NERIUM OLEANDER CULTIVATION IN TAMIL NADU - AN EXPLORATORY STUDY

ABSTRACT

In Indian traditional medicine, Nerium oleander is a significant medicinal herb. This plant has the potential to be fatal in many situations; poisoning cases have been documented in tropical and subtropical regions of the world, and suicide cases are common in South Asian nations, particularly in India and Sri Lanka. The plant is hazardous in all sections and contains a range of cardiac glycosides, such as gentiobiosyl, neriin, oleandrin, cardenolides, and odoroside. Additionally, this plant species produces secondary metabolites with medicinal uses, including steroids, flavonoids, and alkaloids. Antibacterial, anthelmintic, anti-inflammatory, hepatoprotective, immunopotential, anti-pyretic, antioxidant, antifungal, anticancer, and anti-HIV activity are among the significant pharmacological activities (SaabiyaFarooqui, 2018).Neriumindicum is also highly well-liked for its traditional medical applications, which include treating inflammation, wound healing, cancer, asthma, corns, heart disease, and epilepsy. Its bloom is the source of a green dye that is used to cure skin conditions, promote wound healing, and have anti-inflammatory properties (Priyankar 2014). Both ultrasonic transesterification and the magnetic stirrer method have been utilized to produce biodiesel from nerium oleander oil (Ashok, et al., 2016).When administered topically, Nerium oleander's special qualities also have a notable age-defying effect (SaabiyaFarooqui, 2018).Nerium oleander to acquire several C and N compounds as well as heavy metals that are frequently produced by cars, including as Pb, Cd, Ni, and Zn (Noreen, et al 2023). Based on the significance of nerium, the study was conducted in the Kanyakumari district of Tamil Nadu, where there is a greater area dedicated to nerium plant cultivation. The study's focus was on the factors that influence nerium cultivation, the factors that contribute to the volatility of nerium prices, and the challenges that farmers face in terms of production and marketing.

Keywords : Nerium, medicinal value, biodiesel, poisonous substance, environmental friendly.

INTRODUCTION

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Within the Apocynacea family of dogbanes, Nerium (Nerium oleander L.) is an evergreen shrub or small tree (Kiran and Prasad, 2014; Yadav et al., 2013). Within the order Gentianales, the family Apocynacea is rich in species and diversified. According to Barrios and Koptur (2011), the family is widely distributed in tropical and temperate regions. Since Nerium oleander L. is so extensively grown, its exact origin is unknown, however South West Asia has been proposed. It usually happens near arid creek beds. Although nerium is widely spread in India, only Tamil Nadu is used for commercial cultivation. Nerium has erect stems that extend outward as plants age, reaching heights of 2 to 6 meters. The leaves often emerge in groups of three from the stem and are 10 to 22 centimeters long, narrow, sharp, and possess a strong midrib. They have a "leathery" texture. Terminal flower heads are produced by the plant; these are often pink or white (Kiran and Prasad, 2014). Nerium is an ornamental plant that is utilized in urban landscaping because of its amazing blossoming, which varies in color depending on the type, and its ability to withstand extended droughts (Albornoz et al., 2014).Nerium is an ornamental plant that is utilized in urban landscaping because of its amazing blossoming, which varies in color depending on the type, and its ability to withstand extended droughts (Albornoz et al. 2014).

Neriums are perennial ornamental crops with summer bloomsthat are members of the Apocyanaceae family. They are primarily dispersed throughout India's arid tropical areas. Neriumindicaum, Nerium oleander varvariegata, and Nerium indicum are the three commercially significant Nerium species. They go by Kaner or Oleander most of the time. The shapes and hues of the blooms are what give the Nerium cultivars their names. Nerium comes in a variety of forms, including dwarf variants like Petite Salmon and Petite Pink and single rose, single white, single red, double rose, double white, double red, double rose, pink, white, and yellow.

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Table 1 :AREA, PRODUCTION AND PRODUCTIVITY FOR THE MAJOR FLOWER CROPS GROWN IN TAMIL NADU

S.No	Flowers	Area (in Ha)	Production (in Tonnes)	Productivity (Tonnes/Ha)
1	Rose	1949	14130	7.25
2	Jasmine	10623	92951	8.75
3	Mullai	2769	23537	8.50
4	Jadhi malli	841	7569	9.00
5	Crossandra	1317	2634	2.00
6	Chrysanthimum	2240	20160	9.00
7	Marigold	1502	22530	15.00
8	Arali	1195	9261	7.75
9	Tube rose	1529	15290	10.00
10	Others	3174	34343	10.82
	TOTAL	**25610**	**227115**	**8.87**

Source: tnhorticulture.tn.gov.in

Propagation and Planting

Hardwood or semi-hard woodcuttings of 60 cm in length are used to propagate neriums. An arch is formed when the cut ends are buried in the ground. During the months of June through July, rooting cuttings are planted in 30 cm by 30 cm by 30 cm trenches that are filled with red earth, FYM, and top soil. Nerium plants are often spaced two meters apart from one another.

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Soil and Climate

In tropical and subtropical climates, it functions well. Soils that are loamy, black, or red lateritic and have sufficient drainage capacity are good for commercial farming.

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Pruning:

In Nerium, pruning is a crucial cross-cultural procedure. Reversing the previous growth's vigorousness is the process of pruning. It is necessary to remove every weak, diseased, crisscross, and unproductive shoot. To stop die back, cover the cut end with copper oxy chloride paste or Bordeaux paste.

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1st year - Remove one third of the old mature stems near ground level.

2nd year - Remove one half of the remaining old stems and cut back long new shoots.

3rd year - Remove remaining old stems and cut back long new shoots.

Flowering season

Nerium blooms all year round. April to August is when flowers are at their peak.

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Harvesting and Yield

Flowers can be harvested as early as the fourth month following planting. Flower buds that are fully formed and open are picked. Early in the morning and late in the evening is harvest time. One can achieve an approximate flower production of 100–125 kg/ha/day. *("History - International Oleander Society" 2017)*

Floriculture Research Station, TNAU, Thovalai, Tamil Nadu

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Developing and breeding high-yielding flower crop varieties, such as marigold, celosia, chrysanthemum, gomphrena, crossandra, jasmine, tuberose, nerium, and scented rose,

Actions

The list of ongoing subprojects at FRS, Thovalai is provided below.

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• HCBE FRS FLO 10 001: Nerium accessions are gathered and assessed for high yield, extended shelf life, and as benchmarks for decorative purposes.

Achievements - Crop improvement

22 accessions have been assembled thus far from a variety of locations, including Beemanahari, Santhavilai, Thirupathisaram, Aralvaimozhi, Kumarapuram, Thazhakudy, Rasipuram, Salem, Azhaganapuram, and Kulasekaranpudur, which fall under the districts of Kanyakumari, Salem, Theni, and Namakkal. The collected accessions are being evaluated for various yield and growth characteristics as part of the project on the collection and evaluation of Nerium accessions for high yield, prolonged shelf life, and as standards for ornamental purpose. The accs. NI.15 (Red and Pink Mixed Single), assembled from Rasipuram, is clearly showing promise in terms of flower yield based on the data gathered thus far. The trial is now underway. (https://agritech.tnau.ac.in/)

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MYTH

Nerium flowers are utilized as loose flowers as well as cut flowers. They are frequently used as sacrifices to God and in garlands. The plants are utilized for avenue planting and beautification. There is a common misconception that Nerium is an extremely dangerous plant.

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TOXICITY

Since several of the chemicals in Nerium oleander may be harmful when ingested in large quantities, especially by animals, the plant has long been thought to be dangerous. Toxic cardiac glycosides are present throughout the oleander plant. The roots and seeds contain the highest levels. Toxic effects might come from the plant's smoke as well as the water it has been submerged in. These substances include oleandrin and oleandrigenin, also referred to as "cardiac glycosides," which are poisonous when consumed and have a limited therapeutic index. Oral discomfort, nausea, vomiting, cramps, diarrhea, and abdominal pain are signs of oleander poisoning.

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Preventive measures

Oleander plant poisoning and reactions show up rapidly, necessitating emergency medical attention in cases of suspected or confirmed poisoning in humans and animals. Atropine and isoproterenol are typically used to treat conduction abnormalities, and activated charcoal may be taken orally. It has been demonstrated that anti-digoxin Fab fragments are a safe and efficient treatment for severe cardiac arrhythmias brought on by yellow oleander. Anti-digoxin antibody therapy can quickly treat hyperkalemia and bradycardia while restoring sinus rhythm. Digoxin-specific Fab's weaker affinity for nondigoxin cardiac glycosides in oleander leads to a higher dose requirement than for digoxin toxicity in general. (Singh et al, 2013)

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REALITY

Ethnomedicinal value

The leaves have been prepared into a decoction and administered externally to cure scabies and reduce edema. Bark is used as a febrifuge, cathartic, and intermittent fever remedy. It is bitter. Leprosy and scaly skin conditions are treated with oil extracted from the root bark. Seeds are used as a purgative for rheumatism and dropsy. Because the root is poisonous, it is only used externally. Despite its power, it may be resolved and is used to treat tumors in the form of plasters. Nerium's leaves and flowers have antibacterial, diaphoretic, cardiotonic, and diuretic properties.*Nerium* is beaten into a paste with water and applied to lesion andulcers on the penis.

The flowers, leaves, leaf juice or latex, bark, and roots have all been used to cure corns, warts, carcinoma, ulcerating or hard tumors, and the entire plant is thought to have anticancer characteristics. The Federal Drug Administration (FDA) concluded the first phase of oleander extract trials in 2011 and determined that the extract was safe to use in cancer treatment. Additionally, it was discovered that the extract had a favorable effect on malignancies of the bladder, colon, breast, pancreatic, and appendix with very minimal cardiotoxicity or adverse reaction. Patients with advanced cancers have been treated with Anvirze, an aqueous extract of the Nerium oleander plant. In 2000, Pathak et al. Nerium oleander is also used medicinally to treat ringworm, herpes, abscesses, ulcers, hemorrhoids, and leprosy.

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Fig 1 :Biological activities

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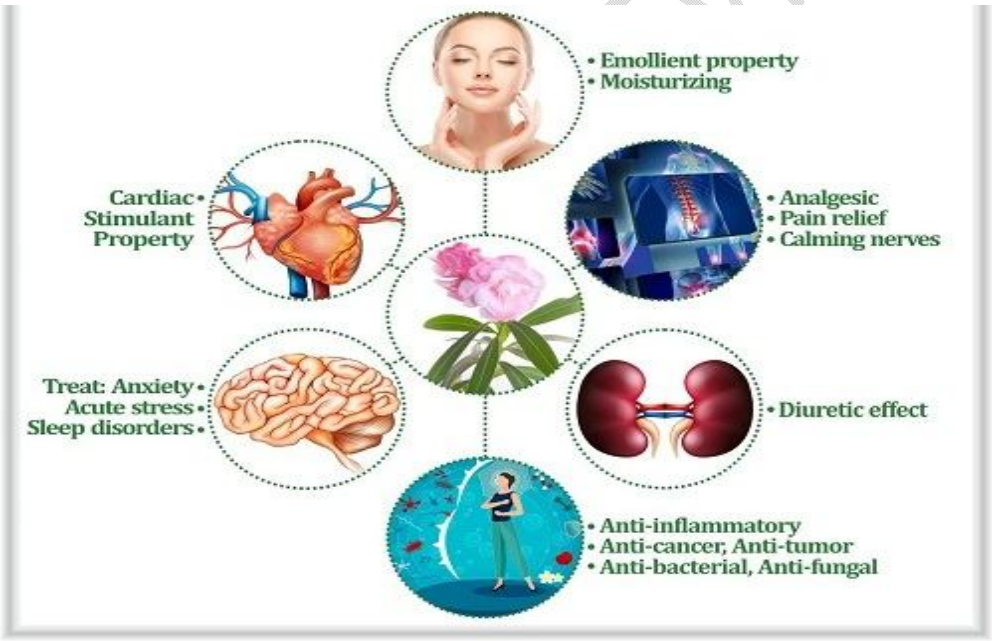

Antioxidant activity

Crude Nerium oleander leaves extract had a greater overall level of antioxidant activity (72.8%) compared to the flower (68%) and superoxide radical, whereas the crude floral extract had a higher scavenging activity (66%) compared to the leaves (25%). Nerium oleander has strong antioxidant properties, including the ability to scavenge free radicals and reduce their

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number. The antioxidant activity was shown to be associated with the amount of total phenolic content found in the corresponding extracts used in each assay. N. Oleander leaf, stem, and root extracts can be utilized as a natural source of strong antioxidants and work well as free radical scavengers.

Anti-inflammatory activity

Without causing any stomach harm, the ethanolic extracts of fresh and dried Nerium oleander flowers demonstrated strong anti-inflammatory effects on mice with carrageenan-induced hind paw edema.

Antimicrobial activity

Since medications generated from plants have significantly improved human health, the plant has served as a source of inspiration for new therapeutic molecules. *B. Subtilis* and *Nyctanthesarbortristis* were two bacterial strains on which ethanolic leaf extract had a notable effect. The antibacterial activity of oleander extracts on gram-negative bacteria was investigated, and it was discovered that these extracts' antibacterial properties were caused by phenolic chemicals, which lower the levels of radicals.

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Larvicidal activity

According to Kumar et al. (2012), the aqueous leaf extract of Nerium oleander demonstrated larvicidal and ovicidal qualities. Additionally, the plant's adulticidal and ovicidal effectiveness against Anopheles stephensi was documented.(Roni and others, 2013) Aqueous flower extracts and crude hexane from Nerium oleander were used to investigate the larval mortality of Culexquinquefasciatus (Raveen et al 2014).

Anticancer activity

It was possible to extract essential oil from oleander flowers by Ali and colleagues (2009). Ehrlich Ascites Carcinoma (EAC) cell lines shown anticancer activity. Different concentrations of Oleandrin (0.01 ng ml-1 to 50 micrograms ml-1) or Anvirzel (1.0 ng ml-1 to 500 micrograms ml-1) were added to cell cultures that were pulse-treated and recovered from.In 2000, Pathak et al. In human cancer cells, Oleandrin and Anvirzel both induced cell death, but not in cancer cells in mice.

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Cellular and humoral immune responses

The Nerium oleander plant has been found to have very beneficial immune-stimulating qualities by concurrent research. Nerium extracts have been demonstrated through research to particularly stimulate T and B lymphocytes, the humoral and cell-mediated immune systems, as

well as the function and capacity of particular subsets of mononuclear cells. Nerium oleander significantly modulates the immunological system of rabbits. Rabbits treated with a leaf extract at a dose of 75 mg/kg body weight showed reduced antibody production, inhibition of the delayed hypersensitivity reaction, and phagocytic activity; in contrast, the immune system was stimulated subcutaneously with low doses of 50 and 25 mg/kg body weight.

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***Nerium oleander* in applied science**

Nerium oleander (which contains oleandrin and other cardiac glycosides) received oral doses for 46 cancer patients ranging from 0.2 mg to 10.2 mg extract/day. These dosages were given out every day in cycles of twenty-one days to twenty-eight days. PBI-05204 was found to be "well tolerated up to the 10.2 mg extract/day dosage" by the researchers, who also found that there was evidence of tumor response and few serious adverse effects. A Nerium oleander extract applied topically does not seem to have any harmful effects. Studies on both humans and animals indicate that using Nerium oleander extract topically is safe because these substances are not easily absorbed via the skin. This demonstrates unequivocally that the plant's extracts may be used safely to boost the immunity of the target insects at a lower dosage, in addition to controlling pests. When used topically, the special qualities of Nerium oleander also yield a striking anti-aging effect. Nerium International was founded as a result of this discovery, and the Nerium AD skin care range was developed. Scientists at Nerium created a ground-breaking method called NBio-PL2 to extract the plant's unique and advantageous qualities while preserving the plant's original flavor. The NAE-8 extract, which has potent antioxidant qualities and is the result of a unique extraction procedure, is utilized to create the first-ever aged-fyingNerium product line.

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One of the main glycosides in Nerium oleander, oleandrin, is described as "A lipid-soluble cardiac glycoside with potential antineoplastic activity" by the National Cancer Institute. The University of Texas's cancer research has shown that AnvirzelTM's constituents are active on two different cellular pathways to induce apoptosis and/or autophagy (cell death) in human tumors, but not in normal cells. It also prevents the activation of NF-kB, a powerful signal that promotes the growth and metastasis of tumor cells. **(**Report to Nerium Biotechnology, Inc; 2009).

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Traditional uses: Leprosy and alopecia are two persistent and chronic skin ailments for which the leaves were applied externally. The leaves were ground into powder and used as a snuff to

treat epilepsy. Root powder mixed with water was administered to treat hemorrhoids and relieve venereal infections. (Khare (2004).

Fig 2 :DIFFERENT FORMS OF NERIUM AND USES

Capslim: This herbal medicine contains Oleander seed powder. This medicine is available in Mexico as a natural anti-obesity treatment.

Oleander flower extract: This is a natural remedy, study research has proven its anticonvulsant activity. (Garima,2010)

Biodiesel production from *Nerium oleander (Thevetiaperuviana)* oil through conventional and ultrasonic irradiation methods

Nerium oleander oil has been utilized as a feedstock for biodiesel production through the application of both magnetic stirrer technology and ultrasonic transesterification. For the best results, a two-step transesterification process was used, with the first step being treatment with 0.2% V/V methanol to oil ratio, 1% V/V KOH alkaline catalyst, 55°C temperature, and 60 min reaction time. The second step involved a 0.40% V/V methanol to oil ratio, 1% V/V H2SO4 catalyst, and 55°C temperature and reaction time. For roughly ten to fifteen minutes, the

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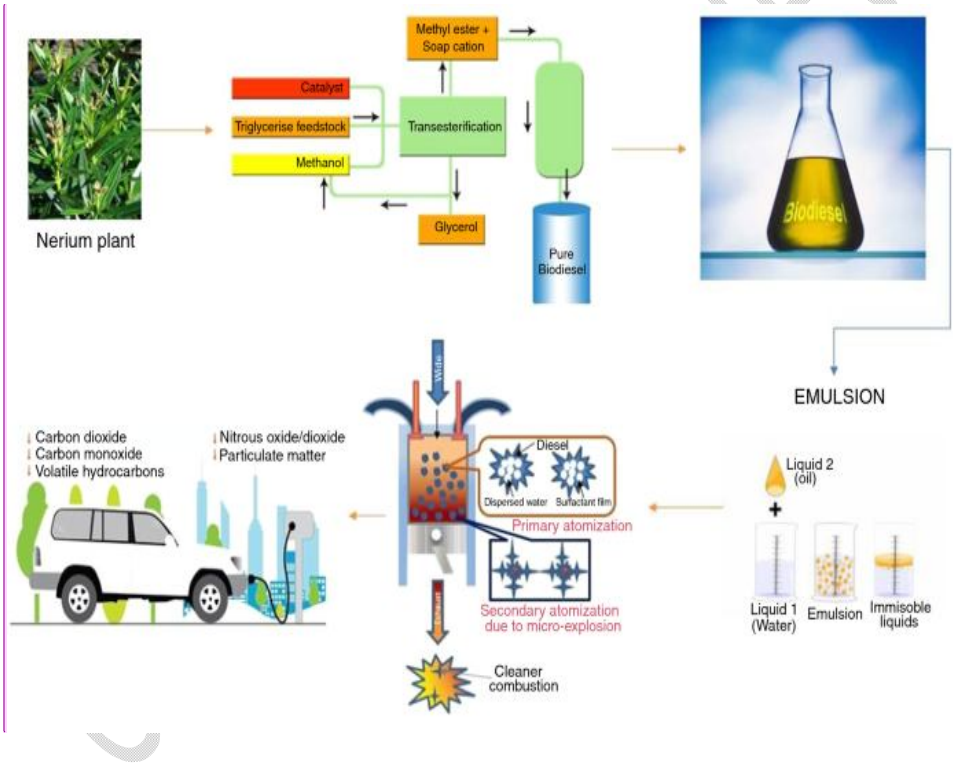
procedure is repeated using an ultrasonic approach with an ultrasonic horn type reactor (50 W) at a frequency of 28 kHz. Following that, the percentage yield and physiochemical characteristics of the biodiesel produced using the magnetic stirrer and the ultrasonic technique were contrasted. Improved physiochemical properties and a maximum yield of 97% by weight of oleander biodiesel were obtained by the use of ultrasonic transesterification. Thus, it can be said that the best technique for turning crude oleander oil into biodiesel is the ultrasonic method. (Ashok et al, 2016)

Fig 3 :**Biodiesel production from *Nerium oleander***



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Nerium oleander could be used for sustainable management of traffic-borne elemental-enriched roadside soils

Roadside habitats are coated with metal contaminants that are emitted by motor vehicles. Because they are not biodegradable, metals biomagnify in the food chain and pose serious health

risks to all trophic levels. Therefore, it is crucial to manage contaminated roadside verges and should be considered when developing particular management plans for these areas. In the most sustainable manner possible, native vegetation may be able to assist clean up soil contaminated by heavy metals. Thus, the purpose of this study was to determine whether Nerium oleander can accumulate heavy metals that are frequently released by cars, like Pb, Cd, Ni, and Zn, as well as different C and N compounds, from five different locations along a busy road in Punjab, Pakistan, in the summer and winter. The heavy metals Pb and Cd could be absorbed by N. oleander; the maximum concentrations of Pb and Cd were 8.991 mg kg-1 and 0.599 mg kg-1, respectively. The soluble proteins, free amino acids, gas exchange properties, and photosynthetic pigments were all adversely impacted by these contaminants. However, it was discovered that N. oleander's antioxidant activity was higher in both seasons. However, the summer was when the plant had more metal buildup. Our strong recommendation is to cultivate Nerium oleander at roadside verges in order to remove automobile pollutants, as this could result in long-term management of these corridors. (Noreen, et al 2023)

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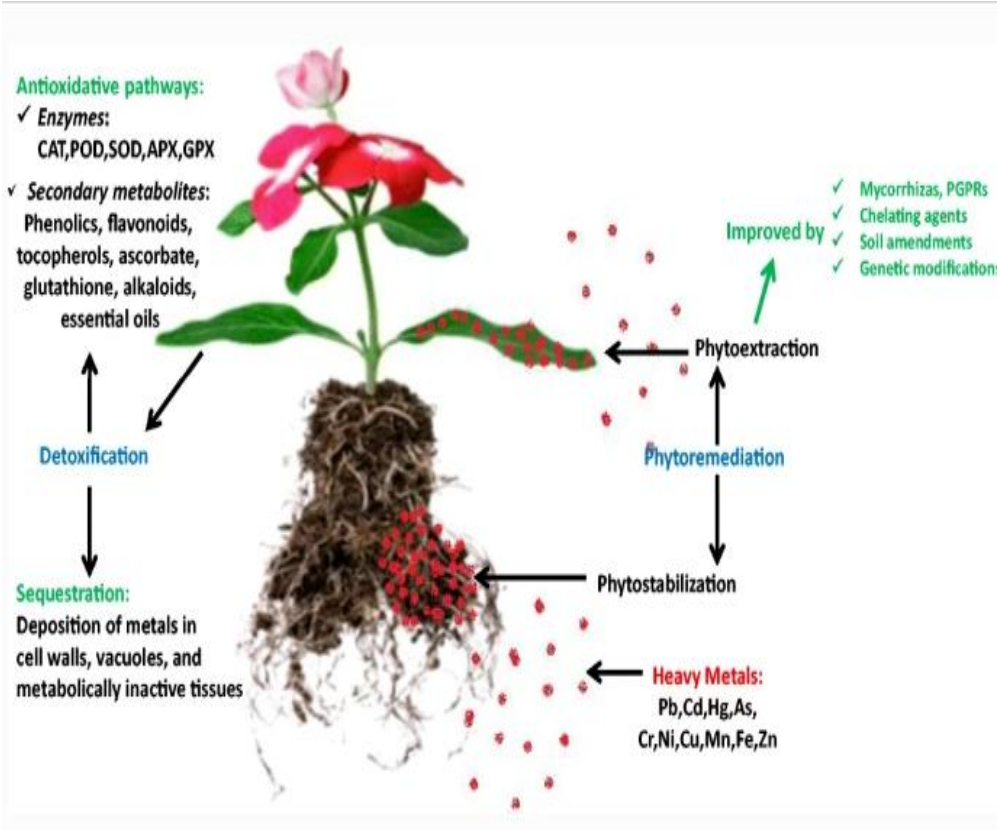

Fig 4 :Nerium oleander could be used for sustainable management of traffic-borne elemental-enriched roadside soils

RESEARCH METHODOLGY

Tamil Nadu's smallest district is Kanniyakumari district. Despite having the lowest area (1672/Sq.Km), Tamil Nadu has the highest population density (1119/Sq.Km). It is the top in literacy. The District stands apart from the other districts of Tamil Nadu just by virtue of its location. It is the only location on Earth where one can see the sun rise and set simultaneously. Its three sides are covered with a 71.5 km long coastline strip.

The district is located between latitudes 8°03' and 8°35' North and longitudes 77°15' and 77°36' East. The district shares borders with the Thiruvananthapuram District (Kerala) in the west, the Arabian Sea in the west, the Indian Ocean in the south, and the Tirunelveli district in the north and northeast. The Western Ghats mountains border the district of Kanniyakumari on its northern side, while the sea is present on three of its sides. The district's geography is varied. One of Tamil Nadu's most important districts for the growth of nerium is Kanniyakumari, where the study was conducted for the research.

- **Locale of research** : Kanniyakumari, Tamil Nadu
- **Data collection** : well-structured interview schedule
- **Statistical tools** : Descriptive statistics
- **Sampling:** Selection of the District –Purposive sampling

  Selection of blocks – Purposive sampling

  Selection of villages – Random sampling

  Selection of respondents- Snow ball sampling

- **Sample size** - 60

Map 1 Map of Kanyakumari district

Map of Kanyakumari District

Table 2 :FACTORS INFLUENCED TO CULTIVATE NERIUM

S.NO	FACTORS	FREQUENCY	PERCENTAGE
1	Suitability of soil	60	100
2	Limited water availability	60	100
3	More returns	38	63.33
4	Less risk	49	81.66

Table 3 :FACTORS INVOLVING IN NERIUM PRICE INSTABILITY

S.No.	Factors	Rank
1	Quality	III
2	Festivals	I
3	Seasonal demand	IV
4	Time of disposing	II
5	Competition among traders	V

Table 4 :CONSTRAINTS IN PRODUCTION

S. No	Factors	Rank
1	Scarcity of labour	I
2	Pest and diseases attack	III

3	**Harvest during rainy season**	**II**
4	**Harvest during cloudy climatic conditions**	**V**
5	**Irregular supply of electricity**	**IV**

Table 5 :CONSTRAINTS IN MARKETING

S. No	Factors	Rank
1	**Seasonal demand**	**V**
2	**Absence of organized retail markets**	**IX**
3	**Poor market information**	**VIII**
4	**High price fluctuation**	**II**
5	**Inadequate transport facilities**	**X**
6	**Lack of adequate cold storage facilities**	**I**
7	**No proper weighing equipment**	**IV**
8	**Price fluctuation**	**VI**
9	**Perishable in nature**	**III**
10	**Inadequate export facility**	**XI**
11	**Irregular payment by the trader**	**VII**

CONCLUSION

Nerium oleander is a unique anti-HIV medication that has been used to treat a variety of ailments. It also demonstrates anticancer and antitumor characteristics. Ethnobotanical and traditional applications of natural substances, particularly those derived from plants, have drawn a lot of attention lately as they have undergone extensive testing to determine their efficiency and are usually regarded as safe for human usage. N. oleander is utilized in Ayurvedic and traditional therapy since it is a well-liked cure across many ethnic groupings. Therefore, more research is required to determine this plant's potential for therapeutic use. Planting more plants will help reduce environmental pollution. Nerium is among the greatest choices in places when water is scarce. It is possible to develop technologies for flower plucking. Flowers can be made more durable by adding preservatives before and after harvesting.

The farmers offered several solutions to address the various obstacles, including the use of chemicals as preservatives for flower storage after plucking, reducing labor demand, increasing durability, and focusing on markets other than the local one. To achieve this, more knowledge about the many applications of nerium is needed, and it can educate growers about these applications, which can increase productivity, nerium can create its own value, and flower prices can be raised and stabilized.

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