

# Comparative Phytochemical Analysis of White and Pink Flower of *Nelumbo Nucifera*

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**Abstract:** Plants are used as a major source in medicine since ancient times, as they are reservoir of biochemical compounds. Lotus is traditionally used as antibacterial, diuretic, uterotonic, antidiabetic, hematemesis, anti-inflammatory etc. The plant is rhizomatous aquatic herb widely distributed in temperate and tropical climates around the world. The family Nymphaeaceae consists of 8 genera, 100 species distributed all over the world of which 4 genera and 7 species occurring throughout India. In the present study, the two varieties of lotus (pink and white flowers) were compared. The preliminary phytochemical analysis revealed the presence of alkaloids, carbohydrates, saponins, phenols, flavonoids, aminoacids, protein, diterpenes, tannins, terpenoids, steroids, oxalate, cardiac glycosides, anthocyanin, carboxylic acid, xanthoprotein, coumarin, quinines, glycosides and leucoanthocyanin. Comparatively, the pink variety showed the presence of more phytoconstituents than the white variety.

**Keywords:** *Nelumbo nucifera* (pink and white), phytochemical

## 1. Introduction

Medicinal plants are the richest bio-resources of folk medicines and traditional systems of medicine and it was invoked as food supplements, nutraceuticals and in pharmaceutical industries and chemical entities for synthetic drugs (Ncube *et al.*, 2008). Herbal medicine was based on the assumption that plants contain natural substances that can promote health and alleviate illness (Balakumar *et al.*, 2011). Phytochemicals are the natural bioactive compounds found in plants, which are solely responsible for their medicinal activity. Knowledge on the Phytochemicals of plants is desirable because such information will be value for synthesis of complex chemical substances (Mojab *et al.*, 2003; Parekh and Chanda, 2007; Parekh and Chanda, 2008). Phytochemicals are naturally occurring in the medicinal plants, leaves, vegetables and roots that have defense mechanism and protect from various diseases.

Phytochemicals are primary and secondary compounds. Chlorophyll, proteins and common sugars are included in primary compounds and secondary compounds have, alkaloids, flavonoids, steroid, tannins and phenolic compounds (Krishnaiah *et al.*, 2007).

*Nelumbo nucifera*, now placed in the mono-generic family Nymphaeaceae, has numerous common names (e.g. Indian lotus, Chinese water lily and sacred lotus) and synonyms (*Nelumbium nelumbo*, *N. speciosa*, *N. speciosum* and *Nymphaea nelumbo*) (Duke *et al.*, 2002). *N. nucifera* is a native of china, Japan and India. In India, *N. nucifera*, commonly known as lotus, kamala or padma, is an aquatic species, requiring plenty of space and full sun in order to thrive. It has stout, creeping, yellow rhizomes and green fruits. Leaves are large, floating rarely aerial orbicular 20-90 cm. in diameter, abruptly acute to form a short tip, petiolate, entire glaucous, non-wettable, strong cupped in case of aerial leaves and flat in case of floating ones. Fruit is an aggregate of indehiscent nut-lets. Ripe nutlets are ovoid, roundish or oblongish upto 1.0 cm long 1.5 cm broad, with

hard smooth, brownish or grayish black pericarp which is faintly longitudinally striated, pedunculated and one seeded. Seeds fill in the ripe carpel (Nagarajan *et al.*, 1966). There are two varieties; one has white flowers and the other has pink or reddish-pink flowers (Chopra *et al.*, 1958). In Siddha System of Medicine, *N. nucifera* was reported to cure cardiac diseases, liver disorders and dysentery (Bharti *et al.*, 2012). The whole plant serves as astringent, emollient, diuretic and sudorific and possesses antifungal, antipyretic and cardiotoxic (Yu and Hu, 1997; Mukherjee *et al.*, 1997a; Mukherjee *et al.*, 1997b). The leaves and flowers of lotus plant were used to treat many bleeding disorders and consumption of flowers is recommended to promote conception. Flowers are useful to treat diarrhoea, cholera, fever, hepatopathy and hyperdipsia (Chopra *et al.*, 1956). This study was aimed to compare phytochemical content of *N. nucifera* (white and pink varieties).

## 2. Materials and Methods

### Collection of Plant Material

The two varieties of plant *Nelumbo nucifera* (white and pink) were collected separately from Bhagaveli and Ranipet. The collected plant material was separated as root, leaves and flower. All the material were washed under running tap water thoroughly, shade dried for 15 to 30 days and grounded into fine powder and stored separately in an airtight container.

### Preparation of Extract

Each sample of 10 g were taken and soaked for 24h in 50 mL of ethanol, aqueous, acetone, chloroform and petroleum ether separately. The extracts were filtered using Whatman filter paper 1, evaporated to dryness and re-dissolved in equal volume of its respective solvent. The extracts were stored at 4°C for future use.

### Phytochemical Analysis

Phytochemical screening was carried out by using the standard protocols as described by Harborne (1973). The alkaloids are determined by Wagner's Test (Tiwari *et al.*,

2011); carbohydrates by Benedict’s Test; saponin by Foam Test; phenol by Ferric Chloride Test; flavonoids by Lead Acetate Test; diterpenes by Copper Acetate Test, terpenoids by Salkowski’s Test (Khanam *et al.*, 2014), aminoacids by Ninhydrin Test; proteins by Biuret Test, Tannins by Ferric Chloride Test; and oxalate by Ethanoic acid glacial (Ugochukwu *et al.*, 2013). Further detection of steroids was carried out by Harborne; detection of coumarin was done by Mace method (1963) and quinone by conc. H2SO4. Xanthoproteins by conc. HNO3 and NH3 Test (Kumar *et al.*, 2013), cardiac glycosides by Kellerkillani synthesis (Misra *et al.*, 2011), anthocyanin by HCl and NH3 (Godghate *et al.*, 2012), leucoanthocyanin by isoamyl alcohol; carboxylic acid by effervescence test and glycosides by Modified Borntrager’s Test (Kokate *et al.*, 2006).

3. Result and Discussion

Table: Phytochemical Analysis of *N. nucifera* (White and Pink Varieties)

S.No	Name of Phytochemical	Acetone			Aqueous			Chloroform			Ethanol			Pet.Ether														
		White	Pink		White	Pink		White	Pink		White	Pink		White	Pink													
		R	L	F	R	L	F	R	L	F	R	L	F	R	L	F	R	L	F									
1	Alkaloids	+	+	-	+	+	-	-	+	+	+	+	-	+	+	+	-	+	+	-	+	+	-					
2	Carbohydrates	-	+	-	-	-	-	+	-	-	-	-	-	+	+	-	+	-	-	-	+	-	-	-	+			
3	Saponins	+	-	+	+	-	-	+	-	+	+	-	-	+	-	-	+	+	+	+	+	+	-	-	+	-		
4	Phenol	+	+	+	-	+	+	-	+	+	-	+	+	-	+	+	-	+	+	-	+	+	-	-	+	-		
5	Flavanoids	-	+	+	-	+	+	-	+	+	-	+	+	-	+	-	-	-	-	+	+	-	+	-	-	-		
6	Aminoacids	-	-	-	-	+	+	+	-	-	-	-	-	-	-	-	+	-	+	+	+	-	-	-	-	-		
7	Diterpenoids	-	-	-	+	-	+	-	+	+	-	+	-	-	-	-	+	-	+	+	-	-	-	+	+	-		
8	Tannins	+	+	+	-	+	-	-	+	+	+	+	+	-	+	+	+	+	+	+	+	-	+	-	-	-	+	
9	Terpenoids	+	-	+	-	+	+	+	-	+	+	-	+	-	-	-	+	+	+	+	+	+	+	-	-	+	+	-
10	Proteins	-	-	-	-	+	+	+	+	+	+	-	-	-	-	-	-	+	+	+	-	+	-	-	-	+	+	
11	steroids	+	+	+	+	-	+	-	+	+	+	+	+	-	+	-	-	-	+	+	+	-	+	+	-	-	-	-
12	Oxalate	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	
13	Cardioglycosides	-	-	+	-	+	-	-	-	-	+	-	+	-	-	-	-	+	-	-	-	+	-	-	-	-	-	
14	Anthocyanin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	
15	Carboxylic acid	-	-	-	-	-	-	+	+	-	-	+	-	-	+	+	+	+	+	+	-	-	+	+	-	-	-	
16	Xanthoprotein	-	-	-	-	+	+	+	-	+	+	-	-	-	-	-	+	+	-	+	-	-	-	+	-	-	+	
17	Coumarin	+	-	+	-	-	-	-	+	-	+	-	+	+	-	-	+	+	+	-	+	+	+	-	+	-	+	
18	Quinines	-	-	+	-	+	-	-	-	+	-	-	+	-	-	+	+	+	-	+	-	-	-	-	-	-	+	
19	Glycosides	-	+	+	-	-	+	+	-	-	+	+	-	-	-	-	+	+	+	+	-	+	+	-	+	-	-	
20	leucoanthocyanin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

[Note: “+” indicates presence and “-” indicates absence of phytoconstituents; R- root and rhizome; L- leaf and petiole, F- Flower]

The chloroform extract revealed the presence of tannin, steroid and coumarin in the white flower. The presence of these metabolites suggests great potential for the plant as a source of useful phytomedicines (Kunle *et al.*, 2003). In pink flower variety, the saponins, tannin and coumarin are present in the chloroform extract of root. Plants having alkaloids are used in medicines for reducing headache and fever. These are attributed for antibacterial and analgesic properties (Pietta, 2000). Alkaloids are used as anaesthetic agents and are found in medicinal plants (Hérouart, 1988). Saponins serve as useful aids as pharmacological and immunological agents in enhancing the recipients’ immune’s response to a supplied antigen (Liener, 1980). Methanol and acetone leaf extract of *N. nucifera* showed less anticancer activity against breast cancer (Arjunet *et al.*, 2012). Krubha and Thirumalai Vasan (2016) reported that preliminary phytochemical analysis of the extract revealed the presence of saponins, phlobotannins, flavonoids, tannins, sterols and phenols but with few differences in receptacles of white

and pink flower. The quantitative screening indicated that the methanolic extract of *N. nucifera* rhizome showed the highest contents of flavonoids and phenols (Ullah *et al.*, 2018). Comparatively, the pink variety showed highest phytoconstituents when compared to white variety.

Both ethanol and aqueous extract of both varieties of *N. nucifera* showed the presence of alkaloids, carbohydrate, saponins, phenols, flavonoids, aminoacids, protein, diterpenes, tannins, terpenoids, steroids, oxalate, cardioglycosides, anthocyanin, carboxylic acid, xanthoprotein, coumarin, quinines, glycosides and leucoanthocyanin. Ethanol extract showed the presence of numerous phytoconstituents in the pink flower. The chloroform extract showed presence of least phytoconstituents.

4. Conclusion

The present study results showed that the two varieties of *N. nucifera* rhizome and root, leaf and petiole and flowers has various phytochemicals such as alkaloids, cardiac glycosides, flavonoids, saponin, tannin, phenolic compounds, etc. To conclude, pharmacological studies of the active phytoconstituents may be considered and studied elaborately to treat various types of diseases. Further comparative analysis on the antioxidant activity of the *Nelumbo nucifera* and isolation of the active components is under process.

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