

**NICULA (*BARRINGTONIA ACUTANGULA* LINN. GAERTN.):
A PHYTOPHARMACOLOGICAL REVIEW****Nirmal Kumar^{1*}, Shivani Ghildiyal², Anil Kumar Singh³**

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ABSTRACT

Medicinal plants are widely used by the traditional medicinal Practitioners for curing various diseases in their day to day practice. A large number of plants are equally used by tribals and folklore tradition in India. Nicula (*Barringtonia acutangula* (Linn.) Gaertn.) is a medicinal plant which is use in several diseases. It is commonly known as Nicula, Hijjala, Vidul etc. Hijjala is used as a folk medicine as a remedy for diarrhoea, amoebic dysentery, worm infestation and gastrointestinal disorders. Present researches have been evaluated antioxidant, anti-nociceptive, anti-inflammatory, hypoglycemic, anthelmintic, hepatoprotective, anti-diarrheal and wormicidal activity in this plant. These research studies support the use of this plant for

uman and animal disease therapy and reinforce the importance of the ethno-botanical approach as a potential source of bioactive substances.

Key words: Hijjala, Ayurveda, *Barringtonia acutangula* (Linn.) Gaertn., Nicula.

1. INTRODUCTION

Nicula has been identified as Hijjala, Vetasa and Jalavetasa. These names refer to two different tree genera belonging to *Salix* and *Barringtonia*. Where Nicula phala or Niculini (pleural form of Nicula) are mentioned, the *Barringtonia* fruits are intended. Vetasa and Jalavetasa are undoubtedly *Salix* species which are either Jalaja(aquatic) or Sthalaja(terrestrial). *Barringtonia* grows near water courses and its root bark has properties similar to *Salix*. Both being Sheeta-veerya and emetic can serve as substitute of each other.

But the Barringtonia fruits are Ushna-veerya, bitter in taste, emetic and laxative, and should only be used when specially mentioned^[1].

2. Nicula (*Barringtonia acutangula* (Linn.) Gaertn.)

Botanical name- *Barringtonia acutangula* (Linn.) Gaertn.

Family- Lecythidaceae

2.1 Name of Nicula in different languages (Tab 1).

2.2 Scientific classification (Tab 2).

2.3 Occurrence and distribution

This plant is distributed in all over the India but mostly seen in Bengal and southern region and also in Sri Lanka and Singapore. Its abundance is particularly noticeable on river banks, ponds, lakes and other low lying areas.^[2]

2.4 Description

Medium sized evergreen tree. **Bark-** 12 mm. thick, rough and blackish-brown in colour. **Leaves-** simple, alternate petiolated. **Flower-** pendulous racemes, up to 40 cm long and 1.5 cm across, dark red flowers with 4 lobed ovate calyx and 2 celled ovary. **Fruit** - A drupe, yellowish-brown, oblong, 2.5-3.3 by 1.00 - 1.3 cm, bluntly quadrangular, broadest in the middle, slightly narrow and truncate at each end, fibrous; no characteristic odor and taste. **Seed** - Single, 2-2.5 by 0.7-1.0 cm, wrinkled longitudinally, dark brown in colour^[3]. **Part used** – Fruits, leaves, root and bark is used. Flowering time- Apr. - June, Fruiting time – July – Aug^[2]. (Fig. 1-6)

2.5 Ayurvedic guna (Properties) (Tab 3)

2.6 Description in Ayurvedic texts

Plant is described in virechana dravya^[4], a content of Mahapanchgavya ghrita in Apasmara Chikitsa^[5], Patolamuladi kwatha in Sotha chikitsa^[6], In Kustha chikitsa^[7], Nilinyada churna in Udararoga chikitsa^[8], and Nicula mula in Varnakara lepa^[9].

2.7 Folklore

Fruit is useful as vamaka(emetic) in kaphaja diseases and virechaka(purgative) in pittaja diseases, leaf swarasa with madhu given in diarrhoea and bark is useful in amoebic dysentery^[10].

2.8 Phytoconstituents

Glucosides, saponin, barringtonic acid, barringtonin, barringtogenol are present in fruit and tannin has been reported from the bark of Nicula (*Barringtoniaacutangula* (Linn.) Gaertn.)^[10].

2.9 Important Formulations

Mahapancagavya Ghrita, Lakshmi Vilasa Rasa (Nardiya), Nyagrodhadi Ghana Kvatha^[11].

3. Pharmacological activity

3.1 Anti-Nociceptive and Anti-Inflammatory activity

Syeda Hurmatul Quader et. al. reported centrally and peripherally mediated anti-nociceptive and anti inflammatory activities of the root of the plant. These activities may be possibly attributed due to the presence of tannins, flavonoids, saponins, alkaloids and terpenoids. These findings are in support of the traditional practices of *B. acutangula* in inflammation and joint pain^[12].

3.2 Hypoglycemic activity

Khatib N. A. and Patil P. A. reported that aqueous extract of *Barringtoniaacutangula* fruit at dose of 400 mg/kg twice daily showed significant hypoglycemic activity in streptozotacin induced hyperglycemic rats^[13]. The preliminary phytochemical study of BA fruit extracts showed the presence of alkaloids, tannins, saponins and polysaccharides. The hypoglycemic activity of BA fruit could be attributed to the presence of these phytoconstituents. Sulfonylureas, such as glibenclamide known to cause hypoglycemia by stimulating insulin secretion from pancreas. BA fruit aqueous extract treatment shows significant recovery when compared with untreated hyperglycemic rats, this could signify the regeneration of beta cells of islets of Langerhans, glibenclamide treatment also showed similar result as reported in literature^[14].

3.3 Hepatoprotective activity

S Mishra et.al. reported that the methanol extract of BA leaves exhibited significant ($P < 0.001$) hepatoprotective activity at a dose of 3.3 mg/mL and 250 mg/kg when screened in vitro and in vivo, respectively. Further studies aimed at elucidation of exact mechanism, isolation and purification of active phytoconstituents with potent hepatoprotective activity^[15].

3.4 Anthelmintic Activity

D.Padmavathi et. al. proved that ethanolic extract of *Barringtonia acutangula* possess significant anthelmintic activity^[16]. The leaf extract of *Barringtonia acutangula* not only produces paralysis, but also caused death of worms especially at a concentration of 100mg/ml shows nearly equal effect as compared to reference drug Piperazine citrate. Phytochemical analysis of the crude extract has revealed tannins to be among the chemical constituent contained with them. Tannins were shown to produce anthelmintic activities^[17].

3.5 Antiimplantation activity

The acetone extract of *B. acutangula* bark reported to show 60-70 percentage antiimplantation activity in female albino rats^[18].

3.6 Antioxidant activity

In vitro antioxidant assays (DPPH - radical scavenging and reducing power activity) revealed the promising potential in methanol extract of leaves^{[19],[20]}.

3.7 Antimicrobial activity

The methanolic extract of leaves of *B. acutangula* was investigated against some selected GIT infection and virulent fish pathogens viz. *Staphylococcus aureus* MTCC*1430, *Enterococcus faecalis* MTCC 2729, *Escherichia coli* MTCC 118, *Pseudomonas aeruginosa* MTCC 1035, *Klebsiella pneumoniae* MTCC 109, *Proteus mirabilis* MTCC 743, *Streptococcus mitis* MTCC*2695, *Salmonella typhi*, *Vibrio cholerae*, *Propionibacteri acnes* MTCC*1951, *Micrococcus luteus*, *Streptococcus equi*, *Aeromonas hydrophila* (two isolates), *Edwardsiella tarda*, *Pseudomonas aureginosa*, *Flavobacterium branchiophylum* and antifungal activity against some human pathogenic fungi viz. *Aspergillus niger* MTCC 1344, *Candida albicans* MTCC 3017, *Candida tropicalis*, *Candida krusei*, *Aspergillus flavus*, *Rizopus orizae* and *Cryptococcus neoformans* by disc diffusion assay method at the concentrations of 1000 and 125 µg/ml and minimum inhibitory concentration values were calculated by two fold serial dilution method. The highest zone of inhibition was found against *Enterococcus faecalis*^{[21],[22]}.

3.8 Anti poisonous activity

Uawonggul N et. al. reported anti-poisonous activity of *Barringtoniaacutangula*Linn. against *Heterometruslaoticus* scorpion venom activity on fibroblast cell lysis^[23].

3.9 Hypolipidemic activity

Nilesh P Babre et.al. proved that The treatment of EBA roots showed marked decrease in glycosylated haemoglobin, as well as marked increase in body weight, protein, HDL-cholesterol levels in serum of STZ-induced diabetic rats. At the same time treatment of EBA roots showed significant decrease in total cholesterol, LDL-cholesterol, VLDL-cholesterol, triglycerides and creatinine levels was observed in serum of diabetic rats. The EBA extract treatment remarkably increased the glycogen level in liver and muscle on STZ-induced diabetic rats. The EBA produced significant beneficial effects on the lipid profile on hyperlipidemic rats at both test doses i.e. 250 mg/kg b.w/p.o and 500mg/kg b.w/p.o.^[24].

3.10 Piscidal activity

Geeta Sharma and Gulshan Ara Latifa proved the toxicant property of absolute ethyl alcohol, 50% ethyl alcohol and water extract of the fresh and dry root bark of *Barringtonia acutangula* (Linn.) Gaertn. was studied on *Heteropneustes fossilis* (Bloch), *Channa punctatus* (Bloch), and some fresh water zooplanktons (Cyclops, Daphnia, chironomid larvae, tadpole larvae and mayfly larvae). The LD 50 values of different extracts were determined for the fishes by graphical method and probit analysis respectively. The dry root bark extracts were found to manifest comparatively higher toxicity than the corresponding fresh root bark extracts. The activity of the extract was due to the presence of saponin^[25].



Fig. 1. A plant of Hijjala (*Barringtonia acutangula* (Linn.) Gaertn.)



Fig. 2. Leaves of Hijjala (*Barringtonia acutangula* (Linn.) Gaertn.)

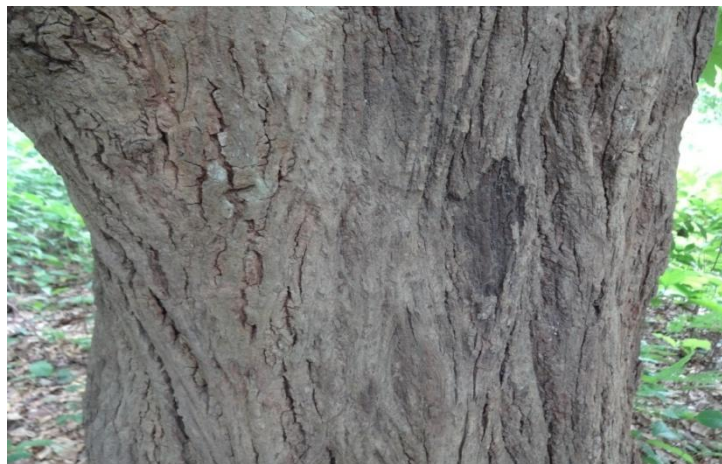


Fig. 3. Bark of Hijjala (*Barringtonia acutangula* (Linn.) Gaertn.)



Fig. 4. Flowering twig of Hijjala (*Barringtonia acutangula* (Linn.) Gaertn.)



Fig. 5. Immature fruits of Hijjala (*Barringtonia acutangula* (Linn.) Gaertn.)



Fig. 6. Mature fruits of Hijjala (*Barringtonia acutangula* (Linn.) Gaertn.)

Tab 1 Name of Hijjala in different languages

| | |
|------------------|---------------------------------|
| Sanskrit | : Hijjala, Vidula |
| Assam | : Hindole |
| Bengal | : Hijjala |
| Gujarat | : Samudraphala |
| Hindi | : Hijjala, Samudraphala |
| Kannada | : Nerruganegalu, Hologonvamara |
| Malayalam | : Manjal Kadamba, Manjal, Kadam |
| Marathi | : Samudraphala |
| Oriya | : Kijolo |
| Punjabi | : Samuderphal |
| Tamil | : Samudrapullarni, Samutrapalam |
| Telugu | : Kanapu, Kadaps |
| Urdu | : Hijjal |
| English | : Indian oak |

Tab 2 Scientific classification

| | |
|------------------|----------------------|
| Kingdom: | Plantae |
| Division: | Angiosperms |
| Class: | Eudicots |
| Order: | Ericales |
| Family: | Lecythidaceae |
| Genus: | Barringtonia |
| Species: | B. acutangula |

Tab 3 Ayurvedic guna (Properties)

| | |
|---------------|---------------------|
| Guna | Laghu, Ruksha |
| Rasa | Katu, Tikta, Kasaya |
| Vipaka | Katu |
| Virya | Ushna |

4. CONCLUSION

Numerous studies have been conducted on different parts of Nicula (*Barringtonia acutangula* (Linn.) Gaertn.) However detailed and systematic study is required for identification, cataloguing and documentation of *Barringtonia acutangula* (Linn.) Gaertn. which may provide a meaningful way for promoting traditional knowledge of the medicinal plant.

5. Conflict of interest statement

We declare that we have no conflict of interest.

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