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Phytochemical Analysis of the Leaf Extracts and Dry Extracts of Nyctanthes Arbor-Tristis

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Abstract: ***Nyctanthes arbor-tristis, commonly known as Night Jasmine, holds significant cultural and medicinal importance. This study aimed to explore its phytochemical composition and potential pharmacological significance. Phytochemical screening revealed the presence of alkaloids, flavonoids, saponins, phenols, tannins, terpenoids, and steroids in the plant extract. Additionally, bioactive compounds were extracted using different solvents, namely methanolic aqueous, aqueous, and acetone-aqueous extracts. The results highlight the diverse chemical profile of Nyctanthes arbor-tristis and its potential therapeutic applications. Further research into these compounds could lead to the development of novel medicines.***

I. Introduction

Nyctanthes arbor-tristis, commonly referred to as Night Jasmine, is a medicinal plant belonging to the Oleaceae family. This woody perennial typically boasts a lifespan ranging from 5 to 20 years (Kiew and Baas 1984). Beyond its botanical characteristics, this plant holds cultural significance and medicinal value.The orange-white corolla of Nyctanthes arbor-tristis serves various purposes, including dyeing cloth and cotton. Additionally, in traditional practices, the entire flower is utilized to color the orange robes worn by Buddhist priests. This underscores the plant's multifaceted utility in both cultural and practical contexts. In the realm of modern pharmaceuticals, natural products like Nyctanthes arbor-tristis play a pivotal role. Baker et al. (1995) highlighted that over 50% of contemporary clinical drugs originate from natural sources. Notably, this plant contains a diverse array of phytochemicals, including flavanols, glycosides, D-mannitol, and nicotiflorin (Bordoloi & Lahkar in 2018). Moreover, research indicates that Nyctanthes arbor-tristis exhibits pharmacological effects, with its leaves demonstrating anti-fungal, anti-inflammatory, and antibacterial properties (Gulsan et al. in 2015). This underscores its potential therapeutic value in various health applications. Nyctanthes arbor-tristis, known by various names such as Night Jasmine, Parijat, and Harasinghar, thrives in tropical and subtropical regions. Doughari & Ioryue (2009) and Meshram et al. (2012) have extensively documented its cultural significance and traditional uses. The research described in various studies aims to delve into the chemical constituents of Nyctanthes arbor-tristis and assess their pharmacological activities. This endeavor seeks to unlock the therapeutic potential of this precious medicinal plant, contributing to advancements in natural medicine and pharmaceutical development.

II. Material and Methods

Plant collection and Processing: The leaves of Nyctanhes arbor-tristis L were collected from Ambala district, Haryana on 18th November 2018. Then it was washed with water and they were shade dried for several months. After complete drying, and powder was prepared using an electric grinder. 50 gram of the powder was taken in conical flask and 250 ml of ethanol added and left 72 hours for maceration and then extracts were filtered through double folded muslin cloth at first then through

whattmann filter paper No.1. Filtrate was evaporated in rotary evaporator. Dry extract was kept in desiccator for further analysis. For the preparation of plant extract 50 gm of leaves were soaked overnight for 24 hours in 3 solvents (Aqueous, methanol-aqueous and acetone-aqueous solvents). The solvents dissolve the active biomolecules. The leaves remain as precipitate and the active biomolecules were present in the solvent. The respective supernatants were taken and the following phytochemical assays were conducted to test the presence of secondary metabolites.

Chemicals used: All the chemicals were purchased and manufactured from Merck and Qualigens Fine Chemicals. Chemicals used were Gallic acid, Quercetin, sodium carbonate, Folin-ciocalteu reagent, Trichloroacetic acid, Aluminium trichloride, Sodium hydroxide, Sodium nitrate, Potassium ferricyanide, Ferric chloride, Paracetamol & Silymarin (Lomus Pharmaceuticals Pvt Ltd).

Instruments used: Computer set with spectrophotometer software, UV visible spectrophotometer, Digital pH meter, GC-MS –QP2010, Digital centrifuge , Digital hot air oven, Digital incubator , Rotary vacuum evaporator, Digital weighing balance, and all the glassware were from Borosil, Religlas & Aarosil.

Phytochemical screening: Phytochemical screening was performed using standard protocols to detect the presence of glycosides, alkaloids, carbohydrates, proteins, flavonoids, saponins, phenols and tannins (Chetia et al., 2014).

Test for Terpenoid: 1.00 gm of plant extract was mixed with 4 ml of chloroform and equal volume of concentrated sulphuric acid was added. Terpenoids presence was confirmed by a reddishbrown colouration of interface.

Test for Tannin: 5ml of plant extract was added with 5 drops of 10% lead acetate. Formation of a light-yellow precipitate indicates the presence of tannin

GC-MS analysis: It was conducted in Department of Food Technology and Quality Control, Babarmahal, Kathmandu Nepal for the analysis of compounds present in the extract.

Test for Phenolic compounds: 2 ml of plant extract was added with 5 drops of 1% ferric chloride and 1 ml of potassium ferro cyanide, a bluish-green solution showed the presence of phenolic compound.

Test for Saponin:

2 ml of the extract was boiled in 20 ml of distilled water and filtered with Whatman filter paper. 2.5 ml of filtrate was mixed with 1 ml of normal distilled water and shaken vigorously. Occurrence of stable persistent froth indicates the presence of saponins.

Test for Flavonoids: To 2 ml of the extract, few drops of dilute sodium hydroxide were added. Presence of flavonoids was indicated upon production of an intense yellow colour in the plant extract which became colourless on addition of 4-5 drops of 50% dilute acid.

Test for Steroid: 4 ml of plant extract was dissolved in 10 ml chloroform and then 10 ml of concentrated sulphuric acid was added. Formation of 2 phases (upper red and lower yellow with green fluorescence) indicates the presence of steroid.

Test for Alkaloids: 5ml of plant extract was mixed with 3 ml of aqueous HCl on water bath and then filtered. 1 ml of Dragendorff's reagent was added in the filtrate. The occurrence of orange-red precipitate indicates the presence of alkaloids in the sample extract.

Test for Carbonyl: 2 ml of plant extract was added with 2 drops of 2, 4-dinitrophenyl hydrazine solution and thoroughly shaken, yellow crystal formation indicates presence of carbonyl compound.

III. Results and Discussion

The following section presents the results and discussion of the phytochemical analysis conducted on extracts obtained from *Nyctanthes arbor-tristis L.* leaves. The study aimed to identify and characterize various bioactive compounds present in the plant material using standard phytochemical tests. The analysis included the detection of alkaloids, flavonoids, saponins, phenols, tannins, terpenoids, and steroids.

Table: 1 Phytochemical Analysis of *Nyctanthes arbor-tristis L.* Leaves

S. No.	Phytochemical Test	Result
1	Alkaloids	Orange-red precipitate
2	Flavonoids	Intense yellow color, colorless upon acid
3	Saponins	Stable froth observed
4	Phenols	Bluish-green solution
5	Tannins	Light-yellow precipitate
6	Terpenoids	Reddish-brown interface coloration
7	Steroids	Two-phase formation, green fluorescence

The phytochemical analysis of the *Nyctanthes arbor-tristis L.* leaves yielded significant insights into its chemical composition. Alkaloids were detected through the formation of an orange-red precipitate, indicative of nitrogen-containing compounds known for their diverse pharmacological activities such as analgesic and antimicrobial effects. Flavonoids, evidenced by the intense yellow coloration, showcased the presence of polyphenolic compounds renowned for their antioxidant and anti-inflammatory properties, confirmed further with the colorless solution upon acidification. Saponins, identified by the stable froth, are glycosides associated with antimicrobial and anti-inflammatory effects. Phenolic compounds, indicated by the bluish-green solution, contribute antioxidant properties crucial for medicinal purposes. Tannins, evidenced by the light-yellow precipitate, offer antioxidant and antimicrobial benefits along with the characteristic astringent taste. Terpenoids, signified by the reddish-brown interface coloration, are secondary metabolites with diverse biological activities, including antimicrobial and anti-inflammatory effects. Finally, the detection of steroids, denoted by two-phase formation and green fluorescence, highlights their significance in physiological regulation and potential pharmacological effects such as anti-inflammatory and immunomodulatory actions. These findings underscore the rich chemical diversity of *Nyctanthes arbor-tristis L.* and its potential therapeutic applications warranting further investigation.

Table: 2 Bioactive Compounds Detected in Different Solvent Extracts of *Nyctanthes arbor-tristis L.* Leaves

S. No.	Solvent	Bioactive compounds detected
1	Methanolic aqueous	Saponin, Tannin, Terpenoids and Phenolic compound.
2	Aqueous	Saponin, Tannin, Flavonoids, Phenolic compound, and Carbonyl.
3	Acetone-aqueous	Tannin, Flavonoids, Phenolic compound

The extraction of bioactive compounds from *Nyctanthes arbor-tristis L.* leaves using different solvents revealed a diverse array of phytochemicals. In the methanolic aqueous extract, the presence of saponins, tannins, terpenoids, and phenolic compounds suggests a rich chemical profile with potential medicinal properties. Saponins, known for their antimicrobial and anti-inflammatory effects, were detected alongside tannins, which offer antioxidant and antimicrobial benefits. Terpenoids, with their varied biological activities including antimicrobial and anti-inflammatory effects, were also identified, along with phenolic compounds, crucial for their antioxidant properties. The aqueous extract showcased a similar range of bioactive compounds, including saponins, tannins, flavonoids, phenolic compounds, and carbonyl compounds. The presence of flavonoids adds further to the extract's potential therapeutic benefits, given their antioxidant and anti-inflammatory properties. Additionally, the detection of carbonyl compounds hints at the presence of potentially bioactive molecules with diverse pharmacological effects. In the acetone-aqueous extract, tannins, flavonoids, and phenolic compounds were detected. These compounds contribute to the extract's antioxidant and anti-inflammatory properties, aligning with its potential medicinal applications. Overall, the varied

composition of bioactive compounds across different solvent extracts underscores the importance of solvent selection in extracting phytochemicals and highlights the potential pharmacological benefits of *Nyctanthes arbor-tristis L.* leaves.

IV. Conclusion

The phytochemical analysis of *Nyctanthes arbor-tristis* leaves revealed a rich chemical composition with significant pharmacological potential. Alkaloids, flavonoids, saponins, phenols, tannins, terpenoids, and steroids were identified, showcasing the plant's diverse bioactive constituents. Moreover, solvent extraction yielded bioactive compounds with varying pharmacological properties, emphasizing the importance of solvent selection in maximizing phytochemical extraction. These findings underscore the medicinal value of *Nyctanthes arbor-tristis* and warrant further research to elucidate its therapeutic benefits and develop effective herbal medicines.

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