

# QUALITATIVE PHYTOCHEMICAL SCREENING OF *NYCTANTHES ARBOR-TRISTIS*, *QUISQUALIS INDICA*, *TRADESCANTIA SPATHACEA* AND *PORTULACA GRANDIFLORA*

Deepika, Shipra Shakya, \*Ranjana Roy Mishra

Department of Botany, Kalindi College, University of Delhi, India.

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\*Corresponding Author: Dr. Ranjana Roy Mishra 

Department of Botany, Kalindi College, University of Delhi, India.

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## ABSTRACT

The increasing global demand for the herbal medicines necessitates the scientific validation of the traditional plant-based therapeutics and the effects of different processing methods on the phytochemical compositions. The aim of the present study was qualitative investigation of phytochemical screening of the fresh and air-dried leaves of *Nyctanthes arbor-tristis*, *Quisqualis indica*, *Tradescantia spathacea* and *Portulaca grandiflora*. The leaf samples were subjected to various standard phytochemical tests for alkaloids, tannins, saponins, flavonoids, sterols, glycosides and terpenoids. The results revealed notable species- specific and processing- dependent variations in phytochemical compositions. Air- drying enhanced the presence of certain phytochemicals such as alkaloids and tannins in specific species, while saponins and sterols showed variable responses to drying. Glycosides were absent in *Nyctanthes arbor-tristis*, *Tradescantia spathacea* and *Portulaca grandiflora*. Terpenoids were consistently abundant in both fresh and air- dried leaf samples across all selected plants. Overall, *Quisqualis indica* exhibited a comparatively richer phytochemical profile. This study shows that the selected plants are rich sources of phytochemicals. It also highlights the effect of processing on the phytochemical composition of leaves of different plants. The present study provides the scientific validation for the traditional uses of the selected plants and provides a baseline data for further quantitative studies.

**KEYWORDS:** Phytochemical screening, Medicinal plants, Air-drying, *Nyctanthes arbor-tristis*.

## INTRODUCTION

Herbal medicines cause no or fewer side effects as compared to the allopathic medicines. Hence their demand is increasing worldwide (Balkrishna et al., 2024; Kala et al., 2006). Recent reports have shown that approximately 85% population living in the developing countries depends on the herbal medicines to treat several ailments. Plants have the medicinal properties due to their phytochemical compositions (El- Saadony et al., 2025). Phytochemicals such as alkaloids, saponins, terpenoids, and sterols are the non- nutrient chemicals produced by the plants which are responsible to protect plants and for their various important therapeutic properties such as antioxidant, anticancer, antiallergic, antibacterial and antiviral (Anas et al., 2025; Sharma et al., 2018 and Jaeger et al., 2016 as cited in Kumar et al., 2023). Qualitative phytochemical analysis is the primary

step in detection of the phytochemicals and it is inexpensive, faster and easier to perform. This analysis provides the scientific validation for the traditional use of the plants and baseline data for further advanced studies for drug development (Maheshwaran et al., 2024). Although various solvents such as ethanol, methanol, petroleum ether and acetone can be used to extract phytochemicals, aqueous extraction was employed in the present study because it is faster, economic and environment friendly (Mishra, 2025; Azwanida, 2015). The phytochemical composition of fresh and air- dried leaves differs significantly, with fresh leaves containing higher level of some bioactive compounds compared to dried leaf extracts, and dried leaf extracts exhibiting changes in relative amounts of other phytochemicals. For instance, a metabolomic profiling study on aqueous extracts of fresh and dried leaves of *Eucalyptus globulus*

reported marked differences in the composition of various phytochemicals between the two sample types (Mishra, 2024; Pinto et al., 2022). Phytochemical composition of plants also varies with the difference in their geographical locations where these are grown (Lee et al., 2024). In the present study the samples are collected from the plants growing in Kalindi College campus. Kalindi College is a renowned institute situated in Delhi, it maintains a herbal garden that supports diverse plant species of medicinal importance (Mishra 2015). Based on the medicinal importance and availability within the study area, four plant species- *Nyctanthes arbor-tristis*, *Quisqualis indica*, *Tradescantia spathacea* and *Portulaca grandiflora* were selected for the present study. *Nyctanthes arbor- tristis*, commonly known as night jasmine or Harsingar is widely used in traditional medicine. Various parts of the plant such as seeds, leaves and flowers are widely utilized for medicinal purposes (Mishra et al., 2022). Traditionally, these plant parts have been utilized to cure various ailments such as asthma, cold, digestive issues, skin irritations, rashes, arthritis, fever and inflammation (Bhatt et al., 2024).

*Quisqualis indica* commonly known as Rangoon creeper or Chinese honeysuckle is a fast- growing vine with various reported medicinal values. Studies have reported its anti-inflammatory, antipyretic, anti- oxidant, anti-bacterial activities. In traditional medicine, this plant has been utilized to cure ailments like colds, diabetes, inflammation, sore throat, stress and fever (Sharma et al., 2024).

*Tradescantia spathacea* is an ornamental plant from the Commelinaceae family. Traditionally, it has been utilized to treat ailments like inflammation, fever, cold and wounds. Several pharmacological activities of this plant, including anti- bacterial, anti- inflammatory, anti- viral, anti- oxidant, hepatoprotective and anti- helminthic have been reported (Tan et al., 2024).

*Portulaca grandiflora* also known as purslane have been utilized in traditional medicine to cure various ailments including detoxification, skin problems and sore throats (Shinde et al., 2014; Chavalittumrong et al., 2007; Anghel et al., 2013 as cited in Sporna- Kucab et al., 2022). The plant is also reported to have the wound healing properties (Budiawan et al., 2024). Several pharmacological activities of this plant including anti-oxidant, anti- bacterial and anti- fungal have also been reported (Sporna- Kucab et al., 2022).

In view of increasing demand for herbal medicines and the influence of processing methods on the phytochemical composition, the present study was undertaken to qualitatively identify the phytochemical constituents present in the selected plants species. The study also aims to evaluate the effect of air- drying on the phytochemical composition and to generate baseline data for future quantitative phytochemical analysis.

## MATERIAL AND METHODS

Methodology is summarized in the flowchart 1.

### Plant material

Leaves of *Nyctanthes arbor-tristis*, *Quisqualis indica*, *Tradescantia spathacea* and *Portulaca grandiflora* were collected from Kalindi College campus. The collected leaves were washed under running tap water to get rid of any dirt and impurities on the leaves surface.

### Preparation of fresh and air- dried samples

The collected leaves were divided into two groups. One group consisted of the fresh leaves which were used immediately for phytochemical analysis. The second group was shade- dried for several weeks until the leaves got completely dry, after drying these dried leaves were ground into a fine powder using pestle and mortar.

### Aqueous extract preparation

**Fresh leaves extract:** Fresh leaves collected from all the selected plants were ground into a thick slurry in distilled water using pestle and mortar in the ratio 1:4 (One parts leaves and four parts distilled water/solvent) as mentioned in (Mishra, 2024).

**Air- dried leaves extract:** The fine powder produced by grinding dried leaves was soaked in the distilled water for few minutes. Water taken was four times the air-dried sample.

The thick slurry produced in both the cases was filtered using muslin cloth to obtain the filtrate. The extracts were freshly prepared. All the qualitative phytochemical tests were performed in triplicates using the freshly prepared filtrates to ensure reliability and reproducibility of results.

**Qualitative phytochemical tests:** All the qualitative tests were performed following previously reported protocols of phytochemical testing.

### Alkaloids test

To 5 ml of filtrate, 5 ml of 1.5% HCl (v/v) was added. This extract was tested for alkaloids using Hager`s test (Salehi- Surmaghi, 1992).

**Hager`s test:** A few drops of Hager`s reagent was added to 2 ml filtrate. Yellow precipitate marked the presence of the alkaloids.

### Tannins test

**Ferric chloride test:** To 2 ml of filtrate, 2 ml distilled water was added. A few drops of 5% ferric chloride (made in 90% alcohol) were added. Green precipitate confirmed presence of tannins (Salehi- Surmaghi, 1992).

### Saponins test

**Foam test:** 2 ml of filtrate was taken and 10 ml of distilled water was added. After vigorous shaking formation of foam confirmed presence of saponins (Kapoor et al., 1969).

**Flavonoids test:** (Salehi- Surmaghi, 1992)

**Alkaline reagent test:** 1 ml of filtrate was added into a test tube, few drops of 10% NaOH (w/v) solution were added to it. The formation of intense yellow color which disappeared after the addition of dilute acid's few drops indicated the presence of flavonoids.

**Lead acetate test:** To 1 ml of filtrate a few drops of 10% lead acetate solution were added. Formation of yellow precipitate confirmed flavonoids presence.

#### Sterols test

Salkowski test: 2 ml filtrate was evaporated to dryness and then dissolved in 2 ml chloroform and 2 ml

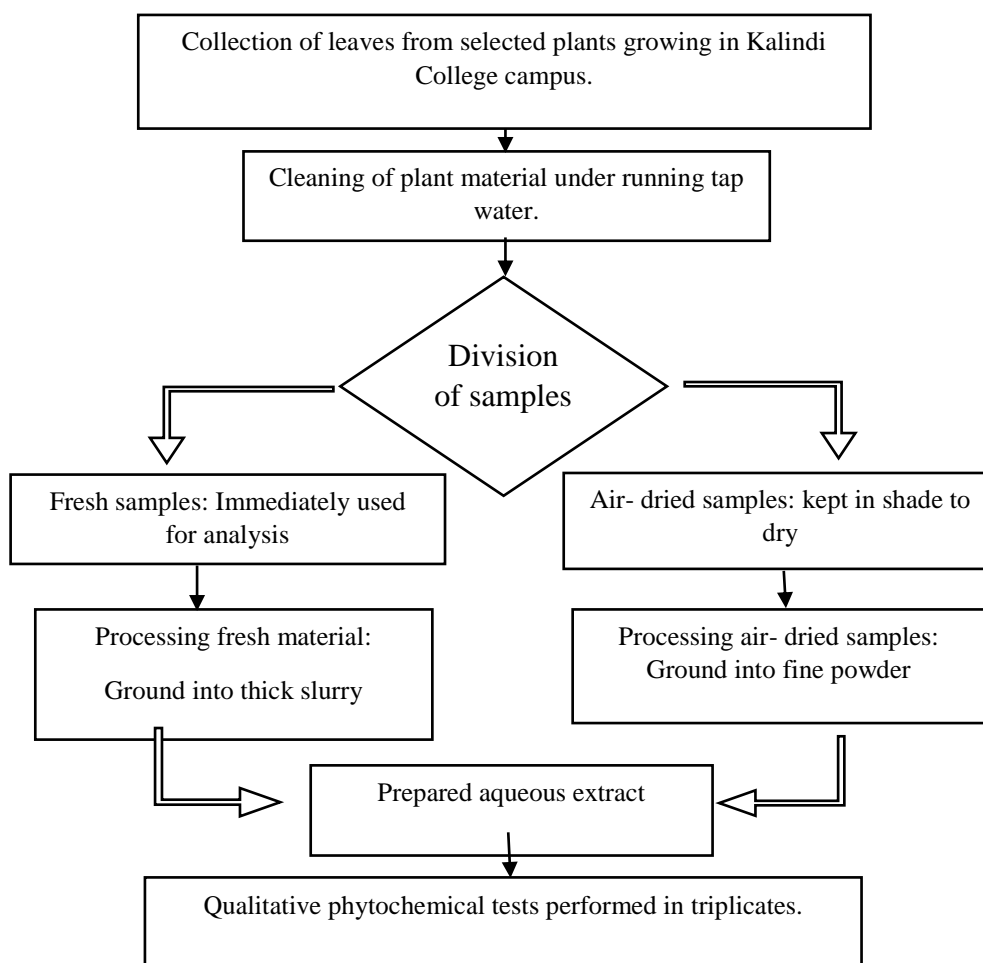
concentrated sulphuric acid. Red color confirmed the presence of sterols (Gibbs, 1974).

**Glycosides test:** (Ajaiyeobu 2002)

Keller- Killiani test: To 2 ml of filtrate, 3 ml glacial acetic acid and 1 drop of 5% ferric chloride was added. Blue color confirmed the presence of glycosides (Ajaiyeobu 2002).

#### Terpenoids test

2 ml filtrate was dissolved in 2 ml chloroform and then evaporated to dryness. To this 2 ml of concentrated sulphuric acid was added and then heated for 2 minutes. Grey color formation indicated terpenoid presence (Harborne, 1973).

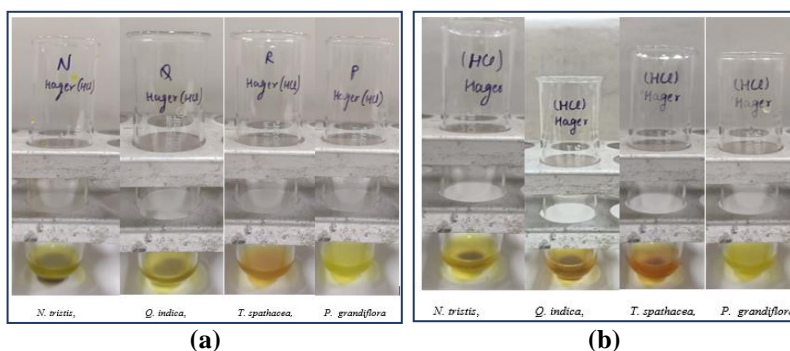


**Flowchart 1: Methodology of qualitative phytochemical tests extract preparation in brief.**

## RESULTS AND DISCUSSION

Alkaloids are the nitrogen- containing compounds and mostly have the pharmacological activities (Bari et al., 2012). They are one of the largest classes of phytochemicals, approximately 20% of plants are reported to produce them (Teoh 2015). Alkaloids are responsible for various important therapeutic properties of the plants such as anti- inflammatory, anticancer, antimicrobial, and antidepressant (Riaz et al., 2023). In the present study alkaloids were tested using the Hager's

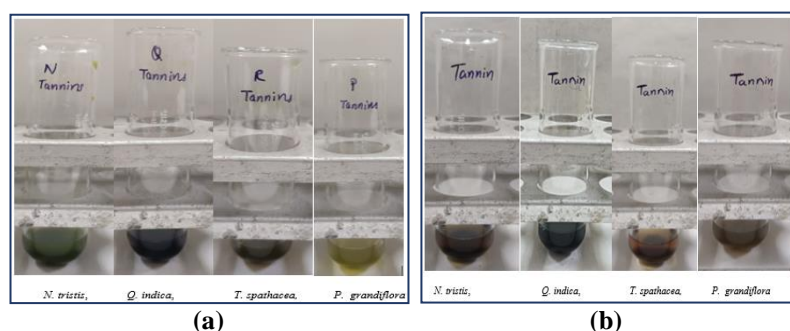
test on the fresh and air- dried leaf extracts of *Nyctanthes arbor-tristis*, *Quisqualis indica*, *Tradescantia spathacea* and *Portulaca grandiflora*. The alkaloids were detected to be maximum in the air- dried leaf extract of *Nyctanthes arbor-tristis* compared to the fresh extract. Whereas there was no change observed in fresh and air-dried leaf extracts of *Quisqualis indica*, *Tradescantia spathacea* and *Portulaca grandiflora*. Overall, all the plants showed the maximum presence of alkaloids (Table 1 and Fig. 1).



**Fig. 1: Alkaloid test a) fresh leaves extract, b) air- dried leaves extract.**

Tannins are the phenolic compounds which are widely produced by plants. These give the bitter taste to plant parts in which these are produced. These are produced by plants to protect themselves from herbivores. These provide the plant with important medicinal properties to cure ailments like burns, piles, inflammation (Mishra, 2024; Agidew, 2022). Tannins presence was detected using the ferric chloride test. In *Nyctanthes arbor-tristis*, tannins were found to be present maximum in air- dried

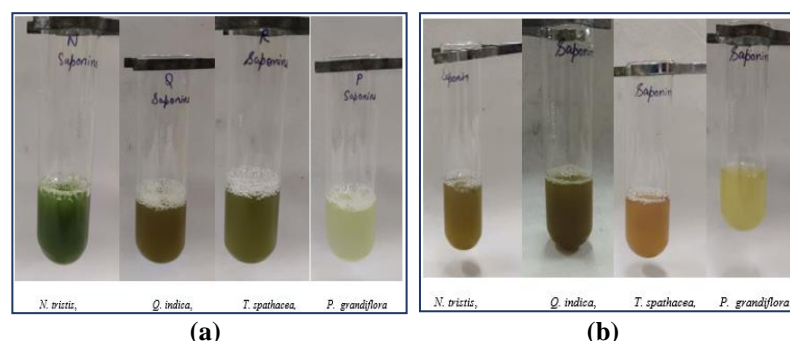
leaf extract compared to the fresh leaf extract. In *Quisqualis indica*, no change was observed in fresh and air dried- leaf extract. *Tradescantia spathacea* and *Portulaca grandiflora* showed absence of tannins in fresh leaf extract and trace presence in air- dried leaf extracts. *Quisqualis indica* showed maximum tannins presence compared to *Nyctanthes arbor-tristis*, *Tradescantia spathacea* and *Portulaca grandiflora* (Table1 and Fig. 2).



**Fig. 2: Tannins test a) fresh leaves extract, b) air- dried leaves extract.**

Saponins are the surface- active compounds and are produced widely by plant species. Saponins are responsible for proving plants with various therapeutic properties such as anti- oxidant, antitumor, and anti-inflammatory (Riaz et al., 2023). In the present study saponins presence was detected using the foam test. *Nyctanthes arbor-tristis* showed no change in saponins

detection in fresh and air- dried leaves. *Quisqualis indica*, and *Tradescantia spathacea* showed maximum saponin in fresh leaf extract and saponins in trace amounts in air- dried leaves whereas *Portulaca grandiflora* showed absence of saponins in air- dried leaves extract (Table 1 and Fig. 3).



**Fig. 3: Saponins test a) fresh leaves extract, b) air- dried leaves extract.**

Flavonoids are the phenolic compounds. These are reported to provide the plants with various important medicinal properties such as anti- oxidation, anti-inflammatory, antimicrobial, antitumor and anti- viral.

These are also helpful in curing heart related diseases such as atherosclerosis and coronary thrombosis (Riaz et al., 2023). Flavonoids were detected in the selected plants using alkaline reagent test and lead acetate test.

Alkaline reagent test showed the maximum presence of flavonoids in *Quisqualis indica*. *Nyctanthes arbor-tristis* and *Tradescantia spathacea* showed absence of flavonoids in fresh leaves and trace presence in air-dried leaves in this test. No change of phytochemical composition was observed in the fresh and air-dried leaves of *Quisqualis indica* and *Portulaca grandiflora* using alkaline reagent test (Fig. 4). Whereas in the lead acetate test, absence of flavonoids was observed in

*Nyctanthes arbor-tristis* and *Tradescantia spathacea*. *Portulaca grandiflora* showed absence of flavonoids in fresh leaves and trace presence in air-dried leaves. In *Quisqualis indica* the increase in the concentration of flavonoids was observed in air-dried leaves (Fig. 5). Overall, *Quisqualis indica* has shown the maximum presence of flavonoids in both alkaline reagent test and lead acetate test (Table 1).

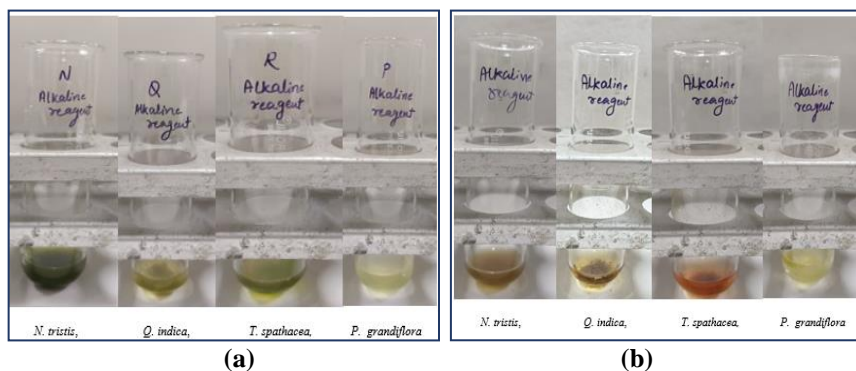


Fig. 4: Flavonoid test (alkaline reagent test): a) fresh leaves extract, b) air-dried leaves extract.

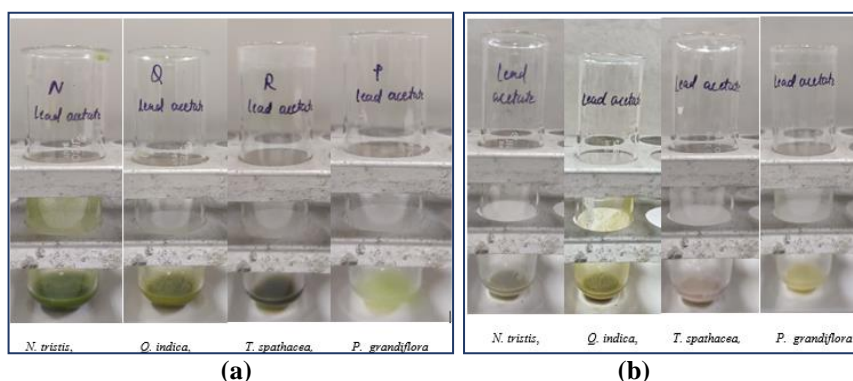


Fig. 5: Flavonoid test (lead acetate test): a) fresh leaves extract, b) air-dried leaves extract.

The predominant sterol in plants is phytosterol (Mishra, 2024). Phytosterols are similar to cholesterol in their chemical structure and functions and are responsible for providing various important medicinal properties to the plants such as cholesterol-lowering, anti-inflammatory and anticancer (Shen et al., 2024). Sterols were detected using the Salkowski test. *Nyctanthes arbor-tristis*

showed absence of sterols in air-dried leaves and moderate presence in fresh leaves. *Quisqualis indica* and *Tradescantia spathacea* showed no change of sterols composition in fresh and air-dried leaves. *Portulaca grandiflora* showed the significant increase in sterols in the air-dried leaves. Overall, *Quisqualis indica* showed maximum presence of sterols (Table 1 and Fig. 6).

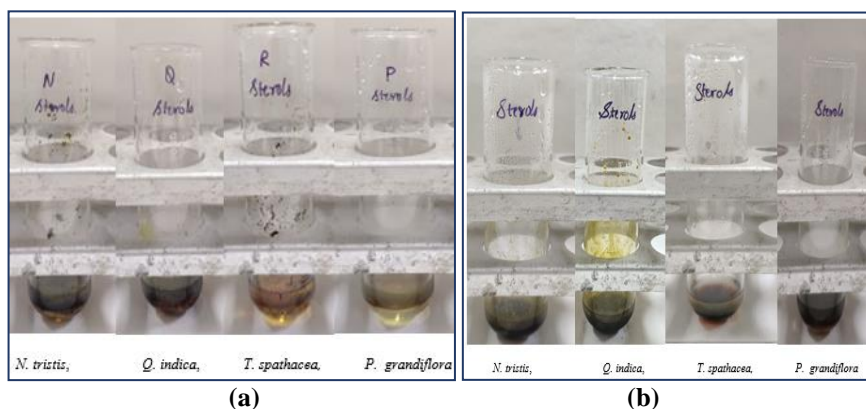


Fig. 6: Sterols test a) fresh leaves extract, b) air-dried leaves extract.

Glycosides are the organic compounds produced by plants. These are composed of glycone and aglycone moieties. These are known to provide analgesic and anti-inflammatory properties to the plants (Khan et al., 2020). In the present study these were qualitatively analyzed using the Keller- Killiani test. *Nyctanthes arbor-tristis*,

*Tradescantia spathacea* and *Portulaca grandiflora* showed the absence of glycosides in both fresh and air-dried leaves. *Quisqualis indica* showed the equal and high presence of glycosides in fresh and air-dried leaves (Table 1 and Fig. 7).

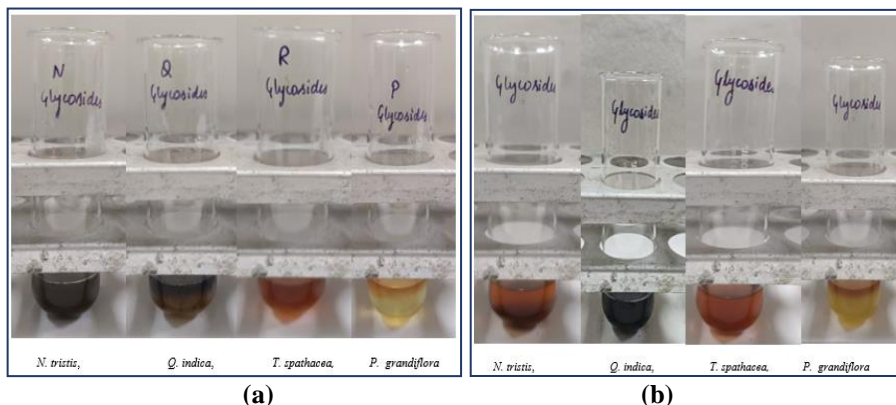


Fig. 7: Glycosides test a) fresh leaves extract, b) air-dried leaves extract.

Terpenoids are the part of secondary metabolism of the plants and are the composed of small units known as C5 isoprene units. These are responsible for providing fragrances and flavors. These are also responsible for providing the plants with various therapeutic and pharmacological activities such as anti-inflammatory, anti-oxidant, anticancer, antiplasmodial, antimicrobial

and anti-diabetic (Riaz et al., 2023). All the selected plants i.e., *Nyctanthes arbor-tristis*, *Quisqualis indica*, *Tradescantia spathacea* and *Portulaca grandiflora* showed maximum presence of the terpenoids and also no significant impact of air-drying on the terpenoids composition in the plants was observed (Table 1 and Fig. 8).

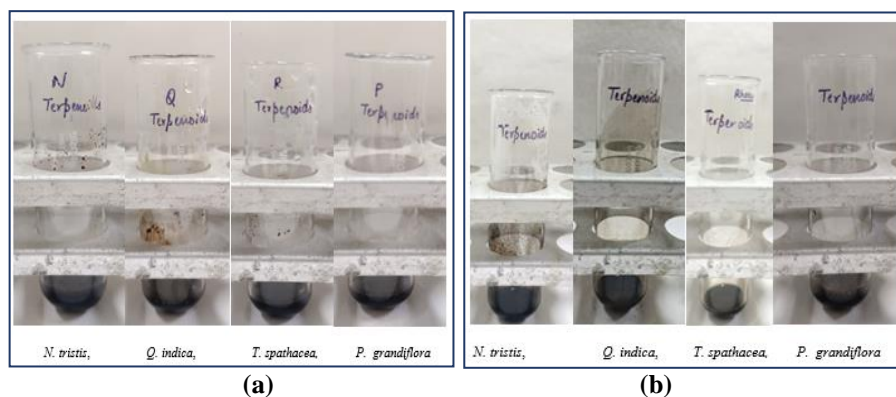


Fig. 8: Terpenoids test a) fresh leaves extract, b) air-dried leaves extract.

Table 1: Observation table of qualitative phytochemical analysis of fresh and air-dried leaf extracts of selected plants.

Phytochemicals	<i>Nyctanthes arbor-tristis</i>		<i>Quisqualis indica</i>		<i>Tradescantia spathacea</i>		<i>Portulaca grandiflora</i>	
	FLE	ADLE	FLE	ADLE	FLE	ADLE	FLE	ADLE
Alkaloids	++	+++	+++	+++	+++	+++	+++	+++
Tannins	+	+++	+++	+++	-	+	-	+
Saponins	+	+	++	+	++	+	++	-
Flavonoids (ART)	-	+	+++	+++	-	+	++	++
Flavonoids (LAT)	-	-	++	+++	-	-	-	+
Sterols	++	-	+++	+++	++	++	+	+++
Glycosides	-	-	+++	+++	-	-	-	-
Terpenoids	+++	+++	+++	+++	+++	++	+++	+++

FLE = Fresh leaves extract, ADLE = Air-dried leaves extract, ART= Alkaline reagent test, LAT= Lead acetate test. +++ indicates high presence of phytochemicals, ++ indicates moderate presence, + indicates trace or low presence of phytochemicals and – indicates absence.

**CONCLUSION**

The findings of this study highlight that leaves of *Nyctanthes arbor-tristis*, *Quisqualis indica*, *Tradescantia spathacea* and *Portulaca grandiflora* are rich source of phytochemicals. The comparative qualitative phytochemical analysis revealed that the air-drying variably alters the phytochemical compositions across different plant species, enhancing certain phytochemicals while reducing others. This study provides the baseline data for future quantitative and pharmacological studies. However, this study is limited by its qualitative nature of phytochemical analysis, limited sample size, and use of only one extraction solvent.

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**Declarations**

**Conflict of interest:** There is no conflict of interest.

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