The Bioscan
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
20(3): 976-984, 2025 www.thebioscan.com

Role of *Ficus racemosa* L. (Moraceae) in Biodiversity Conservation

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DOI: 10.63001/tbs.2025.v20.i03.pp976-984

Keywords
Ficus racemosa L., Plant-Organism Interaction, Biodiversity Conservation

Received on:
11-08-2025

Accepted on:
15-09-2025

Published on:
30-09-2025

ABSTRACT

Genus *Ficus* (Family- Moraceae) is the large and oldest genus present on earth which comprised more than 700 species. It is extremely significant for retaining the biodiversity in tropical and subtropical regions of the world. The *Ficus racemosa* L. typically contributes to the provision of several ecosystem services in rural settings through plant-organism interactions. Fig wasps have unique mutualistic association with this plant species for pollination and consequently, this plant produced fruit throughout the year. The majority of frugivorous avian and chiropteran species rely on them for a healthy diet, due to the high quantities of rare nutrients found in fig fruits. The diverse forms of organisms that includes, 7 species of aves to 3 species of a mammals from advanced class (frugivorous and insectivorous bats) visited this plant species for food supply and habitation (nesting, roosting, settling, and perching etc.). These animals and birds plays crucial role in the dispersal of tropical seeds. The ripe and unripe fruits, as well as leaves, are used as fodder for domestic live stocks. Humans devour ripened fruits as well as used immature fruits in their savory cuisines. It is popularly used as medicinal plant in ayurveda to treat various ailments. The current study focuses on the scenario of biodiversity conservation by emphasizing the various interactions between *Ficus racemosa* L. plant and birds, animals, insects and also human beings which can be increase approaches for biodiversity conservation.

Introduction:

Ficus (Family- Moraceae) is most important largest angiospermic plant genera found in tropical forests of southern Western Ghats (Vanitharani J *et al*., 2009). *Ficus* species is considered as "keystone species," by many environmentalists and ecologists because of it holds the various components together present in the ecosystem (Mahajan M. & Das S., 2020). *Ficus racemosa* L. is commonly known as Gular. In different langauges it is usually known by various vernacular names like in English: Cluster fig, Redwood fig, Country fig; Chinese: Ju Guo Rong; Burmese: Jagyadumbar; Hindi: Gular; Urdu: Dimiri; Sanskrit: Udumbara; Kannada: Atti; Bengali: Dumur;

Tamil: Athi; Marathi: Umber, Audumber; Oriya: Dimpri; Assam: Janyedumuru, Yagyadimru (Kunwar & Bussmann., 2006, Ahmed F & Urooj A., 2010).

Ficus racemosa L. also have various synonyms such as *Ficus glomerata* Roxb., *Covellia glomerata* (Roxb.) Miq., *Ficus semicostata* F.M. Bailey and *Ficus vesca* F.Muell. ex Miq (Ahmed F & Urooj A.,2010, Sharma H *et al.,*2023). The plant mostly grows in many forests and hills from all over India. It frequently grows on the sides of water streams and is also cultivated by villagers (Singh R. *et al*., 2013 & Paarakh PM 2009).

Ficus racemosa L. are large cluster-fig trees grow to a very great height with massive spreading crown, cracked trunk and evergreen leaves (Raktate *et al*., 2025). The leaves are simple with consist of 2 stipules, elliptic to oblong-elliptic in shape, acute apex with reticulate venation, small hairs present when in juvenile stage and deciduous. The leaves provide shed in January. The special type of inflorescence is developing in *Ficus racemosa* L. that is hypanthodium which is looks like a fruit. The flowers and fruits produced from January to April. It consists of three kinds of flowers that are staminate flowers means male flowers; gall flowers mean sterile female flowers and female flowers. The male flowers are sessile, united, diandrous and present in 2-3 whorls at the opening of the receptacles that is ostiole. The Gall flowers are pedicellate, consist of a long stalk and are located between the male and female flowers. Female flowers are sessile or sub-sessile, plentiful with substipitate ovary, glabrous style and simple stigma. They are smaller in size as compare to male flower. The fruits are figs that are subglobose or pyriform or syconus type, fleshy and whose colors vary from dull orangeish-red to bright red Seeds are tiny, lenticular 1 mm (Chopra R.N. *et al*., 1958, Mahajan M. & Das S., 2020).

F. racemosa L. is widely cultivated in all over India and it is also reported for many medicinal properties (Trivedi *et al*., 1969). Universally, this plant is used in various traditional systems of medicine to treat numerous disorders. It is one of the most important herbs noted in all ancient scriptures of Ayurveda, Unani, Siddha and Homeopathy. Various plant parts are used as carminative, vermifuge, anti-dysentery and astringent. It is also a very good medicine for excessive appetite. Moreover, it has vast pharmacological like antioxidant, anticancer, hepatoprotective, antifungal, antibacterial, as well as therapeutic values (Singh D *et al*.,2018, Rajesh Dhakshinamoorthy *et al*., 2025). *Ficus racemosa* L. is applied in various treatments like weight loss, constipation prevention, colon cancer prevention, coronary heart disease, post-

menopausal breast cancer protection, urinary calcium loss, sexual dysfunction and bone strengthens. All plant parts like leaves, bark, latex, fruits and sap of the root are noteworthy medicinally used in a variety of treatments such as diarrohoea, dysentery, diabetes, menorrhea, leukoderma, stomachache, hemoptysis, skin diseases, anaemia, leprosy, cancer, liver diseases, paralysis visceral obstruction, ulcers, constipation, piles and as carminative etc. (Patil V. V. *et al*., 2009, Shiksharthi, A. R., & Mittal, S. 2011, Bhalerao S. A. *et al*.,2014, Hossain et al., 2025).

Ficus racemosa L. is one of the important species from genus *Ficus* which supporting the forest ecosystem balance. It has a great major effect on the biosphere as a food resource and shelter. In addition, *Ficus racemosa* L. have large tap root system that can store water pool and maintain slope. It also has a simply green roof that can absorb Carbon dioxide from air (Yelastri *et al*., 2023). *Ficus racemosa* L. is very crucial resource for birds, insects, animals, bats, humans and other plants, manifesting its keystone role (Sawadogo *et al*.,2025). It provides support to a diverse community of flora and fauna includes animals, humans, birds, reptiles, amphibians, insects, crustaceans, fungi lichens etc hence it also considered as a keystone species for wildlife biodiversity conservation in tropical forest ecosystem. In forest, if frugivores are continue to visit cluster fig trees, these frugivores helps in seed dispersal of fig trees and other tree species ultimately speed up forest regeneration (Mahanty 2021, Parbo D. *et al*., 2024). Fruits produced by cluster fig trees are very important during food scarcity period in the habitat. It provides fruits as a food source for various organisms including insects in forest ecosystem (Susilowati *et al*.,2022). The *Ficus racemosa* L. is frequently visited by various chiropteran sps. like Short nosed fruit bat, Fruit Bat and Indian flying fox (Mahajan M. & Das S., 2020). Flowers of *Ficus racemosa* L. are pollinated by very small fig wasps because of that it shown unique relationship with pollinating wasps (Shanahan M. & Compton SG., 2001). The fruits are predominant resource for many frugivores. The noteworthy members are fruit bats, and a variety of birds like barbets, pigeons, hornbills, parrots, bulbuls, Koels and myna (Vanitharani J et al., 2009).

In Hindus and Buddhists *Ficus racemosa* L. is a sacred tree. In Hindu religion Udumbara is considered scared tree to God Dattaguru (Bhalerao S. A. *et al*., 2014). In various regions, Ficus racemosa trees have intensified cultural status by their associations with local faiths, major religions and traditional uses. The cultural status of *Ficus* trees may be influential in conservation of their populations in rural areas by reducing dying from felling, potentially enhancing their importance as food resources for fruitivores (Cottee Jones *et al*., 2015). *Ficus*

racemosa L. attracts a variety of frugivores for seed dispersal by providing nutritional diet and roosting habitat to frugivores. The ripened fruits fallen on the ground have been consumed by the terrestrial mammals like humans and domestic animals. Traditionally, children also used figs to play by inserting thin sticks into gular figs to make recreational shapes (Singh R. *et al*., 2013). The large spreading branches with dense leaves provide shelter and also helping in retain moisture under the shed. It also provides an admirable habitat for many tree habitants and also for cat like predatory animals (Vanitharani J *et al*., 2009). Humans consume ripened fruits as well as used immature fruits in their savory cuisines. The ripe and unripe fruits, as well as leaves, are used as fodder for domestic live stocks. The present study confirms that the *Ficus racemosa* L. with their multipurpose properties have great importance in biodiversity conservation.

Study area: Present investigation was carried out in Daund tehsil from Pune district, Maharashtra, India. Geographically, Daund tehsil extends from 18°18′ to 18°41′ North latitude and 74°07′ to 74°51′ East longitude covers an area of 1289.86 Sq.km / 128986 hectors. The average height of study area is 554 meters from mean sea level.

Methodology: The present work was based on survey and observation. The entire work was carried between December 2022 and December 2023. The bird's activities were observed daily between 7.00am to 11.00am. The official visit of bats confirmed by mist nets were tied on trees adjacent to the fruiting areas. The relation of plant and animal were established by clicking digital pictures.

The different animals visited to *Ficus racemosa* L. trees for various basic purposes like resting, nesting, perching and predation. The humans used this plant in different ways that is unripe fruits used in their savory cuisines. They also used leaves as a fodder for domestic animals. This information collected from villagers from Daund tehsil in pune district, Maharashtra (India).

Result and Discussion: The *Ficus racemosa* L. tree shows interaction with various organisms like insects, birds, mammals, terrestrial animals and humans. The various insects are depending on *Ficus racemosa* L. to complete their needs like food and shelter. The total 3 species of insect are present on this plant. The fig wasps are important insect visited to this plant because wasps play important role in pollination. The plant provides shelter to fig wasps for reproduction. Gall

forming insect's forms gall on leaves and live inside the galls. Frugivorous and insectivorous avian species plays a significant role in seed dispersion. The diversity of avian visitors can be revealed the importance of these *Ficus racemosa* L. to the bird community by visiting this plant. Total 7 avian sps. are visited to this plant for food supply and habitation (nesting, roosting, settling, and perching etc.). The many farmers and villagers used different parts like leaves, unripe and ripened fruits to feed their live stocks like Goat, Cow, Ox, buffalo and Sheep etc. *Ficus racemosa* L. are visited by chiropterans mostly during the night. Chiropterans are winged mammals depends on well-balanced energy-rich nutritious fruits because fruits are rich in carbohydrates, minerals, amino acids, and fats. Total 3 chiropterian sps. are visited to this plant. The humans used this plant in various ways like food, fodder to domastic live stcocks, in ayurvedic medicines to treat various diseases. Humans devour ripened fruits as well as used immature fruits in their savory cuisines. *Ficus racemosa* L. is worshiping by people in Maharashtra on special occasion that is Datt Jayanti due to this it is religious native plant in India.

Table 1: Studied Plant- Organism Interaction between *Ficus racemosa* L. (cluster fig) and different animal groups.

Scientific Name of the Plant	Insects	Birds (Avian Species)	Animals	Mammals (Chiropteran species)	Other organism
Ficus racemosa L.	Fig Wasps (*Blastophaga psenes*) Fire ant, White antand Black ant sps. Gall forming insect	Red whiskered bulbul (*Pycnonotus jocosus*) Red-vented bulbul (*Pycnonotus cafer*) Crow (*Corvus* sps.) House Sparrow (*Passer domesticus*) Ringneck Parrot (*Psittacula krameri*) Asian Koels&	Cow & Ox (*Bostaurus*) Goat (*Capra aegagrushircus*) Sheep	Short nosed fruit bat (*Cynopterus sphinx*) Fruit Bat (*Rousetus leschenaulti*) Indian flying fox (*Pteropus medius*)	Humans

		Brown Koel (*Eudynamys scolopaceus*) Myna (*Acridotheres tristis*)			

Table 2: Studied relationship and role between *Ficus racemosa* L. and visitors.

Plant	Visitor	Plant Part Used	Use of plant part	Role of Visitor
Ficus racemosa L.	Fig Wasps	Flowers	Shelter and nourishment	Pollination
	Ants	Tree Trunk	Shelter	Plant protection
	Birds	Branches & Fruits	Nesting & Food	Seed Dispersal
	Bats	Fruits	Food	Seed Dispersal
	Domestic Animals	Leaves, Bark & Fruits as well as tree	Fodder & shed	Seed Dispersal
	Humans	Fruits, leaves, barks, roots & whole plant.	Food, medicine & worshiping	Cultivation & Conservation

Conclusion and future aspect: The taxonomic status of *Ficus racemosa* L. is least concern. Now a day the people cut the trees for road and home constructions, due to this the number of trees gets decreased rapidly. The variety of life forms are depending on this plant for their various needs like shelter, fodder etc. The members from group of aves, insect and mammals visited this tree to fulfill their needs and in other hand they help to tree for pollination and seed dispersal. Humans are consuming fruits and also used various plant parts for fed to domestic animals. This is one of the most important herbs in ayurveda to treat various diseases. Therefore, the huge diversity of animals is depending on *Ficus racemosa* L. for their survival hence, this plant plays crucial role in their conservation. The planting of this tree is very necessary and important for conservation of biodiversity.

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