MedExillence International Journal of Pharmacy and Life Sciences (MIJPLS)

A peer-reviewed, open-access platform for high-quality research in Pharmacy, Life Sciences, and Integrative Medicine (MBBS, BAMS, BHMS).

Mail Id :- editormijpls@gmail.com
Website :- www.mijpls.com

Volume :- 01
Issue :- 01 / Nov- 2025
ISSN :-

Research Article

PHARMACOGNOSTIC AND PRELIMINARY PHYTOCHEMICAL EVALUATION OF THE LEAVES OF ASPARAGUS RACEMOSUS WILLD

Mr. Utkarsh Ravindra Mandage*, Miss. Samiksha S. Lokhande[2]

[1] Department of Pharmacognosy, Ravindra Vidya Prasarak Mandal Institute of Pharmacy, Dwarka, Nashik, Maharashtra, India.

[2.] Department of Pharmaceutics, S. S. B.T. College of Pharmacy, Bambhori, Jalgaon, Maharashtra, India

ABSTRACT

This study looks closely at the leaves of Asparagus racemosus Willd. This plant is commonly used in Ayurveda. We focus on its pharmacognostic and early phytochemical properties. The tuberous roots are well-known for their healing properties, but the leaves are mostly unexplored. The study focused on the shape, structure, and chemical properties of the leaves. It aimed to confirm their authenticity and purity for use in medicine. The pharmacognostic assessment looked at three areas: organoleptic, microscopic, and physicochemical analyses. It highlighted important features such as lignified fibers, stomata, epidermal palisade cells, and calcium oxalate crystals. These details help confirm plant identity. Quantitative microscopic evaluations, including stomatal index (4.25), palisade ratio (5.75/mm^2), and phloem fiber width (12.5–68µ), provide key identifiers for the plant material. Physicochemical studies showed total ash at 10.47%. Acid-insoluble ash was found at 1.34%. The water-soluble extractive value was high at 28.86%. These results suggest a strong presence of bioactive compounds. Phytochemical screening showed flavonoids, glycosides, alkaloids, and tannins. This confirms the leaves' therapeutic potential. The high extractive values indicate that both water and alcohol extracts contain many bioactive compounds.

These findings help standardize and validate Asparagus racemosus leaves for medicine. The study provides important baseline data for using these herbs in formulations. This highlights their significance in pharmacology.

Key words: *Extraction, Phytochemical, Ash Value, Extractive Value*

Date of Submission: 02/11/2025 Date of Acceptance: 09/11/2025 Date of Publish: 16/11/2025

INTRODUCTION

Medicinal plants are known for their bioactive compounds. These compounds are important in healthcare. They have therapeutic properties, so they are used in both traditional and modern treatments. Asparagus racemosus Willd., or Shatavari, is a prized medicinal plant in Ayurveda, the old Indian healing system. This plant has a long history of use. People value it for its adaptogenic effects, immune support, and benefits for reproductive health. Because of these properties, it is an important part of many herbal remedies [1]. The tuberous roots of Asparagus racemosus are well-studied for their medicinal benefits. In contrast, the plant's leaves have not been researched as much. Preliminary reports show they have important bioactive compounds with potential health benefits [2]. This research looks at the pharmacognostic and phytochemical properties of Asparagus racemosus leaves. It helps to validate their medicinal value scientifically.

Pharmacognosy is an important part of pharmaceutical sciences. It focuses on identifying, characterizing, and standardizing medicinal plants. This involves checking the shape, structure, and chemical properties of plant parts. This helps confirm their authenticity and purity [3]. Such studies are essential for preventing adulteration, which is a common issue in the herbal medicine industry. Evaluating the leaves of Asparagus racemosus will help identify their key features. This ensures they are correctly recognized in herbal products. Also, microscopic and physicochemical analyses will help set quality control parameters. These parameters are necessary for standardizing herbal medicines [4].

The phytochemical part of this study is also important. It gives insights into the bioactive compounds found in the leaves of Asparagus racemosus. Phytochemicals are naturally occurring compounds in plants that contribute to their medicinal properties. Some phytochemicals, like flavonoids, alkaloids, tannins, glycosides, and phenolic compounds, show pharmacological activities. These activities include antioxidant, antimicrobial, anti-inflammatory, and adaptogenic effects [5]. Asparagus racemosus roots are rich in steroidal saponins, especially shatavarins. Recent studies show that the leaves also have important flavonoids and phenolic compounds. These compounds offer strong antioxidant and anti-inflammatory benefits [6]. A preliminary phytochemical screening of the leaves will help identify secondary metabolites. This process will expand our understanding of the plant's therapeutic potential.

Asparagus racemosus is used in traditional medicine. It supports reproductive health, helps with digestion, and addresses stress-related issues [7]. Some traditional practices use the leaves for their cooling and tonic effects, even if they are less common. Scientific proof of these claims is needed to support their use in herbal medicine. This research analyzes the pharmacognostic features and phytochemical makeup of Asparagus racemosus leaves. The findings will offer useful data for future pharmacological studies. Finding and measuring bioactive compounds in leaves can lead to new ways to use them in herbal products. This might improve their health benefits [8].

Pharmacognostic and phytochemical studies are vital. They help make sure herbal medicines are safe and effective. Herbal drugs can vary in their chemical makeup. This happens because of factors like where they grow, the climate, and how they are cultivated [9]. Standardizing medicinal plant materials through pharmacognostic studies keeps their therapeutic properties consistent. This way, patients get high-quality herbal treatments. Knowing the leaves' phytochemical profile helps us see how they work with other medicinal compounds. This helps create safe and effective herbal formulations [10].

Date of Submission: 02/11/2025 Date of Acceptance: 09/11/2025 Date of Publish: 16/11/2025

The growing global interest in herbal medicines shows the need for scientific proof of traditional plants. Ayurveda and other traditional systems have documented the uses of Asparagus racemosus. We need more pharmacognostic and phytochemical research to establish its scientific credibility [11]. This study's findings will boost knowledge about medicinal plants. They will also help create new herbal products using Asparagus racemosus leaves. This research mixes traditional knowledge with modern science. It connects ancient wisdom to today's medicine. This blend opens doors for future studies on the healing properties of this important plant [12].

MATERIALS AND METHODS

Chemicals

All the chemicals were of highest available purity and were procured from Research Lab Mumbai, India,

Procurement of plant material

The Asparagus Racemosus leaves were gathered from local Area of Nashik, India. And got identified and Authenticated from Botanist. All foreign organic materials were completely removed from the gathered plant material. The leaves were separated, shade-dried, ground into a coarse powder, and then sieved. Studies on pharmacognostics were carried out using both powdered and fresh leaves.

Pharmacognostic Evaluation

Organoleptic evaluation

In organoleptic evaluation, we recorded sensory traits of the plant material. These included size, shape, color, odor, and taste of the leaves. It includes conclusions drawn from studies resulted due to impressions on organs of senses. [13]

Microscopic evaluation

Microscopic evaluation is key for analyzing powdered crude drugs. It helps identify cellular fragments and tissue structures that stay intact in the powder. This method is important for keeping plant-based drugs authentic and pure. A key part of microscopic analysis is looking at surface constants. They give important diagnostic details. We used a camera lucida to find leaf constants. These include stomatal number, stomatal index, and palisade ratio. This process helps identify and standardize leaf-based drugs. These parameters are useful for authentication. They help identify real medicinal plant materials and spot possible adulterants. Microscopic evaluation of Asparagus racemosus Willd. showed unique features in both intact leaves and powdered samples. This was true for samples with and without staining. These findings help in accurately identifying the plant material [14].

Powder Analysis of the Leaf

First, we added a small amount of powdered leaf material to a microscopic slide. Then, we added 1–2 drops of 0.1% phloroglucinol solution. Finally, we included a drop of concentrated hydrochloric acid. The sample was then mounted in glycerol, covered with a cover slip, and observed under a microscope using 10 × 10 magnification. The powdered leaf had several key features. These included vascular tissues, xylem fibers, calcium oxalate crystals, starch grains, and trichomes. Lignified cells, fibers, and stone cells exhibited a pink coloration. The presence of starch grains was confirmed by the formation of a blue color upon the addition of 2–3 drops of 0.01M iodine solution. [15]

Microscopic Determination of Stomatal Index

To find the stomatal index, we took leaf pieces about 5 × 5 mm. We put them in a test tube with 5 ml of chloral hydrate solution. Then, we heated the tube in a water bath until the pieces turned clear. This

Date of Submission: 02/11/2025 Date of Acceptance: 09/11/2025 Date of Publish: 16/11/2025

usually took about 15 minutes. I mounted the cleared leaf fragments in glycerol on a slide. Then, I examined them under a microscope. This helped me look for epidermal cells, types of stomata, and their distribution. I also checked palisade cells, vein islet numbers, and veinlet termination numbers. We used a 40× objective lens and a 6× eyepiece for observations. A camera lucida was attached to capture images of epidermal cells and stomata in a chosen area. The stomatal index shows the percentage of stomata compared to epidermal cells. Each stoma counts as one cell. [14]

Physical Evaluation

The physical evaluation of Asparagus racemosus Willd. The analysis of leaves included checking crude fiber, moisture, and ash values. This covered total ash, acid-insoluble ash, and water-soluble ash. It also looked at extractive values, which are alcohol-soluble, water-soluble, and ether-soluble extractives. Ash values estimate the inorganic salts in plant material. Extractive values show the presence of bioactive compounds based on solubility in various solvents. These experiments were performed in triplicate, and the results were expressed as mean ± SD. The percentage w/w values were calculated with reference to the air-dried drug. [16]

Estimation of Crude Fiber (Acid Detergent Fiber, ADF)

Acid detergent fiber (ADF) consists of cellulose, lignified nitrogen, and alkali-soluble lignin. To find ADF, we took 2 g of leaf material. We put it in a 500 ml Berzelius beaker. Then, we refluxed it with 50 ml of Acid Detergent Solution (ADS). This solution had 20 g of cetrimide mixed in 1 liter of standardized sulfuric acid. The solution was first boiled vigorously and then refluxed more gently for one hour. The solution was then filtered using a tared crucible containing sintered glass plates. The residue was washed thoroughly with boiling water until no foam was observed, followed by three washes with 20 ml of acetone. The final residue was dried overnight in a hot air oven at 100°C, cooled in a desiccator, and weighed. The remaining insoluble portion represented the ADF content of the sample. [14]

Moisture Content (Loss on Drying)

Moisture content was determined by weighing 10 g of fresh Asparagus racemosus Willd. leaves and placing them in a tared evaporating dish. The leaves dried at 105°C for five hours. Weighed them every hour. We stopped when the weight difference was less than 0.25%. A constant weight is reached when the difference between two readings is less than 0.01 g. This follows an extra drying and cooling cycle in a desiccator. [14]

Determination of Total Ash

To find the total ash, first weigh 2 g of leaf powder. Then, put it in a tared silica crucible. Next, incinerate it at a maximum temperature of 450°C. Do this until all the carbon is gone. The resulting ash was cooled and weighed, and the percentage of total ash was calculated with reference to the air-dried leaf material. [15]

Acid-Insoluble Ash

To determine acid-insoluble ash, boil 2 g of leaf powder with 25 ml of dilute hydrochloric acid for five minutes. The insoluble residue was collected on an ashless filter paper, thoroughly washed with hot water, ignited, and weighed. The percentage of acid-insoluble ash was calculated with reference to the air-dried drug. [14]

Date of Submission: 02/11/2025 Date of Acceptance: 09/11/2025 Date of Publish: 16/11/2025

Water-Soluble Ash

To determine water-soluble ash, the total ash obtained from 2 g of leaf powder was boiled with 25 ml of distilled water for five minutes. The insoluble residue was collected on an ashless filter paper, washed with hot water, ignited, and weighed. The percentage of water-soluble ash was calculated with reference to the air-dried drug. [14]

Determination of Extractive values

Determination of Alcohol-Soluble Extractive

Accurately weighed 5 g of Asparagus racemosus Willd. Leaf powder was soaked in 100 ml of 95% ethanol for 24 hours. For the first six hours, it was shaken frequently. Then, it was left undisturbed for the next 18 hours. After 24 hours, the extract was filtered, and 25 ml of the filtrate was evaporated. The remaining extract was dried at 105°C to a constant weight. [15]

Determination of Water-Soluble Extractive

The process for finding the water-soluble extractive value is similar to that for alcohol-soluble extractive. The only difference was using chloroform water for maceration instead of ethanol. [15]

Determination of Ether-Soluble Extractive

To determine the ether-soluble extract, we placed 5 g of leaf powder in a thimble. Then, we used a Soxhlet apparatus for continuous extraction with solvent ether for six hours. The resulting extract was filtered, and the filtrate was evaporated and dried at 105°C until a constant weight was recorded. [13]

This detailed evaluation of Asparagus racemosus Willd. Leaves provide key pharmacognostic and physicochemical details. These are necessary for standardizing and authenticating the plant material used in medicine.

Preliminary Phytochemical Screening

We used a Soxhlet apparatus to extract the powdered leaves of Asparagus racemosus Willd. We started with petroleum ether (60–80°C) and then moved to more polar solvents: chloroform, ethyl acetate, methanol, and water. Each extraction was carried out for eight hours, after which the extracts were evaporated to dryness. The dried extracts were weighed, and their percentage yields were calculated. These extracts were then used for early phytochemical screening. This helped find different bioactive compounds.

We did standard chemical tests to identify various classes of phytoconstituents. Carbohydrates were tested with Molisch's, Fehling's, Benedict's, and Barfoed's Amino acids were detected through Ninhydrin's test. We screened steroids with Salkowski and Liebermann-Burchard reactions. For anthraquinone glycosides, we used Borntrager's test. Saponin glycosides were found with the foam test. Flavonoid glycosides were detected using the Shinoda and alkaline tests. [17]

We confirmed the presence of alkaloids with Dragendorff's, Mayer's, Hager's, and Wagner's tests.

To check for tannins and phenolic compounds, we used: Ferric chloride,Lead acetate, Potassium dichromate , Dilute iodine tests.

These screening methods showed key details about the chemical makeup of Asparagus racemosus Willd. leaves, facilitating further pharmacological and therapeutic investigations.

Date of Submission: 02/11/2025 Date of Acceptance: 09/11/2025 Date of Publish: 16/11/2025

RESULTS AND DISCUSSION

Organoleptic and microscopic evaluation

- **Color:** The leaves exhibit a light greenish hue.
- **Odor:** They possess a characteristic odor.
- **Taste:** The taste is notably bitter.

Microscopic Features:

- Upon microscopic examination of the leaf powder, several diagnostic features are observed:
- Lignified Fibers: These provide structural support to the leaf.
- Epidermal Palisade Cells: These cells are part of the leaf's photosynthetic tissue.
- Stomata: Openings in the epidermis that facilitate gas exchange.

Physical evaluation

We analyzed the physical parameters of the leaves and leaf powder. This includes:

Crude fiber (acid detergent fiber)

Moisture content

Ash values: total ash, acid-insoluble ash, and water-soluble ash

Extractive values: alcohol-soluble, water-soluble, and ether-soluble extractive values.

The findings of this study are presented in Table 2.

These results lay the groundwork for identifying, collecting, and studying the plant more closely. The macro- and micro-morphological characteristics contribute to its authentication and quality assessment.

Table 1. Quantitative microscopy of leaf / leaf powder of Asparagus Racemosus Willd

Parameter	Value
Stomatal index (lower epidermis)	4.25
Vein islet number	22 / mm^2
Phloem fibers (width)	12.5 – 68µ
Veinlet termination number	10 / mm^2
Starch grains (diameter)	15.5 – 30.2µ
Palisade ratio	5.75 / mm^2
Stomatal number (lower epidermis)	260 / mm^2
Calcium oxalate crystals (length)	28.1 – 64.8µ

These findings can help us identify, collect, and study the plant accurately. Both macro- and micro-morphological characteristics contribute to its authentication and detailed evaluation.

Table 2. Physicochemical parameters of leaf powder of Asparagus Racemosus Willd

Parameter	Value (% w/w)
Total Ash	10.47
Acid-Insoluble Ash	1.34
Water-Soluble Ash	5.20
Alcohol-Soluble Extractive Value	11.42
Water-Soluble Extractive Value	28.86
Ether-Insoluble Volatile Extractive	11.23

Date of Submission: 02/11/2025 Date of Acceptance: 09/11/2025 Date of Publish: 16/11/2025

Table 3: Phytochemical Evaluation of Leaf Extract of Aspargus Racemosus Wild

PHYTO - CONSTITUENTS	Successive Extracts				
	Petroleum ether extract	Chloroform extract	Ethyl Acetate	Methanol	Aqueous Extract
Carbohydrates	-	-	-	-	-
Glycosides	-	-	+	+	+
Steroids	+	+	-	-	-
Triterpenoids	+	+	-	-	-
Tannins & Phenolic Group	-	-	+	+	-
Alkaloids	-	-	+	+	-
Flavonoids	-	-	+	+	+
Saponin	+	-	-	-	-

"+"Present

"-" Absent

Date of Submission: 02/11/2025 Date of Acceptance: 09/11/2025 Date of Publish: 16/11/2025

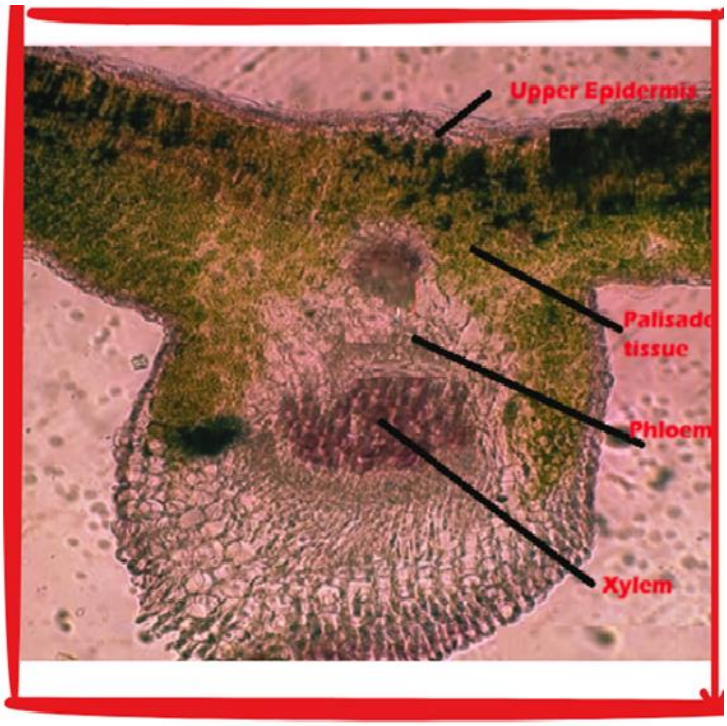

Figure 1. T.S. of Asparagus Racemosus Willd Leaf

Preliminary Phytochemical Evaluation

The quantitative microscopy and physicochemical evaluation of Asparagus racemosus Willd. Leaves give important clues about a plant's structure and chemical makeup. This information helps in identifying the plant, standardizing it, and ensuring quality control. These findings are key for authenticating medicinal plant materials. They help ensure the plants are effective and safe for use in pharmaceuticals and therapies.

Microscopic Evaluation

The microscopic parameters analyzed in Asparagus racemosus Willd. leaves reveal essential diagnostic features that aid in the plant's proper identification. The stomatal index is 4.25, and the stomatal number is 260/mm^2. These figures show how well the plant adapts for gas exchange and transpiration. A clear venation pattern shows a strong vascular network. The vein islet number is 22/mm^2, and the veinlet termination number is 10/mm^2. This structure is important for nutrient transport and support. Phloem fibers measure between 12.5 and 68µ, showing structural support. The starch grain diameter ranges from 15.5 to 30.2µ, highlighting the plant's function in storing carbohydrates. The palisade ratio of 5.75/mm^2 shows how well the photosynthetic tissue works. This helps us understand the plant's metabolic activity. Calcium oxalate crystals (28.1–64.8µ) help detoxify and defend plants. They protect against herbivores and prevent too much calcium buildup.

Physicochemical Evaluation

Physicochemical parameters are crucial for a plant's purity, composition, and therapeutic value. The total ash content is 10.47% w/w. This shows the presence of inorganic minerals. It also measures the leftover material after incineration. This can help identify contamination or adulteration. The acid-insoluble ash (1.34% w/w) helps check for siliceous or insoluble impurities. These impurities should be low to keep the plant's effectiveness.

Date of Submission: 02/11/2025 Date of Acceptance: 09/11/2025 Date of Publish: 16/11/2025

The water-soluble ash is 5.20% w/w. This shows the plant's soluble inorganic parts. These components help make its active ingredients available. The extractive values show the presence of bioactive phytochemicals. The alcohol-soluble extractive value is 11.42% w/w. This indicates polar compounds like flavonoids, glycosides, and alkaloids. The water-soluble extractive value is 28.86% w/w. This signifies the presence of tannins, carbohydrates, and other water-loving constituents. The ether-insoluble volatile extract (11.23% w/w) shows there are essential oils and lipophilic bioactive compounds. These compounds might help give the plant its medicinal benefits.

Significance and Implications

These results offer important baseline data for authenticating and standardizing Asparagus racemosus Willd. leaves, ensuring their quality for use in herbal medicine. The findings match earlier studies, confirming how important this plant is in pharmacognosy. To keep herbal formulas from Asparagus racemosus pure and consistent, we need proper ID. This comes from looking at them under a microscope and checking their physicochemical properties.

The high water-soluble extractive value means the plant's water extracts may have many bioactive compounds. This supports its traditional use in Ayurvedic medicine. Structural elements like phloem fibers, calcium oxalate crystals, and starch grains help the plant adapt. They also show its potential for medicinal uses.

CONCLUSION

The microscopic and physicochemical evaluation of Asparagus racemosus Willd. leaves provides essential parameters for its identification, standardization, and quality control. The plant shows clear anatomical features. These include stomata, phloem fibers, and calcium oxalate crystals. They suggest the plant is healthy in structure and chemistry. Also, the significant extractive values support this integrity. The high water-soluble extractive value shows that it has many bioactive compounds. This supports its traditional use in medicine. These findings ensure that Asparagus racemosus is pure and authentic in herbal products. They also support future pharmacological research.

REFERENCES

1. Mandal S, Patra A, Samanta A, Roy S, Mandal A, Mahapatra TD, et al. Analysis of phytochemical profile of Asparagus racemosus Willd. root extract. J Ethnopharmacol. 2013;148(2):291-9.
2. Sharma U, Bala M, Kumar N, Singh B, Munjal A, Kaur R, et al. Pharmacognostic and phytochemical standardization of Asparagus racemosus Willd. leaves. Pharm Biol. 2015;53(4):544-52.
3. Kokate CK, Purohit AP, Gokhale SB. Textbook of Pharmacognosy. 51st ed. Pune: Nirali Prakashan; 2019.
4. Evans WC. Trease and Evans Pharmacognosy. 16th ed. London: Elsevier; 2009.
5. Wadood A, Ghufran M, Jamal SB, Naeem M, Khan A, Ghaffar R, et al. Phytochemical analysis of medicinal plants occurring in local area of Mardan. Biochem Anal Biochem. 2013;2(4):144.
6. Rajeswari R, Umadevi M, Rahale CS, Pushpa R, Selvavenkadesh S, Kumar KSP, et al. Asparagus racemosus—An overview on phytopharmacological aspects. Int J Pharm Sci Res. 2012;3(7):2065-73.
7. Panda S, Kar A. Asparagus racemosus ameliorates hepatic and renal dysfunctions in L-thyroxine-induced hyperthyroid rats. J Pharm Pharmacol. 2007;59(10):1549-55.

Date of Submission: 02/11/2025 Date of Acceptance: 09/11/2025 Date of Publish: 16/11/2025

8. Mali PY, Bhadane VV. Folk medicinal uses of some indigenous plants from Nandurbar district of Maharashtra. Indian J Nat Prod Resour. 2011;2(1):102-9.
9. Mukherjee PK. Quality control of herbal drugs: An approach to evaluation of botanicals. 1st ed. New Delhi: Business Horizons; 2002.
10. Kirtikar KR, Basu BD. Indian Medicinal Plants. 2nd ed. Dehradun: International Book Distributors; 2003.
11. Singh R, Tiwari M, Prakash H, Agrawal A, Mishra M. Phytochemical and pharmacological importance of Asparagus racemosus: A review. J Med Plants Res. 2017;11(12):233-45.
12. Pattanayak SP, Mazumder PM, Sunita P. Asparagus racemosus: A phyto-pharmacological review. J Ethnopharmacol. 2010;132(1):1-14.
13. Kokate CK, Purohit AP, Gokhale SB. Textbook of Pharmacognosy. 51st ed. Pune: Nirali Prakashan; 2019.
14. Evans WC. Trease and Evans Pharmacognosy. 16th ed. London: Elsevier; 2009.
15. Khandelwal KR. Practical Pharmacognosy: Techniques and Experiments. 19th ed. Pune: Nirali Prakashan; 2008.
16. WHO. Quality control methods for medicinal plant materials. Geneva: World Health Organization; 1998.
17. Alabi D.A. and Alausa A.A., Evaluation of the mineral nutrients and organic food contents of the seeds of Lablab purpurus, Laucaena leucocephala and Mucua utilis for domestic consumption and industrial utilization, World J Agric Sci. 2: 115–118 (2006)

Date of Submission: 02/11/2025 Date of Acceptance: 09/11/2025 Date of Publish: 16/11/2025