# Diversity and Ornamental potential of ferns and fern- allies in India: A review

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#### Abstract

The present study mainly focused on the diversity and ornamental potential of ferns and fern allies (pteridophytes) that have been widely used for decorative purposes since the ancient period. Ferns and fern-allies belong to Order Filicales. They are selected for foliage color, texture of leaves/ pinna, shape of fronds, upright habit and delicate beauty, excellent for decorative prospects, and cultivated as ornamental plants. These species are distributed all over the world, In India, various types of ferns and fern allies are found in the Himalayan mountain range, Eastern Ghat and Western Ghat. They are often neglected, less cultivated, underutilized, unrecognized plants and there is a lack of awareness of the importance of ferns. Thus, ferns and fern allies occupy an intermediate position in the ladder/course of evolution of plant kingdom, thereby making the whole group quite interesting for research & study.

Key words : Pteridophytes, Ferns, Ornamental, Decoration and Fronds.

**P**teridophyta includes ferns and fernallies, which are non-flowering, most primitive vascular and feathery plants. The cluster forms a linking relation between non-vascular lower group plants as well as the higher group of seed-bearing plants. Ferns and fern allies belong to the order Filicales. They are found mostly in humid areas. Species of ferns can inhabit nearly every condition on the planet. Still, most of the fern species prefer tropic, shaded areas with moist soil and these can be combined underneath a shade-giving tree for a spectacular look. Fern will also grow in the

deepest areas of the rainforest. The habitat of ferns can be categorized as terrestrial, aquatic, epiphytic and epipetric. The present investigation provides a comprehensive review of studies on diversity, distribution and important characteristics of ferns for ornamental prospects, carried out by many researchers to provide detailed information on the position and ornamental characters of ferns and decorative prospects, values and significance of using ornamental ferns in the florist and landscape industry. Diversity of ferns and fern-allies (Pteridophytes) :

The pteridophytes are spread all over the world & comprise more than 300 genera and 12,000 species; of which nearly 1000 species are present in India. 47 species are endemic to India and some of these species are placed under Rare, Endangered and Threatened (RET) category according to IUCN<sup>9</sup>. Being a tropical country, India is very rich in the diversity of pteridophytic flora due to its notable difference in eco-climatic conditions, soil types and altitudes. Some of the pteridophytes have been reported to be edible, possess medicinal value, potential for use as bio-fertilizer and ornamental plants. In India, the pteridophytes are distributed in Himalaya region, Eastern Ghats and Western Ghats. The dominance of the species was reported at high altitudes, high rainfall regions and temperate forests. The distribution of the pteridophytes in some states (Meghalaya, Tamil Nadu, Odisha, Karnataka, Maharashtra, Andhra Pradesh, Madhya Pradesh, Uttarakhand, Uttar Pradesh as well as Eastern Ghats and Western Ghats etc.) of India has been reported by various researchers is mentioned below.

About 12,000 pteridophytes have been reported to occur in the world flora, of which more than 1200 species are likely to be reported from the Indian sub-continent<sup>4,6</sup>. A total of 12,000 species of pteridophytes are found in the world flora of which more than 1,000 species are classified into 70 families and 191 genera from India<sup>6</sup>. Pteridophytes are beautiful ornamental flora found in temperate and sub-tropical regions round the globe. They prefer to grow laterally along the running

streams and waterfalls of cool zones with air temperatures below 25°C. The tropical evergreen forest offers lodging for the pteridophytes as epiphytes on tree trunks and branches of the wild plants. In India, luxuriant pteridophytic flora is reported from the Himalayas and Northern parts of the country. Several authors have studied the pteridophytic flora. The distribution and calculable study of pteridophytes of Punyagiri hills near Vizianagaram of Eastern Ghats was studied in detail<sup>15</sup>. Some pteridophytes were reported from Upper Gangetic plains, which include parts of Uttarakhand, plains of Uttar Pradesh, Bihar and part of West Bengal by Chowdhary<sup>5</sup> in 1973. 487 species and 32 infra-specific taxa belonging to 108 genera under 50 families were recorded<sup>8</sup>. Eighteen species are endemic to Uttarakhand, out of these, 10 species and 2 varieties are confined to Uttarakhand state, remaining six taxa also show their occurrence in other parts of India. About 57 species are relatively rare occurrences found as endemic, rare and endangered categories due to other anthropogenic factors.

Subhadra *et al.*<sup>24</sup> in 2016 listed 9 species of teridophytes belonging to 6 families (Salviniaceae, Pteridaceae, Azollaceae, Marsileaceae, Thelypteridaceae, Parkeriaceae) and 6 genera in wetlands of Bhubaneshwar and its connecting areas of Khurda district. 141 ferns and fern allies were reported in Odisha state by Saxena et al during 1994-96.

India is a mega biodiversity nation with 13,000 species of vascular plants of which 1000 species are ferns and fern-allies<sup>2</sup>. Ferns and fern allies belong to the order Filicales. 34 species of ferns and fern-allies belonging

to 25 genera and 20 families were recorded<sup>17</sup>. Ferns and fern-allies were identified and classified based on habit, habitat, morphology, rhizome, venation of pinna, spore size and spore growth<sup>4</sup>. In India around 67 families, 191 genera and more than 1000 species of ferns and fern-allies are found<sup>7</sup>. A maximum number of diversity is encountered in Himalayas, Eastern and Western Ghats. The entire North-East India comes under Himalayan zone and diversity of pteridophytes is projected to be very high. The Western Ghats is one of the major hotspots of the world and also one of the important geographical regions. About 233 species of ferns are found in South India<sup>14</sup>.

Some ferns and fern-allies have been reported from the Papikondalu hills of Eastern Ghats by Amrutha Lakshmi et al.,<sup>1</sup>. Those hills are distributed in three districts of combined Andhra Pradesh state namely East Godavari, West Godavari and Khammam. Papikondalu hills of Eastern Ghats are reported to be reserved by a variety of fern and fern-allies, which include Maiden-hair ferns (Adiantum species), Brake ferns (Pteris species), Climbing ferns (Lygodium species), Tree ferns (Cyathea species), Xerophytic ferns (Actiniopteris radiata), Lithophytic ferns (Selaginella species) Hardy ferns (Blechnum orientable) and water ferns (Marsilea, Salvinia and Azolla species).

## Ornamental significance :

Ferns are one of the chief cut foliage and indoor potted plants grown for their lush green attractive foliage. The foliage of fern is highly valued in the international florist greenery market because of its long post-

harvest life, low expense, year-round availability and versatile design potentials in form, texture and color. The ornamental use of ferns has been practiced since a long times. Umbrella fern (Sticherus flabellatus and Sticherus lobatus) grows naturally in Eastern Australia, New Zealand, New Caledonia and Papua, New Guinea, that is an eye-catching cutfoliage plant<sup>12</sup>. Umbrella fern species (S. flabellatus and S. lobatus) have been identified to be of 'great significance for domestication' in an assessment of the natural resource management and profitable viability of native bush-harvested crops<sup>26</sup>. The vase life of leather leaf fern harvested at many times of the year and at different frond ages was studied by Poole et al.,<sup>18</sup>. The popularity of ferns as cut foliage is due to their ready availability, high consumer acceptance, low cost and generally good durability have been reported by Stamps and Conover<sup>23</sup>. Ferns, with their amazing shape of foliage and wide ecological adaptability, are of great value with regard to urban landscaping and re-vegetation of degraded land<sup>11</sup>. Various available species of the Maiden hair fern include: Adiantum capillus-veneris, Southern Maiden hair fern is medium sized; A. hispidulum, rosy Maidenhair tall and young fronds rosy brown; A. pedatum, Western Maiden hair, most popular one grown and A. peruvianum, silver dollar Maiden hair, large and leaf segments quite large respectively<sup>10</sup>.

Ornamental fern plants that are grown and used for decorative purposes in gardens and landscapes are designed for their attractive flowers and/or stylish leaves<sup>13</sup>. They are grown for the show of aesthetic features like flowers, leaves and overall foliage texture; the purpose of which is for the fun of gardeners, guests and the public. The beauty of offices of corporate organizations like banks, industries, schools, shopping complexes and religious buildings are enhanced by ornamental plants such as ferns. Ornamental plants also provide good-looking surroundings for human fun. The foliage of fern is extremely respected in the national and international florist greenery market owing to its long post-harvest life, low cost, continuous obtainability as well as versatile design makings in form, texture and color<sup>19</sup>. Ferns can be used as ground covers, specimen plants and for cluster, background and border planting in landscapes. They can also be used as fillers in bouquets and flower arrangements.

Sankar *et al.*,<sup>20</sup> evaluated the performance of different fern species and identified the suitable species for commercial cultivation. Eleven species of ferns belonging

to different genera viz., Adiantum tenerum, Asplenium nidus, Asplenium longissimum, Asplenium scolopendrium, Diaplazium acrostichoides, Nephrolepis biserrata 'furcans', Nephrolepis exaltata 'chidisii', Nephrolepis exaltata, Bostoniensis compacta, Nephrolepis cordifolia, Nephrolepis biserrata miniata and Pteris ensiformis were evaluated for growth pattern and suitability for landscape and commercial uses. Fifteen species of pteridophytes listed from Nallamala forests by Tulasi Rao et al., 25, also mentioned the ornamental and medicinal usage of ferns viz. Marsilea, Aspidium, Tectaria, Lycopodium, Osmunda, Davalia, Adiantum, Athvrium and Blechnum. The studies on ornamental potential ferns from Nilgiris of Tamil Nadu were done by Sonia et al.,<sup>22</sup>. The names of plants and their families, along with the characteristics of some of these ornamental ferns, are mentioned in Table-1.

S.	Name of the	Family	Characteristics
no.	plant	i uniny	
1.	Adiantum lunulatum	Adiantaceae	It is a very attractive small fern with palm-like
	Burm.		attractive fronds. Top suitable for gardens and
			can also be used as pot plants.
2.	Asplenium nidus L.	Aspleniaceae	This is used as a household plant and is also
			grown in gardens for its good-looking shape of
			pinna and grows well in humid shady places
			that need normal care.
3.	Adiantum poiretii L.	Adiantaceae	Its fronds are erect, tall and solid without nodes,
			polished brown towards the top but become black
			at the middle and towards the lower parts. The
			fronds possess dichotomous branches and
			compound unipinnate pinna <sup>16</sup> .

Table- List of common ornamental ferns and fern- allies

(9)	37)
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4.	Asplenium	Aspleniaceae	Dark green, shade-loving fern which can be
	normale L.		grown in small pots as an indoor ornamental
			plant.
5.	Cyathea nilgirensis	Cyatheaceae	It is a great tree fern (Tree fern) with beautiful
	Holtt		fronds and it is good to grow in the center of
			the garden and lawn.
6.	Diplazium	Athyriaceae	Fully fledged as a pot plant under humid, well-
	esculentum (Retz.)		drained soil. The faded fronds should be
	Sw.		removed frequently to avoid drying.
7.	Deparia petersenii	Athyriaceae	A medium-sized fern, grown in shady places
	(Kunze) M. Kato		and well-suited for indoor gardens.
8.	Drynaria	Polypodiaceae	This fern can be grown in gardens or as
	quercifolia (L.) J.		epiphytes. An outstanding potted plant inside
	Sm.		the room and balcony.
9.	Phymatodes	Polypodiaceae	It is known as the Golden rod fern. Naturally
	scolopendria		epiphytic, it grows on palm trees or in secondary
	(Bunm. F.)		forests but becomes terrestrial when cultivated
			as a potted plant. Its fronds are deeply pinnatifid
			glabrous and glossy
10.	Nephrolepis	Nephrole-	This is a terrestrial, perennial and short,
	exaltata (L.) Schott	pidaceae	herbaceous fern with curled leaflets. Fronds
			are, short, erect and luxuriant with lush green
			leaves <sup>16</sup> .
11.	Nephrolepis		Its leaflets are lemon colored and grow well on
	furcans (Sw.)		the soil in re-growth forests and inside the pots
			at homes and offices <sup>16</sup> .
12.	Dryopteris	Sinopteridaceae	Ferns with beautiful palmate-shaped fronds.
	concolor (Langsd.		They can be grown in gardens.
	et Fisch.) Kuhn		
13.	Marsilea minuta	Marsileaceae	They are aquatic ferns. These ferns grow well
	L.		in humid parts of the garden, about or in water
			landscapes or floating attractively in shallow
			ponds or streams. They can be also grown in
			aquariums or water containers.
14.	Ophioglossum	Ophioglo-	Adder's tongue plant This beautiful fern is well
	<i>reticulatum</i> L.	ssaceae	appropriate for outdoors in cool weather and it
	plants		can be planted under trees. Admirable for

(	9	3	8)	
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			potted plant.
15.	Actiniopteris radiata (Sw.) Link	Actiniop- teridaceae	"Fan fern" – They are beautiful, small ferns with palm-like beautiful fronds. It is best suited for rockeries and can also be used as pot plants.
16.	<i>Pteris argyrea</i> T. Moore	Pteridaceae	There is an excellent fern right for indoor decoration. It is an attractive fern with some diversifications and has extended leaflets with a silvery white band in the center. This grows in shady and moist places in pots <sup>16</sup> .
17.	<i>Pteris acantho- neura</i> Christ.	Pteridaceae	Fronds are erect, with tall, graceful brown stipe with unipinnate pinna. The leaflets are rough and hard, with deeply serrated margins, an acute or acuminate apex and distinctive basal margins that enhance their beauty.
18.	Stenochlaena palustris (Burm.)	Blechnaceae	This is a beautiful climbing fern that is appropriate for trellis, arches and trailing about tall trees.
19.	Osmunda huegaliana Presl.	Osmundaceae	Royal fern is an attractive, beautiful and small potted plant.
20.	Lygodium flexuosum (L) Sw.	Osmundaceae	This is the climber fern plant with good-looking foliage, appropriate for growing on walls.
21.	Blechnum orientale L.	Blechnaceae	The plant is sometimes harvested from the wild for local use as food and medicine. It is often cultivated as an ornamental.
22.	<i>Odontosoria</i> <i>chinensis</i> (L.) J. Sm.	Lindsaeaceae	This is a beautiful fern with thin fronds, suitable for hanging baskets.
23.	<i>Cheilanthes</i> <i>swartzii</i> Webb. et Benth.	Cheilanthaceae	Plants with small, green attractive fronds and black brittle stipe are best suitable for rockeries. It can also be grown in small pots.
24.	Pityrogramma calamelanos var. aureoflava (Hook.) Weath. ex Bailey	Hemioni- tidaceae	This fern can be grown indoors as a potted plant. Fronds are much more attractive with the golden-yellow powder beneath it (sori).

Present work would help develop a database to undertake the diversity of selected ornamental ferns. The aesthetic values of ferns are for their elegant fronds and a large number of them are cultivated as ornamental plants in houses, offices, schools, hospitals, corridors, streets, parks and botanical gardens. Ferns are mostly located in the wild and few states of India. There is a need for a massive collection and cultivation of ferns for their ornamental, aesthetic and landscaping values. Therefore, mass cultivation and promotion for awareness of the use of ferns as ornamental plants is hereby advocated.

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