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Review Article

A Comprehensive Review of *Olax scandens* Roxb. (Dheniaani)

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ABSTRACT

Olax scandens Roxb. is a scandent, thorny shrub up to 5 metres tall widely distributed throughout Asia. It is traditionally used to treat diseases like anaemia, headache, diarrhoea, joint pains, intestinal and liver diseases, psoriasis, filaria and as a supporting drug to treat diabetes. The phytochemical screening of various parts reported presence of saponins, steroids, triterpenoids, phenolic compounds, alkaloids, flavonoids and carbohydrates. Pharmacologically it is reported to have antimicrobial, antipyretic, anti-inflammatory, antioxidant activity and to synthesise nanoparticles using *O. scandens* leaf extract for anticancer study. The present comprehensive review summarises the traditional claims, phytochemistry and pharmacological activities of *O. scandens* reported in scientific literature. The plant *Olax scandens* Roxb. has innumerable traditional uses and is also used in many folk remedies. Hence comprehensive review is necessary for this plant, to correlate its traditional uses with scientific literature available on it. Further scope of research on this plant lies in extensive and long-term studies on its pharmacological activities, identification of possible lead molecules, standardisation of different parts of the plant to prevent its adulteration.

Keywords: *Olax scandens*, Phytochemistry, Pharmacognosy, Pharmacology, Traditional uses.

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INTRODUCTION

Since times immemorial, medicinal plants are being used for healing, health and recovery of humankind. There has always been a need to explore new medicinal plants to satisfy the quest for newer drugs. This need led to isolation of some very important drugs from plants which could be used to treat various illnesses. Traditional knowledge and ethnomedical uses are the focal point for such research. Based on traditional knowledge, a number of medicinal plants are frequently being evaluated for their pharmacological and therapeutic properties. At the same time, their authentication and standardisation has become equally important so as to emphasise their use in various systems of medicine. It is important to have a sound knowledge and comprehensive view of any medicinal plant so that its therapeutic potential can be utilised to the maximum extent. In addition, further scope lies in extensive and long-term studies on medicinal plants, their phytoconstituents, lead molecules and spectral studies.

One such plant which is rich in traditional knowledge is *Olax scandens* Roxb. It is a member of the *Olacaceae* family also known as Dheniani in hindi and Rimil beeri in folk medicine.[1] It is a scandent, thorny shrub which grows up to 5 metres height and often found in the wild.[2,3] It is widely distributed across India and Asia and reported to be used by different ethnic communities to treat different diseases. Traditionally it is used to treat stomach ache, diarrhoea, fever, cough, mouth ulcers, anaemia, filaria, joint pains, intestinal and liver diseases. Pharmacologically it is reported as antimicrobial, antipyretic, anti-inflammatory and antioxidant.[4] Recently the *O. scandens* leaf extract has been been used along with metals to prepare nanoparticles which were reported to have anti-cancer activity.[5]

Accepted scientific name: *Olax scandens* Roxb.

Habit:[6] Climbing shrub

Habitat:[7] Wild, dry deciduous to moist deciduous forests. Found along the edges of the forests, roadside near streams and in damp shady forests (Figure 1).

Taxonomical classification of *Olax scandens* Roxb.[8] (Table 1).

Synonyms:[9]

Drebbelia subarborescens Zoll.

Fissilia disparilis Comm ex Valeton.

Fissilia psittacorum Lam.

Olax bador Buch Ham.

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Figure 1: *Olax scandens* Roxb. shrub.

Vernacular names:[2]

Hindi – Dheniaani, Bengal – Kokoaru, Jabalpur – Kakundan, Kolami – Rimilbiri, Mundari – Rimilbiri, Marathi – Harduli, Urchirri, Santal – Ehir, hund, Tamil – Malliveppam, Kadalranchi, Kadal azhinji, Telugu – Bapanamushti, Kurpodur, Murikimalle, Nalluvudata, Oriya – Bader, Badaria, Kannada – Karadu,

Distribution:[10,11]

In India: A scandent thorny shrub often found in ravines and stream banks in the sub Himalayan tract in Kumaun, upper Gangetic plain, Deccan and Western Ghats, Bihar, Uttar Pradesh, Madhya Pradesh, Odisha (Mayurbhanj district), Maharashtra (Ahmednagar district, Aurangabad district, Mumbai suburban district, Chadrapur, Nagpur, Nanded, Pune, Yavatmal), Andhra Pradesh (Kurnool district, East Godavari district, West Godavari district, Srikakulam district), Karnataka (Sandur (ballari district), Dakshina Kannada district, Shivamogga district, Uttara Kannada district), Tamil Nadu (Dindigul district, Coimbatore, the Nilgiri, Vellore district, Tiruvannamalai district, Villipuram district, Tiruchirapalli, Cuddalore, Dharnapuri, Salem district), West Bengal.

World distribution:[8] Sri Lanka, Bangladesh, Laos, Myanmar, Thailand, Vietnam, Java, (including Kangean Madura), Lesser Sunda Isl (Bali), peninsular Malaysia (Perlis, Kedah, Negeri Sembilan, Terengganu, Pahang), Beunian, Mauritius, Madagascar.

Traditional uses of *Olax scandens*

Traditionally the tender leaves of plant *O. scandens* Roxb. are used to treat cough and cold and also used as a vegetable.[12] The *O. scandens* stem bark is given in anaemia due to fevers.[13,14] The tribals of Theni district in the Western Ghats, Southern India, tie the boiled leaves of *O. scandens* on the forehead two times to get relief from headache.[15] The ethnic tribes (Yerukalas and Lambadis) who reside in 31 villages in and around Pocharam wildlife sanctuary use the leaf and fruit of *O. scandens* both as food and to treat diarrhoea.[16] The local communities of Kuldiha wildlife sanctuary of Balasore and Sundargarh district, Orissa use crushed leaves prepared in mustard oil and apply locally to treat joint pains.[17] In the tropical evergreen forests of Cuddalore district, Tamil Nadu, the stem of *Olax* is prepared as a decoction to treat kidney diseases.[18] Ethnic groups of Kurnool district, Andhra Pradesh, use the leaf of *O. scandens* to treat psoriasis.[19] Dried leaves are mixed with fresh leaves of *Holarrhena pubescens* (Buch Ham) Wall ex Don and boiled to prepare a decoction. 20 ml of this decoction is given daily in the early morning for 20 days to treat psoriasis. The people of the Munda tribe of Jharkhand use the tender shoots and leaves of *O. scandens* as pot herbs (known as rimbil ara in Mundari).[20] The Chenchus of the Eastern ghats in Andhra Pradesh apply the warm leaf paste over the sores of filaria. The chenchus and the koyas use the decoction prepared with the crushed leaves of *Olax* with black pepper (*Piper nigrum*) to treat diarrhoea and fever by taking two spoonsfuls twice a day till cure.[21] The fruit is edible and is reported to be used in making sherbet. The bark of the plant is used to treat anaemia in Ayurvedic medicine and also used as a supporting drug in diabetes. It is used in folk and Siddha system of medicine.[22] The fresh young leaves are cooked as leafy vegetables and also chewed to treat mouth ulcers and the fruit is edible when ripe.[23] The ethnic communities of South India use *O. scandens* root, flower and bark to treat stomachache, diarrhoea, fever and cough.[24] In Myanmar's Chin district, as a traditional remedy, *O. scandens* has been used as a blood purifier, to treat fever, small pox, measles, intestinal and liver diseases.[25]

Plant description

An extensive straggler with several branches arching over. A scandent shrub which grows upto 5 metres, old wood has stout

Table 1: Taxonomical Classification of *Olax scandens* Roxb.

Taxonomical Classification	
Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliosida
Order	Santalales
Family	*Olacaceae*
Genus	*Olax*
Species	*scandens*

prickles which are slightly curved, branches are terete, more or less pubescent.[2] This climber is very destructive to forest trees because of its rank growth. The wood (wt: 608.76 kg/cu.m) is soft, yellowish white and porous and not put to any industrial use.[26] *O. scandens* is a woody scandent found to be highly stress tolerant.[27] Phylogenetically it is reported to be paraphyletic.[28]

Leaves: 5.9 by 2.5–3.8 cm, simple alternate, elliptic or oblong elliptic, usually obtuse, glabrous above, glabrous or pubescent beneath, entire, base rounded or subacute (cuneate), petioles are 3 to 6 mm long, pubescent.[2] *Pseudocercospora olacicola* is a cercosporoid fungi found on *O. scandens* leaf which causes leaf spots leading to damage to living leaves and fruits thus reducing the yield.[29] In the cleared lamina, the terminal cells of the vein endings are irregular, triangular, oblong or spherical, slightly sclerosed with a broad lumen and the cell wall shows innumerable pits.[30]

Flowers: White, fragrant about 6 mm, long in axillary racemes, short when compared to leaves, buds, oblong, somewhat clavate, pedicels short, pubescent. Ovate – oblong bracts which are the length of pedicels, pubescent, ciliate, caducous. Calyx is cup shaped, truncate and ciliate. Petals are linear, acute more or less connate. Stamens are about half the size of petals. Ovary is ovoid and glabrous. Style is about half of petal size. Stigma is 3 lobed. Fruits are ovoid or globose drupes, yellow, fleshy with accrescent calyx except at tip, apiculate.[2]

Floral anatomy: In the flora of *O. scandens*, the annular calyculus receives 8 to 9 traces which freely branch within it. Each of the 5 petals receives 1 or 2 traced vascular supply. A prominent ring of vascular supply which is described as a disc is observed between the calyculus and the petals. It is adnate to the former. The androecium is comprised of 8 members of which 5 are staminodes and only 3 are functional. The stamens and staminodes are one traced. They are adnate to the petals at the base and agglutinized with them upwards. The anthers are dorsifixed. The gynoecium is tricarpellary with the ovary superior and trilocular at the base. Each carpel is uni ovulate. The ovules are pendulous and arise from the top of a central column.[31]

Flowering: April to August

Fruiting: September to October.[13]

Pharmacognostic profile of the plant

A pharmacognostic evaluation of leaf of *O. scandens* has been reported.[32] The study of transverse section showed trichomes, collenchyma and vascular bundles. Its powder microscopy showed epidermal cells of upper epidermis, paracytic stomata in lower epidermis, unicellular trichomes in epidermis, rosette and calcium oxalate prisms.

In another report, the fresh leaves of *O. scandens* have been studied for molecular characterisation and DNA fingerprint by the RAPD method. All primers used in DNA fingerprinting showed good band pattern. Prominent bands were obtained at ~ 0.4 kb & ~0.9 kb using OPA -02 and OPC – 06 primer respectively in PCR amplification. The plant was established to be genuine due to these unique bright and light bands.[33]

In same study, the microscopic characters of the stem were reported to show trichomes which were unicellular and horn shaped, oil globules, tannin content, crystals of calciumoxalate which were prismatic rhomboidal and vascular bundles with border pitted vessels.

Phytochemical analysis

Phytochemically leaf powder of *Olax scandens* was reported to show carbohydrates, alkaloids, saponins, tannins and triterpenoids. Its nutritional analysis was reported to show macronutrients carbohydrates (62.73% w/w), proteins (12.89% w/w) and fat (3.77% w/w) for each 100gm dry sample. It was also reported to be a good source of minerals like calcium (2.52%), magnesium (0.77%), phosphorus (0.15%) and zinc (27.14mg/kg).[34]

In another study the phytochemical analysis of *O. scandens* roots was reported to show phytoconstituents like alkaloids, carbohydrates, tannins, flavonoids and saponins in hexane, chloroform, methanol and aqueous extracts.[35] While in another study, the alkaloids were reported to be dominant chemical constituents in the hexane, chloroform and methanolic root extracts. In the same study, different fractions of leaf acetone extract were reported to show carbohydrates, saponins, alkaloids and terpenes.[36] Phytochemical screening of *O. scandens* fruits showed alkaloids, tannins, flavonoids, saponins, steroids, glycosides, cardiac glycosides, proteins, coumarins, terpenoids, triterpenoids, quinones, anthraquinones and phytosterols.[37]

Phytochemistry

The aerial parts of the plant *O. scandens* Roxb. were chemically investigated and reported to show phytochemicals like octacosanol, beta sitosterol, oleanolic acid and glucosides of beta sitosterol and oleanolic acid[38] (Figure 2).

The degummed and trans esterified crude oil extracted from *Olax scandens* seeds is used as a bio additive to petroleum diesel to improve the performance of diesel engine. The degummed

Olax oil contains tri, hexa and octadecanoic acids whereas the transesterified Olax oil showed penta, hexa, octa, nonane, decane dioic acid, docosa trienoic acid.[39]

In another study on flavonoids in the Olacaceae family and their taxonomic significance, myricetin was found absent in all species of Olacaceae family and quercetin found present in all species including *O. scandens* except *Erythropalum scandens*. Kaempferol was reported only in *Olax scandens* from Olacaceae family.[40]

PHARMACOLOGICAL REVIEW

Acute oral toxicity of leaves of *O. scandens* Roxb.[41]

A study has reported the acute oral toxicity of *O. scandens* leaves, following the OECD guidelines 425 using 2000 mg/kg as the limit test. The leaf powder was found safe at a dose of 2000mg/kg with no gross behavioural changes in wistar albino rats. The LD_{50} value was much higher than the tested dose in the rat.

Evaluation of leaves of *O. scandens* Roxb. for Intestinal transit time[41]

In the same study the leaf powder of *O. scandens* was evaluated for intestinal transit time and kaolin expulsion test in swiss albino mice at a dose of 1300 mg/kg. The mice were divided into 2 groups with each containing 3 males and 3 females. Group I was normal control receiving distilled water at 10ml/kg. po and Group II received leaf powder of *O. scandens* at 1300mg/kg, p.o. Overnight fasted mice were administered test drug and one hour after drug administration, 40% kaolin solution (0.1ml) was administered through an oral catheter. The animals were carefully observed for the expulsion of white coloured faecal pellets of kaolin. The leaf powder caused a slight increase in intestinal motility when compared with mice of control group and the expelled faecal matter did not show change in consistency to a significant extent.

Antimicrobial activity of *O. scandens* roots

Antimicrobial activity of various extracts of roots of *O. scandens* was reported using the agar well diffusion method and the minimum inhibition assay (MIC) by the twofold serial dilution method.[35] The stock culture of different bacterial strains including *Bacillus subtilis, Enterococcus faecalis, Escherichia coli, Klebsiella pneumoniae, Staphylococcus aureus, Proteus vulgaris* and fungal strains including *Aspergillus niger, Candida albicans* and *Saccharomyces cerevisiae* were prepared at 10^{-6} CFU/ml concentration. 100µl of inoculum was mixed with 6 ml of sterilised nutrient agar and poured onto sterile petri dishes to solidify. 6mm wells were made in the centre of the divided areas and 50µl each of *O. scandens* root hexane, chloroform, methanol and aqueous extract were pipetted into the wells. The petri dishes with bacterial strains were incubated at 28°C for 24 hrs whereas those with fungal strains were incubated at 25°C for 2 days. After the incubation period, the zone of inhibition was determined.

Only the extracts which exhibited inhibition zones were selected for Minimum Inhibition Concentration Assay (MIC). A stock solution of concentration 2000 µg/ml was prepared for each selected extract and from the stock solutions, serial dilutions were done to prepare 1000, 500, 250, 125, 62.5, 31.2 µg/ml concentrations respectively. The nutrient broth mixture of each concentration of each extract was inoculated with a standardised inoculum of each test organism and kept for incubation at 37°C. MIC was recorded which is lowest concentration at which there is growth inhibition. For fungi *C. albicans* and *S. cerevisiae*, incubation at 25°C for 2 days and for *A. niger* it was done for 3 days. The standards used were streptomycin disc (5 µg/ disc) for bacteria and 10µl of 0.5 mg/ml of nystatin for fungi and DMSO was used as negative control.

Various extracts of *O. scandens* roots showed antimicrobial activity on different microbial strains used. *S. pneumoniae* and *K. pneumoniae* were resistant against hexane, chloroform and methanolic extracts whereas *E. coli* and *P. aeruginosa* were resistant to hexane and aqueous extracts. Hexane, chloroform and methanolic extracts showed maximum growth inhibition values against *S. aureus* and hexane extract against *C. albicans*. All root extracts showed good activity against bacteria than fungal strains and Gram +ve bacteria were more sensitive to them than Gram -ve bacteria. The study showed a strong antimicrobial activity of these extracts with a MIC of less than 125 µg/ml.

In another investigation, ethnomedicinal plants including *Olax scandens* used by the Paliyar tribe of Tamil Nadu reported antimicrobial activity. The hexane extract of leaves of *O. scandens* inhibited *Klebsiella pneumoniae, Pseudomonas aeruginosa, Enterococcus faecalis,* and *Bacillus subtilis* at 5 mg/disc concentration with zone of inhibition of 9, 12. 13, 8 mm respectively. At 2.5 mg/disc concentration, it was active against *Pseudomonas aeruginosa* and *Enterococcus faecalis* with zone of inhibition of 9 and 10mm respectively.[42]

Anti pyretic activity[43]

The stem bark of plant *O. scandens* Roxb. showed antipyretic activity in an investigation which used Brewer's yeast to induce pyrexia in rats. In the investigation, 2 groups of Albino rats (200 ± 20 gm each) were made, with 6 in each group. Group I was normal control and Group II was given stem bark of *O. scandens* 540 mg/kg, p.o.

Overnight fasted rats were given distilled water in group I and test drug in group II and rectal temperatures were recorded before administration. One hour post drug administration, 12.5%w/v of dried brewers yeast was given in normal saline at a dose of 1 ml/100 gm body weight subcutaneously to induce pyrexia. The rectal temperature was then recorded 3, 6 and 9 hr after drug

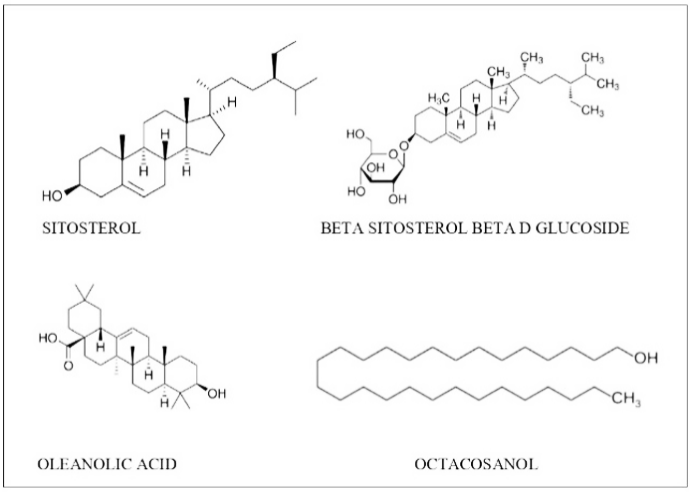

Figure 2: Chemical structures in aerial parts of *Olax scandens* Roxb.

administration. For each time interval the difference between the actual rectal temperature and initial rectal temperature was recorded and registered. The recorded rectal temperatures of the test and control were compared. The rectal temperature of the test drug showed a non-significant reduction (7.69%) after 6 hr and non-significant but marked reduction (39.68%) after 9 hr. As per the study, the stem bark of *O. scandens* (Roxb) was reported to have moderate anti pyretic activity.

Antioxidant activity of dried aerial parts of *O. scandens*[44,45]

Different studies have reported various extracts including petroleum ether (PE), ethyl acetate (EA) and methanolic extracts (MA) of dried aerial parts of *O. scandens* to have antioxidant activity. Different methods like the DPPH scavenging activity, superoxide activity, iron chelating potential, hydroxyl radical scavenging activity, NO radical scavenging activity have been studied. In the same study the total antioxidant activity was reported using the phosphomolybdic acid method.

The DPPH radical scavenging activity of PE, EA, ME and Ascorbic acid as standard was 45.08, 59.12, 66.24 and 72.82% respectively at 800µg/ml concentration and the IC_{50} value for the same order of extracts was 990, 504, 226 and 66µg/ml for ascorbic acid respectively.

The superoxide radical scavenging activity of PE, EA, ME and standard Quercetin was 48.65, 64.12, 70.28 and 99.12% respectively at 1000µg/ml concentration and the IC_{50} value for the same order of extracts was 1070, 495, 185 µg/ml and 60µg/ml for Quercetin respectively.

The iron binding potential of PE, EA, ME and standard Ethylene Diamine tetraacetate was 51.76, 64.70, 68.89 and 96.34% respectively at 1000µg/ml concentration and the IC_{50} value for the same order of extracts was 980, 495, 287 and 65µg/ml for Ethylene Diamine tetraacetate respectively.

The Nitric oxide radical scavenging activity of PE, EA, ME and Ascorbic acid as standard was 52.67, 64.79, 69.87 and 76.34% respectively at 1000µg/ml concentration and the IC_{50} value for the same order of extracts was 822, 505, 253 and 135µg/ml for Ascorbic acid.

The Hydroxyl radical scavenging activity of PE, EA, ME and Ascorbic acid as standard was 65.34 and 96.34% respectively at 1000µg/ml concentration and the IC_{50} value for the same order of extracts was 980, 495, 287 and 65µg/ml for Quercetin.

The Total antioxidant activity of PE, EA, ME and Ascorbic acid as standard was 35.67, 40.66 and 65.42% respectively at 300 µg/ml concentration and the IC_{50} values for the same order of extracts was 790, 495, 205 and 57µg/ml for Ascorbic acid respectively.

In all the methods the methanolic extract was reported to have more antioxidant potential when compared to that of PE and EA extracts.

Metallic Nanoparticle synthesis using *O. scandens* leaf extract

In the recent years, nanotechnology has gained immense importance in various areas of science.[46] It has merged the barrier between physical and biological sciences through novel tools to understand biological systems, diagnosis of a disease and its treatment.[47] Metallic nanoparticles produced through this technology are used in biomedical field including target drug delivery, biosensors and bioimaging.[48] Apart from physical and chemical methods, biological methods using bacteria, fungi and plants are being used to synthesise metal nanoparticles. The synthesis of metallic nanoparticles using green chemistry through use of plant resources is called Phytonanotechnology.[49] Synthesis of metallic nanoparticles by green chemistry is a cost effective, eco-friendly and a simple procedure using non-toxic products.[50]

In an investigation using the green chemistry method, the leaf extract of *O. scandens* was used to synthesize silver copper nanocomposites (Ag – Cu – NCs) and the antimicrobial potential of the nanocomposites was evaluated.[51] The nanocomposites were prepared by dissolving salts of silver nitrate and copper sulphate in deionised water to prepare a 20 millimolar solution.

250 µl each of $AgNO_3$ and $CuSO_4$ solutions were mixed with 500 µl of leaf extract of *O. scandens* and the total reactant volume was made upto 5 ml with deionised water. It was shaken on a shaker for 24 hr at room temperature. The Ag- Cu-Nanocomposites thus formed were indicated by a colour change from light yellow to brown and their antimicrobial activity was evaluated by the agar disc diffusion technique. The MIC values were reported to be *E. coli* (MIC 62 µg/ml), *S. aureus* (MIC 125 µg /ml), *Klebsiella pneumoniae* (MIC 125 µg/ml), *Pseudomonas aeruginosa* (MIC 125 µg/ml) and for fungi like *Candida albicans* (MIC 125 µg/ml)

and *Fusarium moniliforme* (MIC 250 µg/ml). In this study, the metallic salts were reduced and subsequently capped to prevent aggregation by using *O. scandens* leaf extract. The composites thus prepared induced formation of ROS (Reactive Oxygen Species) thereby causing alteration and decrementation of cellular proteins, DNA, lipids etc and eventually leading to cell death of microbes. They were effective against both sensitive and resistant isolates of bacteria (*K. pneumoniae* and *P. aeruginosa*).

In another investigation,[52] gold nanoparticles (B-AuNPs) were synthesised using leaf extract of *O. scandens* which were fluorescent and had an effect on the aggregation behaviour of Ovalbumin (OVA) and other proteins. B-AuN/Ps were synthesised using gold precursor, chloroauric acid and leaf extract of *O. scandens.* These were characterised by the UV-visible method. The biogenic gold nanoparticles showed UV-visible absorption in 510 to 540 nm range in a concentration dependent manner. A secondary peak was visible at 675 nm corresponding to fluorescent components of leaf extract. FTIR spectroscopy of the biogenic gold nanoparticles revealed presence of aldehydes, ketones and polyphenolic compounds which may contribute to reduction of chloroauric acid into gold particles. According to the study, these small sized biogenic gold nanoparticles show attributes similar to chaperones which prevent aggregation of proteins and hence alleviate toxicity caused in neuroblastoma cells by protein aggregation.

Another biosynthetic approach was reported by Mukherjee *et al.*,[53] for gold nanobioconjugates synthesis using leaf extract of *O. scandens* (AuNPs-OX). The AuNPs-OX caused a significant inhibition of proliferation of cancer cells when administered to cancer cell lines of colon (COLO 205), breast (MCF-7) and lung (A549) when compared to that of pristine leaf extract of *O. scandens.*

In a recent study, it was claimed that the methanolic extract of leaf of *O. scandens* contains fluorescent phytochemicals or proteins that attach to biosynthesised silver nanoparticles thus exhibiting strong fluorescent properties inside the cells. The study has also indicated that phytochemicals like octacosanol, glucosides of sitosterol and beta sitosterol conjugate with biosynthesised silver nanoparticles to exhibit antiproliferative activity. Thus the study has claimed that biosynthesised silver nanoparticles could be used as theranostics tool to treat cancer and other diseases.[54]

CONCLUSION

The comprehensive literature review of *Olax scandens* Roxb. has revealed that it is a plant which is medicinally important and extensively used in various folk and traditional systems of medicine. It is a scandent thorny shrub with all its parts being actively used to treat many illnesses by tribes throughout India. Traditionally it is used to treat anaemia, headache, diarrhoea, joint pains, liver and intestinal diseases, as a blood purifier, psoriasis, filaria, mouth ulcers and stomach ache. Pharmacologically the plant is reported to have antimicrobial, antipyretic, antioxidant activity and to biosynthesise metallic nanoparticles using leaf extract of *O. scandens* for anti-cancer activity. Although the plant is extensively quoted and used traditionally, detailed investigations on its standardisation are not available which can justify its effective use in various alternative systems of medicine. Furthermore, spectroscopic study can give an insight into the possible chemical compounds responsible for its various pharmacological activities. The role of the leaf extract to prepare metallic nanoparticles for anti-cancer activity is a therapeutic area which needs to be explored in depth for its potential. Hence a detailed evaluation including standardisation of the plant and long-term studies of its pharmacological activities is necessary so that it can be effectively used in different herbal preparations.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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