



**INTERNATIONAL JOURNAL OF
PHARMACEUTICAL SCIENCES**
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: <https://www.ijpsjournal.com>



Review Paper

Pharmacological Importance of Hydrangea Macrophylla- A Review

Shan Mohammad*, Arjun Abhilash

Department of pharmaceutical science Ettumanoor Kottayam 686008 Kerala India.

ARTICLE INFO

Published: 14 Oct 2026

Keywords:

Hydrangea macrophylla,
Hydrangeaceae,
phytoconstituents,
Hydrangenol, Antioxidant.

DOI:

10.5281/zenodo.23357235

ABSTRACT

Hydrangea macrophylla is a medicinal plant belongs to the family Hydrangeaceae traditionally used for various therapeutic purposes. Different parts of Hydrangea macrophylla, such as leaves, roots, flowers, and stems, contain various bioactive phytoconstituents such as Flavonoids, terpenoids/steroids, alkaloids, tannins, Phenolics, betacyanin, terpenoids, glycosides, flavonoids, quinones, saponins, and coumarins. The wide range of phytochemicals present in different plant parts may contribute to the diverse pharmacological properties reported for Hydrangea macrophylla. Compounds such as hydrangenol and phyllodulcin have been identified as important constituents and have attracted attention because of their biological effects. The plant shows many pharmacological effects including antioxidant, immunostimulatory, anti-inflammatory, antidiabetic, anti-malarial and other pharmacological effects. Recent studies have provided increasing evidence supporting its diverse therapeutic potential, particularly through its antioxidant, anti-inflammatory activities. This review summarizes the botanical characteristics, phytochemical constituents, traditional uses, and reported pharmacological activities of Hydrangea macrophylla, highlighting its potential as a valuable source of biologically active compounds and providing a basis for future pharmacological and phytochemical investigations

INTRODUCTION

Medicinal plants have historically been acknowledged for their healing properties, attributed to the numerous bioactive compounds they possess, each exhibiting distinct biological effects. Hydrangea is a woody shrubs that belong to the Hydrangeaceae family. It is increasingly being acknowledged for its potential health

benefits ^[1] According to recent research, Hydrangea macrophylla leaves show a variety of pharmacological characteristics, such as immunostimulatory, antimalarial, antidiabetic, anti-wrinkle, anti-photoaging, skeletal muscle-enhancing and other pharmacological effects ^[2]

*Corresponding Author: Shan Mohammad

Address: Department of pharmaceutical science Ettumanoor Kottayam 686008 Kerala India.

Email ✉: arjunabhilash2585@gmail.com

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.





(Fig no:01) *Hydrangea macrophylla*

II. PLANT PROFILE:

Synonyms: *Hortensia opuloides* Lam, *Hydrangea hortensia* Siebold, *Hydrangea hortensis* Sm, *Hortensia mutabilis* Schneev, *Hortensia japonica* J.F.Gmel, *Hydrangea florida* Salisb, *Viburnum macrophyllum* Thunb .^[3]

Taxonomy:

Kingdom : Plantae
 Division : Magnoliophyta
 Class : Dicotyledonae
 Order : Cornales
 Family : Hydrangeaceae
 Genus : *Hydrangea*
 Species : *Hydrangea macrophylla*.^[4]

DISTRIBUTION

At least 23 species of the genus *Hydrangea* are found natively in subtropical Central and South America, as well as temperate parts of Eastern Asia and North America. The genus is separated into two sections: *Cornidia*, which includes climbing species from tropical and subtropical regions, and *Hydrangea*, which primarily includes species with temperate climates.^[5] There is a great deal of potential for producing high-quality

hydrangeas in India, especially in regions with cool climates like Kashmir, Himachal Pradesh, Nainital, Kalimpong, Darjeeling, the southern and northern highlands of Shillong, Sikkim, and Ooty. In addition to pot plants, it is cultivated commercially under protected cultivation and produces beautiful cut flowers that are used in both fresh and dried flower arrangements.^[3] It is also grown in Kerala, Maharashtra, Tamil Nadu, Uttarakhand in India.

Identification features

A robust bush. Opposite, elliptic to broadly ovate leaves are coarsely serrated, acuminate at the apex, cuneate at the base, and frequently decurrent into petioles. Pink, blue, or white flowers with a terminal cyme .^[3]

IV. TRADITIONAL USES

The Hydrangeaceae plant known as “soogook,” which is indigenous to the Korean mountains, has long been used in traditional medicine to cure a variety of illnesses, including diabetes and liver problems. It has been observed that HM and its active components have antioxidant, anti-diabetic,

anti-malarial, and immunostimulatory characteristics. [6,7,8,9]

V. CHEMICAL CONSTITUENTS

Several secondary metabolites are present in *Hydrangea Macrophylla*. The most significant secondary metabolites found in plants are phenolics and flavonoids, which have potent antioxidant properties. Flavonoids, terpenoids/steroids, alkaloids, and tannins are secondary metabolite compounds found in the flower buds of the *Hydrangea Macrophylla*. Phenolics, terpenoids/steroids, β -sitosterols, flavonoids, polyphenols, alkaloids, and anthrax are all found in the leaves of this plant. Alkaloids, betasianin, cardioglycosides, terpenoids, steroids, glycosides, flavonoids, quinones, phenolics, saponins, tannins, and coumarin are all found in root. [6]

VI. PHARMACOLOGICAL EFFECTS

Numerous research has proven the various pharmacological activities of the plant *Hydrangea macrophylla*, including antioxidant, anti-malarial, antidiabetic, and immunostimulatory properties.

Immunostimulatory Effect

Lactococcus lactis subsp. *Lactis* LM1185, a lactic acid bacterium, was isolated from *Hydrangea macrophylla*. Strain LM1185 demonstrated 50.5% acid tolerance at pH 2.5, and after twenty-four hours, it demonstrated 30.4% tolerance to 0.3% (w/v) bile salt. It also exhibits bis-(3-ethylbenzothiazoline-6-sulfonic acid) radical scavenging activity.

There was no cytotoxicity seen when strain LM1185 was applied to RAW 264.7 macrophage cells. This strain significantly increased nitric oxide production and had high levels of mRNA expression for cytokines, inducible nitric oxide synthase (iNOS) and tumor necrosis factor- α . This

strain triggered the nuclear factor-kB signaling pathway, which led to the synthesis of iNOS and cyclooxygenase-2 as detected by western blotting. *Lactis* LM1185 has the potential as probiotic and may be essential for the immunostimulatory impact on macrophages. [10,11,12]

Antidiabetic Effect:

Processed leaves of *Hydrangea macrophylla* var. *thunbergii* have been reported to have potential antidiabetic effects. Zhang et al. (2007) found that substances isolated from these processed leaves, including hydrangenol, phyllo dulcin, thunberginol A, and hydrangeic acid, induced adipogenesis in 3T3-L1 cells. Among these, hydrangenol showed significant impacts by boosting adiponectin release and raising adiponectin, PPAR γ 2, and GLUT4 mRNA levels while decreasing the expression of IL-6 mRNA. Furthermore, hydrangenol increased the absorption of glucose in 3T3L1 adipocytes in a concentration-dependent way. Hydrangenol administered orally at a dose of 200 mg/kg/day for two weeks significantly reduced blood glucose and free fatty acid levels in KKAY mice. According to this study, hydrangenol may be a good option for an antidiabetic medication. [13,14]

Antioxidant effect:

The effects of *Hydrangea macrophylla* leaf extract, namely its hexane layer (HLH), on oxidative stress in *Caenorhabditis elegans* were studied by Cho et al. (2024). The worms were fed a 2% glucose diet to cause metabolic stress and boost ROS generation. Under both normal and 2% glucose circumstances, HLH treatment decreased ROS levels in a concentration-dependent manner, suggesting that HLH protected against oxidative stress brought on by glucose. Additionally, catalase (CAT) activity was elevated by HLH in a concentration-dependent manner, indicating that



the antioxidant defense system was linked to its protective impact. Additionally, the study found that separated phyllodulcin (PD) decreased ROS levels and identified PD as a significant component of the hexane fraction. ^[15,16,17]

Antimalarial effect:

Hydrangea macrophylla leaf extract prevented *Plasmodium falciparum* from growing parasitically. *Hydrangea macrophylla* leaf extract has an IC₅₀ value of 0.18 microg/ml against *Plasmodium falciparum*. The IC₅₀ for a normal mouse cell line, NIH 3T3-3, was 7.2 microg/ml. Selective toxicity was therefore 40. For the in vivo test, ddY mice were injected with the rodent malaria parasite *Plasmodium berghei* and given *Hydrangea macrophylla* leaf extract (3.6 mg/0.2 ml) orally three times daily for three days. On days three or four following the parasite inoculation, malaria parasites were detected in the blood of the control group but not in the blood of the treated mice. Four of the five mice who received leaf extract twice a day for three days did not develop malaria parasites, but one mouse did. Day for three days did not develop malaria parasites, but one mouse did. Additionally, mice infected with *Plasmodium berghei* with a parasitemia of 2.7% were given the leaf extract orally three times a day for three days. Malaria parasites in the latter group vanished on day three following the start of treatment, however they reappeared on day five or 6. These findings indicated that the *Hydrangea macrophylla* leaf extract did contain an orally active antimalarial agent, even if they were unable to completely cure the mice. ^[18]

Anti-inflammatory effect:

A water extract of processed *H. macrophylla* leaf (WH) was tested for its anti-inflammatory properties in RAW264.7 macrophage cells treated with lipopolysaccharide (LPS). LPS-stimulated

pro-inflammatory mediators like nitric oxide (NO), prostaglandin E₂ (PGE₂), and tumor necrosis factor- α (TNF- α), as well as its regulatory genes inducible NO synthase (iNOS), cyclooxygenase 2 (COX-2), and TNF- α , were all suppressed by WH without causing any cytotoxicity. Furthermore, via inhibiting I κ B α phosphorylation and degradation, WH dramatically reduced the nuclear translocation of the NF- κ B subunits, p65 and p50, as well as the LPS-induced DNA-binding activity of nuclear factor- κ B (NF- κ B). Additionally, WH enhanced Akt dephosphorylation, which inhibited NF- κ B's ability to bind DNA in LPS-stimulated RAW264.7 macrophage cells. According to their findings, WH suppresses Akt-mediated NF- κ B activity in LPS-stimulated RAW264.7 macrophage cells, thereby downregulating the expression of pro-inflammatory mediators such as NO, PGE₂, and TNF- α . ^[19,20,21]

CONCLUSION

The present review emphasizes *Hydrangea macrophylla*'s significant pharmacological and therapeutic potential with reported antioxidant, anti-inflammatory, anti-malarial, immunostimulatory, antidiabetic activities. More thorough research on *H. macrophylla* and its bioactive components may offer a useful platform for the development of new medications.

REFERENCES

1. Fadhil NK. GC/MS Characterization of The Non-Polar Phytochemical Constituents from Leaves of *Hydrangea macrophylla* Cultivated in Baghdad-Iraq. *Tikrit Journal of Pharmaceutical Sciences*. 2024 Dec 25;18(2):20-6.
2. Pham TL, Nguyen VP, Nguyen TT, Min BS, Kim JA. Phytochemical constituents of *Hydrangea macrophylla* var. *acuminata* leaves



- and their inhibitory activity against PTP1B and α glucosidase. Journal of Enzyme Inhibition and Medicinal Chemistry. 2025 Dec 31;40(1):2584940.
3. India Flora Online [Internet]. Bengaluru: Indian Institute of Science; 2026 [cited 2026 sep 25]<https://indiaflora-ces.iisc.ac.in/herbsheet.php?id=6034&cat=13>
 4. ydrangea macrophylla [Internet]. Scientificlib.com; 2014 [cited 2026 Sep 25]. Available from:<https://www.scientificlib.com/en/Biology/Plants/Magnoliophyta/HydrangeaMacrophylla01.html>
 5. Khaing MT, Jung HJ, Han TH. Trend of hydrangea cultivar development. Trends in Agriculture & Life Sciences. 2016; 53:63-8.
 6. E, Limanan D, Ferdinal F. Phytochemical Screening and Total Antioxidant Capacity of Methanolic-Extract of Kembang Bokor Roots (Hydrangea Macrophylla). In1st Tarumanagara Yulianti International Conference on Medicine and Health (TICMIH 2021) 2021 Dec 1 (pp. 5762). Atlantis Press.
 7. Agustini DM, Yun YF, Suprabawati A, Defara SM. Senyawa terpenoid dan aktivitas antidiabetes ekstrak n-heksana dan metanol Hydrangea macrophylla. InProsiding Seminar Hasil Penelitian dan Pengabdian kepada Masyarakat Unjani Expo (Unex) 2020 Feb 19 (Vol. 1, No. 1, pp. 27-30).
 8. Yang CJ, Wang ZB, Zhu DL, Yu Y, Lei YT, Liu Y. Two new cyanogenic glucosides from the leaves of Hydrangea macrophylla. Molecules. 2012 May 8;17(5):5396-403.
 9. Hariri MR. Kajian pigmen antosianin kelompok bunga hortensia (Hydrangea macrophylla) (Doctoral dissertation, Universitas Negeri Malang).
 10. Cho Y, Han HT, Kim TR, Sohn M, Park YS. Immunostimulatory activity of Lactococcus lactis LM1185 isolated from Hydrangea macrophylla. Food science and biotechnology. 2023 Mar;32(4):497-506.
 11. Geum NG, Eo HJ, Kim HJ, Park GH, Son HJ, Jeong JB. Immune-enhancing activity of Hydrangea macrophylla subsp. Serrata leaves through TLR4/ROS-dependent activation of JNK and NF- κ B in RAW264. 7 cells and immunosuppressed mice. Journal of Functional Foods. 2020 Oct 1;73 :104139.
 12. Jang HJ, Lee NK, Paik HD. Probiotic characterization of Lactobacillus brevis KU15153 showing antimicrobial and antioxidant effect isolated from kimchi: HJ Jang et al. Food Science and Biotechnology. 2019 Oct;28(5):1521-8.
 13. Zhang H, Matsuda H, Kumahara A, Ito Y, Nakamura S, Yoshikawa M. New type of antidiabetic compounds from the processed leaves of Hydrangea macrophylla var. thunbergii (Hydrangeae Dulcis Folium). Bioorganic & medicinal chemistry letters. 2007 Sep 1;17(17):4972-6.
 14. McClain DA, Hazel M, Parker G, Cooksey RC. Adipocytes with increased hexosamine flux exhibit insulin resistance, increased glucose uptake, and increased synthesis and storage of lipid. American Journal of Physiology-Endocrinology and Metabolism. 2005 May;288(5):E973-9.
 15. Al-Yafeai A, Schmitt B, Malarski A, Böhm V. In-Vitro Bioactivity Evaluation of Hydrangenol Extracted from Hydrangea macrophylla (Thunb.) Ser. Leaves. International Journal of Secondary Metabolite. 2024 Feb 14;11(1):78-92.
 16. Thieme C, Westphal A, Malarski A, Böhm V. Polyphenols, vitamin C, in vitro antioxidant capacity, α -amylase and COX-2 inhibitory activities of citrus samples from Aceh, Indonesia. International Journal for Vitamin and Nutrition Research. 2019 Apr 1.

17. Das V, Kaishap PP, Duarah G, Chikkaputtaiah C, Deka Boruah HP, Pal M. Cytotoxic and apoptosis-inducing effects of novel 8-amido isocoumarin derivatives against breast cancer cells. *Naunyn-Schmiedeberg's Archives of Pharmacology*. 2021 Jul;394(7):1437-49.
18. Matsuoka KK, Furuhashi SI, Fujisaki RI, KAWAKAMIA T, Mogi S, Yoshihara H, Aokia N, Ishii A, Shibuya T. Anti-malarial activity of leaf-extract of *Hydrangea macrophylla*, a common Japanese plant. *Acta Medica Okayama*. 2000;54:227-32.
19. Dilshara MG, Jayasooriya RG, Lee S, Jeong JB, Seo YT, Choi YH, Jeong JW, Jang YP, Jeong YK, Kim GY. Water extract of processed *Hydrangea macrophylla* (Thunb.) Ser. Leaf attenuates the expression of pro-inflammatory mediators by suppressing Akt-mediated NF- κ B activation. *Environmental toxicology and pharmacology*. 2013 Mar 1;35(2):311-9.
20. Hseu YC, Wu FY, Wu JJ, Chen JY, Chang WH, Lu FJ, Lai YC, Yang HL. Anti-inflammatory potential of *Antrodia camphorata* through inhibition of iNOS, COX-2 and cytokines via the NF κ B pathway. *International immunopharmacology*. 2005 Dec 1;5(13-14):1914-25.
21. Buzzo CL, Campopiano JC, Massis LM, Lage SL, Cassado AA, Leme-Souza R, Cunha LD, Russo M, Zamboni DS, Amarante-Mendes GP, Bortoluci KR. A novel pathway for inducible nitric oxide synthase activation through inflammasomes. *Journal of Biological Chemistry*. 2010 Oct 15;285(42):32087-95.

HOW TO CITE: Shan Mohammad, Arjun Abhilash, Pharmacological Importance of *Hydrangea Macrophylla*- A Review , *Int. J. of Pharm. Sci.*, 2026, Vol 4, Issue 10, 1986-1992, <https://doi.org/10.5281/zenodo.23357235>

