

Introduction

1. INTRODUCTION

Orchids are one of the extensively allotted flowers which accommodates of terrestrial, saprophytic and epiphytic species. 25,000-35,000 species with 800-1,000 genera has already been recognized globally of this orchid out of which 1300 species and one hundred forty genera of this orchid is handiest located withinside the lower Himalayan belt. For numerous bioactive profiles analyzing of vegetation and microorganism phytochemicals are key elements and phytochemicals together with alkaloids, flavonoids, bibenzyl derivatives, phenanthrenes that are observed to be the bioactive additives in numerous orchids and already observed to own numerous organic houses like antimicrobial, antitumor, anti-inflammatory and antiviral etc. (Janmajoy Banerjee *et al*, 2018).

Orchidaceae is the biggest own circle of species with a predicted 25,000 species located in approximately 880 genera and with 80,000 hybrids comprising 10 % of the Angiosperms (Dressler, 1981). Orchidaceae is an enormously a hit family, with representatives able to occupying nearly each ecological situation, aside from marine environments and habitats characterised through severe bloodless at some point of the year. Majority of the cultivated orchids are local to tropical international locations and inhabit in humid and tropical forests of India, Sri Lanka, Myanmar, South China, Thailand, Malaysia, Philippines, New Guinea, Australia, South and Central America and Mexico. Orchids showcase an exquisite variety of range in size, form and shade in their vegetation and as a result, those plant life have brilliant decorative value (Kasulo *et al.*, 2009).

In India, orchids shapes 9% of the flora. It is predicted that approximately 1300 species belonging to one hundred forty genera are gift withinside the Himalayas with others scattered in Eastern and Western Ghats. Due to the numerous climatic conditions, North jap India includes the biggest organization of temperate and sub-tropical orchids comprising 132 wild genera and 287 species of which seventy-one genera are endemic. The biggest terrestrial genus is *Habenaria* (almost about hundred spp.) and the biggest epiphytic genus is *Dendrobium* (about 70 spp.). The Western Ghats, one the various 34 hotspots of biodiversity, includes a complete of 310 orchid taxa of which

118 are endemic to that region, and approximately a hundred ninety taxa also are found in different components of India and the world (CAMP, 2001). In the existing verbal exchange range of orchids in Uttarakhand has been studied. Seventy-two genera with 236 species of orchids are recorded from Uttarakhand. Among them 17 species are determined medicinally important. 12 Taxa are recorded in red data book of Indian plants. Rapid depletion of orchid species calls for pressing conservation measures. There is a need for instructional programmes on the significance of orchids and their function as important additives of country biodiversity. (G.C. Joshi *et al*; 2009)

Conservation of threatened species of medicinal vegetation and their habitats and Support for livelihood safety via the safety of untamed medicinal vegetation primarily based totally on sustainable harvesting. This offers approximately the merchandising of sustainable medicinal plant cultivation via the manner of constructing IPR and subject gene bank. In-situ conservation of medicinal vegetation in and across the mountains and country-wide park regions and ex-situ strategies concerning cryopreservation and undertaking Ethno clinical survey to discover usage of medicinal vegetation. This includes studies on the propagation and cultivation strategies of decided on indigenous medicinal flowers for human and farm animals disease. Impact on wild populations of medicinal flowers thru harvesting and different sports that includes the conservation of medicinal flowers on-farm pilot propagation and cultivation trials of medicinal flowers on past, gift, and destiny scenarios. Development and implementation of suitable control alternatives and tips for sustainable harvesting of medicinal plant life with the aid of using making use of numerous conservation techniques. The output might be area gene financial institution set up serving studies and conservation. Guidelines for sustainable harvest of medicinal flora and its Cultivation practices may be advanced through imparting earnings-producing sports inclusive of incentives and additionally growing marketplace possibilities for each import and export and formalizing conventional medicine. (Venkata Naveen Kasagna *et al*; 2011)

The peninsular area has an excessive diploma of endemism making it the second richest endemic center after the Himalayas. Peninsular India accommodates 7 states viz., Andhra Pradesh, Goa, Karnataka, Kerala, Maharashtra, Odisha, and Tamil Nadu, and one

union territory specifically Pondicherry. It is certain though the Vindhyan Mountains withinside the north, the Arabian Sea withinside the west, the Indian Ocean withinside the south, and the Bay of Bengal withinside the east. The geography of the area may be divided into 3 zones specifically the Deccan Plateau, the Eastern Ghats, and the Western Ghats (Figure 1.1). The Deccan Plateau is the most important region in India, making up the bulk of the southern part of the country. Eastern Ghats bureaucracy is a damaged chain of hill tiers extending via the states of Odisha, Andhra Pradesh, and Tamil Nadu. It runs northeast to the southwest path in peninsular India. The Western Ghats begins evolved close to the border of Gujarat and Maharashtra, south of the Tapti River, and runs about 1600 km via the states of Maharashtra, Goa, Karnataka, Tamil Nadu, and Kerala ending at Kanyakumari (Myers *et al.*, 2000).

The plant life kind of peninsular India varies from tropical evergreen forest, tropical semi evergreen forests, sholas, wet deciduous forests, dry deciduous forests, scrub jungles and dry savannah forests (Jalal and Jayanthi., 2012)



Figure 1.1 Map of peninsular India (Jalal and Jayanthi, 2012)

The history of orchids probably began with their use as medicinal vegetation. As early as about two hundred BC the Chinese pharmacopeia - “the Sang Nung Pen Tsao Ching”, described *Dendrobium* species which as a supply of tonic, astringent, analgesic,

anti-inflammatory substances. Many species of *Anoectochilus* are utilized by people remedy of China and Taiwan for treating hypertension, and lung and liver disease (Gutierrez, 2010). *Dendrobium* is utilized in conventional people's remedies for antipyretic, eyes-reaping benefits, and immunoregulatory purposes. The aerial components of that vegetation are regularly collected, and reduce into pieces, after which dried for medicinal use (Hamisy, 2007).

Orchidaceae represent one of the most important households of angiosperms. They are one of the maximum ecological and evolutionary vast vegetation and feature correctly colonized nearly every habitat on Earth. It is anticipated that approximately 1,300 species (one hundred forty genera) of orchids are observed in India with the Himalayas as their most important domestic and others scattered in the Eastern and Western Ghats. One of the unique capabilities of this own circle of relatives is the manufacturing of a huge wide variety of minute seeds with the handiest minimum reserves of nutrients. Because orchids have mycorrhizal specificity, pollinator specialization, and confined germination rates, maximum orchids are narrowly disbursed in unique habitats and are extraordinarily prone to habitat disturbance evaluating different vegetation. It is likewise one of the motives that this own circle of relatives Orchidaceae includes a maximum wide variety of the threatened taxa in nature. A huge wide variety of orchid species that have been found in lots of Indian forests are actually on the verge of extinction and a number of them have grown to be so uncommon that a huge wide variety of botanical groups have been not able to hint at them. Vegetative propagating strategies like Cuttings, shoots and Keikis, aerial shoots, division, returned bulbs and so on have been used for *Dendrobium*, *Spathoglottis*, *Phalaenopsis*, *Oncidium*, and so on. In the case of micropropagation, 3 orchid genera have been decided *Phalaenopsis* sp., *Spathoglottis* sp., and *Dendrobium* sp. It became noted that M.S medium supplemented with 1 micromolar BAP confirmed a best reaction withinside the case of *Spathoglottis* sp. and Knudson C medium supplemented with 1.5 micromolar BAP confirmed a best reaction withinside the case of *Dendrobium* sp. *Phalaenopsis* sp. did now no longer display any germination in any of the medium. (Dr. Mary Kutty Joseph; 2017).

From a primitive duration, medicinal flowers have occupied a wonderful area in human life. They had been the spine of conventional natural drug treatments and had been

appreciably studied due to their pharmacological importance. Orchids are certainly considered one of the biggest corporations of Angiosperms belonging to their circle of relatives Orchidaceae. A range of parts received from one-of-a-kind elements of orchids proposes organic activity. Alkaloids are nitrogenous natural heterocyclic molecules that have pharmacological results on human beings and different animals. In orchids, 214 species in sixty-four genera comprise 0.1% or extra alkaloids. Besides alkaloids, additionally, they own flavonoids, phenanthrenes, terpenoids, bibenzyl derivatives, and different biologically lively compounds. (Siddhartha Singh *et al*, 2012).

Ansellia Africana Lindl., the “Leopard orchid” is a species endemic to Africa. Its ethnobotanical utilization has been documented in numerous conventional African pharmacopeias. It has an interest in the Central Nervous System (CNS) and has proven potential withinside the remedy of Alzheimer's disease. However, because of over-exploitation and habitat destruction, the plant is going through the danger of extinction and it's been classified withinside the pink listing of flora as “vulnerable” with the aid of using IUCN. To defend the final herbal populations of *A. africana*, a sustainable conservation approach coupled with the systematic medical exploration of its medicinal ability is of maximum importance. Coupled with this, the advances made withinside the subject of plant metabolomics and transcriptome facts mining of putative plant genes will throw a greater mild in the knowledge of the secondary metabolite biosynthesis of this medicinal plant. This article in brief evaluates the botany, pharmacology, biochemistry, and scope of destiny studies of this crucial medicinal orchid species. As there's little or no literature to be had on the medical documentation of the African, mainly South African medicinal orchids, they try to bring together and report statistics on specific factors of *A. Africana* and spotlight the want for studies and improvement in the ethnopharmacology of this medicinal orchid species (Paromik Bhattacharyya *et al*; 2016)

The clean dried stem of *Dendrobium nobile* is used withinside the guidance of an aphrodisiac, analgesic and durability drug. Some orchid species consisting of *Habenaria fusifera*, *H. plantaginea*, and *H. roxburghii* were used on cuts and as antidotes for toxic bites. Tubers of many of these *Habenaria* species are used as a vermicide and blood purifier. *Acampe praemorsa* is utilized in treating rheumatism. Paste acquired from

A. praemorsa, *Luisia zeylanica*, and aerial roots of *Cymbidium aloifolium* are used for solving human bone fractures. *Cymbidium aloifolium* is likewise used as emetic and purgative. *Dendrobium ovatum* is utilized in curing belly aches, *Eulopia nuda* treats tumors and bronchitis, *Flickengeria nodosa* is an astringent, aphrodisiac, and expectorant. Tubers of *Bulbophyllum neilgherrense* are ate up for right health. Pseudobulb extract of *Malaxis acuminata* is utilized in tonic arrangements and of *Pholidota imbricata* for rheumatic swellings. Velamin root extract of *Vanda tessellata* is used withinside the remedy of dysentery. Some orchids are extraordinarily treasured as assets of alkaloids and fungicides. *Vanda testacea*, *Habenaria acuminata*, *Nervilia aragoana*, *Satyrium nepalense*, and *Zeuxine strateumatica* are a number of the alternative medicinally critical orchids (Reddy *et al.*, 2002).

Orchids are certainly considered one of the biggest plant households and are commercially traded for several purposes, such as decorative plants, medicinal merchandise, and food. These markets contain heaps of species, which can be traded legally or illegally, sustainably or unsustainably, and take location at local, countrywide, or worldwide scales. In this review, we offer the primary evaluation of industrial orchid exchange globally and spotlight the principal sorts that contain wild-amassed plants. Much of this exchange is the result of unlawful harvest which means that it's miles little documented and is absent from professional statistics, at the identical time as being of developing conservation concern. We speak about the related felony–regulatory context, pick out key conservation demanding situations and spotlight 4 key priorities for addressing those demanding situations. These are to (1) study exchange dynamics and the influences of harvest; (2) support the felony exchange of orchids; (3) undertake measures to lessen unlawful exchange; and (4) improve the profile of orchid exchange amongst coverage makers, conservationists, and the public. (Amy hinsley *et al.*, 2018).

Orchids are beneath neath duress species. These are getting a rarity, dropping out to human greed. These species aren't the most effective essential for his or her aesthetic cost however additionally due to the fact they paintings as ecological indicators. Their disappearance suggests an extrade withinside the high-satisfactory of soil and air of the region. In the prevailing verbal exchange variety of orchids in Uttarakhand has been

studied. Seventy-two genera with 236 species of orchids are recorded from Uttarakhand. Among them, 17 species are observed medicinally essential. 12 Taxa are recorded in the red data book of Indian plants. The rapid depletion of orchid species calls for pressing conservation measures. There is a want for instructional programs on significance of orchids and their position as important additives to country biodiversity (G.C. Joshi *et al.*, 2009).

Orchids are one of the biggest companies of Angiosperms belonging to their circle of relatives Orchidaceae. Orchids are extraordinarily famous as decorative plants and lesser is recognized approximately their ethnomedicinal makes use. Since the primitive periods, medicinal flowers which include orchids have occupied a wonderful location in human lifestyles for remedy of type of ailments. The Present work paper offers the enumeration of such medicinal orchids observed in Arunachal Pradesh. 112 orchid species belonging to fifty-three genera are supplied right here with their references. (Jambey Tsering *et al.*, 2017).

From a primitive duration, medicinal flora has occupied a wonderful location in human life. They had been the spine of conventional natural drug treatments and had been drastically studied due to their pharmacological importance. Orchids are one of the most important agencies of Angiosperms belonging to their circle of relatives Orchidaceae. A wide variety of ingredients acquired from one-of-a-kind components of orchid suggest organic activity. Alkaloids are nitrogenous natural heterocyclic molecules that have pharmacological consequences on people and different animals. In orchids, 214 species in sixty-four genera incorporate 0.1% or greater alkaloids. Besides alkaloids, addition they own flavonoids, phenanthrenes, terpenoids, bibenzyl derivatives, and different biologically lively compounds. The gift assessment offers the phytochemicals found in orchids and their medicinal properties. (Siddhartha Singh *et al.*, 2012).

Niyamgiri hills, the home of the primitive Dongria Kandha tribe in southwest Orissa, is a unique wooded area environment harboring wealthy flowers and significant herbal resources. The gift ethnobotanical examination issues a few 20 species of orchids together with sixteen epiphytes and four terrestrials which can be utilized by the Dongrias of the Niyamgiri hill variety to deal with 33 forms of diseases. This paper additionally discusses a number of the threats to the orchids of this hill region, in addition to a few very severe issues concerning their conservation (P.K. Dash *et al.*, 2008).

A green and reproducible protocol advanced for micropropagation of *Pholidota pallida* Lindl. an endangered terrestrial orchid; the use of a 4mm phase of axillary bud section has been advanced. Axillary bud phase have been cultured on Murashige and Skoog (MS) medium supplemented with extraordinary attention of hormones (BAP), [α -naphthalene acetic acid (NAA), indole-3-acetic acid (IAA), and Casein hydrolysates (CH: 5, 10 and 15%)., 2,4-D. The explants advanced protocorm-like bodies (PLBs) within 6–eight weeks at the growth medium. MS+2 mg/l 2,4-D supplemented medium changed into discovered excellent for the induction of PLBs. Upon lifestyle on basal MS medium, the PLBs differentiated plantlets inside 6–eight weeks with in vitro tuber and roots. This easy protocol might be beneficial for large-scale propagation of *Pholidota pallida* Lindl (M. Prasathkumar *et al*; 2016).

The idea of in situ conservation of orchids is wrought with many difficulties, mainly the seed biology of orchids, which is fantastically specialized. Orchid seeds are produced in big numbers but, are enormously small. A single orchid seed pod may also include almost 4 million seeds. Orchid seeds, which have been defined as ‘dust seeds’, can be as small as 0.01 through 0.05 mm in measurement and weigh as low as 10-30 μ g. Orchids show off double fertilization as is common of all flowering plants; however, endosperm improvement stops at an early level and in lots of instances exact endosperm tissues aren't obvious at seed maturity. In addition, the embryos are fantastically reduced. Due to the giant biochemical, physiological, and genetic variety of orchids, various lifestyle media has been distinct for the multiplication of every species. The Knudson C (1946) is the maximum used medium for in vitro sowing and the formulation defined through Vacin and Went (1949) and Murashige and Skoog (1962) medium is maximum used for clonal propagation (Arditti and Ernest, 1990). The isolation and culture of more than one fungal line became not required, and enhancements in germination frequency, germination speed, and seedling energy have been typically observed. Seed germination represents the maximum methodical technique of local terrestrial orchid propagation for conservation purposes. However, orchid seed germination research is frequently considered unreliable or unrealistic seeing that little is thought regarding the germination and In vitro seedling developmental necessities of many orchids (Arditti *et al.*, 1981).

The utility In vitro seed propagation approach for orchid conservation is an effective device for ex-situ biodiversity conservation (Stenberg and Kane 1998; Gangaprasad *et al.*, 1999). With non-symbiotic germination technology, so much of seedlings will be raised to full growth from a sole seed capsule (Griesbach, 2002).

The effectiveness of post-thaw healing of cryopreserved protocorms of 5 indigenous medicinal orchid species namely, *Acampe papillosa*, *Aerides odorata*, *Bulbophyllum lilacinum*, *Cymbidium aloifolium*, and *Pholidota pallida* became investigated. Regeneration costs of protocorms after post-thawed healing extensively numerous from genus to genus in protocorms cryopreserved the usage of cryoprotectant. The maximum rate of betterment became 96% in *Cymbidium aloifolium* and the least became 86% in post-thawed protocorms of *Acampe papillosa* on MS primarily based totally regeneration medium semi-solidified with 0.4% (w/v) agar and supplemented with 2 mg l-1 BAP and 3% (w/v) sucrose the usage of cryoprotectant technique. The maximum rate of betterment became observed to be 97% and it became lowest (89%) at the equal medium the usage of the encapsulation technique. Though there has been no enormous distinction on post-thawed healing the usage of cryopreservation technique both the usage of cryoprotectant or encapsulation approach, the boom index (growth) of cryopreserved protocorms in the case of encapsulation technique became higher than the cryoprotectant technique. The maximum rate of the boom index became in *Acampe papillosa* (56%) and the bottom boom index became 19% in the case of *Cymbidium aloifolium*. The currently used technique of improvement of cryopreservation protocol appears to be a promising approach for the cryopreservation of a few medicinal orchids in Bangladesh. (Hoque *et al* 2016).

Immature seeds had been cultured on 10 distinct media for germination. Maximum germination became carried out on Lindeman orchid medium (37.12%) inside 17 days of culturing. Protocorms with leaf primordia had been cultured on BM-2 and seven distinct adjustments of Murashige and Skoog (MS) medium with numerous hormone combinations [0–3 mg/L indole butyric acid (IBA) and 0–3 mg/L kinetin (Kin)] for plantlet regeneration and mass multiplication. Maximum wide variety of shoots maximum shoot length most root wide variety, and maximum root length had been observed on MS medium with three mg/L IBA and 1 mg/L Kin. Plantlets with 2–3 shoots

had been transferred to distinct potting combos for acclimatization to area situations and in addition multiplication. One hundred percentage survival became acquired in C-eight potting combination which include cocopeat + vermiculite + perlite (1:1:1), which produced 75shoots (25plantlets) after 1 month of transplantation withinside the greenhouse. The present day observed for the primary time a fast In vitro protocorm improvement and mass multiplication protocol for *Dactylophiza hatagirea* (D. Don) So that holds sturdy capability for large-scale propagation and metabolite production. (Ashish Rambhau Warghat *et al.*, 2014).

A test turned into performed on In vitro regeneration and multiplication of *Dendrobium bensoniae*. Different concentrations of BA and IBA on my own or mixture of each hormone have been used as a remedy for regeneration. It turned into found out that shoot regeneration from node turned into the first-rate at 2.0 mg/l BA supplemented to MS medium. It gave higher responses than all different concentrations and mixtures of BA and BA+IBA, used withinside the gift study. The maximum quantity of shoots and leaves have been observed whilst 1.0 mg/l BA with 1.5 mg/l IBA turned into supplemented into MS medium. For rooting, 0.5 mg/l BA with 1.0 mg/l IBA turned into observed to be the maximum effective. The well-rooted plantlets have been effectively acclimatized beneathneath 70-80% humidity and planted in pots and transferred to the coloration residence for establishment. Around 85% of plantlets survived withinside the field. From the prevailing result, it can be encouraged that MS medium supplemented with 2.0 mg/l BA can be used for fast shoot induction and regeneration of *D. bensoniae*. (Riva *et al.*, 2016).

Plant growth regulators (PGRs) namely, 2,4-D, NAA, and BAP have been introduced into Murashige and Skoog (MS) medium to study the effective impact of PGRs at the boom and improvement of *Dendrobium sp.* orchid. Leaf tips of *Dendrobium sp.* have been used as explants and inoculated on MS medium supplemented with 2, 4 D for improvement of PLBs. The most PLBs formation (90%) and the maximum variety of PLBs (16.00) have been discovered in 10 mgL⁻¹ 2,4-D into MS medium after 60 days of culture. Sub-cultured PLBs have been inoculated on MS medium supplemented with extraordinary combos of NAA and BAP for shoot regeneration. Even, the widest variety

of root (four.00), the most root length (1.627cm), and the most plantlet regeneration percentage (93.33%) have been discovered with the blended impact of 0.5 mg NAA and 0.5 mg BAP after 60 days of culture. Finally, regenerated plantlets have been transferred into 1/2 strength of MS medium to attain plants. (Goswami 2015).

The deprivation of plant genetic assets has necessitated the improvement of many ex-situ conservation strategies. Micropropagation is one of the ex-situ strategies that has been used more and more for the conservation of endangered plants. This In vitro approach aids in the mass propagation of the plant species dealing with the danger of extinction. The utility of plant tissue lifestyle strategies in orchid conservation and propagation calls for the green in vitro regeneration protocol. This takes a look at reviews the improvement of such notably green protocols for the in vitro symbiotic seed germination of 3 threatened orchids particularly *Coelogyne nervosa* A. Rich., *Eria pseudoclavicaulis* Blatt. and *Porpax reticulata* Lindl. The utility in vitro seed propagation approach for orchid conservation is an effective device for the ex-situ conservation of biodiversity. With Asymbiotic seed germination technology, heaps of seedlings may be raised to maturity from a sole seed capsule. (Sahaya Shibu, *et al.*, 2012).

Embryogenic calli had been prompted from longitudinally bisected segments of protocorm-like bodies (PLBs) of *Cymbidium Twilight Moon* 'Day Light', a hybrid orchid, on changed Vacin and Went medium [Bot. Gaz. 110 (1949) 605] supplemented with 1-naphthaleneacetic acid (NAA) or 2,4-dichlorophenoxyacetic acid (2,4-D) alone or in aggregate with N-phenyl-N-1,2,3-thiadiazol-5-yl urea (TDZ) within 1 month. The medium consisting the composition of 0.1 mg l⁻¹ NAA and 0.01 mg l⁻¹ TDZ become most advantageous for callus formation. Calli proliferated thoroughly while being sub cultured each four weeks at the equal medium. The PLB formation from callus become executed while callus become transferred to the medium without plant increase regulators. Histological commentary proved the somatic embryo shape formation. Callus-derived PLBs transformed into everyday flora with well- advanced shoots and roots at the medium without plant increase regulators after approximately four months, which was acclimatized withinside the greenhouse with 100% survival. Among 103 twenty-month-antique regenerated flora, no morphological versions had been observed. (Le Van Tuong Huan *et al.*, 2004).

Without contamination, simple, reasonably-priced and efficient protocol for long time In vitro conservation of *Ipsea malabarica* (Reichb. f.) J.D. Hook, ‘the Malabar Daffodil Orchid’, an epidemic and endangered orchid of the Western Ghats of Kerala on the entire plant stage become achieved. Strategies which include discount in salt strength and medium without or with growth regulator/sugar have been followed for conservation in vitro. Culture vessel kind significantly influenced the duration of storage. Jam bottles have been advanced to check tubes for conservation. Half-strength Murashige and Skoog (MS) medium with 3% sugar and 1.5 mg l kinetin in jam bottles facilitated gathering of shoots as much as 14 months without way of life which evolved 25 shoots. Elimination of sugar from the above medium accelerated the storage duration to twenty months. Half-strength growth regulator unfastened medium with sugar exhibited very gradual boom and evolved much less than five shoots. This medium facilitated storage up to twenty months. Half-strength MS boom regulator and sugar removed (photoautotrophic) medium become suitable for in vitro conservation and the storage duration in this medium become 27 months. On this medium, the shoots grew very slowly and infrequently evolved every other shoot. The lifestyle become additionally freed from contamination. Since 1997, approximately a hundred of these threatened orchids were retaining in vitro to entire plant stage (Martin *et al.*, 2003).

Pholidota pallida turned into explored for its phytochemicals at the side of its bioactivities. The qualitative screening of plant extract showed the presence of alkaloids, flavonoids, terpenoids, tannins, steroids, and strains of quinone and coumarin in it. Four fractions like; Methanol (FM), n-hexane (FH), Butanol- 1(BW), and Dichloromethane (FD) of methanolic crude of its leaf, stem, and root had been investigated without cost radical scavenging, anti-inflammatory and anti-microbial activities. The responses had been very particular for distinctive dose and plant components. The maximum scavenging activity exhibited via way of means of the BW of bulb turned into 98.94% at 50 µg/ml dose. The maximum anti-inflammatory activity turned discovered in FD of the plant leaf which turned into 79.16%. The inhibitory impact of various components of the plant towards 4 pathogenic microorganisms turned into numerous i.e., for *S. aureus* (FD of root; 17.5 mm), for *B. subtilis* (FD of bulb; 16.5 mm), for *S. typhii* (BW of root; 12mm), for *B. cereus* (BW of root; 9.5 mm) and root turned into discovered best part. The research shows that

Pholidota pallida is a medicative plant having bountiful phytochemicals with antioxidant, anti-inflammatory and antimicrobial actions (Seema Akter *et al*; 2019).

Three species of medicinal Orchid flora namely; *Acampe papillosa*, *Aerides odoratum*, and *Pholidota pallida* had been extracted with ethanol, chloroform, petroleum ether, and methanolic extract tested for antimicrobial interest in opposition to 5 bacterial lines namely: *Bacillus subtilis*, *Staphylococcus aureus*, *Salmonella typhi*, *Shigella dysenteriae* and INABA-ET (*Vibrio*). Aqueous extracts of the plant additionally screened for their antifungal interest in opposition to six phytopathogenic fungi, *Alternaria alternata* (Fr.) Kedissler., *Botryodiplodia theobromae* Pat., *Colletotrichum corchori* Ikata (Yoshida), *Curvularia lunata* (Wakker) Boedijin, *Fusarium equiseti* (Corda) Sacc., *Macrophomina phaseolina* (Maubl) Ashby. Here, extracts confirmed numerous diploma of interest in opposition to the bacterial and fungal lines. Three, extracts confirmed broad-spectrum antibacterial interest in opposition to all of the take-a-look organisms, and among them *Aerides odorata* Lour. And *Pholidota pallida* Lindl Showed distinguished antibacterial interest. The maximum inhibition turned into recorded with *Aerides odorata* Lour. And *Pholidota pallida* Lindl. *Salmonella typhi* (37.5mm) and *Bacillus subtilis* confirmed a huge variety of antifungal interest with high-quality inhibition in opposition to all of the examined phytopathogenic fungi. The maximum antifungal rate is recorded with the plant extract of *Aerides dratum* Lour. Against *Colletotrichum corchori* (57.14%) observed through *Alternaria alternata* (57.14%). (Mohammed Mozammel Hoque *et al*; 2016).

Orchids are nature's maximum extravagant organization of flora dispensed during the sector from tropics to excessive alpine. They showcase an exceptional variety of range in size, form, and color in their flowers. Though orchids are grown commonly as ornamentals, many are used as natural medicines, and food and different have cultural prices via way of means of one-of-a-kind cultures and tribes in one-of-a-kind elements of the sector. Orchids were used in lots of elements of the sector in conventional restoration machines in addition to withinside the remedy of some sicknesses in historic time. Though Orchidaceae has seemed to be the biggest own circle of relatives of the plant kingdom, little research was accomplished concerning their medicinal properties. Linking the indigenous information of medicinal orchids to trendy studies and sports gives a brand new dependable approach, for

the invention of novel pills a whole lot greater efficient than with random collection. Many of those orchids face the intense threat of extinction because of over-exploitation and habitat loss. Plant tissue subculture might be one of the maximum appropriate Opportunity for equipment to reduce the stress on the herbal populace of medicinal orchids and their sustainable utilization. (Bijaya Pant, 2013).

Determination of the antifungal impact of extract of 4 epiphytic orchids specifically *Luisia zeylanica* Lindl., *Pholidota pallida* Lindl., *Dendrobium nutantiflorum* A. D. Hawkes & A. H. Heller and *Coelogyne breviscapa* Lindl. accumulated from one-of-a-kind locations of the Western Ghats of Karnataka, India. The poisoned meals method changed into completed to assess antifungal impact of orchids towards fungal isolates from plant origin. Growth (in phrases of colony size) of check fungi changed drastically lesser on plates poisoned with orchid extracts. Extracts of *C. breviscapa* and *L. zeylanica* displayed excessive and least inhibitory activity towards check fungi. These orchids look like promising assets of antifungal agents (Shweta *et al*; 2015).

Orchids, belonging to their circle of relatives Orchidaceae show off an outstanding variety in size, form, and shade in their flowers. They occupy a pinnacle role among all of the flowering vegetation and are valued for reducing flower manufacturing and potted vegetation. They are recognized for their durable and bewitchingly stunning flowers, which fetch an excessive rate withinside the worldwide market. Since the early 1970s, specific companies in numerous Universities and Research Institutions were running on ethnobotany and conventional information in orchids and posted many reports. Most of the literature relates to ethnobotany or agricultural operations inclusive of transferring of cultivation and fairs of North Eastern location of India wherein orchids flower in the year. (Ninawe *et al*; 2017).

Orchids are one of the enormously business vegetation in the floriculture zone and are robustly exploited because of their excessive decorative and financial value. Among the collections, 205 species had been labeled as threatened species, observed through ninety species having breeding value, 87 species that might be utilized in conventional medicine, seventy-seven species having perfume and eleven species had been utilized in

the conventional diet. Successful DNA financial institutions of 260 species become built for destiny usage in diverse studies works. The accumulated orchid germplasm which incorporates local orchids become efficiently applied in the breeding programme for the improvement of novel sorts and hybrids. (Pamarthi *et al*; 2019).

Arundina graminifolia (D.Don) Hochr, This terrestrial species is usually called a Bamboo orchid and is normally discovered dwelling at the grassy hillsides or with the aid of using an avenue facet at an elevation of 1200 m above sea level. The stems are normally erect, leafy higher 1/2 of, and now and then branched also. The flora is purple-red, flesh-colored, or white with darker lips than the sepals and petals. The short-lived, scented flora closes for approximately three days starting at a time. The flowering length period is June and October. The vegetation is particularly dispensed in India, Nepal, Thailand, Malaysia, Singapore, South China, and Indonesia. The incidence of vegetation is discovered in Chare, areas of Nagaland. The plant has exact medicinal houses because of its wealthy content material of stilbenoid, flavonoid, and phenanthrene. The rhizome can be used for controlling bacterial contamination as they've antibacterial capability. Root decoction is used for leveling the diabetes rate, tumor, hyperhidrosis, and hepatitis. (Nongdam 2014).

Arundina graminifolia (Orchidaceae) has been broadly used for warmth clearance and detoxification, as an anti-inflammatory diuretic, and as an anti-microbe for 2 thousand years in countrywide minorities, particularly the various Dai people. It became recognized as "Zhuyelan" (Chinese:), "Wenshanghai" (Chinese:), and "Baiyangjie" (Chinese:) withinside the Dai nationality, and in particular used as an antidote, that is characterized by "relieving the poison earlier than getting ill and treating illness". Therefore, it's been normally implemented withinside the remedy for meal poisoning, snake bites, rheumatism, belly pain and worrying injuries. It is likewise used to deal with bronchitis, tuberculosis, and pneumonia withinside the Bulang and the Wa ethnic people. (Xingyu Zhang 2021).

Fig 1.2: *Pholidota pallida* Lindl; - Habitat



Figure 1.3: *Pholidota pallida* Lindl; - Flower

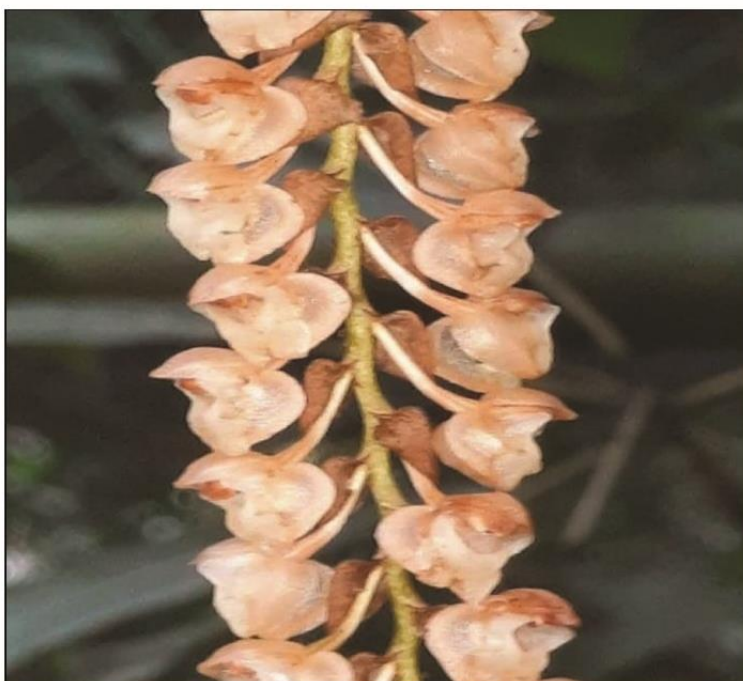


Fig1.4; *Arundina graminifolia* D.Don Hochr; Habit



Figure 1.5; *Arundina graminifolia*; Flower



An observation changed into carried out on seed morphometry of 7 threatened Himalayan orchids (indexed in Appendix II of CITES) belonging to 3 distinct subfamilies, and showing terrestrial (*Arundina graminifolia*, *Cypripedium cordigerum*, *Habenaria marginata*, *Herminium monorchis*), mycoheterotrophic (*Gastrodia falconeri*) or epiphytic (*Aerides multiflora*, *Pholidota articulata*) existence modes. Seeds like fusiform, filiform, or ovoid and their length confirmed a direct correlation with plant structure. They have been extraordinarily smaller in size in epiphytes than their terrestrial or mycoheterotrophic counterparts. Seeds have been truncated besides in *Arundina graminifolia*. Though the orchids generate seeds with a better extent ratio and better percent of air area locate in wider distribution, the localized distribution of *Gastrodia falconeri* (mycoheterotrophic) appears to be associated with its complicated dietary requirement (Jagdeep Vermaa *et al.*, 2012).

In view of the immense medicinal importance apart from the high ornamental value, the present study aims at conserving the two (*P.pallida* and *A.graminifolia*) orchids, endemic to Western Ghats, Kerala, India.

AIMS AND OBJECTIVE

The endemic nature combined with decrease in the wild population necessitates In vitro conservation. The biological activity evaluation aims at bringing out the lesser-known medicinal potential of both the orchids.

***In vitro* propogation**

- Asymbiotic seed germination
- Callus induction
- Multiple shoot development
- Pseudobulb culture
- Hardening

Phytochemical analysis and biological evaluation

- Preliminary phytochemical analysis
- Estimation of total phenol and flavonoid content
- FTIR and GC-MS analysis
- Antibacterial activity Antioxidant activity Anticancer activity

Isolation, identification and bioactivity evaluation of endophytes

- Endophyte isolation
- Molecular characterization of endophytes
- Phylogenetic tree construction
- Bioactivity evaluation
- Nanoparticle synthesis