

Chemical and Pharmacological Evaluation of *Dodonaea Viscosa* Linn

ANEES A. SIDDIQUI

Faculty of Pharmacy

Jamia Hamdard, Hamdard Nagar, New Delhi-110 062, India.

Dodonaea viscosa Linn (N.O. Sapindaceae, *Aliaror sanatha*) is a shrub, rarely a small tree, distributed throughout India, Ceylon and in most warm countries.¹ It is a herbal remedy for human inflammation, swelling, rheumatism and pain.^{2,3} leaves as such or along with the seeds of *Phaseolus mungo* and gum acacia in fine paste form are applied on bone fractures for effective bone setting.⁴

Chemical constituents of *D. viscosa* Linn: It contains wide variety of chemical constituents which can be arranged into different categories as indicated in Table-1.

TABLE-1
CHEMICAL CONSTITUENTS OF *D. VISCOSA* LINN

| Type | Constituent isolated | Part from which isolated |
|------------|---------------------------------------------------------------------------------------------|--------------------------|
| Flavanoid | (i) Aliarin ^{10, 11} | aerial parts |
| | (ii) Aliarin 4'-o-methyl ether ^{10, 11} | aerial parts |
| | (iii) 5,7-Dihydroxy 3'-(3-hydroxy methyl butyl) 3,6,4'-trimethoxy flavone ^{10, 11} | aerial parts |
| | (iv) Isorhamnetin ¹²⁻¹⁴ | flowers, leaves |
| | (v) Kaempferol ¹⁵ | root bark |
| | (vi) Kaempferol 3,4',7-trimethyl ether ¹⁵ | flowers |
| | (vii) 5-Hydroxy 3,6,7,4'-tetramethoxy flavone ¹¹ | aerial parts |
| | (viii) Kaempferol 3,7-dimethyl ether ^{15, 16} | flowers |
| | (ix) 3,4',6-Trimethoxy 5,7-dihydroxy flavone ¹¹ | aerial parts |
| | (x) 5,7,4'-Trimethoxy 3,6-dimethoxy flavone ¹⁷ | aerial parts |
| | (xi) Pinoembrin ¹¹ | aerial parts |
| | (xii) Penduletin ^{11, 13} | aerial parts |
| | (xiii) Santin ¹¹ | aerial parts |
| | (xiv) Viscosol ¹⁸ | aerial parts |
| | (xv) Isorhamnetin 3-rhamnosyl galactoside ^{11, 19} | aerial parts |
| | (xvi) Quercetin 3-rutinoside ¹⁹ | leaves, pods |
| | (xvii) Quercetin 3-galactoside ¹⁹ | leaves, pods |
| | (xviii) Quercetin ^{13, 14} | flowers, root bark |
| Diterpenes | (i) Dodonic acid ²⁰ | aerial parts |
| | (ii) Hautriwaic acid ^{5, 21} | leaves |
| | (iii) ent-labdane ^{5, 22} | leaves |
| | (ent-15,16-epoxy a a H-labda- 13(16),14-dieñe-3a, 8b-diol | |

| Type | Constituent isolated | Part from which isolated |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| Saponins/ Sapogenin | (i) Dodonin ²⁴ (Sapogenin-dodogenin) | seed |
| | (ii) Dodonoside-A ⁷ (sapogenin-barrigenol esterified at C-21 and C-22 with dimethyl oxiran-2-carboxylic acid and 2-methyl butyric acid) | seed |
| | (iii) Dodonoside-B ⁷ (sapogenin-barrigenol esterified at C-21 and C-22 with 2,3-dimethyl oxirane-2-carboxylic acid and angelic acid) | seed |
| | (iv) 21,22-Diangeloyl barringtonenol ²⁵ | stem |
| | (v) 21,22-Diangeloyl R ₁ -barrigenol ^{25, 26} | stem |
| | (vi) 21-Angeloyl R ₁ -barrigenol ²⁵ | stem |
| | (vii) R ₁ -barrigenol ²⁶ | stem bark |
| | (viii) Jegosapogenol ²⁶ | stem bark |
| | (ix) Jegosapotenol 21-(2,3-dihydroxy 2-methyl butyroyl) 22-angelate ⁷ | stem bark |
| | (x) Diviscogenin ¹³ | flowers |
| Sterols | (i) b-Sitosterol ^{12, 17, 27} | aerial parts, leaves, seed |
| | (ii) Stigmasterol ¹² | leaves |
| Phenolic acid/ Ester | (i) Caffeic acid ¹⁵ | aerial parts |
| | (ii) <i>p</i> -Coumaric acid ester ¹⁵ | aerial parts |
| | (iii) 4-Hydroxy 3,5-diprenylbenzaldehyde ²⁸ | stem |
| Fats/lipid | (i) Cyanolipids ² | seed |
| | (ii) Glyceride ²⁷ of palmitic, stearic, arachidic, behenic, oleic and linoleic acid | seed |
| Leucocyanidin | (+)-leucocyanidin ²⁹ | leaves |
| Sugar | Arabinose, glucose and rhamnose ¹⁵ | |
| Essential oil | Monoterpene hydrocarbon, Monoterpene alcohols and sesquiterpene hydrocarbon ^{23, 30} | leaves, flowers |
| Miscellaneous | Protein and water-soluble mucilage ³¹ | seed |

Pharmacological screening: Leaves extract (aqueous and ethanolic) found to exhibit cardioinhibitory, coronary-constricting and spasmolytic activity.⁵

The ethanolic extract was found to be more effective than aqueous extract in counteracting the spasms induced by BaCl₂, histamine acid phosphate and acetylcholine.

Isorhamnetin 3-rhamnosyl galactoside isolated from *D. viscosa* Linn showed 15% blood sugar lowering effect at a dose of 200 mg/kg body weight.⁶

The saponins isolated from seed, (dodonoside A and B) are found to exert antiexudative effect at a dose of 0.7 mg/kg body weight, phagocytosis enhancing and molluscicidal activity (100% letha at a conc. of 25 ppm)⁷.

Essential oil isolated from this plant found to show antibacterial activity against *Staphylococcus albus*, *S. aureus*, *Bordetella bronchiseptica* and *Saccharomyces cerevisiae*.^{8, 9}

REFERENCES

1. R.N. Chopra, S.L. Nayar and I.C. Chopra, Glossary of Indian Medicinal Plants, C.S.I.R. Publication, New Delhi, p. 100 (1956).
2. K.M. Nadkarni, Indian Materia Medica, 3rd Ed., Popular Book Depot, Bombay, p. 457 (1954).
3. K.R. Kirtikar and B.D. Basu, Indian Medicinal Plants, Vol.1, p. 641 (1975).
4. D. Holdsworth and K. Karenga, *International J. Crude Drug Res.*, **25**, 171 (1987).
5. A. Rojas, S. Guz and H. Ponce-Monter, *Planta Medica*, **62**, 154 (1996).
6. Z. Abraham, D.S. Bhakuni, H.S. Garh, A.K. Goel, B.N. Mehrotra and G.K. Patnaik, *Indian J. Exp. Biol.*, **24**, 48 (1986).
7. H. Wagner, C. Ludwig, L. Groylyahn and Mohd. S.Y. Khan, *Phytochemistry*, **26**, 697 (1987).
8. M. Subbarao and T. Satyanarayana, *Indian Drugs*, **23**, 140 (1985).
9. I. Ahmad, M. Ahmad and A. Ahmad, *Fitoterapia*, **65**, 167 (1994).
10. K. Sachdev and D.K. Kulshreshta, *Phytochemistry*, **22**, 1253 (1953).
11. _____, *Indian, J. Chem.* **21B**, 798 (1982).
12. K. Venkateshwara Rao, *J. Indian Chem. Soc.*, **39**, 561 (1962).
13. M.S.Y. Khan., Kalim Javed and M.H. Khan, *Fitoterapia*, **63**, 83 (1992).
14. M.S.Y. Khan, S. Ahmed and P.C. Jain, *Ind. J. Nat. Product*, **2**, 12 (1988).
15. Rene R. Paris and A. Notthis, *Plant Med. Phytother*, **4**, 63 (1970).
16. David L. Dreyer, *Rev. Latinoam. Quim.*, **9**, 97 (1978).
17. X.A. Dominguez, R. Franco, C.G. Can and C.C. Noel, *Rev. Latinoam. Quim.*, **11**, 150 (1980).
18. K. Sachdev and Dinesh K. Kuleshreshtha, *Phytochemistry*, **25**, 1967 (1986).
19. A.G.R. Nair and S.S. Subramanian, *Indian J. Chem.*, **13**, 639 (1975).
20. K. Sachdev and Dinesh K. Kulshreshtha, *Planta Medica*, **50**, 448 (1984).
21. H. Yen Hsu, P. Yuh Chen and H. Kakisawa, *Phytochemistry*, **10**, 2813 (1971).
22. R. Mata, C. Joseluis, P. Daniel, R. Iranda, P. Cartaneda and P.R. Del, *J. Nat. Prod.*, **54**, 913 (1991).
23. A.A. Ahmed, A.F. Sayed, A.F. Hawd, A.S. El-Hadad and M.A. El-Zwi, *Egypt J. Pharm. Sci.*, **34**, 587 (1994).
24. D.B. Parihar and S. Dutt, *Proc. Indian Acad. Sci.*, **26A**, 56 (1947).
25. V.U. Ahmed, I. Fatima and A. Fatima, *Fitoterapia*, **58**, 361 (1987).
26. Z.M. Dimb. M. Kapundu, E. Darimont, W. Edmond, Roger Warin, C. Pelende and R. Huls, *Bull. Soc. Chim. Belg.*, **94**, 141 (1985).
27. R.K. Kochar and S. Dutt, *Indian Soap, J.*, **14**, 132 (1948).
28. Hemlata and S.B. Kalidhar, *J. Indian Chem. Soc.*, **71**, 213 (1994).
29. K.N.S. Sastry and Y. Naudamma, *Leather Sci.*, **13**, 174 (1966).
30. A.G. Mekkwawi and J.S. Moss, *Pharmazie*, **36**, 517 (1981).
31. R.P. Chandola, S. Sethi, C.P. Bhatnagar and S.C. Mathur, *Sci. Cult.*, **41**, 343 (1975).