

A literature based study on *Juglans regia*: A Review

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ABSTRACT

Exhaustive literature study revealed that existing prospections in *Juglans regia* nut inhabitants of the Mediterrean Basin allowed to choose captivating plants. Several cultivars has been opted for wide *Juglans regia* nuts with diluent shells. It is also ripped as an attractive decorative variety tree in parks & large grounds. As such, it has expanded the Royal Horticultural Society's Award of Garden Merit. Various activities have been reported so far on the plant including modification in haematological parameters, anti-fungal activity, nutritive potential & anti-diabetic activity.

Key Words: *Juglans regia*, Literature survey, Pharmacological activities.

INTRODUCTION

Existing prospections in *Juglans regia* nut inhabitants of the Mediterrean Basin allowed to choose captivating plants. In the central Centuries, the adjacent-manner entreaty was habituated everywhere another time in southern Turkey by merchants roaming along the Silk Road. *Juglans regia* germ plasm in China is hypothetical to has been accessible from Central Asia about 2001 years ago, & in few areas has established spontaneously. Cultured *Juglans regia* was familiarized amongst western & northern Europe right initially, in Roman times or earlier, & to the Americas in the middle of 17th century, by English planters. Important nut-growing areas comprise France, Greece, Bulgaria, Romania & in Europe; China in Asia; Baja California including Coahuila in Mexico, while Chile in Latin America. Newly, cultivation has level to other counties, such as New Zealand including southeast of Australia. It is cropped

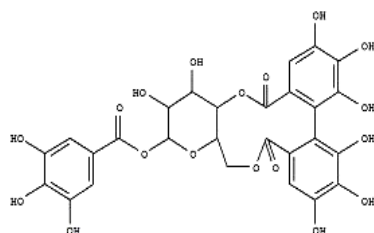
widely from 29° to 51° of autonomy in the Northern Hemisphere & from 29° to 41° in the Southern Hemisphere. Its high-brilliance fruits those are consumed in form of fresh or pressed for their splendidly laced oil. Several cultivars has been opted for wide *Juglans regia* nuts with diluent shells. It is also ripped as an attractive decorative variety tree in parks & large grounds. As such, it has expanded the Royal Horticultural Society's Award of Garden Merit.

Plant Profile

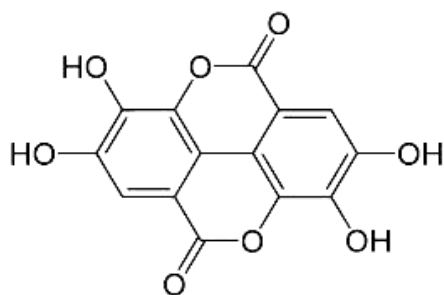
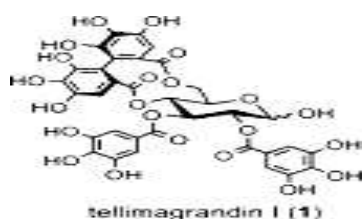
The *Juglans regia* (walnut) belongs to the genus *Juglans* family *Juglandaceae*, predominantly the Persian or English walnut is *Juglans regia*. Precisely it is used for edible purposes after processing. Nut-meat of the eastern black walnut is less commercially available. The walnut is densed in nutrients having protein & essential fatty acids.

The 2 most common species of *Juglans regia* are cropped for the seeds. These are Persian & English *Juglans regia* & black *Juglans regia*. The English walnut (*J. regia*) invented in Persia, while the black walnut from eastern North America. The black walnut having elevated in flavor, but having hard shell with poor hulling specularities it is not cropped for commercial purposes. Several *Juglans regia* cultivars had been industrialized at commercial level, which are approximately all fusions of the English *Juglans regia*.

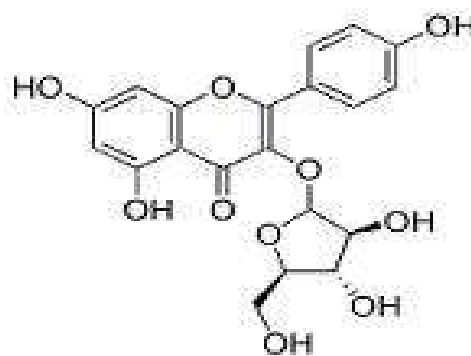
Structure of isolated compounds of *J. regia*



Strictinin (Shimoda et al, 2009)



Ellagic acid



Juglanin

Uses

The plant is reported pharmacologically to be used in various disease conditions as Antibacterial, Antifungal, Antiviral activity, Anti-oxidant, Antidiabetic, Anthelmintic, Anti-inflammatory, Antidepressant, Antityrosinase, Hepatoprotective, Hypotriglyceridemic & anticancer agents.

Apart from these wonderful uses walnut in the diet improves motor & cognitive ability including enhanced performance on rod walking, Institute for Basic Research in Developmental Disabilities has reported that methanolic extract of walnut improves the symptoms of Alzheimer's disease. It is also reported that walnuts may be responsible for its anti-amyloidogenic activity. Likewise, it was observed that two of its prime constituents in walnuts i.e. gallic & ellagic acid which act as "dual-inhibitors" of the acetylcholinesterase enzyme. These findings recommend that walnuts may diminish the hazard or interrupt the occurrence of Alzheimer's disease by preserving amyloidprotein in the soluble practice hence preventing the breakdown of acetylcholine.

Nutritional facts

Juglans regia nut without their shells contains 4 percent water, 15 percent protein, 65 percent fat, & 14 percent carbohydrates with 7 percent dietary fibers.

In a 100 gram of serving, *Juglans regia* nut energise 655 calories & rich content of diverse edible minerals, predominantly manganese at 162% D.V. & vitamin B.

Unlike mostly nuts those are maximum in mono unsaturated fatty acids, *Juglans regia* nut oil is made up of principally of polyunsaturated fatty acids as 71 percent of total fats, chiefly alpha-linolenic acid 13 percent & linoleic acid 57 percent, even though it contains oleic acid 12.5 percent of all over fats.

Conclusions

The existing study was a literature based review on *Juglans regia* and its constituents in the modern era & in previous few years. The study places of interest the conventional uses of the plant including various scientific endorsement of the appealed biological potential *in vivo* & *in vitro*. To best of my acquaintance & literature survey solitary one instance of contact inflammation in dermis was reported subsequently later shelling 15 kilos *Juglans regia* nut. The toxicological studies of numerous ancillary metabolites that donate to its remedial values are still in its beginning & are fetching an imperative restrictive factor for employing the metabolites as healing agent. Further, segregation & characterization of potential secondary metabolites accountable for several

biological activities have not yet been fundamentally illuminated, mechanism of actions, objective organ of toxicity & molecular appliance also lacking to be explored. Supplementary trials in humans are obligatory to find out the potential of *Juglans regia* extracts..

References

1. Gandev, S. Budding and grafting of the walnut (*Juglans regia* L.) and their effectiveness in Bulgaria (Review). *Bulgar. J. Agri. Sci.*, 2007, 13:683-689.
2. Caglarirmak N. Biochemical and physical properties of some walnut genotypes (*Juglans regia* L). *Nahrung Food*. 2003, 47:28– 32.
3. Crews C, et al. Study of the main constituents of some authentic walnut oils. *J. Agric. Food. Chem.*, 2005, 53:4853-4860.
4. Martinez ML, et al. Walnut (*Juglans regia* L.): genetic resources, chemistry, by-products. *J. Sci. Food. Agric.*, 2010, 90: 1959- 1967.
5. Muradoglu FH, et al. Some chemical composition of walnut (*Juglans regia* L.) selections from Eastern Turkey. *Afr. J. Agric. Res.*, 2010, 5: 2379-2385.
6. Pereira JA, et al. Bioactive properties and chemical composition of six walnut (*Juglans regia* L.) cultivars. *Food Chem. Toxicol.*, 2008, 46: 2103-2111.
7. Savage GP. Chemical composition of walnuts (*Juglans regia* L.) grown in New Zealand. *Plant Foods Hum. Nutr.*, 2001, 56: 75- 82.
8. Davis L, et al. The effects of high walnut and cashew nut diets on the antioxidant status of subjects with metabolic syndrome. *Eur. J. Nutr.*, 2007, 46: 155-164.
9. Amaral JS, et al. Determination of sterol and fatty acid compositions, oxidative stability, and nutritional value of six walnut (*Juglans regia* L.) cultivars grown in Portugal. *J. Agric. Food Chem.*, 2003, 51: 7698-7702.
10. Muradolu F. Selection of promising genotypes in native walnut (*Juglans regia* L.) populations of Hakkari central and Ahlat (Bitlis) district, and genetic diversity. PhD dissertation, University of Yuzuncu Yil, Turkey. 2005.
11. Mitrovic M, et al. Biochemical composition of fruits of some important walnut cultivars and selections. *Proceeding of the third International walnut held at Alcobaca, Portugal, Congress. Acta. Horticult*; 1997, 442: 205- 207.

12. Sze-Tao and Sathe SK. Walnut (*Juglans regia* L.): proximate composition, protein solubility, protein amino acid composition and protein in vitro digestibility. *J. Sci. Food Agric.*, 2000, 80:1393–1401.
13. Venkatachakm M, and Sathe SK. Chemical composition of selected edible nut seeds. *J. Agric. Food. Chem.*, 2006, 54:4705– 4714.
14. Ravai M. Quality characteristics of califonia walnuts. *Cereal Foods World*; 2009, 37: 362-366.
15. Payne T. California walnuts and light food. *Cereal Foods World* ; 1985, 30: 215-218.
16. Souci SW, et al. Food composition and nutrition tables. Medpharm, CRC Press, Stuttgart. 1994.
17. Cosmulescu S, et al. Mineral composition of fruits in different walnut (*Juglans regia* L.) Cultivars. *Not. Bot. Hort. Agrobot. Cluj.*, 2009, 37:156-160.
18. Girzu M, et al. Sedative effect of walnut leaf extract and juglone, an isolated constituents. *Pharm. Biol.*, 1998, 36: 280-286.
19. Mouhajir F, et al. Multiple antiviral activities of endemic medicinal plants used by Berber people of Morocco. *Pharm. Biol.*, 2001, 39: 364-374.
20. Vaidyaratnam PSV. Indian Medicinal Plants a Compendium of 500 species. Orient Longman Private Limited, Chennai 2005, 3: 264-65.
21. Fujita T, et al. Traditional medicine in Turkey VII. Folk medicine in Middle and West Black Sea regions. *Econ. Bot.*, 1995, 49: 406-422.
22. Yesilada E. Biodiversity in Turkish Folk Medicine. In: Sener, B. (Ed.), *Biodiversity: Biomolecular Aspects of Biodiversity and Innovative Utilization*. Kluwer Academic/Plenum Publishers, London, 2002, pp. 119–135.
23. Kim HG, et al. Growth-inhibiting activity of active component isolated from *Terminalia chebula* fruits against intestinal bacteria. *J. Food Prot.*, 2006, 69:2205-2209.
24. Jaradat NA. Medical plants utilized in Palestinian folk medicine for treatment of diabetes mellitus and cardiac diseases. *J. Al-Aqsa Univ.*, 2005, 19:1-28
25. Kaileh Mb, et al. Screening of indigenous Palestinian medicinal plants for potential anti-inflammatory and cytotoxic activity *J. Ethnopharmacol.*, 2007, 113: 510-516
26. Spaccarotella KJ, et al. The effect of walnut intake on factors related to prostate and vascular health in older men. *Nutr* 2008, J.,7:13.
27. Gruenwald J. et al. PDR for Herbal Medicines, Medicinal Economic. 2001.
28. Robbers JE and Tyler VE. *Tyler's Herbs of Choice: The therapeutic use of phytomedicinals*, The Havvorth Herbal Press, New York; 1999.
29. Ali-Shtayeh MS and Abu Ghdeib SI. Antifungal activity of plant extracts against dermatophytes. *Mycoses.*, 1999, 42: 665-772.
30. Blumenthal M. *Herbal Medicine (Expanded Commision E Monographs), Integrative Medicine Communications*, Newton Publisher, England. 2000.
31. Baytop T. *Therapy with Medicinal Plants in Turkey (Past and Present)*, 2nd Ed., Nobel Medicine Publisher, Turkey. 1999.
32. Papoutsi Z, et al. Walnut extract (*Juglans regia* L.) and its component ellagic acid exhibit anti-inflammatory activity in human aorta endothelial cells and osteoblastic activity in the cell line KS483. *British J. Nutr.*, 2008, 99:715-722.
33. Liu L, et al. Newalpha-tetralonylglucosides from the fruit of *Juglans mandshurica*. *Chem.Pharm.Bull. Tokyo*; 2004, 52:566-569.
34. Torres-Gonzalez. Protective effect of four Mexican plants against CCl4 –induced damage in the hyh7 human hepatoma cell. *Annals hematology.*, 2011, 10:73-79.
35. Ibrar MFH, Sultan A. Ethnobotanical studies on plant resources of Ranyal Hill, District Shangla, Pakistan. *Pak.J.Bot.*, 2007, 39:329-337.
36. Kunwar RM, and Adhikari N. Ethnomedicine of Dolpa district, Nepal: the plants, their vernacular names and uses. *J. Ecol. App.*, 2005, 8:43-49
37. Tagarelli G, et al. Folk medicine used to heal malaria in Calabria (southern Italy). *J. Ethnobiol. Ethnomed.*, 2010, 6:27.
38. Deshpande RR, et al. Antimicrobial Activity Of different extracts of *Juglans Regia* L. against Oral Microflora. *Int. J. Pharm. Pharm. Sci.*, 2011, 3:200-201.
39. Poyrazolu EC, and Biyik H. Antimicrobial activity of the ethanol extracts of some plants natural growing in Aydin, Turkey. *Afr.J . Microbiol. Res.*, 2010, 4: 2318-2323.
40. Oliveira I, et al. Total phenols, antioxidant potential and antimicrobial activity of walnut (*Juglans regia* L.) green husks. *Food Chem. Toxicol.*, 2008, 46: 2326-2331.
41. Qa'dan F, et al. Characterization of antimicrobial polymeric procyanidins from *Juglans regia* leaf extract. *Eur. J. Sci. Res.*, 2005a, 11:438-443.
42. Qa'dan F, et al. The Antimicrobial Activities of *Psidium guajava* and *Juglans regia* Leaf Extracts to acne-developing organisms. *Am. J. Chin. Med.*, 2005b, 33: 197–204.

43. Citoglu GS and Altanlar N . Antimicrobial activity of some plants used in folk medicine. J. Fac. Pharm. Ankara., 2003, 32:159- 163. Company, New York.
44. Shah T.I, et al. Preliminary phytochemical evaluation and anti-bacterial potential of different leaf extracts of *Juglans regia*: A ubiquitous dry fruit from Kashmir-India. Int.J.Pharm.Sci.Rev.Res; 19(2), Mar-Apr 2003; 93-96.
45. Cruz-Vega DE, et al. Antimycobacterial activity of *Juglans regia*, *Juglans mollis*, *Carya illinoensis* and *Bocconia frutescens*. Phytother. Res., 2008, 22:557-559.
46. Nariman F, et al. Anti-Helicobacter pylori activities of six Iranian Plants. Helicobacter., 2004, 9:2.
47. Kong Y, et al. Natural product Juglone targets three key enzymes from *Helicobacter pylori*: inhibition assay with crystal structure characterization. Acta Pharmacologica Sinica., 2008, 29: 870-876.
48. Upadhyay V, et al. Antifungal activity and preliminary phytochemical analysis of stem bark extracts of *Juglans regia* linn. IJPBA., 2010c, 1:442-447
49. Ahmad S, et al. Fungistatic Action of *Juglans*. Antimicrob. Agents Chemother., 1973, 3:436-438.
50. Mei-zhi Z, et al. Study on Extraction Conditions of Active Antiviral Substance from Walnut Leaves. Chemistry and Industry of Forest Products. 02 [Abstract]. 2007.
51. Qamar W, and Sultana S. Polyphenols from *Juglans regia* L. (Walnut) kernel modulate cigarette smoke extract induced acute inflammation, oxidative stress and lung injury in Wistar rats. Hum. Exp. Toxicol., 2011, 30:499-506.
52. Carvalho M, et al. Human cancer cell antiproliferative and antioxidant activities of *Juglans regia* L. Food Chem. Toxicol., 2010, 48: 441-447.
53. Abbasi MA, et al. Investigation on the volatile constituents of *Juglans regia* and their in vitro antioxidant potential. Pakistan Acad. Sci., 2010, 47:137-141.
54. Rahimipناه M, et al. Antioxidant activity and phenolic contents of Persian walnut (*Juglans regia* L.) green husk extract. Afr. J. Food Sci. Technol., 2010, 1:105-111.
55. Zhang Z, et al. Antioxidant phenolic compounds from walnut kernels (*Juglans regia* L.). Food Chem., 2009b, 113: 160-165.
56. Almeida IF, et al. Walnut (*Juglans regia*) leaf extracts are strong scavengers of pro-oxidant reactive species. Food Chem., 2008, 106:1014-1020.
57. Fukuda T, et al. Antioxidative polyphenols from walnuts (*Juglans regia* L.) Phytochem., 2003, 63: 795-801.
58. Bullo M, et al. Effect of whole walnuts and walnut-skin extracts on oxidant status in mice. J. Nutr., 2010, 26: 823-828.
59. Zhang J, et al. Chemical constituents in green walnut husks of *Juglans regia*. Chinese Traditional and Herbal Drugs. 2009a, 06 [Abstract].
60. Fukuda T, et al. Effect of the walnut polyphenol fraction on oxidative stress in type 33 2 diabetes mice. Biofactors., 2004, 2: 251-253.
61. Jelodar G, et al. Effect of walnut leaf, coriander and pomegranate on blood glucose and histopathology of pancreas of alloxan induced diabetic rats. Afr. J. Trad. CAM., 2007, 43: 299-305.
62. Kale AA, et al. In vitro anthelmintic activity of stem bark of *Juglans regia* L. J. Chem. Pharm. Res., 2011, 3:298-302.
63. Upadhyay V, et al. Anthelmintic activity of the stem bark of *Juglans regia* Linn. Res J. Pharm. Phytochem. (RJPP) 2010a, 2: 465-467
64. Mei-zhi Z, et al. A Study on the Bioactivity of Secondary Metabolites from Walnut Green Gull University. Journal of Northwest Forestry University-01 [Abstract]. 2006.
65. Erdemoglu N, et al. Anti-inflammatory and antinociceptive activity assessment of plants used as remedy in Turkish folk medicine. J. Ethnopharmacol., 2003, 89: 123-129.
66. Mokhtari M, et al. Effect of alcohol extract from leave *Juglans regia* on antinociceptive induced by morphine in formalin test. Med. Sci. J. Islam. Azad. Uni., 2008, 18: 85-90.
67. Rath BP and Pradhan D. Antidepressant Activity of *Juglans regia* L. fruit extract. Int. J. Toxicol. Pharmacol. Res., 1992, 1: 24- 26.
68. Ozer B, and Kivc MB. Antityrosinase activity of some plant extracts and formulations containing ellagic acid. Pharm. Biol., 2007, 5: 519-524.
69. Aitani M and Shimoda H. The Effect of Ascorbic Acid and Arbutin on B16 Melanoma cells. Japan Food Sci., 2005, 44: 58-63.
70. Hiroshi S, et al. Walnut polyphenols prevent liver damage induced by carbon tetrachloride and d-galactosamine: hepatoprotective hydrolyzable tannins in the kernel pellicles of walnut. J. Agric. Food Chem., 2008, 56: 4444-4449.
71. Hiroshi S, et al. Hepatoprotective constituents in endocarps of walnut. J. Pharm. Soc. Japan. 2006, 126:108-109.
72. Shimoda H, et al. Effect of polyphenol-rich extract from walnut on diet-induced hypertriglyceridemia in mice via enhancement

- of fatty acid oxidation in the liver. *J. Agric. Food Chem.*, 2009, 57:1786-92.
73. Sugie S, et al. Inhibitory effects of plumbagin and juglone on azoxymethane-induced intestinal carcinogenesis in rats. *Cancer Lett.*, 1998, 127:177-183.
74. Kamei H, et al. Inhibition of cell growth in culture by quinones. *Cancer Biother Radiopharm.*, 1998, 13:185-8.
75. Segura-Aguilar J, et al. The cytotoxic effects of 5-OH-1, 4-naphthoquinone and 5, 8-diOH-1,4-naphthoquinone on doxorubicinresistant human leukemia cells (HL-60). *Leuk Res.*, 1992, 16: 631-637.
76. Ji Y, et al. Juglone induced apoptosis in human gastric cancer SGC-7901cells via the mitochondrial pathway. *Exp. Toxicol. Pathol.*, 2011, 63: 69-78.
77. Kumudhavalli MV, et al. Phytochemical and pharmacological evaluation of the dried fruit of the plant *Juglans regia* linn. *Oil Drug Invent. Today* 2010, 2: 362-365.
78. Willis L, et al. Dose-dependent effects of walnuts on motor and cognitive function in aged rats. *Br. J. Nutr.*, 2009, 101: 1140- 1144.
79. Chauhan N et al. Walnut extract inhibits the fibrillization of amyloid beta-protein, and also defibrillizes its preformed fibrils. *Cur. Alzheimer Res.*, 2004, 1:183-188.
80. Society for Neuroscience. "News Release: Diet of walnuts, blueberries improve cognition; may help maintain brain function", Society for Neuroscience, 5 November 2007.
81. Iwamoto M, et al. Walnuts lower serum cholesterol in Japanese men and women. *J. Nutr.*, 2000, 130: 171-176.
82. Zibaenezhad MJ, et al. Antihypertriglyceridemic effect of walnut oil. *Angiology.*, 2003, 54: 4.
83. Ros E, et al. Walnut diet improves endothelial functions in hypercholesterolemic subject. *Circulation*; 2004, 109: 1609-1614.
84. Bellido C, et al. Butter and walnuts, but not olive oil, elicit postprandial activation of nuclear transcription factor κ B in peripheral blood mononuclear cells from healthy men. *Am. J. Clin. Nutr.*, 2004, 80: 1487-1491.
85. Oryza. Hepatoprotective and anti-oxidative extract for metabolic syndrome walnut polyphenol. ver.1.0. 2007.
86. Woods B, and Calnan CD. Toxic woods. *Br. J. Dermatol.*, 1976, 94 (suppl, 13): 17.
87. Hausen B. Woods injurious to human health. Berlin: Publisher, Walter de Gruyter, 1981, pp 119-121.
88. Bonamonte D, et al. Hyperpigmentation and contact dermatitis due to *Juglans regia*. *Contact Dermatitis.*, 2001, 44: 101.
89. Haque R, et al. Aqueous extract of walnut (*Juglans regia* L.) protects mice against cyclophosphamide-induced biochemical toxicity. *Hum. Exp. Toxicol.*, 2003, 22:473-80.
90. Saad B, et al. Evaluation of medicinal plant hepatotoxicity in co-cultures of hepatocytes and monocytes. *eCAM.*, 3:93-98. *Salicornia Brachiata*, Ind. Crops Prod., 2006, 23:177.
91. Hosseinzadeh H, et al. Antinociceptive, anti-inflammatory and acute toxicity effects of *Juglans regia* L. Leaves in mice. *Iran Red Crescent Med. J.*, 2011, 13:27-33.
92. Hosamani, KM, and Sattigeri RM. Industrial utilization of *Rivea Ornata* seed oil: A moderate source of vernolic acid. *Ind. Crops Prod.*, 2000, 12: 93.
93. Eganathan P, et al. Oil Analysis in Seeds of *Salicornia Brachiata*, Ind. Crops Prod., 2006, 23:177.
94. Brwon D. Encyclopedia of herbs and their uses. Dorling Kindersley publishers, London. 1995.
95. Facciola S. A source book of edible plants. kampong Publisher,USA. 1990..

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