

ECONOMIC ASPECTS OF THE VERBENACEAE IN BANGLADESH : A REVIEW

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ABSTRACT

The main economic aspects of the family Verbenaceae in relation to the major categories of uses such as timber, medicine, food, fodder, ornamental, insecticide, dye and live fences in Bangladesh have been reviewed. Other possible uses have also been noted. The medicinal uses are grouped disease wise. A checklist of Bangladesh species with the indication of their economic uses has been appended.

সারসংক্ষেপ

বিভিন্ন ব্যবহারিক গুণাবলী যথা : কাষ্ঠ, ভেষজ, খাদ্য, গো-খাদ্য, সৌন্দর্যবর্ধক রক্ষ, কীটনাশক, রং ও জীবন্ত বেড়া প্রভৃতির পরিপ্রেক্ষিতে Verbenaceae গোত্রের অর্থনৈতিক গুরুত্ব পর্যালোচনা করা হয়েছে। সম্ভাব্য অন্যান্য ব্যবহার বিধিও উল্লেখ করা হল। ভেষজ হিসাবে ব্যবহৃত উদ্ভিদসমূহ রোগ অনুযায়ী তালিকাভুক্ত। অর্থনৈতিক বৈশিষ্ট্য নির্দেশ করতঃ বাংলাদেশের Verbenaceae গোত্রের অন্তর্ভুক্ত প্রজাতি সমূহের একটি তালিকাও সংযোজিত করা আছে।

INTRODUCTION

The family Verbenaceae includes herbs, shrubs, trees and many lianas. It has an almost entirely tropical and subtropical distribution, with a few genera and species native to temperate zones. The family is represented by about 75 genera and more than 3,000 species worldwide

(Heathcote 1978) and includes many genera of economic value such as timber, medicinal, ornamental, food, fodder, etc. Members of the family are widely distributed throughout Bangladesh and contain a number of useful plants. No floristic accounts or revision of the family

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in Bangladesh has been done. This family is represented in Bangladesh by about 16 genera and 50 species (Kurz 1877; Clarke 1885; Prain 1903; Brandis 1906; Heining 1925; Kanjilal *et al.* 1939; Raizada 1941; Khan and Banu 1972; Khan and Hasan 1984). The members of the family range in their habitat from mangrove and sand dune vegetation to hill forest. *Avicennia* has been excluded from this family and is now treated under Avicenniaceae.

Forests are being destructed in an alarming rate because of many factors. More land is being brought under agriculture so the supply of forest commodities has become more scarce. Considering the increasing demand and interest on the potential of native flora, the economic potentiality of Verbenaceae in Bangladesh are reviewed in relation to different categories of uses. Available ethnobotanical information have also been furnished. A checklist of the species with abbreviation of different uses has been appended as a precursory note on the floristic composition of the family.

ECONOMIC ASPECTS

The economic uses have been categorised from single to many as follows:

Timber (T)

Most of the tree species produce timber. *Tectona grandis* and *Gmelina arborea* produce beautiful and economically important timber for furniture, cabinet, door and window frames, ship and boat building, panelling, novelties, etc. (Anon. 1956-1976; Benthall 1933; Das 1984; Dastur

1963; Kanjilal *et al.* 1939). Tree species of *Callicarpa* produce fine and smooth wood. The poles of *C. tomentosa* are used as rollers of looms (Kanjilal *et al.* 1939). The timber of *Premna bengalensis* is hard, durable and used for house posts, bridges, turnery and curving works (Gamble 1922; Kanjilal *et al.* 1939). The wood of *Vitex* spp. are hard and durable. The wood of *Vitex glabrata*, *V. peduncularis*, *V. altissima*, *V. pinnata* are used for construction, making of furniture, cartwheels, agricultural implements and for many other purposes (Gamble 1922; Heining 1925; Anon. 1976; Das 1984; Kanjilal *et al.* 1939; Haines 1908). The branches of *V. negundo* are used for making rough baskets (Gamble 1922; Benthall 1933; Dastur 1963).

Medicine (M)

Many species of the family have the medicinal value for many diseases or complaints. The following is a list of disease-wise medicinal uses of different species.

Antibacterial: Leaf extracts of *Vitex negundo*, *V. trifolia* and *V. peduncularis* have antibacterial properties. Leaf extract of *V. trifolia* is reported to be used in the treatment of tuberculosis in the Philippines (Anon. 1976). An alcoholic extract of *Phyla nudiflora* leaves shows antibacterial activities against *Escherichia coli*. Acid extracts of *Lantana aculeata* shoot show antibacterial activities (Chopra *et al.* 1969). An antibiotic of phenolic nature has been isolated from fresh root bark of *Premna corymbosa* (Anon. 1969).

Anticancer properties: Leaf extracts of *Vitex negundo* and *V. trifolia* are reported to have anticancer properties (Anon. 1976).

Antidote for snake bite : *Clerodendrum viscosum* sprout; leaves of *C. serratum* and *Lantana trifolia* (Kirtikar and Basu 1933; Kanjilal *et al.* 1939) and root, bark and fruits of *Gmelina arborea* (Ahuja 1965) are used as antidotes in snake bites.

Asthma : Leaves and roots of *Clerodendrum viscosum* (Khan and Hoq 1975); roots of *C. serratum*, *C. indicum* and the whole plants of *Phyla nudiflora* (Kirtikar and Basu 1933); leaves of *Lantana aculeata* (Catibog 1978) are used for the treatment of asthma.

Astringent : Bark and root of *Vitex glabrata* and bark of *Tectona grandis* (Kirtikar and Basu 1933; Anon. 1976) are used as astringent.

Blood disease : *Clerodendrum inerme* leaves (Uhe 1974), *C. serratum* root, *Phyla nudiflora* plant (Kirtikar and Basu 1933) and flowers of *Gmelina arborea* (Benthall 1933) are used for curing blood diseases.

Body swelling : Leaves of *Vitex negundo* (Rao and Jamir 1982; Shah and Joshi 1971); roots, stem and leaves of *V. trifolia* (Nagata 1971); leaf poultice of *Clerodendrum inerme* is applied on swelling of lymphatic glands (Baquar and Tasnif 1967).

Bronchitis : Leaves of *Vitex trifolia*; roots of *Clerodendrum serratum*, *Premna corymbosa* and *Phyla nudiflora* plant (Kirtikar and Basu 1933); root, flower and bark of *Tectona grandis* (Kirtikar and Basu 1933; Anon. 1976) are used for the treatment of bronchitis.

Carminative : Bark of *Callicarpa tomentosa*, leaf decoction of *Lantana aculeata*,

leaf soup of *Premna corymbosa* and root, bark and leaves of *Vitex negundo* (Kirtikar and Basu 1933) are taken as carminative.

Catarrhal affections : *Clerodendrum serratum* root (Kirtikar and Basu 1933, Kanjilal *et al.* 1939); leaves infusion of *Lantana aculeata* (Catibog 1978) are used in catarrhal affections.

Chest pain : *Clerodendrum viscosum* leaves in the form of pills are taken in chest complaint with cough (Kirtikar and Basu 1933). *Vitex peduncularis* bark (Kirtikar and Basu 1933; Haines 1908; Anon. 1976) and *V. trifolia* leaves (Uhe 1974) are used in chest pain.

Cough : Roots of *Clerodendrum serratum* and *C. indicum*; juice of young leaves of *Gmelina arborea* (Kirtikar and Basu 1933); root, bark and fruits of *Gmelina arborea* (Ahuja 1965); leaf teas of *Stachytarpheta jamaicensis* (Wong 1976) are used in the treatment of cough. Dried leaf of *Clerodendrum indicum* is smoked to cure cough (Kanjilal *et al.* 1939). Leaf and bark of *Nyctanthes arbor-tristis* are used as expectorant (Anon. 1966).

Diuretic : Fruits of *Gmelina arborea*; leaves of *Premna esculenta* and *P. latifolia* (Kirtikar and Basu 1933); roots of *Vitex negundo* (Anon. 1976); flowers and seeds of *Tectona grandis* (Kirtikar and Basu 1933; Anon. 1976) and *Phyla nudiflora* plant (Baquar and Tasnif 1967); and leaf juice of *Nyctanthes arbor-tristis* (Anon. 1966) are used as diuretic.

Dropsy : Leaves of *Premna esculenta* are applied externally and *P. latifolia* leaf

infusion is given internally and applied externally for the treatment of dropsy. The seeds of *Clorodendrum serratum* are mixed with butter and made into an ointment. *Verbena officinalis* plant is used in dropsy (Kirtikar and Basu 1933).

Dysentery : Roots of *Vitex negundo* (Anon. 1976) ; woods of *Tectona grandis* (Kirtikar and Basu 1933) ; bark of *Callicarpa macrophylla* (Jain and Tarafdar 1970) and leaf juice of *Lantana aculeata* (Wong 1976) are taken in the treatment of dysentery.

Eye disease : Leaves of *Vitex negundo*, *V. trifolia* and *Lippia trifolia* plant (Kirtikar and Basu 1933) ; bark of *Tectona grandis* (Anon. 1976) are used in the treatment of eye disease.

Febrifuge : Stem, root and leaves of *Clerodendrum inerme* (Watt 1972 ; Khan and Hoq 1975) ; plant root and leaf juice of *C. viscosum* (Kirtikar and Basu 1933 ; Datta and Mukerjii 1952) ; root and leaves of *C. serratum* (Kirtikar and Basu 1933 ; Haines 1908) ; roots of *Gmelina arborea* (Benthall 1933) ; leaf tea of *Lantana aculeata* (Kirtikar and Basu 1933 ; Catibog 1978 ; Wong 1976) ; *Phyla nudiflora* whole plant (Baquar and Tasnif 1967) ; leaves of *Verbena officinalis* (Kirtikar and Basu 1933) ; leaves of *Vitex negundo* (Kirtikar and Basu 1933 ; Bor 1953 ; Datta and Mukerjii 1952 ; Watt 1972 ; Shah and Joshi 1971) and leaves, roots and flowers of *V. trifolia* (Anon. 1976 ; Kirtikar and Basu 1933) are used in fever. In Bombay, the leafjuice of *Clerodendrum inerme* is taken in a dose of half ounce for the relief from fever. Leaf infusion of *Vitex peduncularis* is used in black water fever (Bor 1953).

Hair growth : *Gmelina arborea* fruits (Kirtikar and Basu 1933 ; Benthall 1933), *Tectona grandis* seed oil (Kirtikar and Basu 1933 ; Anon. 1976) help in growing hair.

Laxative : *Clerodendrum inerme* bark (Uhe 1974) ; roots of *Gmelina arborea*, *Premna corymbosa* and wood of *Tectona grandis* (Kirtikar and Basu 1933) are used as laxatives.

Leprosy : Fruits and flowers of *Gmelina arborea* (Kirtikar and Basu 1933 ; Benthall 1933) are used in the treatment of leprosy.

Nervous disorder / Nervine / Neuralgia : Leaves of *Lippia alba* (Chopra et al. 1969) ; *Verbena officinalis* and whole plant decoction of *Premna corymbosa* (Kirtikar and Basu 1933) are used in nervous disorder.

Pain (toothache, headache) : Bark poultice of *Callicarpa macrophylla* is used for a relief from headache (Kanjilal et al. 1939), Decoction of fresh roots of *Lantana aculeata* is also used for toothache (Catibog 1978). Wood powder plaster of *Tectona grandis* (Kirtikar and Basu 1933) is used in severe headache.

Piles : The leaves of *Premna corymbosa* are good as an external application to piles (Kirtikar and Basu 1933). Root powder of *Vitex negundo* is used as demulcent in piles (Anon. 1976). Roots of *Gmelina arborea*, *Premna corymbosa* and wood of *Tectona grandis* (Kirtikar and Basu 1933) are used in piles.

Rheumatism : Leaves of *Callicarpa tomentosa*, *Vitex negundo* and *Verbena officinalis* ; root of *Clerodendrum inerme*, *C. serratum* and *Gmelina arborea* ; whole plant of *Lantana aculeata*, *Premna corymbosa*

(Kirtikar and Basu 1933) and *Phyla nudiflora*, (Chopra *et al.* 1969); root decoction of *Sphenodesma pentandra*; leaves, seeds and wood of *Vitex trifolia* (Nagata 1971) are used in rheumatism. The leaves of *V. negundo* are used as a fomentation in rheumatism and body swellings by heating in earthen pot (Shah and Joshi 1971). Leaves of *Callicarpa macrophylla* are heated and applied to rheumatic joints (Watt 1972).

Skin disease : Bark decoction of *Callicarpa tomentosa*; leaves, roots and barks of *C. cana* (Kirtikar and Basu 1933); herbaceous portion of *Clerodendrum indicum* (Kanjilal *et al.* 1939); whole plant of *C. fragrans* (Khan and Hoq 1975); seed oil of *Tectona grandis* (Anon. 1976) are used for the treatment of scabies. Stem juice of *Premna barbata* is used for external application. (Shah and Joshi 1971) and leaf juice of *Stachytarpheta jamaicensis* is drunk for eczema (Wong 1976). Powdered seeds of *Nyctanthes arborescens* are used in scurfy affections of the scalp (Anon. 1966).

Stomachache : *Clerodendrum inerme* plant (Uhe 1974); *Lippia alba* leaves (Chopra *et al.* 1969), *Phyla nudiflora* plant (Kirtikar and Basu 1933); root of *Premna corymbosa* (Khan and Hoq 1975) are used in stomachache. In Malaya a decoction of the bark of *Vitex pinnata* is given to relieve stomachache (Anon. 1976).

Tonic : Leaves of *Vitex negundo*; bark of *Gmelina arborea*; root stem and leaves of *Clerodendrum inerme* (Khan and Hoq 1975); leaves of *Verbena officinalis*; bark of *Callicarpa tomentosa*, root of *Vitex trifolia* (Kirtikar and Basu 1933) and

Clerodendrum viscosum plant (Datta and Mukerjii 1952) are used as a tonic.

Tumour : Leaves of *Clerodendrum serratum* and *Premna corymbosa* and roots of *Clerodendrum viscosum* (Kirtikar and Basu 1933) are used externally in tumour.

Ulcer : Root, bark and fruit of *Gmelina arborea* (Ahuja 1965); plant ash of *Vitex negundo* (Sabin and Bedi 1983); whole plant of *Phyla nudiflora* (Kirtikar and Basu 1933) are used in ulcers. For nose ulcer *Stachytarpheta jamaicensis* is used (Uhe 1974). The leaf juice of *Gmelina arborea* (Kanjilal *et al.* 1939; Benthall 1933) and *Vitex negundo* (Kirtikar and Basu 1933) are used as a lotion to remove foetid discharge from ulcers and wounds.

Vermifuge : Leaves and roots of *Clerodendrum viscosum* (Khan and Hoq 1975; Kirtikar and Basu 1933; Datta and Mukerjii 1952); leaves of *Vitex negundo* (Anon. 1976; Kirtikar and Basu 1933); powdered wood of *Tectona grandis* (Kirtikar and Basu 1933) are used as a vermifuge. Leaf juice of *Nyctanthes arborescens* is given to children for the expulsion of round and thread worms (Anon. 1966). Clerodin, a chemical from *C. viscosum* possesses antihelminthic properties.

Food (F)

Verbenaceous plants are not very important as food. None of them is cultivated as food plant. However, various parts of Verbenaceous plants are sometimes used as food, usually in a supplemented manner. The young shoots, leaves and flowers of *Clerodendrum serratum* and the leaves of *C. indicum* are eaten as a vegetable (Kanjilal *et al.* 1939; Chopra *et.*

al. 1969). The fruits of *Lantana aculeata* are edible (Catibog 1978). The leaves of *Lippia alba* are used as a vegetable sage in cookery (Chopra *et al.* 1969). Young leaves of *Clerodendrum colebrockianum* are eaten as vegetables by the Lepchas (Watt 1972). The leaves of *Premna esculenta* (Heining 1925) and *P. latifolia* (Gamble 1922; Biswas and Bhuiyan 1983) are eaten in curries. These are also eaten by the tribals of Chittagong Hill Tracts. The fruits of *Vitex glabrata* are edible (Gamble 1922; Anon. 1976; Heining 1925). The seeds of *Vitex negundo* are eaten in the Philippines after boiling (Anon. 1971). Fruits of *Gmelina arborea* are eaten by tribes of Rajmahal Hills in India (Bedi 1978). The bark of *Premna bengalensis* is soft, sweet and edible (Anon. 1969) and its leaves are used in fish curries locally at Dhaka specially when the fish is bad smelling.

Fodder (Fo)

In Verbenaceae, fodder plants do not usually constitute a major part of original diet. Mostly, leaves and fruits of a few plants are used as a fodder. The leaves of *Callicarpa tomentosa* (Kanjilal *et al.* 1939), *Gmelina arborea* (Anon. 1956), *Premna latifolia* and *P. corymbosa* (Gamble 1922; Anon. 1969) are used as fodder. Cattle and deer are very fond of the fruits of *Gmelina arborea* (Haines 1908). *Lantana aculeata* are eaten by birds and wild cats (Catibog 1978).

Dye (D)

Some members of this family produce important dyes which are economically and commercially important. The leaves

of *Phyla nudiflora* yield two colouring matters—nodiflorin A and nodiflorin B (Chopra *et al.* 1969). The young leaves of *Tectona grandis* contain a yellow or red dye which has been used for dyeing silk (Anon. 1976; Benthall 1933; Heining 1925; Dastur 1963). A yellow dye is extracted from the bark of *Vitex pinnata* (Anon. 1976): The ash of the plant of *V. negundo* is reported to be used in alkali dyeing (Watt 1972; Anon. 1976).

Insect repellent (I)

The leaves of *Vitex negundo* and *V. trifolia* are reported to possess insecticidal properties. They are spread over stored grain and pulses as an insect repellent (Anon. 1976). It is also used in many parts of Bangladesh.

Live fences (L)

Lantana aculeata is reported to be used as live fences in many parts of the Philippines. *Duranta plumieri* and *Vitex negundo* are used as live fences in many parts of Bangladesh.

Ornamental (Or)

Clerodendrum inerme, *C. squamatum*, *Callicarpa macrophylla*, *Duranta plumieri*, *Lantana aculeata*, *L. trifolia*, *Vitex negundo* and *Verbena officinalis* are planted as ornamental plants in many parts of the world (Chopra 1969). *Holmskioldia sanguinea* is well esteemed as an ornamental plant. *Vitex trifolia* with pinkish flowers, *Stachytarpheta jamaicensis* with bluish flowers and *Premna esculenta* with whitish flowers can be introduced as ornamental plants.

Sphenodesma spp. and *Congea tomentosa* with white flowers surrounded by involucre are beautiful species for planting in the garden.

Others (O)

There are several other uses of Verbenaceous plants. *Callicarpa tomentosa* is used for charcoal making (Gamble 1922). The leaves of *Clerodendrum inerme* contain resin, gum, and bitter principle (Baquar and Tasnif 1967). Toothbrush can be made from the stem of *Lantana aculeata* (Catibog 1978). The fresh leaves of *Phyla nudiflora* (Chopra *et al.* 1969) and flowers of *Nyctanthes arbor-tristis* contain essential oil. Vitexin has been isolated from the leaves, roots and bark of *Vitex peduncularis* (Anon. 1976; Chopra *et al.* 1969). *V. peduncularis* has been recommended as a shade tree in tea garden (Anon. 1976). The leaves and twigs of *V. trifolia* yield an essential oil of spicy odour suitable for perfumery (Anon. 1976). The wood of *Callicarpa macrophylla* rubbed against the clean stone with water, and the paste obtained is used in mouth and tongue sores (Shah and Joshi 1971). Bark milk of *Premna latifolia* is given to cattle in colic troubles (Kirtikar and Basu 1933).

CONCLUSION

The economic use of some members of the family have a long history. *Tectona grandis*, *Gmelina arborea* and some species of *Vitex* are not only notable as timber but have a wide range of medicinal uses. The first two species are widely planted in Bangladesh. Thus, additional benefits could also be derived, from these plantation species. *Vitex negundo* and *V. trifolia* have

long heritage as herbal medicines and insect repellents. Herbal medicines can play an important role in the development of community health. Many members of this family have wide range of medicinal uses from febrifuge medicines to anticancer remedies. This review helps us in selecting multipurpose species including a number of ornamental plants.

A view through the check-list indicates that economic uses of a good number of species are neither reported nor known. There might be some uses of these species, also. It is emphasised that ethnobotanical survey of this family followed by phytochemical scanning and clinical diagnosis need immediate attention. Also steps have to be taken for the conservation of rare plants.

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A P P E N D I X

Checklist of the species (Synonyms in parenthesis)

- Callicarpa cana* Linn.-F
C. longifolia Lamk.
C. macrophylla Vahl. -M, Or, O
C. tomentosa (L.) Murr.
 (*C. arborea* Roxb.)
Caryopteris wallichiana Schauer
Clerodendrum bracteatum Wall.
C. colebrookianum Walp. -F
C. fragrans Vent. -M
C. indicum (L.) Ktze. -M, F
 (*C. siphonanthus* R. Br.)
C. inerme (L.) Gaertn. -M, Or, O
C. hastatum Lindl.
C. nerifolium Wall.
C. serratum Spreng. M, F
C. squamatum Vahl -Or
C. viscosum Vent. -M
 (*C. infortunatum* Gaertn.)
C. wallichii Merr.
 (*C. nutans* Wall. ex G. Don)
Congea tomentosa Roxb -O:
Guranta plumieri Jacq. -Or, L
Gmelina arborea Linn. -T, M, F, Fo
Holmskioldia sanguinea Retz. -Or
Lantana aculeata Linn. -M, Or, O, L
 (*L. camara* Linn.)
L. trifolia Linn. -M, Or, O
 (*L. indica* Roxb.)
Lippia alba (Mill.) Br. -M, F, Or
 (*L. geminata* Rich.)
Nyctanthes arbortristis Linn. -M, Or, O
Phyla nudiflora (L.) Greene-M, D, O
 (*Lippia nodiflora* Mich.)
Premna bengalensis Clarke--T, F
P. coriacea Clarke
P. corymbosa (Burm. f.) Roth. et. Willd.-M, Fo
 (*P. integrifolia* Linn.)
P. esculenta Roxb.-M, F
P. flavescens Buch.-Ham.
P. latifolia Roxb.-M, F, Fo, O
P. micrantha Schauer
P. scandens Roxb.
Sphenodesma pentandra Jack.. -M
S. unguiculata Schauer
Stachytarpheta jamaicensis (L.) Vahl. M, Or
 (*S. indica* Vahl.)
Tectona grandis Linn. f.-T, M, D
Verbena officinalis Linn. M, Or
Vitex altissima Linn. -T
V. canescens Kurz. -Fo
V. glabrata Br. -T, M, Fr, O
V. negundo Linn.-M, F, Or, I, D, L
V. peduncularis Wall.-T, M, Or, O
V. peduncularis Var. *roxburghiana* Clarke-
V. pinnata Linn. -T, M, D
 (*V. pubescence* Vahl.)-
V. quinata (Lour.) F. N. Willi
 (*V. heterophylla* Roxb.)
V. trifolia Linn. -M, I, Or, O