

Flora and Fauna of the ICAR-NRC on Litchi: A Hidden Gem of Biodiversity



Sunil Kumar | Bikash Das | Ashok Dhakad | Ipsita Samal
Ankit Kumar | Abhay Kumar | Ganesh Kumar | Rohit Kumar



भा.कृ.अनु.प.-राष्ट्रीय लीची अनुसंधान केन्द्र
ICAR-NATIONAL RESEARCH CENTRE ON LITCHI

मुशहरी प्रक्षेत्र, मुशहरी, मुजफ्फरपुर-842002 (बिहार)
Mushahari Farm, Mushahari, Muzaffarpur - 842002 (Bihar)



Published by

Dr. Bikash Das, Director, ICAR-National Research Centre on Litchi, Muzaffarpur (Bihar)

Email: director.nrcl@icar.org.in

Published in

July, 2025

Authored by

Sunil Kumar, Bikash Das, Ashok Dhakad, Ipsita Samal, Ankit Kumar, Abhay Kumar, Ganesh Kumar and Rohit Kumar

Correct citation

Kumar, S., Das, B., Dhakad, A., Samal, I., Kumar, A., Kumar, A., Kumar, G. and Kumar, R. (2025). Flora and Fauna of the ICAR-NRC on Litchi: A Hidden Gem of Biodiversity. NRCL-TB-19. ICAR- NRCL, Muzaffarpur. Pp.- 40.

Acknowledgement

The authors gratefully acknowledge the contributions of staff members, researchers, students and field assistants of ICAR–National Research Centre on Litchi who provided invaluable support in capturing photographs of the diverse flora and fauna featured in this bulletin. Special thanks are extended to Dr. J. P. Verma and Mr. Shyam Pandit for providing the photographs of the tree plantation by the dignitaries.

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Technical Bulletin

NRCL-TB-19

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FOREWORD



It is with great satisfaction and pride that I present the technical bulletin *"Flora and Fauna of the ICAR-NRC on Litchi: A Hidden Gem of Biodiversity"*, a significant contribution toward recognizing and celebrating the ecological richness that exists within the premises of ICAR–National Research Centre on Litchi, Muzaffarpur.

Though the Centre is globally known for its dedicated work on litchi research, varietal development, and sustainable horticultural practices, it also silently nurtures an astonishing range of biodiversity across its 100-acre green campus. This publication documents, for the first time in such a structured manner, the remarkable variety of flora and fauna – from rare ornamental trees, fruit crops, medicinal and aquatic plants to diverse bird species, beneficial insects, reptiles, and mammals – all co-existing in harmony within a research-intensive environment.

In an era where rapid urbanization and intensive agriculture often lead to biodiversity loss, this bulletin serves as a testament to how scientific institutions can become custodians of nature, demonstrating that productivity and sustainability are not mutually exclusive. The flora and fauna thriving at NRCL not only enrich the environment but also offer vital ecosystem services like pollination, natural pest control, organic matter decomposition, and microclimate regulation – ultimately strengthening our research outcomes and contributing to ecological balance.

Moreover, the green and biodiverse environment of the campus significantly enhances the aesthetic and psychological well-being of the staff, students, visiting researchers, and farmers. It also serves as an open classroom and living laboratory for ecological education and agrobiodiversity awareness.

I commend the authors for their diligent effort in compiling this exhaustive inventory and for their commitment to environmental stewardship. This bulletin will serve as a valuable reference for researchers, ecologists, biodiversity scholars, and institutional planners. I am confident that it will also motivate other research organizations and academic institutions to document, protect, and promote their own biological assets.

I extend my best wishes to the team behind this bulletin and look forward to more such initiatives that integrate biodiversity conservation with scientific excellence.

(Bikash Das)
Director

July, 2025
Muzaffarpur

PREFACE



Biodiversity is the cornerstone of sustainable agriculture, ecological resilience, and environmental well-being. While the ICAR–National Research Centre on Litchi (ICAR–NRCL) is primarily known for its pioneering research and development efforts in the domain of litchi cultivation, our journey through its 100-acre campus revealed something even more profound – a thriving ecosystem where scientific innovation coexists with nature's vibrant diversity.

This technical bulletin, *"Flora and Fauna of the ICAR-NRC on Litchi: A Hidden Gem of Biodiversity"*, is our humble attempt to document, classify, and celebrate the rich natural heritage that the Centre quietly nurtures. What began as an observational exercise evolved into a comprehensive catalogue of over hundreds of plant and animal species – including fruit crops, ornamental plants, forest trees, shrubs, ground covers, grasses, aquatic plants, birds, insects, reptiles, and small mammals – each contributing uniquely to the ecological and aesthetic fabric of the Centre.

We believe that this publication will serve multiple purposes: as a reference for researchers and biodiversity enthusiasts, a learning resource for students and farmers, and a guiding tool for institutions striving to integrate ecological harmony with scientific infrastructure. The species described herein were identified based on field observations, herbarium references, and validated databases, ensuring authenticity and academic utility.

The compilation also emphasizes the role of institutional green spaces in conservation, ecosystem services, and education. In doing so, it reinforces the need for biodiversity-conscious planning within research and academic institutions.

We are deeply thankful to the Director, ICAR–NRCL, for his continued encouragement and vision for promoting agrobiodiversity and sustainability within the Centre. We are also grateful to our colleagues and field staff for their assistance during the documentation and verification processes.

It is our sincere hope that this work inspires appreciation, curiosity, and stewardship toward biodiversity – not only within NRC on Litchi, but across similar campuses and landscapes throughout the country.



(Sunil Kumar)
On behalf of the authors

July, 2025
Muzaffarpur

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Campus Overview and Ecological Significance

In the face of increasing global challenges such as climate change, land degradation, monoculture agriculture, and biodiversity loss, the conservation of natural ecosystems has emerged as a critical priority. Agricultural research institutes, traditionally seen as centres for crop development and productivity enhancement, are now being recognized for another equally important function — as reservoirs of biodiversity and custodians of sustainable ecological landscapes. The ICAR–National Research Centre on Litchi (ICAR–NRCL), situated in the fertile Indo-Gangetic plains of Muzaffarpur, Bihar, is a case in point. Spread over 100 acres, this premier institution is known for its focused research and development in litchi (*Litchi chinensis*), a high-value subtropical fruit crop of national and global importance. However, beyond its core scientific mandate, the NRCL campus is a living mosaic of biodiversity — a dynamic, self-sustaining ecosystem that harbors a remarkable variety of flora and fauna.

Nestled in the heart of Bihar's Muzaffarpur district (26°05'44" N, 85°26'38" E), the Centre's diverse landscape includes well-maintained litchi orchards, experimental plots, water bodies, forested corners, ornamental gardens, and open green areas. These heterogeneous habitats provide ideal conditions for the coexistence of a rich variety of plant species — including fruit trees, forest species, palms, ornamental shrubs, ground covers, grasses, aquatic vegetation, annuals, perennials, and medicinal plants. Each category of flora contributes not just to the ecological aesthetics of the campus, but to essential ecosystem services such as pollinator support, carbon sequestration, nutrient cycling, and water retention. Equally significant is the fauna supported by this verdant landscape. More than 50 species of birds, a wide array of beneficial insects (especially pollinators and decomposers), amphibians, reptiles, small mammals, and aquatic lifeforms have been observed on the campus. These species play vital roles in maintaining ecological balance — serving as bioindicators, controlling pests, and contributing to the overall health and sustainability of the agroecosystem. Importantly, many of these species thrive in harmony with ongoing agricultural research activities, exemplifying the integration of biodiversity with productivity-focused land use.

This technical bulletin is a sincere attempt to document, analyze, and celebrate the ecological wealth of ICAR-NRCL. It presents a detailed account of the plant and animal life that inhabit the Centre's premises — not just as a scientific listing, but as a testament to the importance of biodiversity stewardship in agricultural research environments. The compilation is the outcome of meticulous field observation, expert consultation, and validation from reliable taxonomic sources.

By showcasing the biodiversity of NRCL, we aim to achieve several objectives:

- To create awareness about the ecological assets of the Centre among staff, researchers, students, farmers, and visitors;
- To demonstrate how agricultural institutions can serve as models of biodiversity conservation;

- To provide a reference document that can aid further ecological research and sustainable campus planning;
- And above all, to foster a culture of environmental consciousness and responsibility within and beyond the scientific community.

We adopt formal taxonomic nomenclature (scientific names) for precision and include family names to reflect taxonomic relationships. We also discuss the ecological roles of key species, their conservation status (based on International Union for Conservation of Nature – IUCN Red List categories where applicable), and potential threats they face. In addition, we integrate relevant studies to highlight how green campus biodiversity supports mental well-being and ecosystem services, and we suggest methodologies for ongoing biodiversity monitoring and conservation management.

We hope this bulletin will inspire similar biodiversity documentation efforts at other ICAR institutions, state agricultural universities, and research farms across India. As we move toward a future where sustainability and resilience must be core components of agricultural development, the role of biodiversity can no longer be overlooked.



ICAR–National Research Centre on Litchi (ICAR-NRCL), Muzaffarpur



Aerial view of the ICAR–National Research Centre on Litchi (ICAR-NRCL), Muzaffarpur



Landscape in front of NRCL building



Aerial view of the NRCL Farm



Flora: A Living Laboratory of Plant Diversity

The NRCL campus supports a diverse flora ranging from cultivated fruit orchards to ornamental trees, shrubs, and wild herbs. This diversity of plant life forms creates a variety of microhabitats (orchard understory, hedgerows, lawn, wetland, etc.), which in turn support a wide range of animal species. The flora can be categorized into several groups for clarity, including fruit-bearing trees, ornamental and forest trees, palms and succulents, shrubs and herbs (including medicinal plants and weeds), and aquatic plants. In total, at least 75 tree species and 25 shrub/herb species have been catalogued to date on the NRCL grounds, spanning over 40 different plant families – a testament to high alpha-diversity in this managed landscape.

Orchards and fruit-bearing trees

At the core of NRCL's identity lies the litchi (*Litchi chinensis*) orchard. Litchi trees dominate the landscape in extensive blocks, with cultivated varieties such as 'Shahi', 'China', 'Bedana', 'Rose Scented', 'Purbi', 'Mandrajji', 'Calcuttia', 'Longia', and 'Kaselia', among others. These orchards serve not only research purposes (germplasm conservation, yield trials) but also provide abundant nectar and pollen during flowering season, supporting honey bees and wild pollinators, and later fruits that feed birds and fruit bats. Cross pollination is critical for litchi fruit set and quality, and studies at NRCL and elsewhere have shown that introducing managed honeybee colonies significantly increases litchi yield. The litchi trees thus act as a keystone resource in the campus ecosystem, linking cultivated research efforts with ecosystem processes (pollination services). In addition to litchi, NRCL maintains mixed fruit orchards and scattered fruit trees that enhance botanical diversity (Table 1). These include common tropical/subtropical fruit trees such as mango (*Mangifera indica*), guava (*Psidium guajava*), jamun or Java plum (*Syzygium cumini*), jackfruit (*Artocarpus heterophyllus*), and banana (*Musa paradisiaca*). There are also less common or recently introduced fruit species on campus, for example longan (*Dimocarpus longan*) and rambutan (*Nephelium lappaceum*) from the Sapindaceae family (related to litchi), and avocado (*Persea americana*) from Lauraceae. Citrus species are well-represented, including lime (*Citrus aurantiifolia*), lemon (*C. limon*), pomelo (*C. grandis*), calamondin orange (*C. × madurensis*), and the native bael fruit (*Aegle marmelos*). Other fruiting plants recorded include papaya (*Carica papaya*), phalsa (*Grewia asiatica*), Indian jujube or ber (*Ziziphus mauritiana*), karonda (*Carissa carandas*), custard apple (*Annona reticulata*), sapota (*Manilkara zapota*), Indian gooseberry or aonla (*Emblica officinalis*, syn. *Phyllanthus emblica*), tamarind (*Tamarindus indica*), pomegranate (*Punica granatum*), grapes (*Vitis vinifera*), starfruit (*Averrhoa carambola*), and even strawberry (*Fragaria × ananassa*) in some seasonal plots. An aquatic crop, makhana (*Euryale ferox*, an aquatic lily producing edible seeds), is cultivated in campus ponds, illustrating integration of wetland flora into the landscape.

The fruit tree diversity on campus offers multiple ecological benefits. Flowering and fruiting at different seasons ensure a continuous supply of nectar, pollen, and fleshy fruits, which sustains a variety of pollinators (bees, butterflies, hoverflies) and frugivores

(birds, bats) throughout the year. For instance, mango and litchi blossom in spring, attracting honeybees (*Apis dorsata*, *A. cerana*, *A. mellifera* etc.), while jamun and jackfruit produce summer fruits that feed birds like parakeets and orioles. The mixed orchard thus increases species richness of associated fauna compared to a monoculture, through a complementarity of resources. This aligns with broader findings that biodiversity is essential to ensure the provision of ecosystem services such as pollination and pest control, leading to higher and more stable crop production. In the context of NRCL, richer plant diversity likely bolsters natural pest regulation (see Fauna section) and pollination success in litchi and other fruit crops.

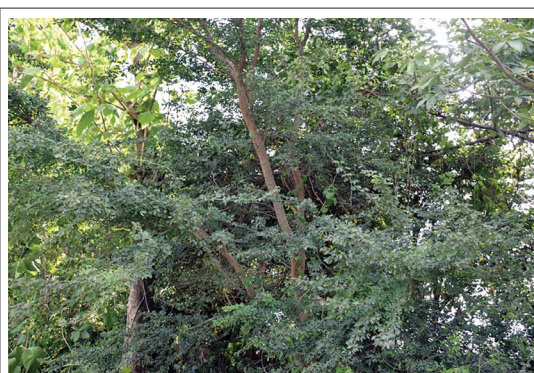
Table 1. Representative fruit-bearing and other tree species documented at the ICAR-NRCL campus

Sl. No.	Common name	Botanical name	Family
1.	Mango	<i>Mangifera indica</i>	Anacardiaceae
2.	Guava	<i>Psidium guajava</i>	Myrtaceae
3.	Jamun	<i>Syzygium cumini</i>	Myrtaceae
4.	Phalsa	<i>Grewia asiatica</i>	Malvaceae
5.	Water apple	<i>Syzygium samarangense</i>	Myrtaceae
6.	Jackfruit	<i>Artocarpus heterophyllus</i>	Moraceae
7.	Longan	<i>Dimocarpus longan</i>	Sapindaceae
8.	Litchi	<i>Litchi chinensis</i>	Sapindaceae
9.	Papaya	<i>Carica papaya</i>	Caricaceae
10.	Banana	<i>Musa paradisiaca</i>	Musaceae
11.	Karonda	<i>Carissa carandas</i>	Apocynaceae
12.	Lime	<i>Citrus aurantiifolia</i>	Rutaceae
13.	Lemon	<i>Citrus limon</i>	Rutaceae
14.	Pomelo	<i>Citrus grandis</i>	Rutaceae
15.	Aonla	<i>Embllica officinalis</i>	Phyllanthaceae
16.	Avocado	<i>Persea americana</i>	Lauraceae
17.	Rambutan	<i>Nephelium lappaceum</i>	Sapindaceae
18.	Peach	<i>Prunus persica</i>	Rosaceae
19.	Pear	<i>Pyrus communis</i>	Rosaceae
20.	Custard apple	<i>Annona reticulata</i>	Annonaceae
21.	Sapota	<i>Manilkara zapota</i>	Sapotaceae
22.	Date palm	<i>Phoenix dactylifera</i>	Arecaceae
23.	Ber	<i>Ziziphus mauritiana</i>	Rhamnaceae
24.	Tamarind	<i>Tamarindus indica</i>	Fabaceae
25.	Pomegranate	<i>Punica granatum</i>	Punicaceae

Sl. No.	Common name	Botanical name	Family
26.	Grapes	<i>Vitis vinifera</i>	Vitaceae
27.	Carambola	<i>Averrhoa carambola</i>	Oxalidaceae
28.	Bael	<i>Aegle marmelos</i>	Rutaceae
29.	Strawberry	<i>Fragaria × ananassa</i>	Rosaceae
30.	Makhana	<i>Euryale ferox</i>	Nymphaeaceae
31.	Dragon fruit	<i>Hylocereus undatus</i>	Cactaceae
32.	Calamondin orange	<i>Citrus madurensis</i>	Rutaceae
33.	Spanish cherry	<i>Mimusops elengi</i>	Sapotaceae



Spanish Cherry – Nature's Fragrant Jewel



Jungle Jalebi – The Wild Sweetness of Nature

Ornamental and native tree Species

Besides fruit trees, the campus is planted with a variety of ornamental, shade, and native forest tree species. These were introduced for beautification, shade, windbreaks, or research trials, but they also play important ecological roles. Neem (*Azadirachta indica*) is a native tree known for its medicinal properties and natural insect repellent compounds, contributing to integrated pest management ethos on campus while the Banyan (*Ficus benghalensis*) and Peepal (*Ficus religiosa*) are *keystone resources* in Indian ecosystems; their figs are eaten by many birds and mammals. Ficus trees also have cultural significance and support strangler fig epiphytes. Kadam (*Neolamarckia cadamba*) is revered in folklore is a fast-growing native tree with ball-shaped fragrant flowers that attract pollinators. Similarly, Indian laburnum (*Cassia fistula*) with bright yellow blossoms, is also an important nectar source for bees and butterflies during late spring. Palash or Flame-of-the-forest (*Butea monosperma*) a native tree with vivid orange flowers rich in nectar, supporting sunbirds and other nectarivores; also, culturally significant. Sita Ashok (*Saraca indica*) having immense cultural significance is an ornamental with orange bunches of flowers, its dense foliage is good for shade and bird perches. These ornamental/forest trees add structural diversity (varying tree heights and canopy architectures) to the campus, which in turn creates niches for different fauna. Tall trees like teak and banyan host bird nests (e.g., crows, owls, parakeets often

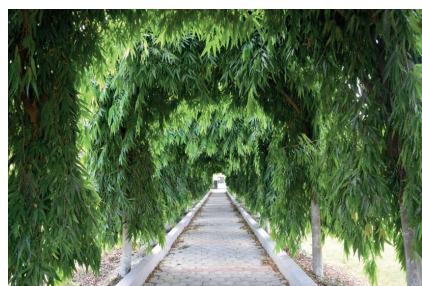
nest in cavities or dense canopies), while flowering ornamentals provide foraging for insects. The mix of deciduous and evergreen species ensures some leaf cover year-round, benefiting resident wildlife. Many of these trees are also used in traditional agroforestry, so their presence demonstrates compatibility of biodiversity conservation with agricultural landscapes.

Table 2. Ornamental and forest tree species documented at the ICAR-NRCL campus

Sl. No.	Common name	Botanical name	Family
1.	Drooping ashoka	<i>Monoon longifolium</i>	Annonaceae
2.	Sita ashok	<i>Saraca indica</i>	Fabaceae
3.	Indian laburnum	<i>Cassia fistula</i>	Leguminosae
4.	Bottle brush	<i>Callistemon lanceolatus</i>	Myrtaceae
5.	Indian rubber tree	<i>Ficus elastica</i>	Moraceae
6.	Paras peepal	<i>Thespesia populnea</i>	Malvaceae
7.	Gulmohar	<i>Delonix regia</i>	Leguminosae
8.	Palash/ flame of the forest	<i>Butea monosperma</i>	Leguminosae
9.	Blue jacaranda	<i>Jacaranda mimosifolia</i>	Bignoniaceae
10.	Indian beech tree	<i>Pongamia pinnata</i>	Leguminosae
11.	Devil's tree	<i>Alstonia scholaris</i>	Apocynaceae
12.	Orchid tree/butterfly tree	<i>Bauhinia purpurea</i>	Leguminosae
13.	Pinwheel flower/Indian crepe jasmine	<i>Tabernaemontana divaricata</i>	Apocynaceae
14.	Silk cotton tree	<i>Bombax ceiba</i>	Malvaceae
15.	Yellow trumpetbush	<i>Tecoma stans</i>	Bignoniaceae
16.	King sago	<i>Cycas revoluta</i>	Cycadaceae
17.	Norfolk island pine	<i>Araucaria heterophylla</i>	Araucariaceae
18.	Pony tail	<i>Beaucarnea recurvata</i>	Asparagaceae
19.	Bamboo tree	<i>Bambusa vulgaris</i>	Poaceae
20.	Golden barrel cactus	<i>Echinocactus</i>	Cactaceae
21.	Gular	<i>Ficus glomerata</i>	Moraceae
22.	Kadamb	<i>Neolamarckia cadamba</i>	Rubiaceae
23.	Semal	<i>Bombax ceiba</i>	Malvaceae
24.	Sagwan	<i>Tectona grandis</i>	Lamiaceae
25.	Neem	<i>Azadirachta indica</i>	Meliaceae
26.	Peepal	<i>Ficus religiosa</i>	Moraceae
27.	Arjun	<i>Terminelia arjuna</i>	Combretaceae
28.	Kachnar	<i>Bauhinia variegata</i>	Fabaceae
29.	Eucalyptus	<i>Eucalyptus citriodora</i>	Myrtaceae



Sl. No.	Common name	Botanical name	Family
30.	Banyan tree	<i>Ficus bengalensis</i>	Moraceae
31.	Pilkhan	<i>Ficus virens</i>	Moraceae
32.	Baheda	<i>Terminalia bellerica</i>	Combretaceae
33.	Rubber plant	<i>Ficus elastica</i>	Moraceae
34.	Mahua	<i>Madhuca longifolia</i>	Sapotaceae
35.	Rudraksh Tree	<i>Elaeocarpus ganitrus</i>	Tiliaceae



Trinity of Life: Peepal, Fig & Gular

Drooping Ashoka Gallery – A Symphony of Grace and Green



Arjun Tree – The Warrior of Wellness



Tectona Tree – The King of Timbers



The Giant Peepal: The Tree of Life, Spirituality and Wisdom



Karanj – Nature's Green Shield

Palms and cactus

Landscape plantings at NRCL include a collection of ornamental palms and succulents. Several exotic palm species can be found lining roads or in garden plots: e.g., Areca palm (*Dypsis lutescens*), foxtail palm (*Wodyetia bifurcata*), pygmy date palm (*Phoenix roebelenii*, a small relative of the true date palm), Washington palm (*Washingtonia robusta*), triangle palm (*Dypsis decaryi*), lady palm (*Rhapis excelsa*), and others. These palms, while primarily aesthetic, also offer perching and roosting sites for birds (particularly when fruiting or flowering) and some bats. The sago palm (cycad) (*Cycas revoluta*) is a living fossil species introduced as an ornamental; it adds to plant phylogenetic diversity on campus (representing the ancient gymnosperm lineage).

Table 3. Palms and cacti documented at the ICAR-NRCL campus

Sl. No.	Common name	Botanical name	Family
1.	Date palm	<i>Phoenix dactylifera</i>	Arecaceae
2.	Areca palm	<i>Dypsis lutescens</i>	Arecaceae
3.	Bottle palm	<i>Hyophorbe lagenicaulis</i>	Arecaceae
4.	Cat palm	<i>Chamadorea cataractarum</i>	Arecaceae
5.	European fan palm	<i>Chamaerops humilis</i>	Arecaceae
6.	Fox tail palm	<i>Wodyetia bifurcata</i>	Arecaceae
7.	Manilla palm	<i>Adonidia merillii</i>	Arecaceae
8.	Lady palm	<i>Rhapis excelsa</i>	Arecaceae
9.	Fishtail palm	<i>Caryota mitis</i>	Arecaceae
10.	Triangle palm	<i>Dypsis decaryi</i>	Arecaceae
11.	Washingtonia palm	<i>Washingtonia robusta</i>	Arecaceae
12.	Pygmy date palm triple	<i>Phoenix roebelinii</i>	Arecaceae
13.	Silver palm	<i>Bismarkia nobilis</i>	Arecaceae
14.	Traveller palm	<i>Ravenala madagascariensis</i>	Arecaceae
15.	Triangle palm	<i>Dypsis decaryi</i>	Arecaceae
16.	Paras pipal	<i>Thespesia populnea</i>	Arecaceae
17.	Golden barrell cactus	<i>Echinocactus</i>	Cactaceae



Agave – The Sculptor of the Desert



Cycas – The Ancient Crown of Green



Shrubs and bushes: The unsung heroes

Understory vegetation and managed gardens at NRCL contain numerous shrubs and herbaceous plants that add texture to the landscape and serve as “unsung heroes” of the ecosystem. Table 4 highlights some noteworthy shrub species on campus, spanning ornamental flowering bushes, medicinal bushes, and naturalized wild plants: Shrubs and bushes add texture and color to the landscape. Flowering shrubs such as Hibiscus, Ixora, and Bougainvillea provide splashes of color and are regularly visited by butterflies and hummingbird hawk-moths for nectar. Coral Jasmine (Harsingar) *Nyctanthes arbortristis* is popular for night-blooming fragrant flowers and has cultural importance. *Calotropis gigantea* (crown flower) is a hardy native shrub often seen on disturbed ground at the periphery; it produces copious nectar and is a known host plant for the caterpillars of Plain Tiger and Common Crow butterflies. *Lantana camara*, though an invasive alien shrub in India, is present in some hedge lines – it produces nectar-rich flowers favored by butterflies, but its ability to form dense thickets means it is monitored and pruned to prevent unchecked spread.

Table 4. Noteworthy shrubs and bushes species on campus

Sl. No.	Common name	Botanical name	Family
1.	China shoe flower	<i>Hibiscus rosasinensis</i>	Malvaceae
2.	Golden duranta	<i>Duranta repens</i>	Verbenaceae
3.	West Indian jasmine	<i>Ixora coccinea</i>	Rubiaceae
4.	Crown flower	<i>Calotropis gigantea</i>	Apocynaceae
5.	Nerium	<i>Nerium oleander</i>	Apocynaceae
6.	Duranta	<i>Duranta erecta</i>	Verbenaceae
7.	Pinwheel flower	<i>Tabernaemontana coronaira</i>	Asteraceae
8.	Crotons	<i>Coediam variegatum</i>	Euphorbiaceae
9.	Pentas	<i>Pentas lanceolata</i>	Rubiaceae
10.	Dracaena	<i>Dracaena sp.</i>	Asparagaceae
11.	Coleus	<i>Coleus blumei</i>	Lamiaceae
12.	Copperleaf or Jacob's coat	<i>Acalypha wilkensiana</i>	Euphorbiaceae
13.	Plumeria	<i>Plumeria sp.</i>	Apocynaceae
14.	Lantana	<i>Lantana camara</i>	Verbenaceae
15.	Harshingar/night jasmine	<i>Nyctanthes arbortristis</i>	Oleaceae
16.	Agave	<i>Agave sp.</i>	Asparagaceae
17.	Ferns	<i>Pteridium sp.</i>	Dennstaedtiaceae
18.	Jatropha	<i>Jatropha curcas</i>	Euphorbiaceae
19.	Night-flowering jasmine/Rat Ki Rani	<i>Cestrum nocturnum</i>	Solanaceae
20.	Chinese banyan	<i>Ficus microcarpa</i>	Moraceae

Sl. No.	Common name	Botanical name	Family
21.	Flax lily	<i>Dianella tasmanica</i>	Asphodelaceae
22.	Orangeade bromeliad	<i>Aechmea blanchetiana</i>	Bromeliaceae
23.	Poison dart plant	<i>Aglaonema commutatum</i>	Araceae
24.	Boston fern	<i>Nephrolepis exaltata</i>	Nephrolepidaceae
25.	Cornstalk dracaena	<i>Dracaena fragrans</i>	Asparagaceae
26.	Garden croton	<i>Codiaeum variegatum</i>	Euphorbiaceae
27.	Copper leaf	<i>Acalypha wilkesiana</i>	Euphorbiaceae
28.	Spider lily	<i>Hymenocallis latifolia</i>	Amoryllidaceae
29.	Snake plant	<i>Dracaena trifasciata</i>	Asparagaceae
30.	Crown of thorns	<i>Euphorbia milii</i>	Euphorbiaceae
31.	Ornamental banana	<i>Musa rubra</i>	Musaceae
32.	Dumbcane	<i>Dieffenbachia seguine</i>	Araceae
33.	Devil's backbone plant	<i>Pedilanthus tithymaloides</i>	Euphorbiaceae
34.	Daylily	<i>Hemerocallis middendorffii</i>	Asphodelaceae
35.	Oyster plant	<i>Tradescantia spathacea</i>	Commelinaceae
36.	Living christmas tree	<i>Araucaria heterophylla</i>	Araucariaceae
37.	Chinese evergreen	<i>Aglaonema commutatum</i>	Araceae
38.	Cabbage tree	<i>Cordyline australis</i>	Asparagaceae
39.	Oriental thuja	<i>Platyclusus orientalis</i>	Cupressaceae
40.	Bougainvillea	<i>Bougainvillea glabra</i>	Nyctaginaceae
41.	Holy basil	<i>Ocimum tenuiflorum</i>	Lamiaceae
42.	Indian basil/Tulsi	<i>Ocimum sanctum</i>	Laminaceae
43.	Red lip	<i>Syzygium myrtifolium</i>	Myrtaceae



Ficus benjamina – The Graceful Guardian



Bottle Brush – Nature's Paintbrush in Bloom



Golden Duranta – A Glow of Green and Gold

Ground covers and grasses: The underrated layers

Ground flora (grasses and sedges) in the lawns and experimental plots include species such as Bermuda grass (*Cynodon dactylon*, commonly used in lawns) and various pioneer species that appear in fallow areas. These low-growing plants help in soil

retention and provide habitat for ground-dwelling invertebrates. The campus's practice of organic horticulture and minimal pesticide use allows many of these herbaceous species to thrive in a balanced manner without heavy herbicide application, thereby maintaining plant diversity at the ground level. In turn, this diversity supports detritivores and pollinators, reinforcing a healthy trophic web.

Table 5. The ground layer of the campus flora

Sl. No.	Common name	Botanical name	Family
1.	Angel's trumpet	<i>Brugmansia suaveolens</i>	Solanaceae
2.	Kangaroo fern	<i>Microsorium diversifolium</i>	Polypodiaceae
3.	Medicinal aloe	<i>Aloe vera</i>	Liliaceae
4.	Oyster plant	<i>Tradescantia spathacea</i>	Commelinaceae
5.	Purple queen	<i>Tradescantia pallida</i>	Commelinaceae
6.	Wedelia	<i>Wedelia trilobata</i>	Asteraceae
7.	Spiny pincushion cactus	<i>Mammillaria spinosissima</i>	Cactaceae
8.	Napier grass	<i>Cenchrus purpureus</i>	Gramineae
9.	Motha	<i>Cyperus rotundus</i>	Cyperaceae
10.	Lemon grass	<i>Cymbopogon citratus</i>	Gramineae
11.	Patchouli	<i>Pogostemon cablin</i>	Lamiaceae
12.	Finger millet	<i>Eleusine coracana</i>	Gramineae
13.	Dudhi	<i>Euphorbia hirta</i>	Euphorbiaceae



Nature's Gentle Movers



Grasses – The Silent Sculptors of the Landscape

Annuals and perennial flowers: Seasonal charm with year-round impact

The vibrant tapestry of annual and perennial flowers across the ICAR-NRCL campus not only enhances the aesthetic appeal of the landscape but also plays a significant ecological role. These flowering plants provide critical support to pollinators, improve soil health, and contribute to microclimate regulation – all while offering year-round visual delight. Annuals are short-lived plants that complete their life cycle within a single

growing season, yet their impact is vivid and dynamic. These species are strategically planted during specific seasons (primarily winter and monsoon) to bring bursts of color, attract pollinators like bees and butterflies, and maintain habitat diversity. Perennial species persist for multiple growing seasons and form a stable foundation for floral diversity on campus. Once established, they require minimal maintenance and contribute to long-term ecological stability.

Table 6. Commonly observed annuals and perennials at NRCL

Sl. No.	Common name	Botanical name	Family
1.	Periwinkle	<i>Catharanthus roseus</i>	Apocynaceae
2.	African marigold	<i>Tagetes erecta</i>	Compositae
3.	French marigold	<i>Tagetes patula</i>	Compositae
4.	Carnation	<i>Dianthus caryophyllus</i>	Caryophyllaceae
5.	Chrysanthemum	<i>Dendranthema grandiflora</i>	Compositae
6.	Gladiolus	<i>Gladiolus grandifloras</i>	Iridaceae
7.	Jasmine	<i>Jasminum spp.</i>	Oleaceae
8.	Rose	<i>Rosa spp.</i>	Rosaceae
9.	Petunia	<i>Petunia hybrida</i>	Solanaceae
10.	Poppy	<i>Papaver somniferum</i>	Papaveraceae
11.	Lotus	<i>Nelumbo nucifera</i>	Nelumbonaceae
12.	Aster	<i>Tripolium pannonicum</i>	Asteraceae
13.	Dahlia	<i>Dahlia variabilis</i>	Compositae
14.	Daisy	<i>Bellis perennas</i>	Compositae
15.	Hollyhock	<i>Althea rosea</i>	Malvaceae
16.	Pansy	<i>Viola wittor ckiana</i>	Violaceae
17.	Prickly pear	<i>Opuntia ficus-indica</i>	Cactaceae
18.	Zinnia	<i>Zinnia elegans</i>	Compositae
19.	Kochia	<i>Kochia scoparia var tricophylla</i>	Amaranthaceae
20.	Amaryllis	<i>Amaryllis belladonna</i>	Amaryllidaceae
21.	Sweet william	<i>Dianthus barbatus</i>	Caryophyllaceae
22.	Sunflower	<i>Helianthus annuus</i>	Asteraceae
23.	Calla lily	<i>Zantideschia spp.</i>	Araceae
24.	Gerbera	<i>Gerbera jamesonii</i>	Compositae
25.	Balsam	<i>Impatiens balsamina</i>	Balsaminaceae
26.	Cosmos	<i>Cosmos bipinnatus</i>	Compositae

Sl. No.	Common name	Botanical name	Family
27.	Celosia	<i>Celosia argentea</i>	Amaranthaceae
28.	Gomphrena	<i>Gomphrena caespitosa</i>	Amaranthaceae
29.	Gailardia	<i>Gallardia pulchella</i>	Compositae
30.	Morning glory	<i>Ipomoea purpurea</i>	Convolvulaceae
31.	Cocks comb	<i>Celosia cristata</i>	Amaranthaceae
32.	Portulaca	<i>Portulaca grandiflora</i>	Amaranthaceae
33.	Donkey ear plants	<i>Kalanchoe gastonis-bonnieri</i>	Crassulaceae



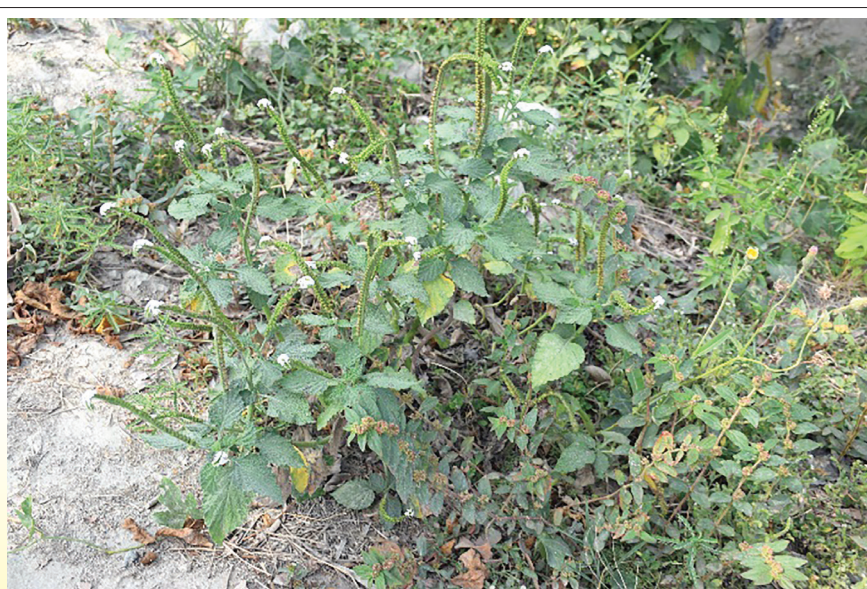
Roses – The Eternal Emblem of Beauty and Love

Weeds of the campus: The unnoticed yet influential residents

While often considered undesirable, weeds are an integral component of any ecological landscape, including agricultural and research campuses. At NRCL, a diverse assemblage of weed species has been recorded across orchards, roadsides, water bodies, fallow lands, and research plots. These plants, though unmanaged, offer both challenges and ecological services, making them important to recognize and understand. The NRCL campus harbors a variety of annual, biennial, and perennial weeds, encompassing grasses, broadleaf species, and sedges.

Table 7. Notable weed species observed in the campus

Sl. No.	Common name	Botanical name	Family
1.	Seed-under-leaf/ Hazardana	<i>Phyllanthus niruri</i>	Euphorbiaceae
2.	Choti-dudhi	<i>Euphorbia macrophyllae</i>	Euphorbiaceae
3.	Badi-dudhi	<i>Euphorbia hirta</i>	Euphorbiaceae
4.	Little seed canary grass	<i>Phalaris minor</i>	Poaceae
5.	Perennial sow thistle	<i>Sonchus arvensis</i>	Asteraceae
6.	Wild oats	<i>Avena fatua</i>	Poaceae
7.	Leafy spurge	<i>Euphorbia simplex</i>	Euphorbiaceae
8.	Common lambs quarter	<i>Chenopodium album</i>	Chenopodiaceae
9.	Grass pea	<i>Lathyrus sativus</i>	Fabaceae
10.	Vetch	<i>Vicia sativa</i>	Fabaceae
11.	Blue pimpernel	<i>Anagallis arvensis</i>	Primulaceae
12.	Mexican poppy	<i>Argemone mexicana</i>	Papaveraceae
13.	Indian hemp	<i>Cannabis sativa</i>	Cannabaceae
14.	Water grass	<i>Echinochloa crusgalli</i>	Poaceae
15.	Water grass	<i>Echinochloa colona</i>	Poaceae
16.	Wild rice	<i>Oryza spp.</i>	Poaceae
17.	Common sedge	<i>Cyperus difformis</i>	Cyperaceae
18.	Hedgehog sedge	<i>Cyperus compressus</i>	Cyperaceae
19.	Carrot grass/ Congress grass	<i>Parthenium hysterophorus</i>	Asteraceae



Indian Heliotrope – The Humble Healer of the Wild

Aquatic plants: Silent stewards of water ecosystems

The NRCL is not only a haven for terrestrial biodiversity but also hosts a modest yet vital population of aquatic plant species in its water bodies, farm ponds, and seasonal wetlands. These aquatic plants play an indispensable role in maintaining hydrological balance, nutrient cycling, and ecological stability within the campus ecosystem. It includes small water bodies (ponds or low-lying fields that seasonally hold water) where aquatic vegetation is found. Key aquatic plants recorded are lotus (*Nelumbo nucifera*), water lily (*Nymphaea* sp.), makhana (*Euryale ferox* as noted), and water hyacinth (*Eichhornia crassipes*). Lotus is sometimes cultivated for its ornamental and religious significance; it provides floating leaves that shade water and flowers that attract pollinators like bees (and occasionally beetles). Water hyacinth, an invasive floating plant, occasionally intrudes into ponds – it can proliferate rapidly and deplete oxygen in water, so its spread is controlled. However, in moderate presence, water hyacinth mats can offer refuge for aquatic invertebrates and young fish. The centre promotes sustainable agriculture and organic horticultural practices, which benefit the native flora and contribute to soil health, attracting a wealth of biodiversity.

Overall, the flora of the NRCL campus exemplifies a harmonious blend of cultivated and wild plant species, managed in an environmentally friendly manner. Regular maintenance like pruning, weeding, and organic soil management is practiced not only to support research crops but also to enhance habitat quality. The result is a campus that functions as an open-air laboratory for botany and ecology, where one can study phenology (flowering/fruiting times), plant-pollinator interactions, and the effects of invasive species and their management in a contained setting. The diverse plant life contributes significantly to local climate regulation (trees provide shade and cooling, mitigating the heat island effect of buildings), carbon sequestration (woody biomass storing carbon), and cultural ecosystem services (aesthetic beauty and stress relief for staff and visitors). Indeed, exposure to such green, biodiverse environments has been scientifically linked to reduced stress and improved well-being, a benefit that the NRCL community likely experiences through daily interaction with their verdant campus.



Fauna: A Sanctuary for Regional Wildlife

Thanks to lush plantations and pockets of relatively undisturbed habitat, the NRCL campus supports a rich faunal diversity within its boundaries. The interface of orchard, woodland, and water creates a safe haven for many animal species, despite being in a semi-urban agricultural region. Wildlife observations over the years have recorded dozens of bird species, a variety of insects (including pollinators and beneficial predatory insects), arachnids, reptiles (particularly snakes), amphibians, and small mammals. The species diversity indicates that even a research farm can function akin to a biodiversity hotspot at the local scale when managed with ecological considerations. Below we detail the main faunal groups observed, their ecological roles on campus, and any relevant conservation aspects.

Avifauna (Birds): The sky dwellers

Birdlife on the NRCL campus is especially vibrant. Bird surveys by staff and visitors have documented over 50 species of birds, a remarkable number given the limited area, reflecting the variety of habitats (tree canopies, shrubs, open fields, water edges) available. Birds are highly visible components of campus biodiversity and serve as excellent indicators of environmental health. They provide essential ecosystem services: many are pollinators or seed dispersers for campus plants, and insectivorous birds act as natural pest controllers.

The bird community on campus includes both resident species and migratory or seasonal visitors. Residents like the *house crow* and *rose-ringed parakeet* are well-adapted to human-dominated landscapes and often nest on the larger trees or building ledges. The presence of parakeets in significant numbers is noteworthy – flocks of rose-ringed parakeets feed on guava, litchi, and other fruits, sometimes causing crop loss, but they also aid in seed dispersal of wild fruits. Managing their impact is part of the integrated approach (for instance, harvesting fruit on time, or using netting on research trees if needed). Insectivorous birds such as drongos, magpie-robins, flycatchers, warblers, and hoopoes provide invaluable pest control by consuming caterpillars, beetles, and other insects that could otherwise become agricultural pests. It has been observed generally that farms retaining natural habitat and tree cover experience more benefits from birds in controlling pests, whereas farms devoid of non-crop vegetation suffer higher pest damage. In NRCL's case, the retention of hedgerows, windbreak trees, and patches of wild growth likely encourages such beneficial birds to breed and feed on-site, thereby naturally reducing pest populations (for example, drongos hawking for moths in litchi orchards or hoopoes probing for grubs in the soil). The Black Drongo in particular, locally called *Bhujanga*, is known as the "farmer's friend" for its aggressive pursuit of crop-damaging insects; several drongo territories have been noted around the farm blocks. Birds of prey, including the Indian Eagle Owl and Barn Owl, have been spotted during twilight hours. These nocturnal raptors predominantly hunt rodents in and around the campus. The Barn Owl, which often nests in quiet roof spaces or tree hollows, can consume dozens of rats or mice in a week, making it an effective biocontrol agent for rodents that might otherwise damage stored seeds or gnaw tree bark. Encouraging



such raptors (e.g., by installing owl nest boxes or simply by minimal disturbance of their nesting sites) is part of a holistic pest management strategy. Diurnal raptors like Black Kites and occasionally Shikras (small hawks) have also been observed soaring above – they help control snakes, rodents, and small birds, maintaining ecological balance. Water-associated birds are fewer given the small aquatic area, but cattle egrets are regular visitors, stalking insects in the fields, especially after irrigation or ploughing. Occasionally, kingfishers (such as the White-throated Kingfisher) perch near water tanks or rain-filled ditches to catch tadpoles and small fish; they also hunt lizards on land. During winter, migratory songbirds like some warblers or flycatchers may pass through or spend a few weeks on campus, taking advantage of the relatively green oasis in a dry landscape. The bird diversity at NRCL not only enhances the aesthetic appeal (birdsong, flashes of color) but also provides educational value. Students and trainees can practice bird identification and understand avian ecology firsthand. From a conservation standpoint, most bird species found are common (IUCN Red List: Least Concern), but their sustained presence indicates that the campus contributes to regional conservation by acting as a stopover or refuge in an increasingly intensified agricultural matrix. Table 7 lists a selection of bird species observed on campus, spanning different dietary and habitat guilds.

Table 8. List of bird species observed on campus

Sl. No.	Common name	Scientific name	Family	Remarks
1.	Owl	<i>Bubo bengalensis</i>	Strigidae	Nocturnal predator; nests in quiet, wooded areas, controls rodent populations.
2.	Crow	<i>Corvus splendens</i>	Corvidae	Ubiquitous; scavenger and predator of insects; often seen around habitation
3.	Eagle	<i>Aquila chrysaetos</i>	Accipitridae	Majestic raptor found in open terrains; powerful predator with keen eyesight; feeds on mammals and birds
4.	Rose-ringed parakeet	<i>Psittacula krameri</i>	Psittacidae	Common parrot; feeds on fruits (including litchi) and seeds; nests in tree cavities
5.	Pigeon	<i>Columba livia</i>	Columbidae	Highly adaptable; often seen in urban areas; feeds on grains, seeds, and human scraps; breeds year-round in crevices and buildings
6.	Cuckoo	<i>Cuculus canorus</i>	Cuculidae	Famous for brood parasitism; lays eggs in nests of other birds; known for its distinctive two-note call during spring and summer

Sl. No.	Common name	Scientific name	Family	Remarks
7.	Nightingale	<i>Luscinia megarhynchos</i>	Turdidae	Shy and elusive; renowned for its melodious singing, especially during dawn and dusk; prefers dense shrubs and woodlands
8.	Eurasian collared-dove	<i>Streptopelia decaocto</i>	Columbidae	Pale dove with a black neck ring; feeds on grains and seeds; commonly seen in villages and urban outskirts
9.	Spotted dove	<i>Spilopelia chinensis</i>	Columbidae	Ground forager for seeds; soft cooing calls; found near farms and groves
10.	Hen	<i>Gallus gallus domesticus</i>	Phasianidae	Domesticated bird; raised for eggs and meat; feeds on grains, insects, and kitchen waste
11.	Kingfisher/ Ram Chiraiya	<i>Alcedo atthis</i>	Alcedinidae	Perches near water and fields; eats fish, insects, small reptiles; bright turquoise plumage
12.	Black drongo	<i>Dicrurus macrocercus</i>	Dicruridae	Fearless bird; insect hunter; often seen on electric wires or cattle backs; known for aggressive defense of territory
13.	Rufous treepie	<i>Dendrocitta vagabunda</i>	Corvidae	Noisy and inquisitive; feeds on fruits, insects, and leftovers; common in wooded areas and gardens
14.	Eastern cattle egret	<i>Bubulcus coromandus</i>	Ardeidae	Often seen with grazing cattle; feeds on insects and small vertebrates disturbed by livestock
15.	White-throated fantail	<i>Rhipidura albicollis</i>	Rhipiduridae	Energetic insect hunter; fans tail while foraging; known for melodious, mimicry-rich calls in gardens
16.	Parrot	<i>Psittaciformes</i>	Psittacidae	Bright green plumage; strong curved beak; intelligent and social; mimics sounds and speech; feeds on fruits, seeds, and nuts
17.	Koyal	<i>Eudynamys scolopaceus</i>	Cuculidae	Brood parasite on crows; feasts on fruits (figs, etc.); famous for its calls.
18.	Bulbul	<i>Pycnonotus barbatus</i>	Pycnonotidae	Common garden bird; eats fruits (including berries of shrubs) and insects; active seed disperser
19.	Bhujang	<i>Dicrurus macrocercus</i>	Dicruridae	



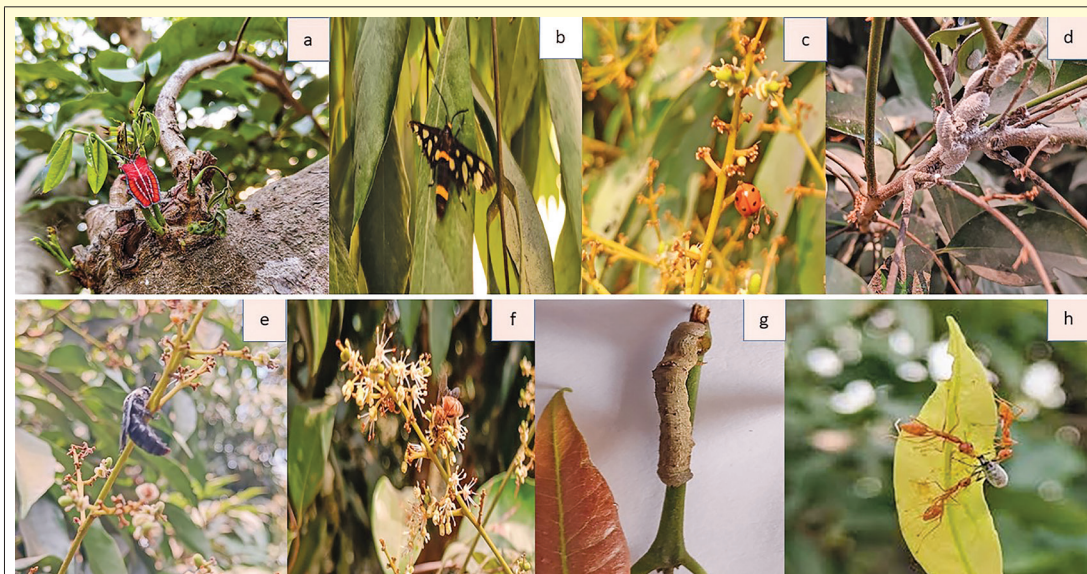
Poultry as a part of Integrated Farming System (IFS) at NRCL Farm

Insects and pollinators: The tiny titans

Insects are fundamental to the campus ecosystem, driving processes like pollination, decomposition, and serving as a food base for higher trophic levels. A variety of insect species inhabits the NRCL campus, though only a representative subset has been formally catalogued. Notably, pollinator insects abound due to the flowering of litchi and other plants, and natural enemies of pests are observed in the organic farming environment. Table 8 lists some insect and invertebrate species recorded, illustrating the range from beneficial to pest species (some being research subjects themselves, as litchi pests).

Table 9. List of Insects observed on campus

Sl. No.	Common name	Scientific name	Family
1.	Termite/ white ants	<i>Odontotermes obesus</i>	Termitidae
2.	Mosquito	<i>Culex Pipiens</i>	Culicidae
3.	Honey bees	<i>Apis mellifera</i>	Apidae
4.	Bed bugs	<i>Cimex lectularius</i>	Cimicidae
5.	Cockroach	<i>Periplaneta americana</i>	Blattidae
6.	Ants	<i>Monomorium pharaonis</i>	Formicidae
7.	Spiders	<i>Argiope catenulata</i>	Araneidae
8.	Common horse fly	<i>Haematopota pluvialis</i>	Tabanidae
9.	Wasp	<i>Vespula vulgaris</i>	Vespidae
10.	Stink bug	<i>Tessaratoma javanica</i>	Tessaratomidae
11.	Bark eating caterpillar	<i>Indarbela quadrinotata</i>	Cossidae
12.	Leaf folders	<i>Pleotypeplus aprobola</i>	Crambidae
13.	Leaf eating weevils	<i>Myllocerus undecimpustulatus</i>	Curculionidae
14.	Fruit & shoot borer	<i>Conopomorpha sinensis</i>	Gracillariidae
15.	Loopers	<i>Perixera illepidaria</i>	Gracillariidae
16.	Mite	<i>Aceria litchi</i>	Eriophyidae
17.	Mealy bug	<i>Drosicha mangiferae</i>	Pseudococcidae



a. Litchi stink bug, *Tessarotoma javanica* b. Handmaiden moth, *Amata cyssea* c. Lady bird beetle, *Coccinella* spp.
d. Scale, *Drosicha* spp. e. Carpenter bee, *Xylocopa* sp f. European bee, *Apis mellifera* g. Litchi looper
h. Asian weaver ant, *Oecophylla smaragdina* predating on Ash weevil, *Myloecerus* spp.

Pollinators: The most significant pollinators on campus are the bees (Table 9). Both wild and managed honey bee species are present. *Apis dorsata*, the Giant Asian honeybee, often forms temporary hives on tall trees during litchi flowering – their swarms can be seen actively foraging on litchi panicles. *Apis cerana indica*, the Indian hive bee, is another native species that likely nests in tree hollows locally and visits flowers. NRCL also occasionally uses *Apis mellifera* (European honeybee) colonies placed in orchards to boost pollination – a practice shown to markedly increase litchi fruit set. In addition to honeybees, solitary bees (*Xylocopa* carpenter bees, leafcutter bees, etc.) and syrphid flies contribute to pollination of various flowers on campus. Butterflies and moths are abundant during certain seasons; for instance, the bright orange *Plain Tiger* (*Danaus chrysippus*) and *Common Mormon* (*Papilio polytes*) butterflies are frequently observed around flowering shrubs. They inadvertently transfer pollen while feeding on nectar. Even tiny thrips and ants play a role in pollinating some of the smaller flowers (e.g., some of the weed species or garden herbs).

Table 10. Different pollinators and floral visitors of litchi

Sl. No.	Common name	Scientific name	Order	Relative Abundance / Importance	Notes
1.	European honey bee	<i>Apis mellifera</i>	Hymenoptera	Most efficient (up to 35% visitation)	Principal pollinator in many regions
2.	Rock bee	<i>Apis dorsata</i>	Hymenoptera	High (up to 33% visitation; up to 50% in some)	Migratory, dominant in some regions

Sl. No.	Common name	Scientific name	Order	Relative Abundance / Importance	Notes
3.	Indian honey bee	<i>Apis cerana indica</i>	Hymenoptera	Moderate (up to 15% visitation)	Important native pollinator
4.	Little bee	<i>Apis florea</i>	Hymenoptera	Variable (7–37% visitation)	Sometimes most abundant
5.	Stingless bee	<i>Tetragonula iridipennis</i>	Hymenoptera	Minor (up to 9% visitation)	Also contributes to pollination
6.	Hoverflies	<i>Episyrphus balteatus</i> , etc.	Diptera	Minor (varies by region)	Syrphid flies visit flowers
7.	House fly	<i>Musca domestica</i>	Diptera	Minor	Occasional visitor
8.	Blow fly	<i>Lucilia sericata</i>	Diptera	Minor	Occasional visitor
9.	Ladybird beetle	<i>Coccinella septempunctata</i>	Coleoptera	Minor	Occasional visitor
10.	Butterflies & moths	Various	Lepidoptera	Minor	Occasional visitors

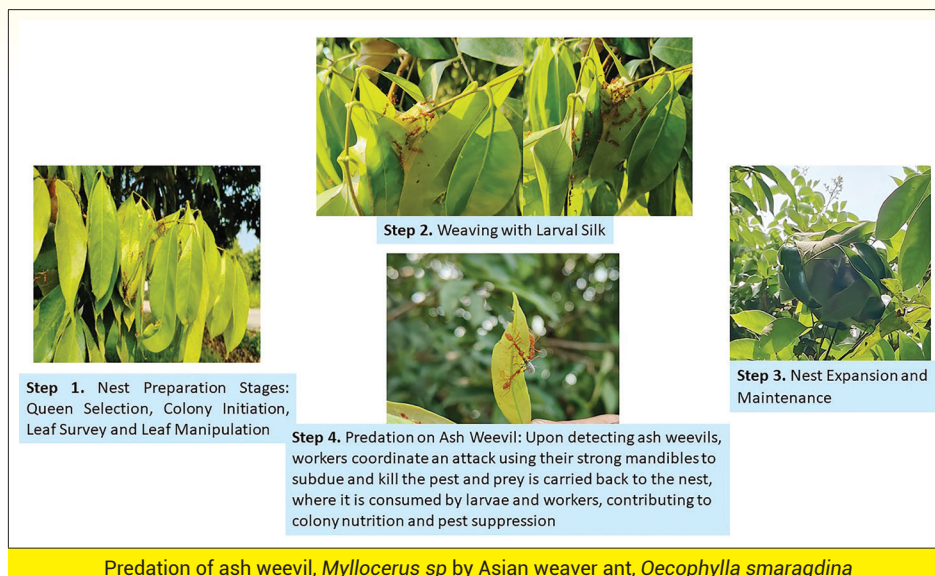
The Asian small hive beetle (*Aethina tumida*) is an invasive pest of honeybees (recently reported), that can cause significant damage in beekeeping units, were recently found in beekeeping units of ICAR-NRCL. The presence of Asian small hive beetle in ICAR-NRCL beekeeping units is likely due to a combination of weak colonies, poor apiary hygiene, damaged hive equipment, shaded hive placement, movement of infested materials, over-superning, insufficient monitoring, and broader environmental or globalization factors. Addressing these factors with strong colony management, regular cleaning, equipment maintenance, and strategic hive placement is essential for prevention and control.



Asian small hive beetle, *Aethina tumida* infesting honey bee colonies at ICAR-NRCL

Natural pest control agents: With minimal pesticide usage, the campus fosters a healthy community of insect predators and parasitoids. Apart from the birds and bats that eat insects, numerous insect predators patrol the crops: ladybird beetles feeding on aphids, lacewings whose larvae devour pests, predatory shield bugs, mantises, and predatory mites. Spiders (though not insects, they are arachnids) are extremely important – orb-weaver spiders (such as *Argiope* species, easily recognized by their large web with a zigzag stabilimentum) are commonly seen in the gardens and between crop rows,

capturing many flying pests. Ground spiders and hunting spiders help keep crawling insects in check. The diversity of spiders is a good indicator of low pesticide pressure and contributes to a natural equilibrium.



Decomposers and soil fauna: Equally crucial are insects like termites and dung beetles, as well as earthworms (segmented worms) in the soil. Termites at NRCL primarily feed on dead wood and leaf litter, accelerating nutrient recycling and improving soil structure with their tunneling – although they occasionally can attack weak live plants or wooden structures, in a healthy ecosystem their damage is balanced by their benefits to soil. *Odontotermes* species build subtle mounds and break down fallen logs, facilitated by the fact that organic mulches and manure are used on the farm. Earthworms have proliferated in plots where organic matter (compost, leaf litter) is ample; their castings enrich the soil and enhance its fertility and moisture retention. These soil invertebrates collectively support the soil food web and thereby the long-term sustainability of orchard productivity.

Mammals: The elusive ones

Large mammals are largely absent on the campus due to its size and fencing, but small mammals coexist with the farm environment. The most frequently encountered mammals are rodents. Field rats and mice (collectively referred to by *Rattus* spp. and *Mus* spp.) do occur, especially near grain storage or compost areas. Rodents form prey for many of the predators discussed (snakes, owls, etc.), keeping their numbers under natural check. The Five-striped Palm Squirrel (*Funambulus pennantii*) is a ubiquitous daytime mammal on campus. These squirrels scamper on tree trunks and open grounds, feeding on fallen fruits, seeds, and even insects. They often nest in palm crowns or building crevices. While they sometimes nibble on fruits or grains, their impact is minimal and they also aid in seed dispersal (burying seeds of trees like neem or acacia). They are a part of the natural scenery and an indicator of a green area (squirrels thrive where trees are plenty). Other mammals occasionally sighted include Indian Hare (in



early mornings on the lawns, nibbling grass) and small civets or mongooses at night (the Small Indian Mongoose is likely in the vicinity, which would help control snakes and rats – though direct evidence on campus is scant, one may infer presence from tracks or indirect signs). Bats (Order Chiroptera) certainly utilize the campus at night: insectivorous bats flit around streetlights catching moths, and fruit bats (Indian Flying Fox *Pteropus giganteus* or the smaller Short-nosed Fruit Bat *Cynopterus sphinx*) may visit litchi trees when fruits are ripe, aiding in pollination or seed dispersal unwittingly. These bats are important in controlling nocturnal insects and pollinating nightblooming flowers (like the dragon fruit cactus or kapok tree if present).

Though not directly observed, the proximity of the campus to rural landscapes means animals like jackals, jungle cats, or foxes could traverse the area at night. There was an unconfirmed report of a Golden Jackal (*Canis aureus*) sighting near the boundary during a quiet dawn – possibly attracted by rodents or looking for water. Such transient visits highlight the role of the campus as a green refuge. Domestic animals (not wildlife, but noteworthy) include occasional cattle or buffalo grazing along the perimeter (though not allowed inside research plots) and pet dogs of staff. These can influence wildlife – for example, free-ranging dogs might chase or harm wild animals; hence a strict control is maintained to not let feral dogs become established. Cattle egrets and mynas often follow the cattle, indicating an interesting commensal relationship benefiting birds. Overall, mammalian fauna on the campus is limited in diversity but still plays roles in the ecosystem's energy flow. Being mostly small and nocturnal/crepuscular, they often escape notice, yet their interactions (herbivory on plants, predation by snakes/owls, etc.) are vital. The ecological equilibrium observed – with prey (rodents) not overrunning the place thanks to predators, and herbivores (like hares or squirrels) not causing major damage and thanks to abundant plant resources and predation – is a microcosm of a healthy food web.

Table 11. Small mammals observed in NRCL

Sl. No.	Common name	Scientific name	Family
1.	Rabbit	<i>Lepus nigricollis</i>	Leporidae
2.	Mongoose	<i>Urva edwardsii</i>	Herpestidae
3.	Bat	<i>Barbastella barbastellus</i>	Vespertilionidae
4.	Cat	<i>Felis catus</i>	Felidae
5.	Dog	<i>Canis lupus familiaris</i>	Canidae
6.	Cow	<i>Bos taurus</i>	Bovidae
7.	Goat	<i>Capra aegagrus hircus</i>	Bovidae

Reptiles and amphibians

Reptiles and amphibians, though less conspicuous, form an integral part of the campus ecosystem, often acting as biological control agents for pests like rodents and insects. The term “silent guardians” is apt especially for snakes, which quietly keep rodent populations in check, and for frogs and lizards that devour insects. A variety of snakes

has been reported on the NRCL campus, reflecting a relatively healthy environment (snakes are usually shy and sensitive to disturbance, so their presence indicates good habitat quality).

Table 12. Reptiles and amphibians observed in NRCL

Sl. No.	Common name	Scientific name	Family
1.	Monitor lizard	<i>Varanus komodoensis</i>	Varanidae
2.	Rat/Mouse	<i>Rattus norvegicus</i>	Muridae
3.	Squirrel	<i>Callosciurus prevostii</i>	Sciuridae
4.	Bearded dragons	<i>Pogona vitticeps</i>	Agamidae
5.	Common krait	<i>Bungarus caeruleus</i>	Elapidae
6.	Spectacled cobra	<i>Ophiophagus hannah</i>	Elapidae
7.	Russell's viper	<i>Daboia russelli russelli</i>	Viperidae
8.	Saw-scaled viper	<i>Echis carinatus</i>	Viperidae
9.	Common water snake	<i>Nerodia sipedon</i>	Colubridae
10.	Indian rat Snake	<i>Ptyas mucosa</i>	Colubridae
11.	Indian rock python	<i>Python molurus</i>	Pythonidae
12.	Common wolf snake	<i>Lycodon capucinus</i>	Colubridae
13.	Red sand boa	<i>Eryx johnii</i>	Boidae
14.	Eastern rat snake	<i>Pantherophis alleghaniensis</i>	Colubridae



Snakes – The Silent Guardians of the Ecosystem

Aquatic animals and fish diversity: Hidden biodiversity in campus waters

Water bodies – no matter how small – are dynamic ecosystems that support a wide variety of animal life. The presence of ponds, irrigation channels, seasonal wetlands,

and low-lying waterlogged zones creates favorable microhabitats for several aquatic and semi-aquatic animal species. These include fish, amphibians, reptiles, aquatic invertebrates, and water birds, which collectively contribute to ecological balance, pest control, and biodiversity enhancement on campus. These species form part of a delicate aquatic food web and contribute significantly to maintaining water quality, ecosystem stability, and biological interactions with the surrounding terrestrial environment.



Lifeline of the landscape – the campus pond nurtures a thriving aquatic ecosystem in harmony with research activities



Grace in Motion – A Duck's Dance on Water

Benefits of Campus Biodiversity

The diverse flora and fauna of the NRCL campus confer numerous ecological, educational, and health benefits. As a microcosm of nature, the campus provides ecosystem services that support both the institute's research mission and the well-being of those who work or study here. Below, we outline key benefits, supported by scientific understanding:

Enhanced pollination and pest management

The variety of pollinators (bees, butterflies, birds) sustained by campus flowering plants directly benefits litchi and other crop productivity. Empirical research affirms that greater biodiversity ensures robust pollination services and natural pest control, leading to higher and more stable yields in agroecosystems. At NRCL, this is evidenced by improved fruit set in open-pollinated orchards and reduced pest outbreaks due to predatory insects and birds. In effect, the campus biodiversity acts as a living component of integrated pest management (IPM) and sustainable agriculture, reducing reliance on chemical inputs.

Soil fertility and nutrient cycling

A rich assemblage of plants (especially deep-rooted trees and legumes) and soil biota (earthworms, decomposer insects, fungi) contributes to the formation of fertile soil. Leaf litter from diverse trees decomposes at different rates, ensuring a steady release of nutrients. The presence of nitrogen-fixing species (e.g., legumes like *Cassia fistula* or *Saraca indica*) can improve soil nitrogen. Earthworms and termites physically mix and aerate the soil, enhancing its structure and water-holding capacity. All these factors improve the growing conditions for research crops and sequester carbon in soils, aligning with sustainable land management.

Microclimate regulation

Tree cover and vegetation mediate the local climate by providing shade, transpiring water, and breaking winds. On hot summer days, the shaded avenues and orchards can be noticeably cooler and more humid than the surrounding open areas, creating a more comfortable microclimate. This not only benefits plants and animals (reducing heat and water stress) but also humans working on the farm. It's part of ecosystem services that vegetation provides by mitigating extreme temperatures and improving air quality (plants capture dust and pollutants on their foliage).

Mental health and well-being

Access to green, biodiverse environments has proven positive effects on human mental health. Studies in urban ecology have found that exposure to natural green spaces can reduce stress, lower blood pressure and cortisol levels, and improve mood and cognitive function. The NRCL campus, with its pleasing landscape and wildlife, offers staff and visitors a restorative environment amid their work. Casual birdwatching during breaks or tending to the garden patches can alleviate stress and improve overall well-being. In essence, the campus biodiversity provides a natural therapeutic landscape that

complements the scientific workplace – a concept increasingly recognized as important for productivity and quality of life.

Educational and research value

The living biodiversity on site serves as an immediate educational tool. Students, interns, and visiting scientists can observe and learn taxonomy, ecology, and conservation first-hand. Instead of abstract classroom lessons, they can identify a real *Psidium guajava* tree or watch a *Dicrurus* catching insects. Such experiences deepen understanding and appreciation of biology. The campus can host biodiversity documentation exercises, species inventories, and even research on topics like plant-pollinator networks, biocontrol efficacy, or phenological studies (timing of flowering/fruitletting in relation to climate). These opportunities augment the institute's profile as not only a crop-specific center but also a promoter of agrobiodiversity research.

Ecosystem services and sustainability

Broader ecosystem services provided by campus biodiversity include water regulation (vegetation slows runoff, enhancing groundwater recharge and reducing soil erosion during heavy rains), carbon sequestration (biomass of trees and longlived perennials stores carbon, contributing to climate change mitigation in a small yet meaningful way), and genetic reservoir (the campus maintains local varieties and wild relatives of fruit species, which is important for genetic diversity in breeding programs). Biodiversity underpins these services; for example, a mix of plant species at different canopy layers intercepts rain and anchors soil better than a monoculture, and a variety of root depths ensures efficient use of soil nutrients and water. The campus thus functions as a model of an agroecosystem where productivity and biodiversity go hand-in-hand.

In summary, the NRCL campus demonstrates that biodiversity and human enterprise can coexist beneficially. The benefits range from tangible agricultural gains to intangible improvements in quality of life and knowledge. This reinforces the imperative that conserving biodiversity is not an isolated environmental concern but a foundation for resilient and sustainable agricultural systems and human health. By valuing and actively managing its flora and fauna, NRCL is effectively future-proofing its research environment against ecological.





Conservation and Ecological Stewardship

The ICAR–NRCL has shown a strong commitment to environmental stewardship on its campus. Several practices and initiatives underline how conservation is integrated into daily operations and long-term planning:

Eco-friendly land management

Chemical pesticide use is deliberately minimized. Instead, organic practices are emphasized – such as the use of compost and vermicompost for soil fertility, neem-based bio-pesticides for pest deterrence, and trap crops or pheromone traps for pest monitoring. This approach protects non-target organisms like pollinators and soil fauna, thereby maintaining biodiversity. Regular maintenance of a green cover (cover cropping, mulching) ensures soil is not left barren, providing continuous habitat for organisms and preventing erosion.

Habitat protection and enhancement

Key habitat features are preserved. Old trees (even if not commercially important) are retained as they provide nesting hollows for birds and bats. A small patch of native vegetation is allowed to regenerate in one corner as a biodiversity refuge. The campus pond is maintained with some fringe vegetation to support aquatic life (contrasting with many farms that might fill in wetlands). In plantings, care is taken to include flowering plants throughout the year to provide continuous resources for pollinators. Even “insect hotels” or wooden logs are left in certain spots to serve as nesting sites for solitary bees and shelter for reptiles. These actions are low-cost but high-gain for biodiversity.

Awareness and training

NRCL conducts or participates in workshops on agro-biodiversity, Integrated Pest Management (IPM), and pollinator conservation for farmers, students, and staff. By sharing knowledge on the role of predatory insects, birds, and bats in agriculture, the institute helps dispel misconceptions (e.g., indiscriminate fear of all snakes, or viewing all insects as pests) and promotes coexistence strategies. Demonstrations, such as how to set up a beehive in litchi orchards or how to identify beneficial insect larvae, empower stakeholders to adopt biodiversity friendly farming in their own operations.

Monitoring and documentation

The centre encourages periodic biodiversity surveys. Some staff and research scholars maintain checklists of bird sightings, flowering calendars, and wildlife photographs. Though not yet a formal scientific monitoring program, these efforts create a baseline inventory. Plans are in place to develop a digital database of campus biodiversity observations. This could be linked with national portals (like India Biodiversity Portal) to contribute citizen-science data from NRCL. Over time, such data allow tracking of changes in species abundance or the arrival of new species (e.g., noting if any species declines or if any invasive species become problematic), which is valuable for adaptive management.

Collaboration with environmental institutions

There is scope for collaboration with local universities or the Wildlife Institute of India for expert guidance on biodiversity audits. For example, engaging herpetologists to train staff in snake handling or bat specialists to advise on roost conservation can enhance in-house capacity. The campus has thus far been self-sufficient in its conservation measures, but opening it as a “field lab” for academic studies (bird banding, insect surveys) would further strengthen its conservation profile.

Legal compliance and protection

NRCL abides by wildlife protection laws – no hunting or trapping is allowed on campus. The security staff are instructed to protect wildlife; any rescued animal (like a snake caught in a building) is safely released back into appropriate habitat. The campus essentially acts as a safe zone for flora and fauna that might be at risk outside (for instance, tree felling and wetland draining are common outside, but not within NRCL). This sanctuary-like status, albeit small, contributes to the survival of those species locally. One visible outcome of these conservation-oriented practices is the synergistic relationship between research and ecology at NRCL. The healthier the ecosystem, the better the research outcomes have been – for example, pollination success in experiments, or reduced pest interference in trials. This provides a compelling case study for advocating biodiversity conservation in all agricultural research stations and farms. By treating the entire campus as an integrated agroecosystem to be managed sustainably (rather than just isolated experimental plots), NRCL aligns with modern agroecological principles that enhance long-term resilience and productivity.



Conclusion

The ICAR–National Research Centre on Litchi (ICAR-NRCL), while primarily dedicated to advancing scientific research and development in litchi cultivation, exemplifies how a research institution can evolve into a model of ecological harmony. This technical bulletin has sought to document the remarkable biodiversity thriving within its 100-acre campus – a unique landscape where scientific infrastructure, cultivated orchards, ornamental gardens, aquatic habitats, and wooded areas coalesce into a vibrant living ecosystem.

The extensive inventory of plant and animal life – including fruit crops, ornamental trees, medicinal herbs, aquatic vegetation, pollinators, birds, reptiles, mammals, and fish – underscores the campus's role as a microcosm of natural diversity. From the rustling canopy of native trees to the subtle stirrings in pond waters, every layer of this landscape plays a functional role in maintaining ecological balance. This biodiversity is not incidental; it is the result of conscious decisions to preserve green spaces, minimize chemical use, encourage organic farming practices, and promote agro-ecological integration.

The benefits of such a rich biodiversity base are manifold:

- Enhanced ecosystem services such as pollination, pest control, soil fertility, and water purification
- Natural resilience against environmental stress and climate variability
- Educational and research value, providing a real-world classroom for students, scientists, and farmers
- Mental and physical well-being for campus dwellers, through access to green, natural spaces

Importantly, the documentation of biodiversity at ICAR-NRCL is not just an academic exercise – it is a call to action. As agricultural landscapes across the country face increasing pressure from urbanization, monoculture practices, and environmental degradation, there is an urgent need to reintegrate biodiversity into mainstream research and development agendas. NRCL's efforts provide a replicable model for how biodiversity conservation can be meaningfully woven into the operational fabric of agricultural institutions.

Moving forward, it is imperative to not only conserve but also actively monitor and enrich this biodiversity. Creating butterfly gardens, bird shelters, wetland buffers, and herbal plant trails could further enhance the ecological and outreach potential of the Centre. Regular biodiversity audits, awareness campaigns, and farmer field schools on ecological farming can amplify the impact of these efforts.

In conclusion, the flora and fauna of ICAR-NRCL are not merely incidental companions to science – they are collaborators in a shared journey toward sustainable agriculture. By valuing and protecting this hidden gem of biodiversity, we not only preserve our natural heritage but also lay the foundation for a resilient, inclusive, and ecologically sound future.



Way Forward and Recommendations

To build on the achievements and address remaining gaps, the following steps are recommended for NRCL and similar campuses:

Regular biodiversity documentation and database creation

This could involve seasonal surveys of different taxa (birds, insects, plants) and the use of digital tools (a campus biodiversity mobile app or participation in citizen science platforms) to record sightings. Over time, data can be analyzed to compute biodiversity indices (e.g., Shannon Diversity Index) and detect trends. A published flora and fauna compendium of the campus could be updated annually, providing a reference for researchers and visitors.

Habitat mapping using GIS

Leverage Geographic Information Systems (GIS) to create a detailed habitat map of the campus, delineating orchards, scrub, water bodies, etc. This map can be layered with species observation data to identify biodiversity “hotspots” on campus or critical habitats for certain species. Such spatial analysis will aid in targeted management – for example, knowing where a rare plant patch is or where snakes are frequently seen can guide protective measures. GIS-based monitoring also allows visualization of changes over time (e.g., tree cover increase or decrease).

Enhancement of key habitats

Based on survey feedback, take measures to enrich habitats. If pollinator diversity is dropping, consider establishing pollinator gardens with native flowers. If certain bird species lack nesting sites, install nest boxes (for owls, passerines) at appropriate locations. Create small brush piles or rock piles at the fringes as shelter for hedgehogs, mongooses, or reptiles. Ensure the pond has a shallow gradient at parts for wading birds and frogs. Introduce host plants for butterflies (like planting citrus for Lime Swallowtails, milkweeds for Danaiine butterflies) to encourage their life cycles.

Pollinator conservation program

Develop a formal program focusing on bees and other pollinators. This can include maintaining bee boxes on campus (with *Apis cerana* or stingless bees), training staff in basic beekeeping, and planting bee-forage species (e.g., sunflowers, basil, cosmos) along field margins. Collaboration with entomologists could help identify and multiply native pollinator species. Public outreach can be done on World Bee Day or similar occasions to highlight pollinators' role in litchi yield, supported by research that shows improved fruit quality with bee pollination.

Integrated pest and pollinator management (IPPM)

Align pest management with pollinator safety. For instance, schedule any necessary spraying (even of biopesticides) at times when bees are least active, to avoid harm.



Prioritize biological controls – e.g., releasing *Trichogramma* wasps for caterpillar control – and create awareness that some “weeds” might be necessary for harbouring pest enemies (a strip of wild vegetation can host ladybugs that later move to crops). By integrating pest and pollinator management, the campus can serve as a showcase for new paradigm of farming where conservation and production goals synergize.

Monitoring migratory and indicator species

Pay special attention to any migratory species (birds, butterflies) that use the campus during certain seasons. For birds, participate in national migratory bird counts or Asian Waterbird Census if applicable (for water birds). These species are often indicators of broader environmental health. Similarly, track indicator species like amphibians (sensitive to pollution) or orchids (if any wild orchids are present, they indicate microclimate stability). The continued presence or return of these species each year can be a metric of success for campus conservation efforts.

Awareness and capacity building

Continue and expand training programs for both staff and local farmers on biodiversity-friendly practices. Perhaps create a small interpretation center or trail on campus highlighting interesting species and their roles (a self-guided nature trail with signboards describing the banyan tree ecosystem or a demonstration of bat houses). This will sensitize everyone to the idea that the campus is not just a workplace but an ecosystem that needs nurturing. Encourage staff or students to take ownership as “biodiversity ambassadors” for different sections (e.g., someone responsible for monitoring the pond life, another for the butterfly garden, etc.).

Collaboration and research integration

Integrate biodiversity data with ongoing research. For example, when analyzing litchi yield data, also consider pollinator activity data to draw correlations. Encourage research projects (M.Sc./Ph.D.) that utilize the campus: topics could be “Assessment of beneficial insect diversity in organic vs. conventional litchi orchards” or “Role of birds in controlling litchi fruit borer pests”, etc. By publishing such studies, NRCL can contribute to the scientific literature on agro-biodiversity. Seek collaborations with ecology departments or NGOs to get expert input on managing less-understood groups (herpetologists for snake management plans, botanists for controlling invasives like *Parthenium* in eco-friendly ways).

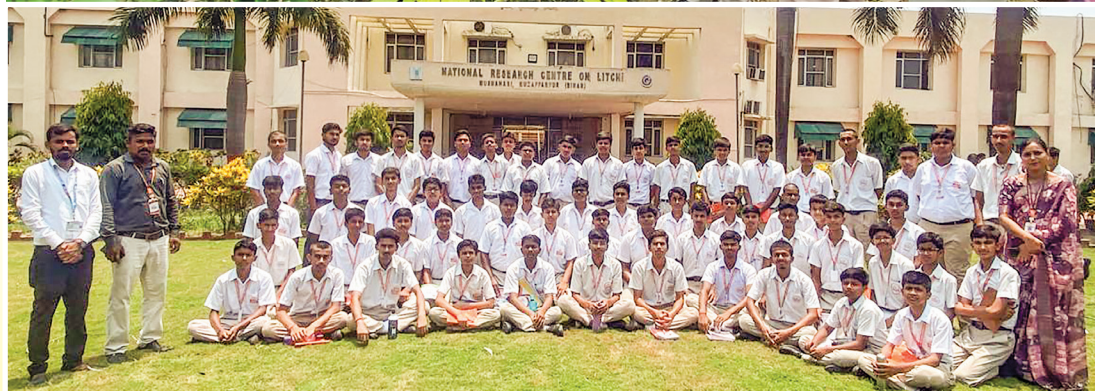
Conservation of threatened species

If any species on campus is identified as threatened (e.g., the Indian Rock Python sighting, or perhaps any rare plant that emerges), formulate a mini conservation plan. This could mean ensuring the python, if resident, has safe passage (like raising awareness so nobody harms it, and ensuring its prey base is abundant), or propagating the rare plant in multiple spots to secure its presence. Coordinating with local wildlife authorities for rescue-release protocols, especially for snakes and mammals that wander in, will also reinforce conservation outcomes beyond campus boundaries.

Community outreach

Leverage the campus as a green space to involve the community. School children could be invited for nature walks on environment day, or local birding groups could help in bird counts. Demonstrating to the community that biodiversity can thrive alongside farming might inspire replication in home gardens and farms. It also builds goodwill and recognition for NRCL as an environmentally conscious institute.

By pursuing these steps, NRCL can not only preserve but enhance its biodiversity legacy. Such proactive stewardship will ensure that the “hidden gem of biodiversity” continues to sparkle and provide value for generations to come – scientifically, ecologically, and culturally. The experience at NRCL reinforces a broader lesson: agricultural research stations can double as conservation zones, and in doing so, they secure a sustainable future for both science and nature.



Plantation by Dignitaries: Strengthening Green Commitments at NRCL

Tree plantation is not only a symbolic gesture of commitment to environmental sustainability but also a tangible contribution to enhancing the green cover and ecological health of a research campus. At ICAR–National Research Centre on Litchi (ICAR-NRCL), visiting dignitaries – including senior officials from ICAR, policy makers, scientists, administrators, and delegates from national and international organizations – have regularly participated in tree plantation activities as part of their official visits. These plantation events reflect NRCL's broader vision of "Science with Sustainability" and are strategically planned to diversify the flora of the campus. Species selected for plantation include native forest trees, fruit trees, shade trees, and ornamental plants, carefully chosen for their ecological, aesthetic, and cultural value.



Shri Vijay Kumar Sinha, Hon'ble Deputy Chief Minister & Minister of Agriculture, Govt. of Bihar planted pink Mussaenda (*Mussaenda philippica*) on 17th May 2025. (Photo credit: Mr. Shyam Pandit)



Dr. Mangi Lal Jat, Secretary, Department of Agricultural Research and Education (DARE) and Director General, Indian Council of Agricultural Research (ICAR) planted Norfolk Island pine (*Araucaria heterophylla*) on 17th July 2025. (Photo credit: Mr. Shyam Pandit)



Dr. Himanshu Pathak, Secretary, Department of Agricultural Research and Education (DARE) and Director General, Indian Council of Agricultural Research (ICAR) planted Pink (Dwarf) *Syzygium myrtifolium* on 27th February 2023. (Photo credit: Dr. J. P. Verma)



Dr. Trilochan Mohapatra, Secretary, Department of Agricultural Research and Education (DARE) and Director General, Indian Council of Agricultural Research (ICAR) planted Pink (Dwarf) *Syzygium myrtifolium* on 06th November 2021. (Photo credit: Dr. J. P. Verma)



Shri Chhabilendra Roul, Additional Secretary, Department of Agricultural Research and Education (DARE) and Secretary, Indian Council of Agricultural Research (ICAR) planted Litchi on 12th September 2018. (Photo credit: Dr. J. P. Verma)



Dr. A. K. Singh, DDG (Horticultural Sciences) Indian Council of Agricultural Research (ICAR) planted a tree on 01st December 2018. (Photo credit: Dr. J. P. Verma)



Dr. Bikash Das, Director and other staff of the ICAR-NRCL planted Neem (*Azadirachta indica*) on 29th August 2024 on the occasion of the campaign "Ek Ped Man Ke Naam". (Photo credit: Mr. Rohit Kumar)



भा.कृ.अनु.प.-राष्ट्रीय लीची अनुसंधान केन्द्र ICAR-NATIONAL RESEARCH CENTRE ON LITCHI

मुशहरी प्रक्षेत्र, मुशहरी, मुजफ्फरपुर-842002 (बिहार)
Mushahari Farm, Mushahari, Muzaffarpur - 842002 (Bihar)

