

A Review on Phytotherapy by *Morus Alba*

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ABSTRACT

Phytotherapy is frequently considered to be less toxic and free from side effects than synthetic drugs. Hence, the present study was designed to investigate the protective use of crude water extract of *Morus alba* leaves on ocular functions including cataractogenesis, biochemical diabetic and hypercholesterolemic markers, retinal neurotransmitters and retinopathy of rat pups maternally subjected to either diabetes and/or hypercholesterolemia. Application of crude water extract of *Morus alba* resulted in amelioration of the alterations of maternal serum glucose, LDL, HDL, total cholesterol and creatine phosphokinase activity as well as retinal neurotransmitters including acetylcholine (ACE), adrenaline (AD), nor-adrenaline (NAD), serotonin (5-HT), histamine (HS), dopamine (DA) and gamma amino butyric acid (GABA). The retina of pups of either diabetic and/or hypercholesterolemia mothers exhibited massive alterations of retinal neurotransmitters. The alterations of retinal neurotransmitters were correlated with the observed pathological alterations of retinal pigmented epithelium, photoreceptor inner segment and ganglion cells and increased incidence of DNA fragmentation and apoptosis cell death. However, protection with *Morus alba* extract led to amelioration of the pathological alterations of retinal neurons and estimated neurotransmitters. Furthermore, a striking incidence of cataract was detected in pups of either diabetic and/or hypercholesterolemic mothers. Highest cataractogenesis was observed in pups of combined -treated groups. Our data indicate that experimental maternal diabetes alone or in combination with hypercholesterolemia led to alteration in the ocular structures of their pups, with an increasing incidence of cataract and retinopathy, and the effects of the extract might be attributed to the hypoglycaemic, antihypercholesterolemic and anti-oxidative potential of flavonoids, the major components of the plant extract.

Keywords: Hypercholesterolemia, Diabetes, *Morus Alba* L, pups, cataract, retina neurotransmitters.

INTRODUCTION

Morus alba, known as **white mulberry**, is a short-lived, fast-growing, small to medium sized mulberry tree, which grows to 10–20 m tall. The species is native to northern China, and is widely cultivated and naturalized elsewhere. It is known as

in Hindi, *Tuta* in Sanskrit, *Tuti* in Marathi and *Toot* in Persian language (Farsi), Iran. The white mulberry is widely cultivated to feed the silkworms employed in the commercial production of silk. It is also notable for the rapid release of its pollen, which is launched at over half the speed of sound^{1,2,3}.



Scientific classification	
Kingdom:	Plantae
(unranked):	Angiosperms
(unranked):	Eudicots
(unranked):	Rosids
Order:	Rosales
Family:	Moraceae
Tribe:	Moreae
Genus:	<i>Morus</i>
Species:	<i>M. alba</i>
Binomial name	
<i>Morus alba</i>	
L.	

BOTANICAL DESCRIPTION

On young, vigorous shoots, the leaves may be up to 30 cm long, and deeply and intricately lobed, with the lobes rounded. On older trees, the leaves are generally 5–15 cm long, unlobed, cordate at the base and rounded to acuminate at the tip, and serrated on the margins. The leaves are usually deciduous in winter, but trees grown in tropical regions can be evergreen. The flowers are single-sex catkins, with catkins of both sexes being present on each tree; male catkins are 2–3.5 cm long, and female catkins 1–2 cm long. The fruit is 1–2.5 cm long; in the species in the wild it is deep purple, but in many cultivated plants it varies from white to pink; it is sweet but bland, unlike the more intense flavor of the red mulberry and black mulberry. The seeds are widely dispersed by birds, which eat the fruit and excrete the seeds. The white mulberry is scientifically notable for the rapid plant movement involved in pollen release from its catkins. The stamens act as catapults, releasing stored elastic energy in just 25 μ s. The resulting movement is approximately 350 miles per hour (560 km/h), over half the speed of sound, making it the fastest known movement in the plant kingdom.

CULTIVATION

Cultivation of white mulberry for silkworms began over four thousand years ago in China. In 2002, 6,260 km² of land were devoted to the species in China. The species is now extensively planted and widely naturalized throughout the warm temperate world. It has been grown widely from India^[2] west through Afghanistan and Iran to southern

Europe for over a thousand years for leaves to feed silkworms.^[4]

More recently, it has become widely naturalized in urban areas of eastern North America, where it hybridizes readily with a locally nativered mulberry (*Morus rubra*). There is now serious concern for the long-term genetic viability of red mulberry because of extensive hybridization in some areas. As a result, it is listed as an invasive plant in parts of North America^{4,5,6}.

USES

White mulberry leaves are the preferred feedstock for silkworms, and are also cut for food for livestock (cattle, goats, etc.) in areas where dry seasons restrict the availability of ground vegetation. The fruit are also eaten, often dried or made into wine. In traditional Chinese medicine, the fruit is used to treat prematurely grey hair, to "tonify" the blood, and treat constipation and diabetes.^[citation needed]

The bark is used to treat cough, wheezing, edema, and to promote urination. It is also used to treat fever, headache, red dry and sore eyes.

For landscaping, a fruitless mulberry was developed from a clone for use in the production of silk in the U.S. The industry never materialized, but the mulberry variety is now used as an ornamental tree where shade is desired without the fruit. A weeping cultivar of white mulberry, *Morus alba* 'Pendula', is a popular ornamental plant.

Medicinal uses

Dental caries: The root bark of *Morus alba* (Moraceae) has been used as a traditional medicine in Asian countries and exhibits

antibacterial activity against food poisoning micro-organisms. Using activity against *S. mutans* in bioassay-guided fractionation of a methanol extract of dried root bark, and organic solvent fractions of this extract, the active antibacterial constituent was identified as kuwanon G. The compound displayed an MIC of 8 µg ml⁻¹ against *S. mutans*, which was comparable

to chlorhexidine and vancomycin (1 µg ml⁻¹). Time-kill assays indicated that *S. mutans* was completely inactivated by 20 µg ml⁻¹ kuwanon G within 1 min, while testing against other bacteria suggested that the compound displayed preferential antimicrobial activity against cariogenic bacteria. Electron microscopic examination of *S. mutans* cells treated with kuwanon G indicated that the mode of antibacterial action was inhibition or blocking of cell growth, as treated cells showed a disintegrated surface and an unclear cell margin. Hypolipidemic and antioxidant effects from freeze-dried powder of mulberry (*Morus alba* L.) fruit

Neuroprotective effects in in vitro and in vivo (fruit) Treatment of hyperuricemia and gout Albarol A(1), isolated from the root bark extract of *Morus alba* may be a promising lead compound for developing an effective drug for treatment of leukemia. Moracin M, Steppogenin-4'-O-β-D-glucoside, Mullberroside A were isolated from the root bark of *Morus alba* L. and all produced hypoglycemic effects. A methanol extract of *Morus alba* roots showed adaptogenic activity, indicating its possible clinical utility as an antistress agent. *Morus alba* leaf extract help restore the vascular reactivity of diabetic rats. Free radical-induced vascular dysfunction plays a key role in the pathogenesis of vascular disease found in chronic diabetic patients. An ethanolic extract of mulberry leaf had antihyperglycemic, antioxidant and antiglycation effects in chronic diabetic rats, which may suggest its use as food supplement for diabetics.

OTHER USES

An acidified methanolic extract of the fruit of *Morus alba* can be used as an acid-base indicator in acid-base titrations.

Titration shows sharp colour change at the equivalence point. This is a natural indicator that is useful, economical, simple and accurate for determining acids and bases. Snakebite "*Morus alba* plant leaf extract has been studied against the Indian *Vipera/Daboia russelii* venom induced local and systemic effects. The extract completely abolished the in vitro proteolytic and hyaluronolytic activities of the venom. Edema, hemorrhage and myonecrotic activities were also neutralized efficiently. In addition, the extract partially inhibited the pro-coagulant activity and completely abolished the degradation of A α chain of human fibrinogen. Thus, the extract processes potent antisnake venom property, especially against the local and systemic effects of *Daboia russelii* venom."

In Culture

An etiological Babylonian story that was later incorporated into Greek and Roman mythology attributes the reddish purple color of the white mulberry (*Morus alba*) fruits to the tragic deaths of the lovers Pyramus and Thisbe. The "White Mulberry Tree" is title of a crucial chapter in Willa Cather's 1913 novel, *O Pioneers!*, in which two forbidden lovers are killed, a reference to the story of Pyramus and Thisbe⁷⁻¹⁰.

CONCLUSION

Herbs and herbal products have been used in the remedy of several human ailments. Medicinal plants are being popularized as an exciting aspect of alternative therapy due to less or no side effects, cost effectiveness and lack of development of drug resistance. Snakebite, one of the major causes of mortality in tropical and subtropical countries, is treated with conventional animal based anti venom. However, the rural folks of third world countries apply various medicinal plants in their crude forms or with some additives as antidote to snakebites. Some of these antiophidians have been evaluated pharmacologically for potential anti venom and positive outcome from the experiments has indicated possible therapeutic value of the botanicals.

Therefore, herb based antivenin might serve as an alternative treatment against snake venom provided the tests pass through the rigors of clinical trials.

REFERENCES

1. Suttie JM. (undated). FAO Report: *Morus alba* L.
2. Taylor Philip, Gwyneth Card, James House, Michael Dickinson, Richard Flagan (2006-03-01). "High-speed pollen release in the white mulberry tree, *Morus alba* L". *Sexual Plant Reproduction*. 19 (1):19–24. DOI: 10. 1007/s 00497-005-0018-9.
3. Bean WJ. *Trees and Shrubs Hardy in the British Isles*. John Murray ISBN,1978,0-7195-2256-0.
4. Burgess KS, Morgan M, Deverno L and Husband BC. *Asymmetrical introgression between two *Morus* species (*M. alba*, *M. rubra*) that differ in abundance*. *Molec. Ecol*. 2005;14: 3471–3483.
5. *Morus alba* L. USDA Plants Profile.
6. Howstuffworks.com.
7. Kuwanon G. An antibacterial agent from the root bark of *Morus alba* against oral pathogens.
8. Yang X, Yang L and Zheng H. Hypolipidemic and antioxidant effects of mulberry (*Morus alba* L.) fruit in hyperlipidaemia rats. *Food and Chemical Toxicology* 2010;48:8-9:2374-2379.
9. Kim HG, Ju MS, Shim JS, Kim MC, Lee SH, Huh Y, Kim SY and Oh MS. Mulberry fruit protects dopaminergic neurons in toxin-induced Parkinson's disease models. *The British journal of nutrition*. 2010;104:1 (8-16)
10. Wang CP, Wang Y, Wang X, Zhang X, Ye JF, Hu LS and Kong LD. Mulberroside A Possesses Potent Uricosuric and Nephroprotective Effects in Hyperuricemic Mice. *Planta Medica*. 2010.