



E-ISSN: 2278-4136

P-ISSN: 2349-8234

www.phytojournal.com

JPP 2021; 10(6): 266-270

Received: 07-09-2021

Accepted: 09-10-2021

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Pharmacognostic and phytochemical study of Karavīra Patra of two different geographical regions: Ānūpa and Jāñgala Desa

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Abstract

The description of *Nerium oleander* Linn. (Karavīra) is found from the Vedas, which are the oldest available literature in India to the latest Nighantus and recent researches. The flower of Karavīra has high spiritual significance and people also believe that it eliminates all bad elements of the body and provides good health. Caraka included Karavīra under Kuṣṭaghna mahākaṣāya, Susruta mentioned it as Dāhaśamanārtha and also included under Laksadi Gana. Though Karavīra is mentioned under Upavisa, after proper sodhana it is said to have best actions against Kusta, Kandu etc. Usage of Leaves of Karavīra is mentioned in many diseases like Kikkisa, Kusta etc. The present paper highlights the differences that are observed between leaves of Karavīra belonging to two different geographical regions i.e., Jāñgala Desa and Ānūpa Desa. There was noted difference in the leaves of both desa Karavīras. This was adaptation to the environmental condition of the particular region. This is mentioned in detail further.

Keywords: Karavīra, Desa, Ānūpa Desa, Jāñgala Desa, *Nerium oleander*, pharmacognostic study

Introduction

It is an evergreen shrub or small tree, which is cultivated all over the world, especially in south-west Asia. The ancient city of Volubilis in Morocco took its name from the old Latin name for the flower. It is naturalized in the vast area ranging from Mauritania, Morocco, and Portugal. It is used as an ornamental shrub in the Mediterranean region and in southern Asia. The pink flower variety plant, *N. oleander* is exclusively native to India, Bangladesh, Nepal, Myanmar, and China. It is most commonly known as oleander, from its superficial resemblance to the unrelated olive *Olea*.

Taxonomic Classification ^[1]

Kingdom	:	Plantae
Subkingdom	:	Tracheobionta
Super division	:	Spermatophyta
Division	:	Magnoliophyta
Class	:	Magnoliopsida
Family	:	Apocynaceae
Genus	:	<i>Nerium</i>
Species	:	<i>oleander</i>

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Synonyms And Their Etymologies:

Karavīra	It is a highly potent drug.
Kaṇavīra	
Pracanda	
Candātaka	
Candāta	
Pratīhāsa	
Candālikā	It is a plant with lanceolate leaves.
Śataprāsa	
Dīrghapatra	
Abjabījabhrta	
Aśvaghna	Its seeds resembling those of Lotus
Aśvamāraka	It causes accidental poisoning to Horses.
Hayaghna	
Hayāri	
Sugandhikusuma	Flower shaving pleasant smell
Kasturika	
Sthalādikumuda	
Caṇḍīkuṣuma	Its flowers are used for worshipping gods.
Divyapuṣpa	
Gandharvasva	
Ganeśakusuma	
Gaurīpuṣpa	
Siddhipuṣpa	
Sitapuṣpa	It produces many flowers at a time
Śitakumbha	

Rasa Pancaka

Rasa	:	Katu, Tikta, Kaṣāya
Guna	:	Laghu, Rūkṣa
Vīrya	:	Uṣṇa
Vīpāka	:	Katu
Dośakarma	:	Kapha-Vātahara
Karma	:	Kuṣṭaghna, Vraṇahara, Cakṣuṣya

Morphology ^[3]:**Habitat**

Nerium oleander is cultivated as an ornamental shrub in gardens throughout India, In Southern India, it is found on the road sides and grown over the fences. It is distributed all over the Philippines, India and Nepal found on the ranges of 6400 feet. Also found Mediterranean region, Iran, the Indian subcontinent and southern China.

Habit

Nerium oleander is evergreen shrub that grows up to 5 m. in height with lanceolate leaves and Pink, White or Yellow flowers.

Leaves

Leaves usually in whorls of three, four, six by one inch, linear lanceolate or oblong thickly coriaceous, acuminate, smooth, dark green and shining above, rough and dotted beneath; midrib stout; lateral nerves, numerous, parallel and transverse; petiole short.

Flowers

Flowers 1.5 inch diameter, red, white or rose coloured generally sweet scented, double under cultivation, in large terminal racemose cymes.

Sepals: Broad-subulate.

Corolla: Funnel shaped; lobes spreading overlapping to the right.

Corona: Appendages laciniate in to numerous irregular segments.

Stamens : Near the top of the stigma; calls with long twisted appendages.

Fruit: Six to seven by three to four inch rigid.

Seeds: Linear, ribbed, vilous with and having a coma of grayish brown hairs.

Flowering and fruiting time: Plant flowers in April-June or summer season and flowering often throughout the year. Fruiting during cold season.

Chemical Constituents ^[4]

Karabin, Neriodorein, Neriodorin, Docosanoic, Eicosanoic, Tri-penta, aheptaandnona-decanoic, lauric, Palmitic, Myristic and Stearic acids; Paraffins, Benzyl and β-phynylethyl alcohols and their acetates; campesterol, stigmasterol, Odoroside A, Kaempferol-3-glycoside; Oleanolic and Ursolic acids; β- sitosterol and its glucoside; Dambonitol; Adyberin, Neriodin, Nerium D, 16-deacetyl-anhydrooleandrin (Nerium E), Rutin, an unsaturated lactone glycoside of plumericin and neriaside have also been isolated from the plant.

Pharmacological Activities ^[5]

Hepatoprotective, Antidiabetic, Neuroprotective, Antioxidant, Analgesic, Antimalarial, Antiulcer, Molluscicidal, Antiangiogenesis, Antiviral, Antifungal, Diuretic, Antileukemic, Immunomodulating, Anticancer, Radiotherapy supplementation, Antimicrobial, Anti-inflammatory, Antidiarrheal, Antitermite.

Cultivation ^[3]

Red lateritic or black or loamy soils with adequate drainage are suitable for *Nerium* cultivation.

Propagation ^[3]

Hard or semi hard wood cuttings of 60 cm length are used for planting. Their ends are buried inside the soil forming an arch. Rooted cuttings can also be planted in the normal manner during June to July in 30 cm x 30 cm x 30 cm pits dug at 2 x 2 m spacing and filled with FYM, red earth and top soil.

Harvesting

Harvesting begins from the 4th month after planting.

Useful Part: Whole plant.

DOSAGE: 30-125mg as maximum dose.

AIM: To study the macroscopic and microscopic analysis of Karavīra patra of two different geographical regions – Ānūpa Desa and Jāṅgala Desa.

For Jāṅgala Desa drug was collected from Tirupati, Chittoor dist., Andhrapradesh and for Ānūpa Desa studies drug was brought from Udupi, Karnataka.

Pharmacognosy Of *Nerium Oleander* Linn. Leaf – Jāṅgala Deśa

Name of the Sample	:	Karavīra
Scientific Name	:	<i>Nerium oleander</i> L
Family	:	Apocyanaceae
Plant part	:	Leaf

Drug Description

Freshly collected green leaves from Jāṅgala Deśa (surroundings of Tirupati), Leaves are thick, leathery, dark green, narrow, lanceolate.

Organoleptic Properties of Leaf

Size	: Length: 5 to 21cm long and 1-3.5cm Breadth
Shape	: Lanceolate
Colour	: Dark Green
Odour	: Not specific
Taste	: Not characteristic

Leaves are dorsi - ventral, narrow, Lanceolate, Leathery, Margin Entire, Apex acute, Base cuneate, Venation reticulate, Generally leaves are in pairs or whorls of three i.e. whorled phyllotaxy.

Microscopic Properties of Leaf

1. T.S. of Leaf: Transverse Section of Leaf is done by Free hand Section cutting and Simple staining procedure and findings are as mentioned below.

A. Epidermis

- Leaf on either sides covered with Epidermal layers i.e. Upper Epidermis and Lower Epidermis.
- The Upper epidermis is Multi Layered and composed of 4 to 5 layer of small lignified parenchyma cells.
- Many simple, non-glandular, uni-cellular Trichomes are present on the surface of upper Epidermis.
- Lower epidermis is formed of 3-4 layers of small lignified parenchyma cells.
- There are many sunken stomata are present on Lower epidermis and these stomata are covered with large number of hairs.
- Stomata are Anisocytic and hypostomatic i.e. located in Lower epidermis
- The number of hairs in the lower epidermis is larger than the upper Epidermis they are unicellular, simple and non-glandular.
- The cells of upper and lower epidermis walls are almost straight.
- Both the Epidermal layers externally covered with cuticle, cuticle on the lower epidermis is thinner than the upper epidermis.

B. Mesophyll

- In between upper and Lower epidermal layers mesophyll region is present
- Mesophyll tissue distinguished in to Palisade and Spongy Parenchyma
- The leaf consist of 2 to 3 layers of palisade cells, followed by upper epidermis, they are compact, without inter cellular spaces, long and filled with dense Chloroplast
- The spongy parenchyma is formed of loosely arranged parenchyma cells with large intercellular spaces. Cells of the spongy parenchyma are located in the narrow central part of the leaf
- There are some Rosette crystals (druses) of calcium oxalate are Present in the region of Mesophyll.
- Lateral veins appeared in the region between the palisade and spongy parenchyma. They are formed of phloem and xylem vessels.
- In the mid-rib region, the upper epidermis is followed by 7-8 layers of collenchyma and 8-9 layers of Parenchyma. Lower epidermis is followed by 4-5 layers of collenchyma and 10-12 layers of parenchyma cells. In some of the cells of Parenchyma Rosette crystals (Druses) of calcium oxalate are present.

C. Vascular Bundle

- In the Mid-Rib region, A well-developed crescent-shaped Bi-Collateral vascular bundle is present.
- In the Bi-collateral Vascular Bundle Xylem is present at the centre and Phloem is present on either sides of xylem i.e. outer and inner sides.
- Phloems is formed of sieve tube cells, companion cells and phloem parenchyma.
- Xylem is Lignified and composed of radial vessels, the Meta xylem elements are facing towards lower region and Proto xylem elements are facing towards the upper region, They are separated by xylem parenchyma.
- These Anatomical characters of leaf are xeromorphic adaptations and this plant grows in dry and arid regions.

Microscopic structure of *Nerium oleander* Linn. (leaf) – Jāṅgala Deśa

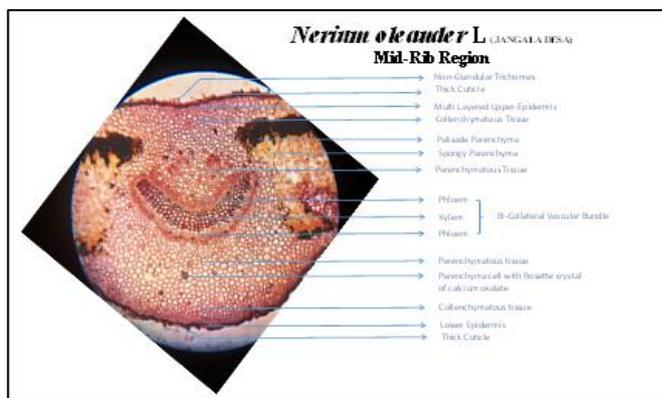


Image 1: Transverse section of Karavīra leaf – Jāṅgala Deśa

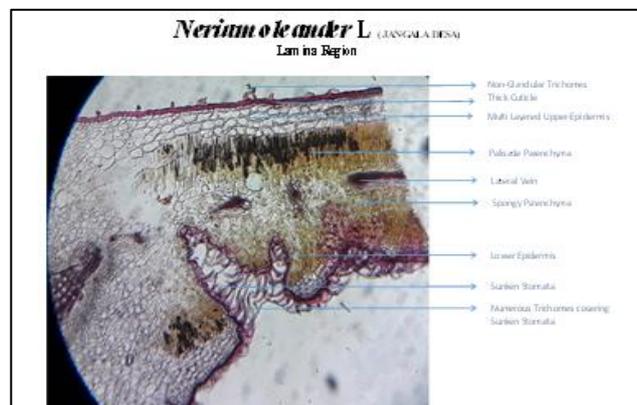


Image 2: Transverse section of Karavīra leaf – Lamina region

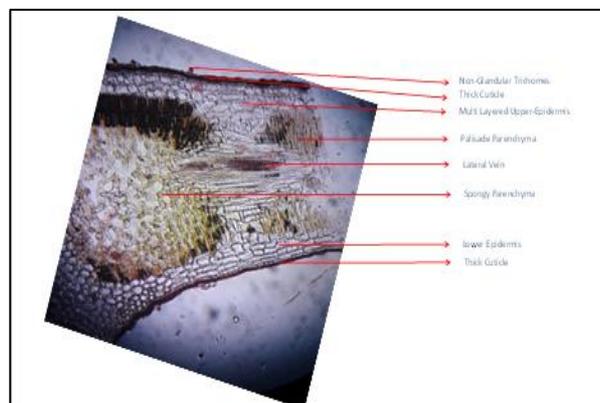


Image 3: Transverse section of Karavīra leaf – Lamina region (Enlarged view)

Pharmacognosy of *Nerium Oleander* Linn. LEAF– ĀNŪPA DEŚA

Name of the Sample	:	Karavīra
Scientific Name	:	<i>Nerium oleander</i> L
Family	:	Apocyanaceae
Plant part	:	Leaf

Drug Description

Leaves are thick, leathery, dark green, narrow, lanceolate.

Organoleptic Properties of Leaf

Size	:	Length: 5 to 21 cm long and 1-3cm Breadth (Narrow than Jāṅgala Deśa)
Shape	:	Lanceolate
Colour	:	Dark Green
Odour	:	Not specific
Taste	:	Not characteristic

Leaves are dorsi ventral, narrow, Lanceolate, Leathery, Margin Entire, Apex acute, Base cuneate, Venation reticulate, Generally leaves are in whorls of three or more i.e. whorled phyllotaxy.

Microscopic study of Leaf:

2. T.S. of Leaf: Transverse Section of Leaf is done by Free hand Section cutting and Simple staining procedure and findings are as mentioned below.**A. Epidermis**

- Leaf on either sides covered with Epidermal layers i.e. Upper Epidermis and Lower Epidermis. (Both the Epidermal Layers are slightly wavy in outline when compare with Jāṅgala Deśa variety)
- The Upper epidermis is Multi Layered and composed of 4 to 5 layer of small lignified parenchyma cells.
- Many simple, non-glandular, uni-cellular Trichomes are present on the surface of upper Epidermis.
- Lower epidermis is formed of 3-4 layers of small lignified parenchyma cells.
- There are many sunken stomata are present on Lower epidermis and these stomata are covered with large number of hairs. (The number of Sunken stomata are more in the Jāṅgala Deśa variety than Ānūpa Deśa).
- Stomata are Anisocytic and hypostomatic i.e. located in Lower epidermis
- The number of hairs in the lower epidermis is larger than the upper Epidermis they are unicellular, simple and non-glandular. (Number of Trichomes are more in Ānūpa Deśa Variety than Jāṅgala Deśa)
- The cells of upper and lower epidermis walls are almost straight.
- Both the Epidermal layers externally covered with cuticle, cuticle on the lower epidermis is thinner than the upper epidermis.

B. Mesophyll

- In between upper and Lower epidermal layers mesophyll region is present
- Mesophyll tissue distinguished in to Palisade and Sponge Parenchyma
- The leaf consists of 2 to 3 layers of palisade cells, followed by upper epidermis, they are compact, without inter cellular spaces, long and filled with dense Chloroplast.
- The spongy parenchyma is formed of loosely arranged parenchyma cells with large intercellular spaces. Cells of

the spongy parenchyma are located in the narrow central part of the leaf.

- There are several Rosette crystals (druses) of calcium oxalate are Present in the region of Mesophyll. (The Number and distribution of Rosette crystals of calcium oxalate is more in Ānūpa Deśa than Jāṅgala Deśa variety)
- Lateral veins appeared in the region between the palisade and spongy parenchyma. They are formed of phloem and xylem vessels.
- In the mid-rib region, the upper epidermis is followed by 7-8 layers of collenchyma and 8-9 layers of Parenchyma. Lower epidermis is followed by 4-5 layers of collenchyma and 10– 12 layers of parenchyma cells. In some of the cells of Parenchyma Rosette crystals (Druces) of calcium oxalate are present.

C. Vascular Bundle

- In the Mid-Rib region, A well-developed crescent-shaped Bi-Collateral vascular bundle is present.
- In the Bi-collateral Vascular Bundle, Xylem is present at the centre and Phloem is present on either sides of xylem i.e. outer and inner sides.
- Phloems is formed of sieve tube cells, companion cells and phloem parenchyma.
- Xylem is Lignified and composed of radial vessels, the Meta xylem elements are facing towards lower region and Proto xylem elements are facing towards the upper region, They are separated by xylem parenchyma.
- These Anatomical characters of leaf are xeromorphic adaptations and this plant grows in dry and arid regions.

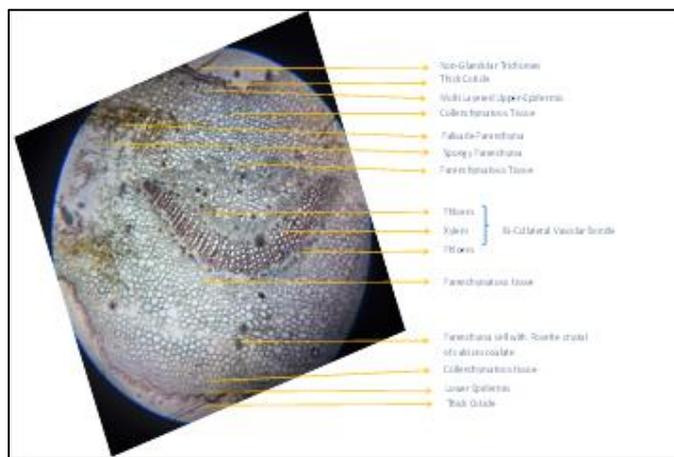


Image 4: Transverse section of Karavīra leaf – Mid rib region

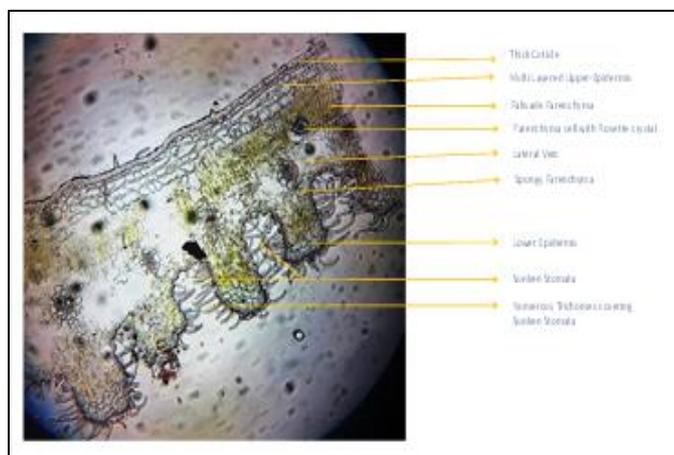


Image 5: Transverse section of Karavīra leaf – Lamina Region

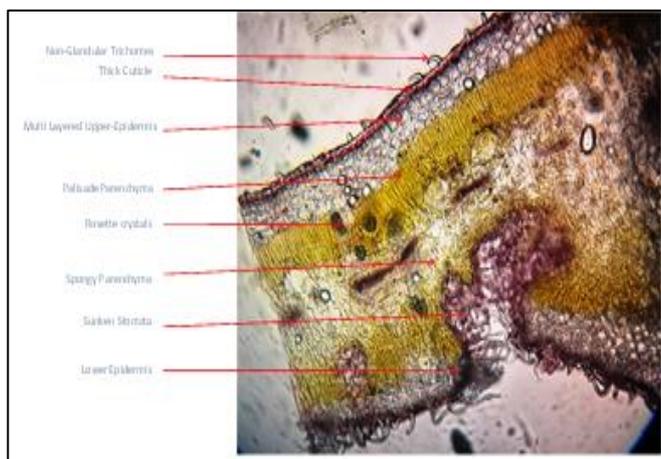


Image 6: Transverse section of Karavira leaf – Lamina region (Enlarged view)

Patra Curna – Jāṅgala Phytochemical Analysis of Karavira Desa And Ānūpa Desa

S. No.	Phytochemical	Test Name	KPT* - JD**	KPT – AD***
1	Alkaloids	Mayer's Test	-	-
2	Carbohydrates	Molisch Test	+	+
3	Reducing sugars	Benedicts Test	+	++
4	Proteins	Biuret Test	+	+
5	Xantho Proteins	Xantho protein test	+	+
6	Amino acids	Ninhydrin Test	-	-
7	Starch	Iodine test	-	-
8	Tannins	Ferric chloride test	+	+
9	Steroids	Salkowski reaction	+	+

+ Positive ; - Negative

Discussion

Ayurveda gives lot of importance to desa and kala in case of medicinal plants. Ayurveda has divided whole of the earth into three desas – Sadharana, Ānūpa and Jāṅgala on basis of environmental conditions, soil, growth of plant, humidity and moisture. Ayurveda notifies that the people living in Ānūpa desa are Kaphaja predominant and Jāṅgala desa are with Vata and Pitta predominance. Looking into the importance of dosas of desa, the study was done to observe the anatomical adaptations of Karavira plant, physiological, physicochemical and phammacognostic studies were done. The following are the observations seen.

Macroscopic study shows that the leaf is lanceolate, Dark Green, Doesn't have specific odour and characteristic taste. The only difference observed is the leaf of Ānūpa Deśa is narrow than leaf of Jāṅgala Deśa, this may be because to reduce the transpiration of water as water is sufficient in Ānūpa desa.

- Microscopic study shows that both the Epidermal Layers (upper and lower) are slightly wavy in outline when compare with Jāṅgala Deśa variety.
- Microscopic studies shows that Jāṅgala Deśa has more number of sunken stomata than Ānūpa Deśa. Sunken means hidden stomata or stomata those which are not directly exposed to surface. It is in a small pit, which protects the escaping water vapour from air currents, decreasing water loss from the leaf. So, to prevent water loss, Jāṅgala Deśa leaf might have more stomata comparatively.

- It is also observed that number of trichomes are more in Ānūpa Deśa than in Jāṅgala Deśa. Trichomes serve a number of functions, which include physical and chemical protection for the leaf against microbial organisms, aphids and insects, and the maintenance of a layer of still air on the leaf surface, thus combating excess water loss by transpiration. As humidity increase chance of infestation, Ānūpa Deśa might have more trichomes for protection.
- There is one more important observation seen, the number and distribution of Rosette crystals of calcium oxalates is more in Ānūpa Deśa than in Jāṅgala Deśa, which serve a primary function in bulk regulation of calcium in tissues and a secondary function in defence against grazing animals.
- Karavira of Jāṅgala Deśa showed presence of Carbohydrates, Sugars, Proteins, Xanthoproteins, Tannins and Steroids, whereas Karavira from Ānūpa Deśa showed almost same results except for sugars. *Comparatively Sugars are higher in quantity in samples of Ānūpa Deśa than in Jāṅgala Deśa.*

Conclusion

The present study was to evaluate the effect of desas on Karavira plant to explore the adaptation qualities of the plant in different geographical regions. Ayurveda gives lot of importance to desa as dosa predominance plays important role in the health of individuals.

- The pharmacognostical studies shows that macroscopically leaf of Ānūpa desa is narrow than the leaf of Jāṅgala desa.
- Microscopically Jāṅgala Desa has more number of sunken stomata, study also showed that number of trichomes are more in Ānūpa Desa than in Jāṅgala Desa.
- The more important observation, number and distribution of rosette crystals of calcium oxalates is more in Ānūpa desa than in Jāṅgala desa.
- Phytochemical studies of Karavira patra curna showed the presence of more sugar quantity in samples of Ānūpa desa than in Jāṅgala desa.
- Thus all the above mentioned observations of Karavira patra of Jāṅgala Desa and Ānūpa Desa are purely adaptogenic to varying geographical conditions.

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