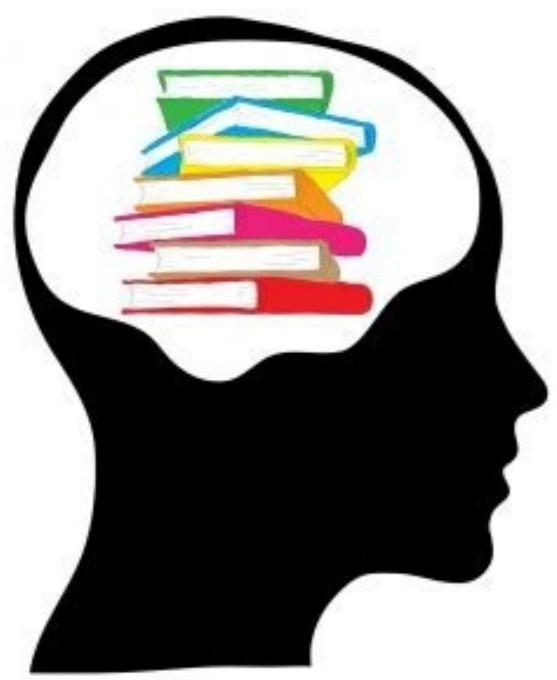
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Antioxidant and DNA damage preventive properties of Bacopa monniera (L.) wetstt. *Free Rad Antioxid.* (2011) 1:84-90. 10.5530/ax.2011.1.13 [CrossRef] [Google Scholar]7.

Russo A, Izzo AA, Borrelli F, Renis M, Vanella A. Free radical scavenging capacity and protective effect of Bacopa monniera L. on DNA damage. *Phytother Res.* (2003) 17:870-5.



10.1002/pr.1061 [PubMed] [CrossRef] [Google Scholar]8. Phulara SC, Shukla V, Tiwari S, Pandey R. Bacopa monnieri promotes longevity in Caenorhabditis elegans under stress conditions. *Pharmacogn Mag.* (2015) 11:410. 10.4103/0973-1296.153097 [PMC free article] [PubMed] [CrossRef] [Google Scholar]9. Oyouni AAA, Saggou S, Tousson E, Mohan A, Farasani A. Mitochondrial nephrotoxicity induced by tacrolimus (FK-506) and modulatory effects of Bacopa monnieri (Farafakh) of Tabuk region. *Pharmacognosy Res.* (2019) 11:4103/pr.100_18 [CrossRef] [Google Scholar]10. Abdul Manap AS, Vijayabalan S, Madhavan P, Chia YY, Arya A, Wong EH, et al. Bacopa monnieri, a neuroprotective lead in Alzheimer Disease: a review on its properties, mechanisms of action, and preclinical and clinical studies. *Drug Target Insights.*



(2019) 13:1177392819866412. 10.1177/1177392819866412 [PMC free article] [PubMed] [CrossRef] [Google Scholar]11. Bhandari P, Kumar N, Singh B, Kaul VK. Cucurbitacins from Bacopa monnieri. *Phytochemistry.* (2007) 68:1248-54. 10.1016/j.phytochem.2007.03.013 [PubMed] [CrossRef] [Google Scholar]12. Chakravarty AK, Sarkar T, Nakane T, Kawahara N, Masuda K. New phenylethanoid glycosides from Bacopa monniera. *Chem Pharm Bull.* (2002) 50:1616-8. 10.1248/cpb.50.1616 [PubMed] [CrossRef] [Google Scholar]13. Rauf K, Subhan F, Al-Othman A, Khan I, Zarrelli A, Shah M. Preclinical profile of bacosides from Bacopa monnieri (BM) as an emerging class of therapeutics for management of chronic pains. *Curr Med Chem.* (2013) 20:1028-37. 10.2174/09296713805288897 [PubMed] [CrossRef] [Google Scholar]14. Chatterji N, Rastogi R, Dhar M. Chemical examination of Bacopa monniera Wetstt: Part I-isolation of chemical constituents. *Indian J Chem.* (1963) 1:212-5. [Google Scholar]15. Mathew J, Paul J, Nandhu M, Paulose C. Bacopa monnieri and Bacoside-A for ameliorating epilepsy associated behavioral deficits. *Fitoterapia.* (2010) 81:315-22. 10.1016/j.fitote.2009.11.005 [PubMed] [CrossRef] [Google Scholar]16. Deepak M, Amit A. The need for establishing identities of bacoside A and B', the putative major bioactive saponins of Indian medicinal plant Bacopa monnieri. *Phytomedicine.* (2004) 11:264. 10.1078/0944-7113-00351 [PubMed] [CrossRef] [Google Scholar]17. Bhandari P, Sendri N, Devidas SB. *Drug Deliv.* (2012) 9:55-62.



Dammarane triterpenoid glycosides in Bacopa monnieri: a review on chemical diversity and bioactivity. *Phytochemistry.* (2020) 172:112276. 10.1016/j.phytochem.2020.112276 [PubMed] [CrossRef] [Google Scholar]18. Kishore K, Singh M. Effect of bacosides, alcoholic extract of Bacopa monniera Linn. (brahmi), on experimental amnesia in mice. *Indian J Exp Biol.* (2005) 43:640-5.

[PubMed] [CrossRef] [Google Scholar]19. Deepak M, Amit A. 'Bacoside B'-the need remains for establishing identity. *Fitoterapia.* (2013) 87:7-10. 10.1016/j.fitote.2013.03.011 [PubMed] [CrossRef] [Google Scholar]20. Sivaramakrishna C, Rao CV, Trimurtulu G, Vanisree M, Subbaraju GV. Triterpenoid glycosides from Bacopa monnieri. *Phytochemistry.* (2005) 66:2719-28. 10.1016/j.phytochem.2005.09.016 [PubMed] [CrossRef] [Google Scholar]21. Chandel R, Kulshreshtha D, Rastogi R. Bacogenin-A3: a new saponogen from Bacopa monnieri. *Phytochemistry.* (2007) 68:1248-54. 10.1016/j.phytochem.2007.03.013 [PubMed] [CrossRef] [Google Scholar]22. Kulshreshtha D, Rastogi R. Bacogenin-A1: a novel dammarane triterpene saponogen from Bacopa monnieri. *Phytochemistry.* (1974) 13:1205-6. 10.1016/0031-9422(74)80101-9 [CrossRef] [Google Scholar]24. Kulshreshtha D, Rastogi R. Identification of ebelin lactone from Bacoside A and the nature of its genuine saponogenin. *Phytochemistry.* (1973) 12:2074-6. 10.1016/S0031-9422(00)91552-8 [CrossRef] [Google Scholar]25. Rastogi S, Pal R, Kulshreshtha DK. Bacoside A3? A triterpenoid saponin from Bacopa monnieri. *Phytochemistry.* (1994) 36:133-7. 10.1016/S0031-9422(90)97026-2 [PubMed] [CrossRef] [Google Scholar]26. Chakravarty AK, Garai S, Masuda K, Nakane T, Kawahara N. Bacosides III-V: three new triterpenoid glycosides from Bacopa monnieri. *Chem Pharma Bull.* (2003) 51:215-7. 10.1248/cpb.51.215 [PubMed] [CrossRef] [Google Scholar]27. Chakravarty AK, Sarkar T, Masuda K, Shiojima K, Nakane T, Kawahara N. Bacoside I and II: two pseudojujubogenin glycosides from Bacopa monnieri. *Phytochemistry.* (1996) 42:815-20. 10.1016/0031-9422(95)00936-1 [PubMed] [CrossRef] [Google Scholar]29. Garai S, Mahato SB, Ohtani K, Yamasaki K. Dammarane-type triterpenoid saponins from Bacopa monnieri. *Phytochemistry.* (1996) 42:815-20. 10.1016/0031-9422(95)00936-1 [PubMed] [CrossRef] [Google Scholar]31. Garai S, Mahato SB, Ohtani K, Yamasaki K. Bacosapaponin DA pseudojujubogenin glycoside from Bacopa monnieri. *Phytochemistry.* (1996) 43:447-9. 10.1016/0031-9422(96)00250-6 [PubMed] [CrossRef] [Google Scholar]30. Mahato SB, Garai S, Chakravarty AK. Bacosapaponins E and F: two jujubogenin bisdesmosides from Bacopa monnieri. *Phytochemistry.* (2000) 53:711-4. 10.1016/S0031-9422(99)00384-2 [PubMed] [CrossRef] [Google Scholar]31. [PubMed] [CrossRef] [Google Scholar]32. Sinha J, Raay S, Das N, Meddi S, Garai S, Mahato S, et al. Bacosapaponin C: critical evaluation of anti-leishmanial properties in various delivery modes. *Drug Deliv.* (2002) 9:55-62.

10.1080/107175402753413181 [PubMed] [CrossRef] [Google Scholar]33. Miro M. Cocurbitacins and their pharmacological effects. *Phytther Res.* (1995) 9:159-68. 10.1002/ptr.2650090302 [CrossRef] [Google Scholar]34. Chowdhury AR, Mandal S, Mittra B, Sharma S, Mukhopadhyay S, Majumder HK. Retulinic acid, a potent inhibitor of eukaryotic topoisomerase I: identification of the inhibitory sites, the major functional group responsible and development of more potent derivatives. *Mod Sci Monit.* (2002) 8:BR254-60. 10.12659/MS.937927 [PubMed] [CrossRef] [Google Scholar]35. Ghosh T, Maity TK, Singh J. Antihyperglycemic activity of bacoside, a triterpene from Bacopa monnieri, in alloxan-induced diabetic rats. *Planta Med.* (2011) 77:904-8. 10.1055/s-0030-1250600 [PubMed] [CrossRef] [Google Scholar]36. Paethorne HM, Smith E, Tomita Y, Nakane T, Yoo AJ, Price TJ, et al. Bacosides I and II act in synergy to inhibit the growth, migration and invasion of breast cancer cell lines. *Molecules.* (2018) 24:3539. 10.3390/molecules24193539 [PMC free article] [PubMed] [CrossRef] [Google Scholar]37. Pai JV, Kourghi M, De Leo ML, Campbell EM, Dorward HS, Hardingham JE, et al. Differential inhibition of water and ion channel activities of mammalian aquaporin-1 by two structurally related bacoside compounds derived from the medicinal plant bacopa monnieri. *Phytochemistry.* (2016) 116:10582 [PubMed] [CrossRef] [Google Scholar]38. Smith E, Paethorne HM, Tomita Y, Pai JV, Townsend AR, Price TJ, et al. The purified extract from the medicinal plant Bacopa monnieri, bacoside II, inhibits growth of colon cancer cells in vitro by inducing cell cycle arrest and apoptosis. *Cells.* (2018) 7:81. 10.3390/cells7010081 [PMC free article] [PubMed] [CrossRef] [Google Scholar]39. Puoti C. New insights on hepatocellular carcinoma: epidemiology and clinical features. *Hepatoma Res.* (2018) 4:57.

10.2051/2394-5079.2018.67 [CrossRef] [Google Scholar]40. Garg A, Kumar A, Nair A, Reddy A. Elemental analysis of brahmi (Bacopa monnieri) extracts by neutron activation and its bioassay for antioxidant, radio protective and anti-lipid peroxidation activity. *J Radioanal Nuclear Chem.* (2009) 281:53-8. 10.1007/s10967-009-0081-z [CrossRef]

[Google Scholar]41. Ghosh T, Maity T, Bose A, Dash GK, Das M. A study on antimicrobial activity of Bacopa monnieri Linn. aerial parts. *J Nat Remed.* (2006) 6:170-3. [Google Scholar]42. Xu Z, Shi M, Tian Y, Zhao P, Niu Y, Liao M. Dirhamnolipid produced by the pathogenic fungus Colletotrichum gloeosporioides BWH-1 and its herbicidal activity. *Molecules.* (2019) 24:2969. 10.3390/molecules24162969 [PMC free article] [PubMed] [CrossRef] [Google Scholar]43. Janani P, Sivakumari K, Geetha A, Ravisan Kar B, Parthasarathy C. Chemopreventive effect of bacoside A on N-nitrosodiethylamine-induced hepatocarcinogenesis in rats. *J Cancer Res Clin Oncol.* (2010) 136:759-70. 10.1007/s00432-009-0715-0 [PubMed] [CrossRef] [Google Scholar]44. Janani P, Sivakumari K, Geetha A, Yuvaraj S, Parthasarathy C. Bacoside A downregulates matrix metalloproteinases 2 and 9 in DEN-induced hepatocellular carcinoma. *Cell Biochem Funct.* (2010) 28:164-9. 10.1002/cbf.1638 [PubMed] [CrossRef] [Google Scholar]45. Menon BR, Rath J, Thirumoothi L, Gopalakrishnan V. Potential effect of Bacopa monnieri on nitrobenzene induced liver damage in rats. *Indian J Biochem.* (2010) 25:401-4. 10.1007/s12291-010-0048-4 [PMC free article] [PubMed] [CrossRef] [Google Scholar]46. Keime-Guibert F, Chinot O, Taillandier L, Cartalat-Carel S, Frenay M, Kantor G, et al. Radiotherapy for glioblastoma in the elderly. *N Engl J Med.* (2007) 356:1527-35. 10.1056/NEJMoa065901 [PubMed] [CrossRef] [Google Scholar]47.

Minniti G, Muni R, Lanzetta G, Marchetti P, Enrichi RM. Chemotherapy for glioblastoma: current treatment and future perspectives for cytotoxic and targeted agents. *Anticancer Res.* (2009) 29:5171–84. [PubMed] [Google Scholar]48. Hovinga KE, Shimizu F, Wang R, Panagiotakos G, Van Der Heijden M, Moayedpazdzi H, et al.. Inhibition of notch signaling in glioblastoma targets cancer stem cells via an endothelial cell intermediate. *Stem Cells.* (2010) 28:1019–29. 10.1002/stem.429 [PMC free article] [PubMed] [CrossRef] [Google Scholar]49. Kanamori M, Kawaguchi T, Nigro JM, Feuerstein BG, Berger MS, Miele L, et al.. Contribution of Notch signaling activation to human glioblastoma multiforme. *J Neurosurg.* (2007) 106:417–27. 10.3171/jns.2007.106.3.417 [PubMed] [CrossRef] [Google Scholar]50. Westphal M, Maire CL, Lamszus K. EGFR as a target for glioblastoma treatment: an unfulfilled promise. *CNS Drugs.* (2017) 31:723–35. 10.1007/s40263-017-0456-6 [PMC free article] [PubMed] [CrossRef] [Google Scholar]51. Nogueira L, Ruiz-Ontanón P, Vazquez-Barquero A, Moris F, Fernandez-Luna JL. The NF κ B pathway: a therapeutic target in glioblastoma. Oncotarget. (2011) 2:646. 10.18632/oncotarget.322 [PubMed] [CrossRef] [Google Scholar]52. Abbas M, Kausar S, Cui H. Therapeutic potential of natural products in glioblastoma treatment: targeting key glioblastoma signaling pathways and epigenetic alterations. *Clin Transl Oncol.* (2020) 22:963–7. 10.1007/s12094-019-02227-3 [PubMed] [CrossRef] [Google Scholar]53. Mishra R, Kaur G. Aqueous ethanolic extract of *Tinospora cordifolia* as a potential candidate for differentiation based therapy of glioblastomas. *PLoS ONE.* (2013) 8:e78764. 10.1371/journal.pone.0078764 [PMC free article] [PubMed] [CrossRef] [Google Scholar]54. Racoma IO, Meisen WH, Wang Q-E, Kaur B, Wan A. Thymoquinone inhibits autophagy and induces cathepsin-mediated, caspase-independent cell death in glioblastoma cells. *PLoS ONE.* (2013) 8:e72882. 10.1371/journal.pone.0072882 [PMC free article] [PubMed] [CrossRef] [Google Scholar]55.

Tavani E, Mollazadeh H, Mohatahari E, Modaresi SMS, Hosseini A, Sabri H, et al.. Quercetin and its polyphenolic metabolites for the treatment of glioblastoma multiforme. *BioFactors.* (2020) 46:356–66. 10.1002/bf.21605 [PubMed] [CrossRef] [Google Scholar]56. John S, Sivakumar K, Mishra R, Bacsoide A induces tumor cell death in human glioblastoma cell lines through catastrophic macropinocytosis. *Front Mol Neurosci.* (2017) 10:171. 10.3389/fnmol.2017.00171 [PMC free article] [PubMed] [CrossRef] [Google Scholar]57. Louis CU, Shohet JM. Neuroblastoma: molecular pathogenesis and therapy. *Annu Rev Med.* (2015) 66:49–63. 10.1146/annurev-med-011514-023121 [PMC free article] [PubMed] [CrossRef] [Google Scholar]58. Łojewski M, Pomierny B, Muszyńska B, Kowalewski W, Budziszewska B, Szewczyk A. Protective effects of *Bacopa monnieri* on hydrogen peroxide and staurosporine-induced damage of human neuroblastoma SH-SY5Y cells. *Planta Med.* (2016) 82:205–10. 10.1055/s-0035-1558166 [PubMed] [CrossRef] [Google Scholar]59. Petcharat K, Singh M, Ingkaninan K, Attar J, Yasothornsrkul S. *Bacopa monnieri* protects SH-SY5Y cells against tert-Butyl hydroperoxide-induced cell death via the ERK and PI3K pathways. *Sriraj Med.* (2016) 67:20–6. [PMC free article] [PubMed] [CrossRef] [Google Scholar]60. Atlas D. International Diabetes Federation IDF Diabetes Atlas. 7th ed. Brussels: International Diabetes Federation (2015). [Google Scholar]61. Al-Attar AM, Alsalmi FA. Influence of olive leaves extract on hepatorenal injury in streptozotocin diabetic rats. *Saudi J Biol Sci.* (2019) 26:1865–74. 10.1016/j.sjbs.2017.02.005 [PMC free article] [PubMed] [CrossRef] [Google Scholar]62. Edwin J, Balakrishnan JS, Chandra JD. Diabetes and herbal medicines. *Iran J Pharmacol Therap.* (2008) 97–106. [Google Scholar]63. Kooti W, Farokhipour M, Asadzadeh Z, Ashتary-Larky D, Asadi-Saman M. The role of medicinal plants in the treatment of diabetes: a systematic review. *Electron Physician.* (2016) 8:1832. 10.19082/1832 [PMC free article] [PubMed] [CrossRef] [Google Scholar]64.

Rao MU, Sreenivasulu M, Chengaiha B, Reddy KJ, Chetty CM. Herbal medicines for diabetes mellitus: a review. *Int J PharmTech Res.* (2010) 2:1883–92. [Google Scholar]65. Ghosh T, Sengupta P, Dash D, Bose A. Antidiabetic and in vivo antioxidant activity of ethanolic extract of *Bacopa monnieri* Linn. aerial parts: a possible mechanism of action. *Iran J Pharm Res (IJPRI).* (2008) 7: 61–8. [Google Scholar]66. Kishore L, Kaur N, Singh R. Renoprotective effect of *Bacopa monnieri* via inhibition of advanced glycation end products and oxidative stress in STZ-nicotinamide-induced diabetic nephropathy. *Ren Fail.* (2016) 38:1528–44.

10.1080/0886022X.2016.1227920 [PubMed] [CrossRef] [Google Scholar]67. Pandey SP, Singh HK, Prasad S. Alterations in hippocampal oxidative stress, expression of AMPA receptor GluR2 subunit and associated spatial memory loss by *Bacopa monnieri* extract (CDRI-08) in streptozotocin-induced diabetes mellitus type 2 mice. *PLoS One.* (2015) 10:e0131862. 10.1371/journal.pone.0131862 [PMC free article] [PubMed] [CrossRef] [Google Scholar]68. Hosamani R. The efficacy of *Bacopa monnieri* extract in modulating Parkinson's disease. In: *Genetics, Neurology, Behavior, and Diet in Parkinson's Disease.* (2010). Cambridge, MA: Elsevier. p. 609–24. 10.1016/B978-0-12-815950-7.00039-4 [CrossRef] [Google Scholar]69. Singh B, Pandey S, Runman M, Mahdi AA. Neuroprotective effects of *Bacopa monnieri* in Parkinson's disease model. *Metab Brain Dis.*

International Diabetes Federation IDF Diabetes Atlas. 7th ed. Brussels: International Diabetes Federation (2015). [Google Scholar]70. Al-Attar AM, Alsalmi FA. Influence of olive leaves extract on hepatorenal injury in streptozotocin diabetic rats. *Saudi J Biol Sci.* (2019) 26:1865–74. 10.1016/j.sjbs.2017.02.005 [PMC free article] [PubMed] [CrossRef] [Google Scholar]71. Edwin J, Balakrishnan JS, Chandra JD. Diabetes and herbal medicines. *Iran J Pharmacol Therap.* (2008) 97–106. [Google Scholar]72. Kooti W, Farokhipour M, Asadzadeh Z, Ashتary-Larky D, Asadi-Saman M. The role of medicinal plants in the treatment of diabetes: a systematic review. *Electron Physician.* (2016) 8:1832. 10.19082/1832 [PMC free article] [PubMed] [CrossRef] [Google Scholar]74.

Rao MU, Sreenivasulu M, Chengaiha B, Reddy KJ, Chetty CM. Herbal medicines for diabetes mellitus: a review. *Int J PharmTech Res.* (2010) 2:1883–92. [Google Scholar]75. Ghosh T, Sengupta P, Dash D, Bose A. Antidiabetic and in vivo antioxidant activity of ethanolic extract of *Bacopa monnieri* Linn. aerial parts: a possible mechanism of action. *Iran J Pharm Res (IJPRI).* (2008) 7: 61–8. [Google Scholar]76. Medina M, Avila J. New perspectives on the role of tau in Alzheimer's disease. *Implic Ther Biochem Pharmacol.* (2014) 88:540–7. 10.1016/j.bcp.2014.01.013 [PubMed] [CrossRef] [Google Scholar]77. Dhanasekaran M, Tharakarn B, Holcomb LA, Hitt AR, Young KA, Manayam BV. Neuroprotective mechanisms of ayurvedic antidiabetic botanical *Bacopa monnieri*. *Phytomed.* (2007) 21:965–9. 10.1002/ptr.2195 [PubMed] [CrossRef] [Google Scholar]78.

Ssingh H, Rastogi R, Srimal R, Dhawal B. Effect of bacosides A and B on avoidance response in rats. *Phytomed.* (1988) 2:70–5. 10.1002/ptr.2650020205 [CrossRef] [Google Scholar]79. Das TK, Hamid M, Das T, Shad KF. Potential of Glyco-withanolides from *Withania Somnifera* (Ashwagandha) as therapeutic agents for the treatment of Alzheimer's disease. *World J Pharm Res.*

(2015) 4:16–38. [Google Scholar]80.

Esfandian E, Ghadiani M, Rashidi B, Mokhtarian A, Vatankhah AM. The effects of *Acorus calamus* L. in preventing memory loss, anxiety, and oxidative stress on lipopolysaccharide-induced neuroinflammation rat models. *Int J Prev Med.* (2018) 9:85. 10.4103/jipm.IJPM.75_18 [PMC free article] [PubMed] [CrossRef] [Google Scholar]81.

Habtemariam S. The therapeutic potential of rosemary (*Rosmarinus officinalis*) diterpenes for Alzheimer's disease. *Evid Based Complement Altern Med.* (2016) 2016:2680409. 10.1155/2016/2680409 [PMC free article] [PubMed] [CrossRef] [Google Scholar]82. Kim H-J, Jung S-W, Kim S-Y, Cho I-H, Kim H-C, Rhim H, et al.. Panax ginseng as an adjuvant treatment for Alzheimer's disease. *J Ginseng Res.* (2018) 42:401–11. 10.1016/j.jgr.2017.12.008 [PMC free article] [PubMed] [CrossRef] [Google Scholar]83. Liao Z, Cheng L, Li X, Zhang M, Wang S, Huo R. Meta-analysis of Ginkgo biloba preparation for the treatment of Alzheimer's disease. *Clin Neuropharmacol.* (2020) 43:93–9.

10.1097/WNF.0000000000000394 [PubMed] [CrossRef] [Google Scholar]84.

Abubandit N, Wattanathorn J, Mucimapun S, Ingkaninan K. Cognitive enhancement and neuroprotective effects of *Bacopa monnieri* in Alzheimer's disease model. *J Ethnopharmacol.* (2010) 127:26–31. 10.1016/j.jep.2009.09.056 [PubMed] [CrossRef] [Google Scholar]85. Holcomb LA, Dhanasekaran M, Hitt AR, Young KA, Riggs M, Manayam BV. *Bacopa monnieri* extract reduces amyloid levels in PSAPP mice. *J Alzheimers Dis.*

(2016) 9:243–51. 10.3233/JAD-20069303 [PubMed] [CrossRef] [Google Scholar]86. Mathew M, Subramanian S. Evaluation of the anti-amyloidogenic potential of nootropic herbal extracts in vitro. *Int J Pharm Sci.* (2012) 3:4276–80. [Google Scholar]87. Roy S, Chakravarthy S, Talukdar P, Talapatra SN. Identification of bioactive compounds present in *Bacopa monnieri* against caspase-3 and Tau Protein Kinase I to prevent Alzheimer's disease: an *in silico* study. *Pharma Innov. J.* (2019) 8:855–61. [Google Scholar]88. Sidique YH, Mujtaba SF, Faisal M, Jyoti S, Naz F. The effect of *Bacopa monnieri* leaf extract on dietary supplementation in transgenic Drosophila model of Parkinson's disease. *Eur J Integr Med.* (2016) 6:571–80.

10.1016/j.eujim.2014.05.007 [PMC free article] [PubMed] [CrossRef] [Google Scholar]89. Naqvi AAT, Jairajpuri DS, Norman OM, Hussain A, Islam A, Ahmad F, et al.. Evaluation of pyrazolopyrimidine derivatives as microtubule affinity regulating kinase 4 inhibitors: towards therapeutic management of Alzheimer's disease. *Curr Top Med Chem.* (2020) 20:1059–73. 10.2174/15680266066200106125910 [PubMed] [CrossRef] [Google Scholar]90.

Shamsi A, Mohammad T, Anwar S, Alajmi MF, Hussain A, Hassan MI, et al.. Probing the interaction of Rivastigmine Tartrate, an important Alzheimer's drug, with serum albumin: attempting treatment of Alzheimer's disease. *Int J Biol Macromol.* (2020) 148:533–42. 10.1016/j.ijbiomac.2020.01.134 [PubMed] [CrossRef] [Google Scholar]91. Bondi MW, Edmunds EC. Alzheimer's disease: past, present, and future. *J Int Neuropsychol Soc.* (2017) 23:818–31. 10.1017/S135561771700100X [PMC free article] [PubMed] [CrossRef] [Google Scholar]92. Medeiros R, Baglietto-Vargas D, LaFerla FM. The role of tau in Alzheimer's disease and related disorders. *CNS Neurosci Ther.* (2011) 17:514–24. 10.1111/j.1755-5949.2010.00177.x [PubMed] [CrossRef] [Google Scholar]93.

Medina M, Avila J. New perspectives on the role of tau in Alzheimer's disease. *Implic Ther Biochem Pharmacol.* (2014) 88:540–7. 10.1016/j.bcp.2014.01.013 [PubMed] [CrossRef] [Google Scholar]94. Dhanasekaran M, Tharakarn B, Holcomb LA, Hitt AR, Young KA, Manayam BV. Neuroprotective mechanisms of ayurvedic antidiabetic botanical *Bacopa monnieri*. *Phytomed.* (2007) 21:965–9. 10.1002/ptr.2195 [PubMed] [CrossRef] [Google Scholar]95.

Singh H, Rastogi R, Srimal R, Dhawal B. Effect of bacosides A and B on avoidance response in rats. *Phytomed.* (1988) 2:70–5. 10.1002/ptr.2650020205 [CrossRef] [Google Scholar]96.

Das TK, Hamid M, Das T, Shad KF. Potential of Glyco-withanolides from *Withania Somnifera* (Ashwagandha) as therapeutic agents for the treatment of Alzheimer's disease. *World J Pharm Res.*

(2015) 4:16–38. [Google Scholar]97.

Esfandian E, Ghadiani M, Rashidi B, Mokhtarian A, Vatankhah AM. The effects of *Acorus calamus* L. in preventing memory loss, anxiety, and oxidative stress on lipopolysaccharide-induced neuroinflammation rat models. *Int J Prev Med.* (2018) 9:85. 10.4103/jipm.IJPM.75_18 [PMC free article] [PubMed] [CrossRef] [Google Scholar]98.

Habtemariam S. The therapeutic potential of rosemary (*Rosmarinus officinalis*) diterpenes for Alzheimer's disease. *Evid Based Complement Altern Med.* (2016) 2016:2680409. 10.1155/2016/2680409 [PMC free article] [PubMed] [CrossRef] [Google Scholar]99. Kim H-J, Jung S-W, Kim S-Y, Cho I-H, Kim H-C, Rhim H, et al.. Panax ginseng as an adjuvant treatment for Alzheimer's disease. *J Ginseng Res.* (2018) 42:401–11. 10.1016/j.jgr.2017.12.008 [PMC free article] [PubMed] [CrossRef] [Google Scholar]100. Liao Z, Cheng L, Li X, Zhang M, Wang S, Huo R. Meta-analysis of Ginkgo biloba preparation for the treatment of Alzheimer's disease. *Clin Neuropharmacol.* (2020) 43:93–9.

10.1097/WNF.0000000000000394 [PubMed] [CrossRef] [Google Scholar]101.

Abubandit N, Wattanathorn J, Mucimapun S, Ingkaninan K. Cognitive enhancement and neuroprotective effects of *Bacopa monnieri* in Alzheimer's disease model. *J Ethnopharmacol.* (2010) 127:26–31. 10.1016/j.jep.2009.09.056 [PubMed] [CrossRef] [Google Scholar]102. Malishew R, Chekhan N, Nandi S, Kalishava S, Gorit E, Jelesh E, Palusz D, Bacoide-A, an Indian traditional medicine substance, inhibits β -amyloid cytotoxicity, fibrillation, and membrane interactions. *ACS Chem Neurosci.* (2017) 8:894–91. 10.1021/acscchemneuro.6b00438 [PubMed] [CrossRef] [Google Scholar]103.

Chen J, Niu S, Nandi S, Kalishava S, Gorit E, Jelesh E, Palusz D, Bacoide-A, an Indian traditional medicine substance, inhibits β -amyloid cytotoxicity, fibrillation, and membrane interactions. *ACS Chem Neurosci.* (2017) 8:894–91. 10.1021/acscchemneuro.6b00438 [PubMed] [CrossRef] [Google Scholar]104.

Malishew R, Chekhan N, Nandi S, Kalishava S, Gorit E, Jelesh E, Palusz D, Bacoide-A, an Indian traditional medicine substance, inhibits β -amyloid cytotoxicity, fibrillation, and membrane interactions. *ACS Chem Neurosci.* (2017) 8:894–91. 10.1021/acscchemneuro.6b00438 [PubMed] [CrossRef] [Google Scholar]105.

Chen J, Niu S, Nandi S, Kalishava S, Gorit E, Jelesh E, Palusz D, Bacoide-A, an Indian traditional medicine substance, inhibits β -amyloid cytotoxicity, fibrillation, and membrane interactions. *ACS Chem Neurosci.* (2017) 8:894–91. 10.1021/acscchemneuro.6b00438 [PubMed] [CrossRef] [Google Scholar]106.

Malishew R, Chekhan N, Nandi S, Kalishava S, Gorit E, Jelesh E, Palusz D, Bacoide-A, an Indian traditional medicine substance, inhibits β -amyloid cytotoxicity, fibrillation, and membrane interactions. *ACS Chem Neurosci.* (2017) 8:894–91. 10.1021/acscchemneuro.6b00438 [PubMed] [CrossRef] [Google Scholar]107.

Malishew R, Chekhan N, Nandi S, Kalishava S, Gorit E, Jelesh E, Palusz D, Bacoide-A, an Indian traditional medicine substance, inhibits β -amyloid cytotoxicity, fibrillation, and membrane interactions. *ACS Chem Neurosci.* (2017) 8:894–91. 10.1021/acscchemneuro.6b00438 [PubMed] [CrossRef] [Google Scholar]108.

Malishew R, Chekhan N, Nandi S, Kalishava S, Gorit E, Jelesh E, Palusz D, Bacoide-A, an Indian traditional medicine substance, inhibits β -amyloid cytotoxicity, fibrillation, and membrane interactions. *ACS Chem Neurosci.* (2017) 8:894–91. 10.1021/acscchemneuro.6b00438 [PubMed] [CrossRef] [Google Scholar]109.

Malishew R, Chekhan N, Nandi S, Kalishava S, Gorit E, Jelesh E, Palusz D, Bacoide-A, an Indian traditional medicine substance, inhibits β -amyloid cytotoxicity, fibrillation, and membrane interactions. *ACS Chem Neurosci.* (2017) 8:894–91. 10.1021/acscchemneuro.6b00438 [PubMed] [CrossRef] [Google Scholar]110.

Malishew R, Chekhan N, Nandi S, Kalishava S, Gorit E, Jelesh E, Palusz D, Bacoide-A, an Indian traditional medicine substance, inhibits β -amyloid cytotoxicity, fibrillation, and membrane interactions. *ACS Chem Neurosci.* (2017) 8:894–91. 10.1021/acscchemneuro.6b00438 [PubMed] [CrossRef] [Google Scholar]111.

Malishew R, Chekhan N, Nandi S, Kalishava S, Gorit E, Jelesh E, Palusz D, Bacoide-A, an Indian traditional medicine substance, inhibits β -amyloid cytotoxicity, fibrillation, and membrane interactions. *ACS Chem Neurosci.* (2017) 8:894–91. 10.1021/acscchemneuro.6b00438 [PubMed] [CrossRef] [Google Scholar]112.

Malishew R, Chekhan N, Nandi S, Kalishava S, Gorit E, Jelesh E, Palusz D, Bacoide-A, an Indian traditional medicine substance, inhibits β -amyloid cytotoxicity, fibrillation, and membrane interactions. *ACS Chem Neurosci.* (2017) 8:894–91. 10.1021/acscchemneuro.6b00438 [PubMed] [CrossRef] [Google Scholar]113.

Malishew R, Chekhan N, Nandi S, Kalishava S, Gorit E, Jelesh E, Palusz D, Bacoide-A, an Indian traditional medicine substance, inhibits β -amyloid cytotoxicity, fibrillation, and membrane interactions. *ACS Chem Neurosci.* (2017)