglion blocking action and that a depressant action on the higher cerebral centres so contributed to the hypotension. <sup>18</sup>	Root extract
5.	<i>Boerhavia diffusa</i> Linn.	<i>Punarnava</i>	<i>Nyctaginaceae</i>	Herb	Root	Liriodendrin & hypoxanthine. Punarnavine	Ca channel antagonist <sup>19</sup>	Methanolic extract of roots
6.	<i>Tinospora cordifolia</i> Willd.	<i>Giloy</i>	<i>Menispermaceae</i>	Climbing shrub	Stem, root	Alkaloids, phytosterols, glycosides, tinosporaside, tinospora acid, tinosporin.	<i>Tinospora cordifolia</i> is known as a <i>medhya rasayana</i> (learning	Root extract

							and memory enhancer) in <i>Ayurveda</i> . The root of <i>T. cordifolia</i> is known to be used traditionally for its anti-stress activity. <sup>20</sup>	
7.	<i>Nigella sativa</i> Linn.	<i>Kalongi</i>	<i>Ranunculaceae</i>	Herb	Seed	Thymoquinone, dithymoquinone, thymohydroquinone, thymol, carvacrol, tanethole and 4-terpineol.	Anti-atherosclerosis, ACE inhibitor, nitrodilators. <sup>21</sup>	The oral dose of an extract
8.	<i>Allium sativum</i> Linn.	<i>Lahsun</i>	<i>Liliaceae</i>	Bulbous/Herb	Flower bud	Minerals, enzymes, amino acids, about 33 sulphur compounds.	Vasodilating effects on the carotid arteries and aorta, reduces blood pressure and enhances the diameter of venules and arterioles <sup>22,23,24</sup> the increase of nitric oxide production <sup>25</sup> , ACE inhibitor	Dried garlic
9.	<i>Centella asiatica</i> (Linn.) Urban	<i>Bharmanduki</i>	<i>Apiaceae</i>	Herb	Whole plant	Saponins (Asiatic acid, centelloside and medecassosides), flavonoid, amino acids, tannins and sugar.	The herbal extract reduces the resting flux and increases the veno arterial response. <sup>26</sup>	Powder
10.	<i>Zingiber officinalis</i> Roscoe.	<i>Adarak</i>	<i>Zingiberaceae</i>	Herb	Rhizome	Volatile oil and sesquiterpenes (bisabolene zingiberene and zingiberol)	Induces $Ca^{+2}$ channel-blocking activity	Crude extract
11.	<i>Elaeocarpus ganitrus</i> Roxb.	<i>Rudraksha</i>	<i>Elaeocarpaceae</i>	Small tree	Whole plant	Quercetin, rudrakin, gallic acid, ellagic acid	Inhibits Angiotensin Converting Enzyme activity	Aqueous extract
12.	<i>Carum copticum</i> Benth. & Hook.	<i>Ajwain</i>	<i>Apiaceae</i>	Herb	Seeds	Thymol	Produces a dose-dependent fall in arterial blood pressure, fall in BP and heart rate (HR), and calcium channel blocking (CCB) effect. <sup>27</sup>	Crude extract, Juice orally. <sup>28</sup>
13.	<i>Cassia absus</i> Linn.	<i>Chaksu</i>	<i>Caesalpinaceae</i>	Herb	Leaves, roots, seeds	Linoleic acid and linolenic acids.	Produces a dose-related decrease in systemic arterial blood pressure, accompanied by a decrease in heart rate.	Methanolic seed extract. <sup>29</sup>
14.	<i>Cassia occidentalis</i> Linn.	<i>Kashondi</i>	<i>Caesalpinaceae</i>	Small tree	Leaf	Alkaloids <sup>30</sup>	Relaxation of smooth muscle and reduction of BP by inhibiting $Ca^{+2}$ influx through the receptor-operated channel and voltage-sensitive channel, showing its non-	Leaf extract

							selectivity on these Ca <sup>+2</sup> channels. <sup>31</sup>	
15.	<i>Daucus carota</i> Var. Sativa DC.	Gajar	Apiaceae	Herb	Aerial part	Two coumarin glycosides coded as DC-2 and DC-3. <sup>32</sup>	Blockade of calcium channels	Intravenous administration of these glycosides <sup>33</sup> .
16.	<i>Lavandula stoechus</i> Linn.	Uastkhudus	Aamiaceae	Herb	Flower and oil	Essential oil <sup>34</sup>	Calcium channel blockers	Crude extract
17.	<i>Ocimum basilicum</i> Linn.	Basil	Lamiaceae	Herb	Leaves, stem	Linalol, eugenol, caryophyllene, rosmarinic, estragole and methyl cinammate <sup>35</sup>	Blocking the calcium channels <sup>36</sup>	Infusion (crude extract)
18.	<i>Punica granatum</i> Linn.	Dadim	Lythraceae	Shrub	Fruit	Polyphenols that include flavonoids, condensed tannins and hydrolyzable tannins <sup>37</sup>	Reduces the activity of angiotensin-converting enzymes (ACE) by about and decreases systolic blood pressure. <sup>38</sup>	Juice
19.	<i>Momordica charantia</i> Linn.	Karela	Curcubitaceae	Herb	Whole plant	Triterpenes, protein, steroids, polyphenols, alkaloids, lipids and inorganics <sup>39</sup>	Reduce the systemic BP and heart rate	Maceration
20.	<i>Elettaria cardamomum</i> Maton	Choti elaychii	Zingiberaceae	Herb	Seeds, fruits	1,8-cineole	Blocks Ca <sup>+2</sup> channels	Fruits powder, crude extract <sup>40</sup>
21.	<i>Tribulus terrestris</i> Linn.	Gokharu	Zygophyllaceae	Herb	Fruit	Flavonoids, flavonol glycosides, steroidal, saponins and alkaloids	Increases NO, Reduces ACE <sup>41</sup>	Aqueous extract
22.	<i>Viola odorata</i> Linn.	Banfasha	Violaceae	Hardy herb	Leaves	Alkaloids, saponins, tannins, phenolics, coumarins and flavonoids	Increases NO, Regulates Ca <sup>+2</sup> . <sup>42</sup>	Leaves extract
23.	<i>Pueraria lobate</i> Willd.	Kudzu	Fabaceae	Herb	Dry root	Isoflavones	Attenuates cardiac and aortic hypertrophy, cardiac fibrosis and phospho-ERK1/2 with a mild reduction in SBP. <sup>43</sup>	Ethanol extract of roots
24.	<i>Crocus sativus</i> Linn.	Saffron	Iridaceae	Herb	Stigmas, petals	Flavonols, carotenoids, phenolic compounds, anthocyanins, terpenoids and alkaloids, crocin, safranal, picrocrocin.	Blocks Ca <sup>+2</sup> channels, reduces oxidative stress. <sup>44</sup>	Aqueous and ethanol extracts of <i>Crocus sativus</i> petals.
25.	<i>Andrographis paniculata</i> Nees.	Kalmegh	Acanthaceae	Herb	Whole plant	14-deoxy-11, 12-didehydrographolide,	Blocks Ca <sup>+2</sup> channels, reduces ACE. <sup>45</sup>	Extract of the whole plant
26.	<i>Rauwolfia serpentina</i> Benth ex. Kurz	Sarpagandha	Apocynaceae	Shrub	Root	Rauwolfanine, rescanscine, reserpine, reserpine, serpentine, ajmaline	Adrenergic blocking agent. ACE inhibitor	Root extract

## DISCUSSION

Hypertension is a serious disease affecting a significant population globally. Hypertension is managed in *Ayurveda* with herbs having *vata-pitta shamaka* action with an affinity to CNS and CVS. *Ayurveda* medicinal plants contain many phytochemicals that have been effective in lowering blood pressure and improving heart

functions. The pharmacological activities of plants and their isolates affect the pathogenesis of hypertension by modulating several parameters like endothelial function, ROS production, pro-inflammatory signaling, platelet activation, opening and closing of ion channels, ACE inhibition. This review article documented several medicinal plants and their mode of

action that have been reported to be effective in the management of hypertension in the field of *Ayurveda*. This study finds that the most researched and frequently utilized medicinal plants for the treatment of hypertension are *Sarpagandha*, *Jatamamsi*, *Punarnava*, *Arjuna*, *Ashwagandha*, *Gokshura*, *kalmegh*.

- a) The chemical constituents of *Andrographis paniculata* 14-deoxy-11, 12-didehydroandrographolide decrease the level of  $Ca^{+2}$ .<sup>46</sup>
- b) The chemical constituents of *Crocus sativus* mainly crocin act as  $Ca^{+2}$  channel blockers and reduced heart rate.<sup>47</sup>
- c) Antihypertensive activity of reserpine, Indole derivatives isolated from *Rauwolfia serpentina* can reduce both systolic and diastolic blood pressure.<sup>48</sup>
- d) *Punarnava* contains active principles like Liriodendrin & Hypoxanthine which are active anti-hypertensive agents, and the former is  $Ca^{+2}$  channel antagonist. It acts as a diuretic by increasing renal blood flow.<sup>49</sup>

Chemical constituents of above, mentioned herbs acts on CNS & CVS, attenuates both systolic and diastolic blood pressure, ACE inhibitor and induces  $ca^{+2}$  channel-blocking activity. In other words, herbs having anti-hypertensive, stress-reducing, cardio-tonic, diuretic, antioxidant actions are used to manage this condition.

## CONCLUSION

Natural medicinal products are considered in the case of primary healthcare because of better cultural acceptability, safety, potency, and lesser side effects. Several traditional herbal medicines and supplements have been recognized as potential therapeutic agents to manage hypertension and its associated complications. This review aims to document medicinal plants having potential Antihypertensive action given in *Ayurveda*. This compilation may help the Researchers, Pharmaceutical companies, and Investigators to further use these plants for Clinical research purposes.

## REFERENCES

1. Chalmers J et al, WHO-ISH Hypertension Guidelines Committee. 1999 World Health Organization-International Society of Hypertension Guidelines. *J. Hypertens.* 1999, 17: 151- 183.
2. Kyrou I, Chrousos GP, Tsigos C. Stress, visceral obesity, and metabolic complications. *Ann N. Y. Acad Sci*, 2006, 1083: 77-110.
3. Wofford MR, Hall JE. Pathophysiology and treatment of obesity hypertension, *Curr Pharma Design*, 2004, 10: 3621-27.
4. Lackland DT, Egan BM, Dietary salt restriction and blood pressure in clinical trials. *Curr Hypertens Rep*, 2007, 9: 314-9.
5. Djousse L, Mukamal KJ, Alcohol consumption and risk of hypertension, Dose the type of beverage or drinking pattern matter. *Rev Esp Cardiol*, 2009, 62: 603-5.
6. Lee JH, O'Keefe JH, Bell D, Hensrud DD, Holick MF. Vitamin D deficiency an important, common, and easily treatable cardiovascular risk factor. *J Am Coll Cardiol*, 2008, 52: 1949-56.
7. Cheryl D. fryar, Yechian Ostchega, Craigm M. Hales and Deanna Kruszon-Moran, Prevalence of hypertension among adults, 2015-2016, available from: <https://www.cdc.gov.nchs/databriefs no. 289, October 2017>.
8. Midhan Tanu et al, Prevalence of hypertension in India: A meta-analysis *World J Meta-Anal*, 2013, August 26, 1(2): 83-89.
9. World Health Organization, Global Health Repository available from: [http://www.who.int/gho/ncd/risk\\_factors/blood\\_pressure\\_prevalence\\_text/en/index.html](http://www.who.int/gho/ncd/risk_factors/blood_pressure_prevalence_text/en/index.html). Last accessed February 6, 2015.
10. Beevers G, Lip GY, O'Brien E. ABC of hypertension: The pathophysiology of hypertension. *BMJ*. 2001, 322 (7291): 912-916, DOI: 10. 1136/bmj.322.7291-912.
11. Pt. Kasinatha Pandaya and Dr Gorakha Natha Chaturvedi Ji, Agnivesh, Charaka Samhita with Vidyotini Hindi commentary, Varanasi. Reprint year: 2013 Chaukhamba Bharati Academy, Sutra sthan chapter 18, Pg. 44-47.
12. Sohail, F. and M.N. Sohail. Despite its weedy nature is an important medicinal plant of NWEP, Pakistan. *Int. J. Pharmacol*, 2011. 7: 747-748.
13. Dwivedi S, Agarwal MP. Antianginal and cardioprotective effects of *Terminalia arjuna*, an indigenous drug in coronary heart disease. *J Assoc Physi Ind*. 1994, 42: 287-289.
14. International Research Journal of Pharmacy (ISSN 2230-8407), Review article of Velishala Hindu IRJP 2012.3(1).



15. Dinesh Dhingra, Rekhavalecha, Evaluation of the anti-depressant like activity of *Convolvulus pluricaulis* Choisy. In the mouse forced swim and tail suspension tests (Med scimonit) 2007, 13(7): BR 155-161.
16. Singh 1997, Shukla 1981 a, 1981 b.
17. International Journal Med. Arom. Plants. ISSN 2249-4340 (Vol. 3, no. 1, PP 113-124, March 2013) [Rahman, H, Murlidharan, 2010] Comparative study of anti-depressant activity of methanolic extract of *Nordostachys jatamansi* DC. Rhizome on normal and sleep derived mice. De Pharmacia Lettre, 2(5): 441-449.
18. Malhotra CL, Das PK, Dhalla NS, Prasad K. Studies on *Withania ashwagandha*, Kaul III. The effect of total alkaloids on the cardiovascular system and respiration. Indian J Med Res 1981, 49: 448-460.
19. Vandana S. Nade, Laxman A. Kawale, Anjali B. Tanjanpure. Antihypertensive Potential of *Boerhavia diffusa* Linn. In Adrenaline-induced Hypertensive Model. International Journal of Experimental Pharmacology, 2015, 5(10): 24-30.
20. Reena Kulkarni et al, 2010 Apr-Jun, 1(2): 112-121, International Journal of Ayurvedic Research.
21. Prema Modak, Satyajit Halder, Bidduth Kumar Sarkar, Ananya Das, Arghya Prosun Sarkar and Sukalyan Kumar Kundu, Traditional Antihypertensive Medicinal Plants. World Journal of Pharmacy and Pharmaceutical Sciences, vol. 9, 884-912, 2020.
22. Lash, JP., LR. Cardoso, PM. Mesler, DA. Walczak and R. Pollak. The effect of garlic on hypercholesterolemia in renal transplant patients. Transplant. Proc, 1998, 30: 189-191.
23. Schulz, VR. Hansel and VE Tyler. Rational Phytotherapy, A Physicians Guide to Herbal Medicine. Springer, Berlin, Germany, 1979;306.
24. Korotkov, VM, The effect of garlic juice on blood pressure. Vrach. Delo, 1966; 6: 123.
25. 49 Plants That Treat High Blood Pressure. <https://wildfoodism.com/2014/01/49-plants-that-treat-high-blood-pressure>.
26. Prema Modak, Satyajit Halder, Bidduth Kumar Sarkar, Ananya Das, Arghya Prosun Sarkar and Sukalyan Kumar Kundu, Traditional Antihypertensive Medicinal Plants. World Journal of Pharmacy and Pharmaceutical Sciences, vol. 9, 884-912, 2020.
27. AH. Gilani, Q. Jabeen, MN. Ghayur, KH. Janbaz, MS. Akhtar. Studies on the antihypertensive, antispasmodic, bronchodilator and hepatoprotective activities of the *Carum copticum* seed extract, 2005, 8, 98(1-2): 127-35.
28. Mohammad Hossein Boskabady, Saeed Alitaneh and Azam Alavinezhad. *Carum copticum*, A Herbal Medicine with various Pharmacological effects. BioMed Research Internal, 2014, 11: ID 569087.
29. Saeed Ahmad, Ayesha Hassan, Waheed Mumtaz Abbasi, Tayyeba Rehman. Phytochemistry and pharmacological potential of *Cassia absus*- A review. Journal of Pharmacy and Pharmacology, 2017, 70(1), 27-41.
30. Vijayalakshmi S, Ranjitha J, Devi Rajeswari V, Bhargiyalakshmi M. Pharmacological Profile of *Cassia occidentalis* Linn. – A Review. International Journal of Pharmacy and Pharmaceutical Sciences, 2013, 5(3): 29-33.
31. Ajagbonna OP, Majiminiyi FBO, Sofola OA. Relaxant effects of the aqueous leaf extract of *Cassia occidentalis* on rat aortic rings. Afr J Biomed Res, 2001, 4: 127-9.
32. Fu HW, Zhang L, Yi T, Feng YL, Tian JK. Two new guaiane-type sesquiterpenoids from the fruits of *Daucus carota* Linn. Fitoterapia, 2010, 81: 443-6.
33. Mahammad Shakheel B, Tripathi Saliyan, Satish S and Karunakar Hedge. Therapeutic Uses of *Daucus carota*- A Review. International Journal of Pharma and Chemical Research, 2017, 3(2): 138-143.
34. Lavender. [www.rxlist.com/lavender/supplements.htm](http://www.rxlist.com/lavender/supplements.htm).
35. Azhar I, Aftab K, Usmanghani K. Naturally occurring calcium channel blockers. Hamdard Medicus, 1995, 38: 5-16.
36. Ibarrola DA, Montalbetti Y, Heinichen O, Alvarenga N, Figueredo A, Ferro EA. Isolation of hypotensive compounds from *Solanum sisymbriifolium*. J Ethnopharmacol, 70: 301-7.
37. Hamid Reza Rahimi, Mohammad Arastoo, and Seyed Nasser Ostad. A Comprehensive Review of *Punica granatum* Properties in Toxicological, Pharmacological, Cellular and Molecular Biology Research. Iran J Pharm Res, 2012, 11(2): 385-400.
38. Glaucé SB, Viana, Silvana Magalhaes Siqueira Menezes, Luciana N. Cordeiro, F.J.A. Matos. Biological Effects of Pomegranate, especially its Antibacterial Actions Against Micro-organisms Present in the Dental Plaque and Other Infectious Processes. Bioactive Foods in Promoting Health, 2010, 457: 459-478.
39. Kumar DS, Sharathnath KV, Yogeswaran P, Harani A, Sudhakar K, Sudha P, Banji D. A medicinal potency

- of *Momordica charantia*. *Int. J. Pharmaceut Sci Review Res*, 2010, 1: 95-100.
40. Archana Sengupta and Shamee Bhattacharjee. Cardamom and its Active Constituent, I, 8-cineole. *Molecular Targets and Therapeutic Uses of Spices*, 2009, 65-85.
  41. Sharifi AM, Darabi R, Akbarloo N. Study of antihypertensive mechanism of *Tribulus Terrestris* in 2K1C hypertensive rats: role of tissue ACE activity. *Life Sci.*, 2003, 73(23): 2963-71.
  42. Hasan S Siddiqi, Malik H Mehmood, Najeeb U Rehman, and Anwar H Gilani. Studies on the antihypertensive and antidyslipidemic activities of *Viola odorata* leaves extract. *Lipids Health Dis.*, 2012, 11:6.
  43. Chunxiang Tan, Aimei Wang, Chan Liu, Yao Li, Yuepin Shi and Ming-Sheng Zhou. Puerarin Improves Vascular Insulin Resistance and Cardiovascular Remodeling in Salt- Sensitive Hypertension. *The American Journal of Chinese Medicine*, 2017, 45(6): 1169-1184.
  44. H. A. El-Beshbishy, M.H. Hassan, M.A. Aly, S.A. Doghish, A.A. Alghaithy, *Ecotoxicol. Environ. Saf.* 83, 47-54 (2012). <https://doi.org/10.1016/j.ecoenv.2012.06.003>
  45. T. Jayakumar, C.-Y. Hsieh, J.-J Lee, J.-R. Sheu, *Evid. Based Complement. Alternat. Med.* 2013, 1-16 (2013). <https://doi.org/10.1155/2013/846740>
  46. B. Salehi, A. Venditti, C. Frezza, A. Yucetepe, U. Altuntas, S. Uluata, M. Butnariu, I. Sarac, S. Shaheen, S.A. Petropoulos, K.R. Matthews, C.S. Kilic, M. Atanassova, C.O. Adetunji, A.O. Ademiluyi, B.Ozcelik, P.V.T. Fokou, N. Martins, W.C. Cho, J. Sharifi-Rad. *Appl. Sci.* 9, 3547-3586 (2019). <https://doi.org/10.3390/app9173547>
  47. P.D.D. Dzeufiet, A. Mogueo, D.C. Bilanda, B-F.O. Aboubakar, L. Tedong, T. Dimo, P. Kamtchouing, *MBC Complement. Altern. Med.* 14, 507-519 (2019).
  48. K. Kiran, A. J. Priya, R. G. Devi, *Drug Invent. Today* 10 (1), 2674-2678 (2018).
  49. Kumar A, Singhal T, Upadhyay BN: PUNARNAVA- A Potential Rejuvenator, *Dav's Ayurveda*, issue-20, vol. 1, 2011. [www.davayurvedaezine.com/ezine/feb\\_2009/punarnava\\_a\\_potential\\_rejuvenator.php](http://www.davayurvedaezine.com/ezine/feb_2009/punarnava_a_potential_rejuvenator.php).

## ABBREVIATIONS

BP- Blood pressure, SBP- Systolic blood pressure, OPCs- Oligomeric proanthocyanidins, ACE-

Angiotensin-converting enzyme, P-ERK- Phospho-intracellular signal-related kinase, CNS- Central nervous system, CVS- Cardiovascular system, ROS- Reactive oxygen species

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