

CHAPTER-8

MORPHOLOGICAL CHARACTERS AND MEDICINAL PROPERTIES OF *ACACIA NILOTICA* (L.) WILLD. EX DELILE

Mohd. Nafees Iqbal

Department of Botany,

MSP Art, science and K.P.T Commerce College, Manora,

District -Washim (MS) India

Email : khan2013msp@gmail.com

Summary

Medicinal plants are the source of the secondary metabolites i.e., alkaloids, flavonoids, terpenoids, tannins and reducing sugars. Medicinal plants play a vital role in preventing various diseases. The antidiuretic, anti-inflammatory, antianalgesic, anti-cancer, anti-viral, anti-malarial, anti-bacterial and anti-fungal activities of the medicinal plants are due to the presence of the above mentioned secondary metabolites. The qualitative phytochemical studies were carried out in the solvents viz. Methanol, Chloroform and n-Butanol. The Methanol, Chloroform and n-Butanol Leaves and roots extract of *Acacia nilotica* . shows the presence of alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols but in Bark of *Acacia nilotica* high intensity of phytochemicals than that of leaves

Keyword: *Acacia nilotica*, Methanol, Chloroform, n-Butanol and phytochemicals etc.

Introduction

The genus *Acacia* belongs to family Mimosaceae. *Acacia* Willd is a very large genus containing trees, shrubs and climbers. *Acacia nilotica* (linn), Willd ex del is known in India as babul, kikar, babur (Hindi). It is a moderate sized tree with a spreading crown. It is indigenous to the Indian Sub-continent as also in Tropical Africa, Burma, Sri Lanka, Saudi Arabia, Egypt and in West and East Sudan. In India, natural babul forests are generally found in Maharashtra, Gujarat, Andhra Pradesh, Rajesthan, Haryana and Karnataka. However, scattered trees in groups occur naturally and also widely planted in almost all states and Union territories

except north-eastern states, Kashmir and Kerala. *A. nilotica* is truly a multipurpose tree. Its timber is valued by rural folks, its leaves and pod are used as fodder and gum has a number of uses. It tolerates extremes of temperature and moisture. It is suited for planting on marginal lands and can survive both drought and flooded conditions.

Classification

Acacia nilotica is a complex species and has number of sub-species. Presently, 9 sub-species are known. These sub-species have been differentiated mainly on the basis of the shape, size and degree of pubescence of the branches, characteristics of pods, the habitat of the tree and the shape of the crown. The important features and distribution of different sub-species are given below:

- *Acacia nilotica* sub-species *nilotica* : The branchlets of this sub-species are generally glabrous to sub-glabrous or rarely pubescent. The arrangement of pods is necklace like, regularly constricted between the seeds having a smooth surface devoid of hair.
- *Acacia nilotica* sub-species *indica* : The young branchlets of this sub-species may vary from sub-glabrous to thinly pubescent. Pods are arranged necklace like, narrowly clogged between the seeds and are densely white-tomentose.
- *Acacia nilotica* sub-species *cupressiformis* : This sub-species bears a characteristic crown which make it conspicuous and identifiable from other sub-species of *Acacia nilotica*. The tree has a narrow erect cypress like crown. The branches tend to go upwards and make a narrow angle with the main stem.

In Maharashtra, the species occurs widely in the rain shadow region of Western Maharashtra and Vidharbha region. In Vidharbha region, it particularly occurs in Amaravati, Akola, Yavatmal, Wardha and Nagpur districts. In Western Maharashtra, it is found in Pune, Satara, Sangli, Ahmednagar and Sholapur districts. It is reported that *Acacia nilotica* is common in Sholapur districts throughout the undulating plateau of this region. It also occurs in erstwhile Marathwada region in Aurangabad, Jalna, Beed, Parbhani and Nanded districts. The species is almost absent along coastal areas. It occurs mostly on agricultural land in black cotton soil along nala banks. Orissa In Orissa, *Acacia nilotica* is distributed mainly in the western part which adjoins Madhya Pradesh. The species is not gregarious in forest areas but has been introduced in semi-arid areas in degraded forests and road side plantations, particularly in Sambalpur and adjoining districts. Punjab In Punjab, this species has been widely planted in strips along road and canal side plantations. It occurs naturally in pockets in riverain sites along Siwalik hills. Rajasthan In Rajasthan, this species occurs in most part of the state but it avoids extreme arid conditions. The species is abundant in northern Rajasthan, particularly in the districts of Jaipur, Bharatpur, Alwar, Sawai Madhopur, Dausa, Kota and Bundi and adjoining areas, where rainfall is comparatively better. Tamil Nadu In Tamil Nadu, the species grows

widely in the districts of Salem, Erode, Dharmapuri and Coimbatore. It is absent in coastal districts and higher hills. The species has been widely planted in tank foreshore plantations under social forestry programmes.

Material and Methods

Collection of Plant Material

Collection of *Acacia nilotica* (L.) Willd. ex Delile. plant part were collected from Manora Local Area, district, Washim, Maharashtra state, India. Plant part i.e. Roots and leaves cleaned soil dust with tap water. The plant material and specimens were identified by using standard floras like Cook 1907, Dhore 2005, Naik 1989, Yadav and Sardesai 2002.

Preparation of Plant Part Extract

Preparation of plant part Roots and leaves dried under shade and prepared fine powder, plant part extraction according to previously method used by Megala, and Elango, 2012, but were used some modified method in which the 5 gram of roots and leaves dried powder extracted with 50 ml of three different solvent i.e. methanol, chloroform and n-butanol, 24 hrs at room temperature and shaking constant and then filter with Whatman filter paper no.1, excess solvent in extract evaporated and extract used for Qualitative and quantitative evaluation of phytochemicals. The preliminary screening test were performed for the presence of following secondary metabolites such as alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols (Harborne, 1973) and Sofowara (2005).

According to Budhiraja, 2012, Roots and leaves powder extract in Chloroform and n-butanol solvent shows positive results of phytochemicals constituent and their activities against the anticancer and antibacterial so were used chloroform and n-butanol solvent.

Qualitative analysis of *Acacia Nilotica* (L.) Willd. ex Delile

Alkaloids test: The plant extract was evaporated to dryness and the residue was heated on a boiling water bath with 2% hydrochloric acid. After cooling, the mixture was filtered and treated with a few drops of Mayer's reagent. Formation of turbidity or yellow precipitation showed the presence of alkaloid.

Glycosides: Glycosides are compounds which upon hydrolysis give rise to one or more sugars (glycones) and a compound which is not a sugar (Glycone or Genine). To the solution of the extract in glacial acetic acid, few drops of ferric chloride and concentrated sulphuric acid are added, and observed for a reddish-brown coloration at the junction of two layers and the bluish green colour in the upper layer.

Terpenoids and steroids: Four milligrams of extract were treated with 0.5 ml of acetic anhydride and 0.5 ml of chloroform. Then concentrated solution of sulphuric acid was added slowly and red violet colour was observed for terpenoid and green bluish colour for steroids.

Flavonoids: 4 ml of extract solution was treated with 1.5 ml of 50% methanol solution. The solution was warmed and metal magnesium was added. To this

solution, 5 – 6 drops of concentrated hydrochloric acid was added and red colour was observed for flavonoids and orange colour for flavones.

Saponins: 0.5 g of extracts was added to 5 ml of distilled water in a test tube. The solution was shaken vigorously and observed for a stable persistent froth. The frothing was mixed with 3 drops of olive oil and shaken vigorously after which it was observed for the formation of an emulsion.

Phenols: The extract (50 mg) is dissolved in 5 ml of distilled water. To this few drops of neutral 5% ferric chloride solution are added. A dark green colour indicates the presence of phenolic compounds.

Tannins: To 0.5 ml of extract solution 1 ml of water and 1-2 drops of ferric chloride solution was added. Blue colour was observed for gallic tannins and green black for catecholic tannins.



Acacia nilotica



Bark and dried powder of A. nilotica



Dried powder dissolved in different solutions



Extraction with Soxhlet Assembly

Fig. 1. Different phases of Experimentation on Extraction of Phytochemicals from A. Nilotica

Results and Discussion

Botanical description of Acacia nilotica (L.) Willd. ex Delile

Babul (*Acacia nilotica* (L.) Willd. ex Delile) is a medium sized, thorny, nearly evergreen tree that can reach a height of 20-25 m but may remain a shrub in poor growing conditions. The trunk is short, thick (1 m in diameter) and cylindrical, covered with grey bark. The crown may be flattened or rounded. The root system depends on the growing conditions and subspecies: a deep taproot

in dry conditions and extensive lateral roots in flooded conditions. The leaves are 5-15 cm long, alternate and compound with 7 to 36 pairs of elliptical, 1.5-7 mm long x 0.5-2 mm broad, grey-green, hairy leaflets. Flowers are sweetly scented and bright to golden yellow in colour. The fruits are linear, flattened, narrow indehiscent pods, 4-22 cm long and 1-2 cm broad, dark-brown to grey in colour and glabrous or velvety. The pods contain 8 to 15 elliptical, flattened bean-shaped dark seeds. There are two groups of *Acacia nilotica* subspecies. The first group (*nilotica*, *tomentosa*, *cupressiformis*, *indica*) consists of tall riverine trees that grow in seasonally flooded areas. Their pods have a characteristic "necklace" shape with constrictions between the seeds. The second group (*adstringens*, *keraussiana*, *leiocarpa*, *subalata*) grows in drier areas and has straight-edged pods.

Table 1: Qualitative analysis of *Acacia nilotica* (L.) Willd. ex Delile Bark and leaves

Sr. No.	Phytochemical	Plant extract of Bark in			Plant extract of Leaves in		
		Methanol	Chloroform	n-butanol	Methanol	Chloroform	n-butanol
1.	Alkaloids	+	+	++	++	+	+
2.	Glycosides	++	+	+	+	-	+
3.	Terpenoids	+	++	+	+	+	+
4.	Steroids	-	+	-	-	-	+
5.	Flavonoids	++	++	++	++	+	+
6.	Saponins	++	++	++	+	++	++
7.	Phenols	++	+	++	++	+	+
8.	Tannins	++	++	++	+++	+++	+++

The qualitative phytochemical studies were carried out in the solvents viz. Methanol, Chloroform and n-Butanol. The Methanol, Chloroform and n-Butanol Leaves and roots extract of *Acacia nilotica* . shows the presence of alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols but in Bark of *Acacia nilotica* high intensity of phytochemicals than that of leaves showed in table no.1 by twice and tannin absence in methanolic Roots and n-butanol extract of leaves.

Medicinal Uses

Root: The roots are used against cancers and/or tumour's (of ear, eye, or testicles), tuberculosis and indurations of liver and spleen.

Leaf: The leaves are Chemopreventive, antimutagenic, anti-bacterial, anticancer, astringent, anti- microbial activity

Tender leaves: Tender leaves are used to treat diarrhoea, Aphrodisiac, dressing of ulcers, anti- inflammatory and Alzheimer's diseases. Gum Astringent, emollient, liver tonic, antipyretic and antiasthma tic.

Stem bark: Anti-bacterial, antioxidant, anti-mutagenic, cytotoxic bark is used as astringent, acrid cooling, styptic, emollient, anthelmintic, aphrodisiac, diuretic, expectorant, emetic, nutritive, in haemorrhage, wound ulcers, leprosy, leukoderma, small pox, skin diseases, biliousness, burning sensation, toothache, leukoderma, dysentery and seminal weakness. The trunk bark is used for cold, bronchitis, diarrhoea, dysentery, biliousness, bleeding piles and leukoderma.

Conclusion

The selected ten medicinal plants are the source of the secondary metabolites i.e., alkaloids, flavonoids, terpenoids, tannins and reducing sugars. Medicinal plants play a vital role in preventing various diseases. The antidiuretic, anti-inflammatory, antianalgesic, anti-cancer, anti-viral, anti-malarial, anti-bacterial and anti-fungal activities of the medicinal plants are due to the presence of the above mentioned secondary metabolites. Medicinal plants are used for discovering and screening of the phytochemical constituents which are very helpful for the manufacturing of new drugs. The previous phytochemical analysis and present studied show nearly the similar results due to the presence of the phytochemical constituents. The phytochemical analysis of the medicinal plants is also important and have commercial interest in both research institutes and pharmaceuticals companies for the manufacturing of the new drugs for treatment of various diseases.

References

- [1] Begum, S., Ahmed, M., Siddiqui, B. S., Khan, A., Saify, Z. S. (1997). Triterpenes, A sterol and Amonocyclic alcohol from Momordicacharantia. *Phytochem* , 44: 1313-1320.
- [2] Brenan, J. P. M. (1983). Manual on the taxonomy of Acacia species, present taxonomy of four species of Acacia, FAO, Rome, Italy 42.
- [3] Debnath, B. Uddin, J., Patari, P., Das, M., Maiti, D. and Manna, K. (2015). Estimation of Alkaloids and Phenolics of Five Edible Cucurbitaceous Plants and Their Antibacterial Activity. *Int J Pharm & Pharm Sci*, 7(12): 223-227.
- [4] Harborne, J. B. (1973). *Phytochemical Method. A Guide to Modern Technique of Plants Analysis*. Chapman and Hall, London.
- [5] Hérouart, D., Sangwan, R. S., Fliniaux, M. A., Sangwan-Norreel, B. S. (1988). Variations in the Leaf Alkaloid Content of Androgenic Diploid Plants of *Datura innoxia*. *Planta Med*, 54: 14-17.
- [6] Hilliard, O. M. (1977). *Compositae in Natal*. Pietermaritburg. South Africa: University of Natal Pres.

- [7] Kim, H. B., Bang, H. S., Lee, H. W., Seuk, Y. S., Sung, G. B. (1999). Chemical characteristics of mulberry syncarp. *Korean J Med. Crop Sci*, 47: 3206-3209.
- [8] Kimura, Y., Akihisa, T., Yuasa, N., Ukiya, M., Suzuki, T, (2005). Cucurbitane-type triterpenoids from the fruit of *Momordica charantia*. *J Nat Prod*, 68: 807-809.
- [9] Plummer, D. T. (1990). Introduction to practical biochemistry. 3rd 25. Ed. Tata McGraw Hill Publishing Company Limited, India.
- [10] Stephens, J. M. (2003). Gourd *Luffa-Luffa* cylindrical, *Luffaegyptica* and *Luffaacutangula*. *J Horti Sci Univ Florida*, 3: 19-21.
- [11] Yogisha, S., Raveesha, K. A. (2009). In-vitro antibacterial effect of selected medicinal plant extracts. *J Nat Prod*, 2: 64-69.



©2025 Copyright Author(s). Chapters are published under the
book title “Advances in Botanical Research”. An Open Access
Book under CC-BY license at
<https://press.vyomhansjournals.com>
by Vyom Hans Publications
E-Book ISBN: 978-81-981814-9-7
Year April, 2025
