

REPORT OF GREEN CAMPUS AUDIT



Submitted to

Dr.N.G.P.ARTS AND SCIENCE COLLEGE
Coimbatore – 641 048, Tamil Nadu, India.

Date of Audit: 01.11.2021 (Monday)

Submitted by



NATURE SCIENCE FOUNDATION
*(A Unique Research and Development Centre
for Society Improvement)*



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1. Introduction

Green campus is an area of the Organisation or the Organisation as a whole itself contributing to have an infrastructure or development that is structured and planned to incur less energy, less water, less or pollution free, less or no CO₂ emission (Aparajita, 1995). Green Campus Audit is a tool of the environment management system which is used methodologically for protection and conservation of environment and sustenance of the ecosystem. Green campus constitutes the environmental friendly practices and education combined to promote sustainable and eco-friendly practices along with user-friendly technology in the campus. It creates environmental culture, develops sustainable solutions to environmental problems and provides solutions to various social and economic needs (APHA, 1981). It provides the concept of Green building and oxygenated building which in turn provides a healthy atmosphere to the stakeholders.

Green Campus Audit ensures the Organization's campus should be greenish with large diversity of trees, herbs, shrubs, climbers and lawns to reduce the environmental pollution and soil erosion, also useful for biodiversity conservation, landscape management, proper water irrigation, natural topography and vegetation (Gowri and Harikrishnan, 2014). The maintenance of an eco-friendly campus ensures a neat and clean environment. For the benefit of stakeholders, solid state management, recycling of water, disposal of sewage and waste materials including electronic and biomedical wastes, plastic use, etc. should be followed consistently in the organization campus.

Green Campus Audit procedures includes the definition of green audit, methodology on how to conduct Green audit at Educational Institutions and Industrial sectors as per the checklist of Environment Management Systems and International Standards on ISO 14001:2015, Indian Green Building Council, Swachh Bharath Scheme under Clean India Mission to understand the principles and importance of various audits in the context of the organization and risk assessment at 360° views (Gnanamangai *et al.*, 2021). It analyses to help the educational institutions and industries to maintain eco-friendly environment and personal hygiene to various stakeholders and supports the nation as a whole for the noble cause of environmental protection and nature conservation which in turn enhances the quality of life to all living beings (Arora, 2017).

2. Role of Educational Institutions in India

Educational institutions are playing important role in a nation's growth and development which starts from maintenance of green campus without harming the environment. A clean and healthy environment in an Organization determine effective learning and provides a conducive learning environment to the students. Educational institutions are asked both Central and State Governments to give eco-friendly atmosphere to the stakeholders. In addition, all the Educational institutions are asked to save the environment for future generations and to solve the environmental problems such as recycling of solid wastes and wastewaters, plastics usage, napkin disposal water consumption, water harvesting and storage mechanisms, etc. through Environmental Education. Implementing Swachh Bharath Abhiyan Scheme launched by the Indian Government plays by the Educational institutions plays a major role in terms of giving

neat and clean environment to tribal, rural and urban people across the country, besides, the regular and conventional activities carried out by NSS, NCC, Nature club, Eco club, Science club, Fine Arts club, Flora and Fauna club, You Red cross unit, etc. Seminar, Conference, Workshop, training and awareness programmes on Biodiversity conservation education, environmental awareness programmes, etc. may be conducted periodically by the Management and Administrative people of an Organization to the stakeholders.

Green campus auditing is a systematic process whereby an organization's environmental performance is checked against its environmental policies and compliances of the Government guidelines. This audit process is definitely useful for the Educational institutions to maintain the campus neatly and can give pure atmosphere to the students and staff members including Management people. It is like an official examination of the environmental effects on an organization's campus as per the Government guidelines. The audit report may be useful to improve the organization's campus significantly by following the recommendations and suggestions given in the report.

3. Green Campus and Environment Policy

The green campus and environment policy aims to provide an education and awareness in a clean and green environment to the stakeholders with regards to environmental compliance. The scope of this policy applies to all employees and students of the Institution to provide an ecofriendly atmosphere. Policy making dealt with cleanliness on the campus is maintained through proper disposal of wastes and steps taken to recycle the biodegradable wastes. Utilization of eco-friendly supplies and an effective recycling programme to maintain the campus free from hazardous wastes. The concept of eco-friendly culture is disseminated among the students as well as rural community through various awareness programmes, seminars / conferences, reuse and recycle the waste materials. Attempts is made to limit energy usage and also replace non-renewable energy sources with renewable energy sources. The Head of the Organization, Department Heads and Senior Managers including Management Representatives are responsible for monitoring the go green initiatives of the College / University and maintain a clean/green campus. In addition, the staff and student volunteers from Nature club, Eco clubs, Science club, Fine Arts club, Youth Red cross unit, NCC and NSS units are also responsible for the implementation of the green campus and environment policy in the Organization.

4. Environment Friendly Campus

The organization is responsible to provide an eco-friendly atmosphere to the stakeholders along with making good drinking water facility to the students and staff members. The organic manure, cow dung, farmyard manure and vermicompost for the cultivation of plants should be adopted. All non-compostable, single-use disposable plastic items, single-use plastic utensils, plastic straws and stirrers should be avoided. Education on the commitment to plastic-free alternatives for all incoming and current students, staff and faculty should be undertaken. Reduction of use of papers alternated with e-services and e-circulars, etc. and proper disposal of wastes, recycling and suitable waste management system should be taken into consideration.

5. Aims and Objectives of Green Campus Audit

- To recognise the initiatives taken towards the green campus by means of gardening by the Organization.
- To identify and provide baseline information to assess threat and risk to the ecosystem due to Organization development.
- To recognise and resolve different environmental threats of the Organization.
- To grow a large number of oxygen producing and carbon-di-oxide absorbing plants in the campus to give a pure atmosphere to the stakeholders.
- To ensure proper utilization of resources available in the surrounding areas towards future welfare of the community.
- To set a procedure for disposal of all kinds of wastes and use green cover as a carbon sink for pollution free air.
- To assess the greenish nature of an Organization campus in terms of trees, herbs, shrubs, climbers, vines, lianas, lawns and reflected in reducing the environmental pollution soil erosion, biodiversity conservation, landscape management, natural topography and vegetation.

6. Scope and Goals of Green Auditing

The Management of the Organization (Auditee) should be shown their inherent commitment towards making ecofriendly atmosphere through the green auditing and ready to encourage all types of green activities. They should promote all kinds of green activities such as conduct of environment awareness programmes, campus farming, planting trees, maintenance of greening, irrigation, use of biofertilizers and avoidance of chemical fertilizers and agrochemicals on the campus etc., before and after the green auditing. The management should formulate 'Green and Environment Policies' based on green auditing report. A clean and healthy environment should enhance an effective teaching and learning process and provides a conducive learning environment to the stakeholders. They should create the awareness on the importance of environment through environmental education among the student members. Green Audit is the most efficient and ecological way to manage environmental problems.

Green campus audit may be beneficial to the campus in improving the greenery activities which in turn useful to save the planet for future generation. Green campus audit is a kind of professional care and a simple indigenized system about the environment monitoring in terms of planting a large number of trees which is the responsibility of each and every individual who are the part of economical, financial, social, environmental factors. It is necessary to conduct green audit frequently at least once in three years in campus because students and staff members should aware of the green audit and its advantages to save the planet by means of 'Go green concept' and help the institution to set environmental examples for the community, and thereby to educate the young learners. Green audit is a professional and useful tool for an Organization to determine how and where they are maintaining the campus eco-friendly manner. It can also be used to implement the mitigation measures is a win-win situation for all the stakeholders and the planet. It gives an opportunity for the development of ownership, personal and social responsibility for the stakeholders.

7. Benefits of the Green Auditing

There are several benefits on conduct of green audit by the Organization which may be definitely useful to improve the campus significantly after receiving the report of audit. The green campus audit contained methodology followed and both qualitative and quantitative measurements including physical observation of greeneries in terms of growing of terrestrial and aquatic plants, animals and microflora in the campus. The natural and planted vegetation and their maintenance are also considered in the organization campus through topography, landscape management design and soil erosion control in environment sustainable development. The following are the major benefits of the green auditing.

- Know the status of development of internal and external Green campus audit procedures and implementation scenario in the Organization.
- Establishment of Green campus objectives and targets as on today as per the 'Green and Environment Policy', 'Indian Biodiversity Act' and 'Wildlife Protection Act' of the Ministry of Environment, Forests and Climate Change, New Delhi and World & Indian Green Building Council concepts.
- Assigning the roles and responsibilities of Environmental Engineer and Agriculture Staff to give to improve green initiatives.
- Development of ownership, personal and social responsibility for the Organization and its environment and developing an environmental ethic and value systems to young generations.
- Enhancement of the Organization profile and reach the global standards in proving the green campus and eco-friendly atmosphere to the stakeholders
- Improving the drinking water / RO water / Borewell water / Open well water / Pond water / Municipal or Corporation water quality through the analysis of Physico-chemical properties of water.
- Creation of wastewater treatment facility and solid waste management provision in the campus for recycling of wastewater and solid wastes to minimize the air, water and soil pollution.
- Suggested of availability of Biogas plant to the management to restrict the usage of fossil fuel in cooking purposes.
- Implementing status of the rain harvesting system, water reservoirs, etc. in the campus to increase the ground water level.
- Establishment of terrace garden, herbal garden, kitchen, zodiac, ornamental gardens, etc. for enhancing teaching and learning and commercial exploitation.
- Treated water consumption towards plant cultivation, canteen, hostel, machinery cleaning, transport, toilet use and etc. on water consumption and per capita water consumption per day calculation.
- Studying the campus flora by making a complete data on total number of both terrestrial and aquatic plants, herbs, shrubs, climbers, twigs and grasses.
- Survey of campus fauna by conducting the number living and visiting animals, insects, flies, moths and worms in the campus.
- Documentation of the number of oxygen producing and carbon dioxide absorbing plants planted in the campus to give pure atmosphere to the stakeholders.
- Operation of water irrigation, drip and sprinkler irrigation methods to improve the green campus.

- Studying the biodiversity conservation through Life Sciences and Biological Sciences people to conserve economically important, rare and endangered plant and animal species in the campus ecosystem.
- Recommendation in use of biofertilizers, organic and green manures, cow dung manures and farmyard manures for the cultivation of plants to protect the environmental health
- Conduct of outreach programmes for dissemination of Green Campus motto and Green pledge initiatives to rural, tribal and urban people through Eco club, Nature club, Science club, Fine Arts club, Youth Red Cross unit, NCC and NSS bodies.
- Academic credentials like major and minor Projects, Dissertations and Thesis work on green campus, environment protection and nature conservation by the students and staff members.
- The plants available in the campus must be tagged with their common name and Botanical name for the stakeholders to impart the knowledge on medicinal and ornamental, economic and food values of plant varieties.
- MoU may be signed with Government and non-Governmental Organizations (NGOs) to utilize the resources for nature conservation and environmental protection.
- Implementation of Government schemes (Swachh Bharath Abhiyan under Clean India Mission) to give pure and safe water to rural people and teach the importance of cleanliness of toilets and restrooms.
- Conduction of awareness programmes and cultural activities on global warming, environmental changes and ecosystem maintenance to the stakeholders.
- Steps taken for organic, inorganic, toxic, e-waste, biomedical, food, sewage waste management, segregation of wastes and reuse methods.
- Public transport, low-emitting vehicles and control of car smokes and exhaust towards carbon accumulation in the campus by carbon footprint studies.
- Implementation of advanced methods for watering plantations (Drip irrigation, Sprinkler irrigation, etc.) and use of metering for water utility, IoT based watering, automation, water device, remote water lines, etc.
- Percentage of Organization's budget for environment sustainability efforts and green campus initiatives planning and efforts.
- Campus facilities for disabled, special needs and or maternity care including security, safety and health infrastructure facilities for stakeholder's wellbeing.
- More efficient resource management, provide basis for improved sustainability and creation of plastic free campus to evolve health consciousness among the stakeholders.
- Impart environmental education through systematic environmental management approach and improving environmental standards by making a benchmark for environmental protection initiatives
- Best practices followed on green campus initiatives in the Organization listed and disseminated among the stakeholders.
- Recommendations for improving the green initiatives, planning and efforts in the campus after audit report to improve further.

8. About the Organization

Dr.N.G.P Arts and Science College was established by the Kovai Medical Center Research and Educational Trust Coimbatore in 1997. The college incepted its educational journey with 4 Under Graduate Programmes and today it is emerged as one of the major academies in self-financing institutions in Tamil Nadu, India.

The college conferred with the autonomous status in 2015-2016 by the UGC and is affiliated to Bharathiar University, Coimbatore. The College was accredited by the NAAC with 'A' Grade in the second cycle. Our college is consecutively ranked at the national level within 100 ranks by NIRF and currently at 59th position in India.

The college, at present offers 31 UG, 16 PG and 13 M.Phil. & 12 Ph.D. programmes, 04 PG Diploma, 07 Diploma and 05 Certificate Programmes under 33 well established departments through six variant faculties. Our college has an intellectual capital of more than 332 academically well experienced teaching fraternity amongst 179 faculty members are doctorates and they cater to the needs of 6694 students on roll. The primary principle of the college is to impart standard education together with discipline and moral values in order to make the students efficient, skilled, and innovative and adopt themselves in the digital global arena.

Dr.N.G.P Arts and Science College is maintaining more green cover area and open unutilized landfills zone after building construction as per the guidelines of World Green Building Council, Indian Green Building Council, Environmental Regulations and Compliances.

8.1. Dr.N.G.P. Arts and Science College Campus details

S.No.	Details of Area	Total area
1.	Total Campus area	7.41 acres
2.	Total Built up area	5,74,175 sq. feet
3.	Covered Car parking area	46,000 sq. feet
4.	Air-conditioned area	36,772 sq. feet
5.	Non-Airconditioned area	5,37,403 sq. feet
6.	Gross Floor area	5,74,175 sq. feet
7.	Public area	82,672 sq. feet
8.	Service area	82,672 sq. feet
9.	Forest vegetation	--
10.	Planted vegetation	81,700 sq. feet

8.2. Dr.N.G.P. Arts and Science College Campus- Bird's eye view



9. Audit Details

Date / Day of Audit	:01.11.2021 (Monday)
Venue of Audit	:Dr.N.G.P Arts and Science College Coimbatore - 641 048, Tamil Nadu, India.
Audited by	:Nature Science Foundation, Coimbatore - 641 004, Tamil Nadu, India.
Audit type	:Green Campus Audit
Name of ISO EMS Auditor	:Mrs. S. Rajalakshmi, Chairman, ISO QMS & EMS Auditor, NSF.
Name of Lead Auditor	:Dr. R. Mary Josephine, Board of Directors & Botanist, NSF.
Name of Subject Expert-I	:Dr. D. Vinoth kumar, Joint Director & Biotechnologist, NSF.
Name of Subject Expert-II	:Dr. V.S. Ramachandran, Professor (Retired) in Botany, Bharathiar University, Coimbatore.
Name of IGBC AP Auditor	:Dr. B. Mythili Gnanamangai, IGBC AP, Indian Green Building Council.
Name of ASSOCHAM Auditor	: Er. Ashutosh Kumar Srivastava, Associated Chambers of Commerce and Industry
Name of Eco & Green Officer	: Ms. S. Sowndharya, Eco & Green Council Programme Officer, NSF.



10. Procedures followed in Green Campus Audit

Green campus audit is a structured process of documenting the credentials in terms of number of trees, herbs, shrubs, lawns, climbers and lianas reflected in reducing the environmental pollution and soil erosion and useful for biodiversity conservation, landscape management, natural topography and vegetation. It is a kind of a professional tool for assessing the green campus. Green audit projects the best environmental practices and initiatives taken in the organisation at the prescribed site of audit that brings added value to the organisation in maintaining the eco-friendly campus to the stakeholders. The first step of the audit is ensuring that the organisation has a central role in building the green campus, in order to validate the same (Adeniji, 2008).

Green campus is not intended for the self-sustainability of the building alone, it also involves in propagation of the green campus initiatives so as to be adopted by any individuals and organization at a minimum cost. Green campus audit has been conducted as per the checklist of Nature Science Foundation, Coimbatore, Tamil Nadu, India (www.nsfonline.org.in) through the authenticated Professionals for people qualified to investigate and evaluate the campus for validating the best environmental practices. Professional team of ISO Environment Management Audit (14001:2015), Indian Green Building Council Accredited Professionals, Experts of Green campus Lead Auditors and Botanists / Zoologists / Biotechnologists were selected to conduct the Green campus audit process.

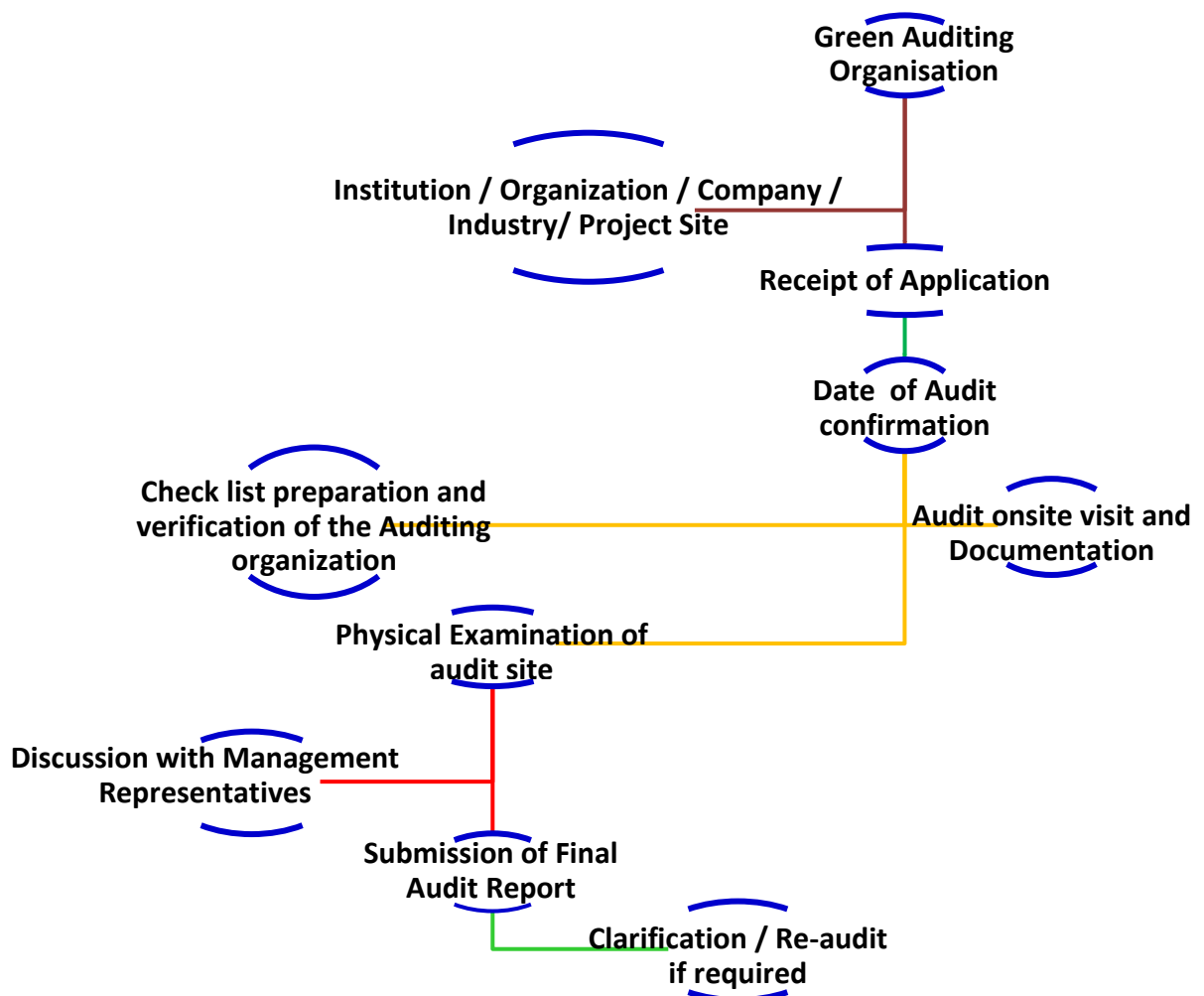
During the audit, the nature of plants and animals / birds species present in the campus were recorded. Establishment of lawns, trees, herbs, shrubs and climbers and establishment of terrace / kitchen / herbal / zodiac / ornamental / medicinal garden in the campus were recorded. Labelling of common names and Botanical names of plants were observed. The operation of the water irrigation system, drip and sprinkler irrigation methods and use of recycled water for irrigation purpose or any other purpose in the campus area were noted. The number of water wells, bore wells and water reservoir facilities in the campus were also noted as per the Audit Manual of Gnanamangai *et al.* (2021).

Attempts made for water scarcity during summer season towards the maintenance of plants and frequency of watering for plantations in the campus were noted. Biodiversity conservation education, projects, awareness programmes, etc., through Indian Biodiversity Act and Ministry of Environment, Forests and Climate Change, Government of India and the conduct of outreach programmes for dissemination of Green campus motto were recorded (Venkataraman, 2009). Conduct of outreach programmes for dissemination of Green campus motto to the students and staff members including public domain and signing of MoU with Government and Non-Governmental Organizations to ensure green campus activities for future generation were noted. Technology driven solutions initiated by the Green campus organization can also be disseminated and documented successively for propagating the attitude of the Green campus in wider masses.

Projects, Dissertations and Thesis are the academic effort credentials that always fosters the innovative ideas on thinking and implementation of new innovative approaches towards the green campus. These should be disseminated through presentations and publications in social media, books, magazines and journals so as to spread the innovative ideas and methods to the broad public. These efforts taken by the students and staff were deliberated while conducting the Green campus audit. Green audit processes are taking place as per the following flow-chart starting from the receipt of application forms from the auditee (organization) and ending upon the submission of final report to the concerned organization within 15 days. During the audit process, the best environmental / greenery practices followed and new initiatives undertaken in the organisation to reduce the environmental pollution and steps taken for nature conservation that brings added value to the organisation in maintaining the eco-friendly

campus to the stakeholders were assessed (IGBC, 2021; WGBC, 2021). In addition, the role of students and staff members in supporting the vision and mission of the greenery activities of the Organization is also assessed.

The purpose of the green audit is to ensure that the practices followed in the campus are in accordance with the Green and Environment Policy developed by the Government and private agencies working with environment sustainable development adopted by the institution. The criteria, methods/procedures, checklists and recommendations used in the audit were based on the identified risks. The methodology includes: preparation and filling up of questionnaire along with checklists, physical inspection of the campus, observation and review of the document, interviewing responsible persons and data analysis, measurements and recommendations. The methodology adopted for this audit was a four step process comprising of data collection, data analysis, best practices followed in the campus and recommendations and suggestions given to the organization to improve the greeneries practices further.



Flow-chart of Green Campus Audit Procedures

10.1. Onsite Green Campus Audit activities

1. The opening meeting is the first step between the audit team and auditee. In this meeting, the purpose of the audit, the procedure to be followed for the conduct of the audit, document verification and the time schedules were discussed in brief along the Management Representatives.
2. Site inspection is the second step for onsite activity. In this step, the Audit team members visited different sites in Dr.N.G.P Arts and Science College and sufficient photographs were taken then and there for preparing the audit report.
3. During the onsite phase of visit, it is vivid how the various facilities made by Dr.N.G.P Arts and Science College Management to the stakeholders without disturbing the landscape, natural topography and vegetation to ensure the green campus.
4. It is observed how the environment is protected in the campus and by what means an eco-friendly atmosphere is being given to the stakeholders. It is assessed the strengths and weaknesses of the Auditee's Management controls and risks associated with their failure in Green campus facilities were recorded.
5. Gathering audit evidence *ie*, collecting data and information from the auditee as per the audit protocol were carried out.
6. An exit meeting was conducted to explain the findings of the audit with the Management Representatives and staff members along with the audit team in brief.

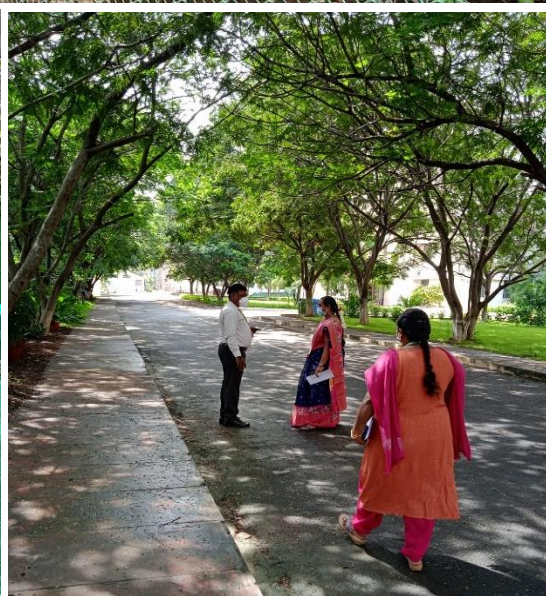
10.2. Pre-Audit stage activities

A pre-audit meeting (opening meeting) is conducted with Management and Administrative people along with staff coordinators of Energy and Environment audit process, wherein, audit protocol and audit plan were discussed in brief. The purpose of this meeting is to provide an opportunity to reinforce the scope and objectives of the audit and discussions held on the practicalities associated with the audit. Pre-audit stage activities are an important prerequisite for the green audit to meet the auditee and to gather information about the campus and necessary documents were collected directly from the Organization before the initiation of the audit processes. Audit team was selected by the Nature Science Foundation as per the checklist comprised of Lead Auditor of ISO (EMS 14001:2015), Botanist, Agriculture and Horticulture Scientists from Conventional and Technical Universities across India, Accredited Professionals from Indian Green Building Council, Hyderabad and Associated Chambers of Commerce and Industry of India, New Delhi.



Meeting with the Principal of Dr.N.G.P Arts and Science College with the Audit Team of the Nature Science Foundation

Green Audit Activity at Dr.N.G.P Arts and Science College by NSF Audit Team



10.3. Target Areas of Green Auditing

Green campus audit is nothing but a professional tool to assess the greenery activities in the educational institutions and give a value addition to the campus and considered as a resource management process. Eco-campus concept mainly focuses on the efficient use of energy and water; minimize waste generation or pollution and also economic efficiency. Green campus audit process may be undertaken at frequent intervals and their results can illustrate improvement or change over time. Eco-campus focuses on the reduction of carbon emissions, water consumption, wastes to landfill and enhance energy use conservation to integrate environmental considerations into all contracts and services considered to have significant environmental impacts.

There are several target listed in the Green audit process in which a few are taken into consideration as per the Indian scenario is concerned. They are water use efficiency, energy use efficiency, solid, e-waste biomedical, food, sewage waste management and reuse methods, planting of oxygen producing and carbon dioxide absorbing plants, landscape management, topology, vegetation, soil erosion control, carbon footprint due to use of vehicles, electricity and fossil fuels. drinking water quality supply, Biogas plant, rain harvesting system, water reservoirs, establishment of various herbal, terrace and ornamental, gardens, campus and flora fauna, water irrigation, implementation of Government schemes, conduction of awareness programmes, management, public transport, low-emitting vehicles and control of car smokes and exhaust, Organization's budget for greenery activities, campus facilities for disabled, special needs and or maternity care, security, safety and health infrastructure facilities for stakeholder's wellbeing.

10.4. Study area of Flora and Fauna diversity

Dr.N.G.P Arts and Science College Campus is situated on the Centre of Coimbatore city. It is located about 4 km from Coimbatore International Airport. College campus is considered as one of the Green Educational Institution in Coimbatore with a rich flora and faunal diversity. The campus now quite clean, green and has much less pollution to the rest of the city. The College campus is important not only from education point of view but also as green lung. It is frequently visited by several nature enthusiasts to study the floral and faunal aspects. Biodiversity provides a useful measure of the quality of the environment and the ecological studies are important aspects of environment, in view of the consideration of environmental quality and protection of natural flora and fauna.

10.4.1. Topography

Dr.N.G.P Arts and Science College consists of an environment of moist dry land at an altitude of 356.72 m mean sea level, 11°04' E of longitude and 76°93' N latitude. It located at near Coimbatore International Airport. This institution is very nearby the Information Technology park at Hope College stop, Coimbatore.

10.4.2. Geology and Soil condition

Among the 34 hotspots in the world, Western Ghats is one of the hotspots in Southern India in which surround Coimbatore areas are located. The area has a predominant red soil impregnated with good organic matter, water holding capacity and granite, bed rock is overlaid with shallow, sandy loam and glacial soils are moderate to well drained.

10.4.3. Climatic conditions

Temperature begins increasing after March. April is the hottest month with near daily maximum temperature of 38.2°C and minimum of 25-26°C. The maximum and minimum temperature may go up to 37°C and 16°C; respectively. The average rainfall received in the Coimbatore district is 670 – 699 mm for the past 20 years. Due to the presence of the mountain pass major parts of the district from the south west monsoon in the months from June to August. The rainfall of the south west monsoon is irregular as the masses of clouds are intercepted only very little rain in September. After a warm, humid September, the regular monsoon starts from October lasting till early November. In October north east monsoon sets in heaviest rains are usually or the end of October and throughout November. Out of the total rainfall 25% is received during south west monsoon 49% during October and November and remaining 21% during September.

Annual rainfall is about 60-70 cm, although this rainfall is not enough to sustain the city for the entire year, small rivers like the Siruvani and Atthikadavu fulfill the city's water needs. The Siruvani river is well known for having water of the purest taste. This is because of large number of Amla (*Emblica officinalis*) trees present in the mountains where the Siruvani river originates which making the greatest assets of Coimbatore city.

Soil edaphic and environmental parameters of Dr.N.G.P. Arts and Science College

S.No	Details of Parameters	Data colleted
Soil edaphic parameters		
1.	Soil pH	6.33
2.	Soil types	Red, sandy loam with glacial
3.	Total organic carbon	4.56
4.	Electrical conductivity	0.52-
5.	Water holding capacity	40.23%
6.	Total Nitrogen	3956 ppm
7.	Available Phosphorous	14.56 ppm
8.	Exchangeable Potassium	19.56 ppm
Environmental parameters		
1.	Minimum Temperature	16-22°C
2.	Maximum Tempearure	25-37°C
3.	Minimum Relative humidity	66-80%
4.	Maximum Relative hundity	7-100%
5.	Annual Average Rainfall	60-70 cm
6.	Annual Average Sunshine	3-6 hrs/day
7.	Wind speed	15.2-17.8 km/h

11. Identification of Plant Species at Dr.N.G.P Arts and Science College Campus

11.1. Identification of Flowering Plant Species

Various vascular plant species were collected across Dr.N.G.P Arts and Science College campus and subjected to identify them based on botanical name, family, habitat, uses and anthropogenic disturbances to the natural vegetation in campus. The plants were freshly collected and their digital photographs were also taken. The collected plant specimens have been identified using taxonomic literatures (Gamble and Fischer, 1915-1936; Matthew, 1983; Nair and Henry, 1983; Henry *et al.*, 1989; Chandrabose and Nair, 1988). Further, their identification was confirmed by matching with authentic specimens in the Madras Herbarium (MH), Botanical Survey of India, Southern Circle, Coimbatore, India.

11.1.1.Key to Plant Families Identification

1a. Seeds enclosed in fruit wall, Perianth Present.....	2
b. Seeds not enclosed in fruit wall, perianth absent.....	Gymnosperm
2a. Leaves usually net veined seeds-2.....	3
b. Leaves parallel veined, seeds-1.....	66
3a. Petals free.....	4
b. petals connate.....	41
4a. Corolla and calyx present.....	5
b. Corolla and calyx absent.....	24
5a. calyx of united sepals; ovary inferior.....	31
b. Calyx of distinct or unit sepals; ovary syncarpous.....	6
6a. Sepals imbricate in bud.....	7
b. Sepals valvate in bud.....	24
7a. Sepals more or less united at the base.....	19
b. Sepals free.....	8
8a. Stamens more than 12.....	9
b. Stamens 10 or fewer.....	13
9a. Sepals 2-3.....	11
b. Sepals 4 or more.....	10
10a. Stamens inserted on the disk.....	Cleomaceae
b. Stamens inserted of the gynophore.....	Capparaceae
11a. Trees, Petals more or like the sepals; carpels free.....	Mangnoliaceae
b. Herbs, petals coloured unlike the sepals; carpels united.....	12
12a. Plants with yellow sap, Flowers pedicelled.....	Papaveraceae
B. Plants with watery sap, Flowers sessile.....	Portulacaceae
13a. Flowers unisexual, gynoecium apocarpous.....	Menispermaceae
b. Flowers bisexual, gynoecium Syncarpous.....	14
14a. Petals 4, Stamens 6.....	Brassicaceae
b. Petals 5, Stamens ∞	15
15a. Ovary 1, loculated.....	16
b. Ovary 2-more loculated.....	17
16a. Flowers actinomorphic, placentas free- central.....	Caryophyllaceae
b. Flowers zygomorphic, placentas parietal.....	Viloiaceae
17a. Filaments of anthers more or less united.....	Polygalaceae

- b. Filaments of anthers more or less united18
- 18a. Leaves stipulate; stamens 5 or 1019
 - b. Leaves exstipulate; stamens usually 8Sapindaceae
- 19a. Style 5; stamen 5 Oxalidaceae
- b. Style many; stamens 10 Zygophyllaceae
- 20a. Leaves pellucid-gland dotted Rutaceae
 - b. Leaves not gland dotted21
- 21a. Placentas parietal; Fruit elongatedMoringaceae
 - b. Placentas axile; Fruits not elongated22
- 22a. Ovules and seeds pendulous; sometimes horizontal.....Meliaceae
 - b. Ovules and seeds erect or ascending23
- 23a. Stamens alternate with the petals..... Anacardiaceae
 - b. Stamens opposite the petalsVitaceae
- 24a. Leaves simple; Flowers 3-merous.....Annonaceae
 - b. Leaves compound; Flowers 4-6 merous 25
- 25a. Filaments of anther united into a columnar toothed cup.....26
 - b. Filaments of anther free; rarely connate at the base in ring28
- 26a. Stamens 15; anther unitedStericuliaceae
- b. Stamens 2; anther free.....27
- 27a. Anther unilocular; pollen muricateMalvaceae
 - b. Anther bilocular; pollen smoothBombacaceae
- 28a. Stamens 4-5; usually embraced and adnate to the base of the petal.....29
 - b. Stamen many; atleast twice as many as and free from the petals30
- 29a. ShrubLythraceae
 - b. StragglerRhamnaceae
- 30a. Anther dehisce by slits; fruits capsuleTiliaceae
 - b. Anther dehisce by spores; fruits drupeElaeocarpaceae
- 31a. Ovary syncarpous; placentas 3-5, parietal.....32
 - b. Ovary 1 or more free, placentas basal.....33
- 32a. Climbing herbs tendril.....Passifloraceae
 - b. Erect shrubs or trees with tendril.....Turneraceae
- 33a. Ovules arising from the inner angles or from base of the carpels or loculi.....34
 - b. Ovules pendulous form the apex of the carpels or locules.....Combretaceae
- 34a. Carpels solitary; fruits legume.....35
 - b. Carpels more than 1; fruits otherwise.....37
- 35a. Flowers zygomorphic; petals imbricate.....36
 - b. Flowers actinomorphic; petals valvate.....Mimosaceae
- 36a. Upper petals outermost stamens monodelphous or diadelphous.....Fabaceae
 - b. Upper petals innermost stamens always freeCaesalpiniaceae
- 37a. Flowers unisexual.....Cucurbitaceae
 - b. Flowers bisexual.....38
- 38a. Ovary 1-celled.....Cactaceae
 - b. Ovary more than 1 celled.....39
- 39a. Carpels free if ultimately united the styles distinct.....40
 - b. Carpels and styles united throughout.....Myrtaceae
- 40a. Flowers in dichasial – polychasial cyme.....Molluginaceae
 - b. Flowers in clustered, cymes or solitary.....Aizoaceae

41a. Ovary inferior, stamens as many as the corolla lobes.....	42
b. Ovary superior, stamens numerous.....	43
42a. Anther free; ovary 2-loculed; stipulate.....	Rubiaceae
b. Anther syngenesious; ovary 1-loculed, exstipulate.....	Asteraceae
43a. Ovary 1-loculed; placentation free central.....	Plumbaginaceae
b. Ovary 2-many loculed; placentation axile or parietal.....	44
44a. Ovary 3 or more carpelled.....	Sapotaceae
b. Ovary 2-carpelled.....	45
45a. Corolla actinomorphic.....	46
b. Corolla zygomorphic.....	50
46a. Plants leafless; parasitic.....	Cuscutaceae
b. Plants leafy ; not parasitic	47
47a. Leaves opposite; stamens 2.....	48
b. Leaves alternate; stamens 4 or more	49
48a. Leaves not scabrid, corolla tube white: fruits berry	Oleaceae
b. Leaves scabrid; corolla tube orange; fruits capsules	Nyctanthaceae
49.a. Anther inseperatable; corona present	Asclepidiaceae
b. Anther seperatable; corona absent	Apocyanaceae
50a. Corolla lobes imbricate;fruit drupe	Boraginaceae
b. Corolla lobes plicate; fruit capsule	Convolvulaceae
51.a Ovary cells many ovulated	Solanaceae
b.Ovary cells 1-4 ovuled.....	52
52.a Carpels 2 or more ovulated ; fruits dehiscent	53
b.Carpels 1 –ovulated ; fruits indehiscent	57
53.a Fruits dehiscent; seeds supported on reticulae.....	Acanthaceae
b.Fruits indehiscent; seeds not supported on reticulae.....	54
54.aLeaves compound; fruits elongated; seeds winged	Bignoniaceae
b. Leaves simple;fruits not elongated, seeds not winged.....	55
55.a Ovules many on swollen placentas; seeds albuminous.....	Scropulariaceae
b.Ovules 2 lobed placenta ; seeds not albuminous.....	56
56.a Flowers solitary; axile placentation	Pedaliaceae
b. Flowers raceme; axile placentation.....	Marytiniaceae
57.a Ovary entire, style terminal	Verbinaceae
b. Ovary 4 –lobed, style gynobasic.....	Lamiaceae
58.a Flower bisexual	59
b. Flower unisexual	62
59.a. Ovary inferior	60
b. Ovary superior	61
60.a Ovary 4-6 loculated; ovules many	Aristolochiaceae
b. Ovary 1-loculated; ovules 1-4	Santalaceae
61.a Perianth not tubular	Amarathaceae
b. Perianth trubular	Nyctaginaceae
62a. Leafless trees; brachlets ribbed and joined at the nodes.....	Casuarinaceae
b.Leaves well developed ; brachlets not ribbed and not joined at the nodes.....	63
63 a. Ovary 1- loculed; ovules 1-2 in each loule.....	64
b. Ovary 2 or more loculed;ovules 1 or 2 in each locule.....	65
64a. Leaves glandular.....	Euphorbiaceae

b. Leaves glandular.....	Urticaceae
65a. Filaments inflexed in bud with reversed anther.....	Moraceae
b. Filaments not inflexed in bud, not with reversed anther.....	Ulmaceae
66a. Terrestrial or epiphytic.....	67
b. Aquatic, marsh or riparian.....	Cyperaceae
67a. Arbrorescent woody; leaf blade many nerved articulate with sheath...	Bambusaceae
b. Herbs with herbaceous culms; leaf blade sessile not articulate with sheath.....	68
68a. Perianth 0 or reduced to scale.....	Araceae
b. Perianth present.....	69
70a. Plant armed.....	71
b. Plant unarmed.....	72
71a. Plants Xerophytic; leaves fibrous.....	Agavaceae
b. Plants not xerophytic; leaves nor fibrous.....	Lilliaceae
72 a. Perianth segments connate.....	Amaryllidaceae
b. Perianth segments free.....	73
73a. Outer perianth calycine; inner coroline.....	Commelinaceae
b. Outer and inner perianth.....	74

11.2. Identification of Non-Flowering Plant Species

11.2.1. Lichen Identification

The lichen specimens were collected from Dr.N.G.P Arts and Science College campus and then identified based on the lichen identification key of Awasthi (2007). The representative lichen were identified based on the morphological features of thalli such as rhizine, cilia and pseudocephellae and reproductive structures (fruiting bodies) such as apothecia, perithecia, soredia, soralia, conidia and isidia embedding on the thalli surface using a stereo microscope (CZM4, Labomed, India). The anatomy of thallus used in the present study characterized the features of micro morphological analysis such as medulla thickness, upper and lower surface of thallus, lobes, size and shape of spores. Thin section of apothecia and perithecia was made to observe the nature ascus spores and the arrangement of the algal and fungal layers in the thallus; respectively. Over 700 secondary metabolites are known to produce from lichen species which were identified based on Thin Layer Chromatography (TLC) techniques. Spot tests featured the use of chemical reagents to detect lichen substances by appearances of the characterized colour changes on lichen thallus was noted. The lichen chemistry was analyzed according to Culberson and Kristinson (1970) methods. The colour spot test was done on medulla of lichen thallus using test reagents of potassium hydroxide (K), calcium hypochlorite (C) and paraphenylene di amine (PD). Lichen was identified based on colour spot test using the procedure described by Orange *et al.* (2001).

To authenticate the identified lichen samples, the representative samples were compared with the voucher specimens at the lichen herbarium centre of National Botanical Research Institute (NBRI), Lucknow, Uttar Pradesh, India and Department of Botany, Bharathiar University, Coimbatore, Tamil Nadu. The lichen species might be confused with other species unless their morphological, biochemical and anatomical features were closely monitored. Therefore, apart from microscopic observation, spot tests, chemical profiling and TLC tests, attempts were made to compare the representative samples with voucher specimens.

11.2.2. Key to identify the Lichen Genera

Key to Genera

- 1 a. Photobiont cyanobacterium *Leptogium cyanascens*.
- 1 b. Photobiont green alga 2
- 2. Thallus leprose, crustose..... Group I
- 3. Thallus foliose..... Group II
- 4. Thallus fruticose..... Group III

Group I

- 1 a. Thallus leprose,..... *Chrysothrix chlorina*
- 1 b. Thallus crustose..... *Graphis* sp

Group II

- 1 a. Lower side of thallus pseudocyphellae, photobiont Nostoc *Pseudocyphellaria*
- 1 b. Thallus lacking pseudocyphellae 2
- 2 a. Upper cortex thick walled longitudinally oriented, conglutinate hyphae..... 3
- 2 b. Upper cortex otherwise..... 4
- 3 a. Thallus lower side canaliculated zeorin, norstictic and salazinic acids, and unknown pigments and triterpenoids present..... *Heterodermia leucomelos*
- 3 b. Thallus lower side no canaliculated only in medulla..... *Heterodermia diademata*
- 4 a. Cilia bulbate at the base, thallus grey to grey brown *Bulbothrix*
- 4 b. Cilia present or absent, not bulbate..... 5
- 5 a. Rhizines dichotomously branched present throughout the margins... *Hypotrachyna*
- 5 b. Rhizines restricted to center of lower surface, margin bare, smooth shining..... 6
- 6 a. Lobes narrow, long, dichotomously branched, canaliculate..... *Everniastrum*
- 6 b. Lobes otherwise..... 7
- 7 a. Lobe margins ciliate..... 8
- 7 b. Lobe margins eciliate..... 9
- 8 a. Salazinic acid present K⁺ Red cortex..... 10
- 8 b. Salazinic acid absent 11
- 9 a. Thallus with isidia..... *Parmotrema tinctorum*
- 9 b Thallus with soredia..... 12
- 10 a. thallus emaculate..... *P. stuppeum*
- 10 b. thallus maculate..... *P. reticulatum*
- 11 a. Protolichesternic acid in medulla *P. grayanam*
- 11 b. Alecoronic acid in medulla..... *P. nilgherrense*
- 12 a. Thallus large lobed, loosely attached, mainly corticolous *P. austrosinense*
- 12 b. Thallus smaller, closely to strongly attached, saxicolous..... *P. defectum*

Group III

- 1 a. Squamules in thallus..... *Cladonia* sp
- 1 b. Squamules absent in thallus 2
- 2 a. Thallus flat, strap shaped or palmately lobed..... *Ramalina*
- 2 b. Thallus round to angular in section 3
- 3 a. Thallus bright yellow to orange, K⁺ purple... *Teloschistes*
- 3 b. Thallus greenish grey or yellowish grey pendent or erect..... 4
- 4 a. Medulla K⁺ red Stictic acid present *Usnea stigmatoides*
- 4 b. Medulla K⁻ norstictic psoromic acid present..... *Usnea dasaea*

11.2.3. Identificayion of Algae Genera

Algae are the members of a group of predominantly aquatic photosynthetic organisms of the kingdom *Protista* followed by terrestrial algae found in freshwater and slump areas. They are non-flowering and lower group of plants which are green in colour because of presence of chlorophyll pigments in the body called thallus. Algae have many types of life cycles, and they range in size from microscopic *Micromonas* to species to giant kelps that reach 60 metres (200 feet) in length. Their photosynthetic pigments are more varied than those of plants, and their cells have features not found among plants and animals. In addition to their ecological roles as oxygen producers and as the food base for almost all aquatic life, algae are economically important as a source of crude oil and as sources of food and a number of pharmaceutical and industrial products for humans. Algae are defined as eukaryotic (nucleus-bearing) organisms that photosynthesize but lack the specialized multicellular reproductive structures of plants, which always contain fertile gamete-producing cells surrounded by sterile cells. Algae also lack true roots, stems, and leaves features they share with the avascular lower plants (e.g., mosses, liverworts, and hornworts). Algae identification key consists of couplets of characteristics using algal description of the specimen based on morphological characterization from 58 Genera to species level identification as per the comprehensive key (Bellinger and Sigeo, 2010).

Key to Identification of Algal Genera

1A. Plant pigments contained in chromatophores or chloroplasts -----	10
IB. Plant pigments not contained, but diffused through protoplast -----	2
2A. Plants filamentous; cells arranged in trichomes -----	4
2B. Plants colonial, not filamentous -----	3
3A. Cells in regular rows, in multiples of four; -----	<i>Agmenellum</i>
3B. Cells somewhat evenly arranged toward periphery of spherical colony; barely visible gelatinous strands radiate from center of colony to cells ----	<i>Gomphosphaeria</i>
3C. Colony asymmetrical; cells very dense and unevenly distributed -----	<i>Anacystis</i>
4A. Filaments straight or slightly flexed -----	6
4B. Filaments curved, twisted, or spiralled -----	5
5A. Heterocysts and akinetes present -----	<i>Anabaena</i>
5B. Heterocysts absent -----	<i>Raphidiopsis</i>
6A. Heterocysts present -----	9
6B. Heterocysts absent -----	7
7A. Filaments without a sheath; cells discoid -----	
<i>Oscillatoria</i>	
7B. Filaments with distinct sheath -----	8
8A. Trichomes tangled; sheaths confluent -----	<i>Phormidiwn</i>
8B. Trichomes separate; sheaths not confluent -----	<i>Lyngbya</i>
9A. Heterocysts terminal -----	<i>Cylindrospermum</i>
9B. Heterocysts intercalary -----	<i>Ahphanizomenon</i>
10A. Cell walls without punctae or striae -----	31
10B. Cell walls rigid, ornamented with punctae or striae -----	11
11A. Frustules adiametric, two or more times longer than wide, elongate -----	15
11B. Frustules isodiametric, generally shorter in length than in diameter, round or elliptical or ovoid or nearly so -----	12

12A. Frustules elliptical or ovoid or nearly so -----	14
12B. Frustules discoid or nearly so -----	13
13A. Valves radially punctate -----	<i>Stephanodiscus</i>
13B. Valves with two concentric regions, the inner being smooth -----	<i>Cydotella</i>
14A. Frustules with marginal keel containing a raphe -----	<i>Surirella</i>
14B. Frustules with a pseudoraphe or with a raphe not in a marginal keel ---	<i>Cocconeis</i>
15A. Frustules cylindrical arranged end to end into filament -----	<i>Melosira</i>
15B. Frustules not arranged into filaments -----	16
16A. Frustules with a raphe in at least one valve -----	21
16B. Frustules without a raphe in either valve, pseudoraphe evident -----	17
17A. Frustules united in zigzag chains -----	<i>Tabellaria</i>
17B. Frustules not in zigzag chains -----	<i>Pseudoraphe</i>
18A. Frustules united laterally -----	<i>Fragilaria</i>
18B. Frustules not united laterally -----	19
19A. Frustules united apically forming spokelike colony -----	<i>Asterionella</i>
19B. Frustules not forming spokelike colony -----	20
20A. Frustules needle shaped without costae -----	<i>Synedra</i>
20B. Frustules with prominent costae -----	<i>Diatom</i>
21A. Frustules sigmoid or "S" shaped -----	<i>Gyrosigma</i>
21B. Frustules not sigmoid -----	22
22A. Frustules longitudinally symmetrical, other than lunate in valve view -----	25
22B. Frustules with raphe in both valves, longitudinally asymmetrical, lunate -----	23
23A. Valves with transverse costae -----	<i>Epithemia</i>
23B. Valves without transverse costae -----	24
24A. Raphe a smooth curve with well defined central and polar nodules ----	<i>Cymbella</i>
24B. Raphe not a smooth curve, gibbose with marginal central nodule -----	<i>Amphora</i>
25A. Frustules with raphe in both valves -----	27
25B. Frustules with pseudoraphe in one valve and raphe in other valve -----	26
26A. Frustules wedge-shaped in girdle view and cuneate in valve -----	<i>Rhoicosphenia</i>
26B. Frustules shaped otherwise -----	<i>Achnanthes</i>
27A. Raphe extended length of valve; polar nodules; central nodules lacking -	<i>Eunotia</i>
27B. Raphe restricted to polar regions -----	28
28A. Raphe located in a canal -----	<i>Nitzschia</i>
28B. Raphe not located in a canal -----	29
29A. Frustules with symmetrical valves -----	30
29B. Frustules with valves symmetrical but asymmetrical -----	<i>Gomphonema</i>
30A. Valves with transverse costae -----	<i>Pinnularia</i>
30B. Valves with transverse punctae -----	<i>Navicula</i>
31A. Cells solitary -----	45
31B. Cells colonial or grouped -----	32
32A. Cells enclosed in conical to cylindrical lorica; joined lorica have treelike appearance -----	<i>Dinobryon</i>
32B. Cells and lorica without treelike appearance -----	33
33A. Colony discoid, one cell in thickness; cells in concentric rings -----	<i>Pediastrum</i>
33B. Colony not discoid -----	34
34A. Colonies spherical or globose -----	40
34B. Colonies not spherical -----	35

35A. Colony with elongate cells radiating from common center -----	<i>Actinastrum</i>
35B. Colony with cells not radiating from common center -----	36
36A. Colony with four to eight cells positioned in linear series -----	<i>Scenedesmus</i>
36B. Colony with cells not in linear series -----	37
37A. Colony with arcuate to lunate cells with apices acutely-----	<i>Selenastrum</i>
37B. Colony with spherical to broadly ellipsoidal cells -----	38
38A. Cells without spines or setae -----	<i>Crucigenia</i>
38B. Cells with spines or setae -----	39
39A. Cells quadrate, closely apposed; free face of each cell with spines ----	<i>Tetrastrum</i>
39B. Cells quadrate and united; free face cell with long delicate setae ---	<i>Micractinium</i>
40A. Colony with biflagellated cells -----	
<i>Pandorina</i>	
40B. Colony with nonflagellated cells -----	41
41A. Cells lunate to sickle shaped -----	<i>Kirchneriella</i>
41B. Cells spherical or nearly so -----	42
42A. Cells borne terminally on dichotomously branched threads ----	<i>Dictyosphaerium</i>
42B. Cells not on dichotomously branched threads -----	43
43A. Colony a hollow sphere -----	<i>Coelastrum</i>
43B. Colony not a hollow sphere -----	44
44A. Colony surrounded by gelatinized and expanded parent cell wall -----	<i>Oocystis</i>
44B. Colony with cells equidistant and toward periphery -----	<i>Sphaerocystis</i>
45A. Cells with median constriction dividing cell into two distinct halves -	<i>Cosmarium</i>
45B. Cells without pronounced median constriction -----	46
46A. Cells nonflagellated -----	53
46B. Cells flagellated -----	47
47A. Cell walls without polygonal plates -----	49
47B. Cell walls with polygonal plates -----	48
48A. Cells walls of thick plates with distinct sutures -----	<i>Peridinium</i>
48B. Cells walls with faintly distinct plates and sutures -----	<i>Glenodinium</i>
49A. Cells uniflagellate -----	52
49B. Cells biflagellate -----	50
50A. Cells with two flagella of equal length -----	<i>Chlamydomonas</i>
50B. Cells with two flagella of unequal length -----	51
51A. Cells with single chromatophore -----	<i>Chroomonas</i>
51B. Cells with 2 large chromatophores -----	<i>Cryptomonas</i>
52A. Cells surrounded by distinct lorica -----	<i>Trachelomonas</i>
52B. Cells without lorica; fusiform to acicular shaped; posterior end -----	<i>Euglena</i>
53A. Cells acicular to fusiform with ends tapering into long spines -----	<i>Schroederia</i>
53B. Cells without ends tapering into long spines -----	54
54A. Cells without setae -----	56
54B. Cells with setae -----	55
55A Cells with subpolar or both subpolar and equatorial long setae -----	<i>Chodatella</i>
55B Cells with multiple peripheral long delicate setae -----	<i>Golenkinia</i>
56A Cells long, slender, and tapered at both ends -----	<i>Ankistrodesmus</i>
56B Cells flattened or isodiametric, triangular, quadrangular -----	<i>Tetraedron</i>

11.2.4. Identification of Major Groups of Mushrooms

Mushrooms are called as single cell protein and fleshy in nature. They are spore-bearing fruiting body of a fungus, typically produced above ground, on soil, or on its food source. The standard for the name "mushroom" is the cultivated white button mushroom, *Agaricus bisporus*; hence the word "mushroom" is most often applied to those fungi (Basidiomycota, Agaricomycetes) that have a stem (stipe), a cap (pileus), and gills (lamellae, sing. lamella) on the underside of the cap. Mushroom also describes a variety of other gilled fungi, with or without stems, therefore the term is used to describe the fleshy fruiting bodies of some Ascomycota. These gills produce microscopic spores that help the fungus spread across the ground or its occupant surface. Forms deviating from the standard morphology usually have more specific names and gilled mushrooms themselves are often called "agarics" in reference to their similarity to *Agaricus* or their order Agaricales (Vooren *et al.*, 1992).

1. Mushroom growing on other mushrooms or the decayed remains ----- *Mycotrophs*
2. Growing shelflike on wood (or, if not, then gills *concentric* rather than radial); mushroom *very* tough and leathery, corky, or woody (try tearing it in half); gills tough and hard, sometimes maze-like; cap frequently (but not always) with concentric zones of colour ----- *Polypores*
3. Gills running down the stem, not platelike and thus not easily separable from the cap and stem (try removing an entire "gill" with your fingers or a sharp object); mushroom usually *not* growing on wood ----- *Chanterelles and Trumpets*
4. Gills not as above; mushroom growing on wood or elsewhere ---- *Gilled Mushrooms*
5. Stem absent--or, if present, lateral, Flesh in stem tough----- *Polypores*
6. Cap round in outline; pore surface not running down the stem, or only slightly running down the stem; spore print not white-----
-*Boletes*
7. Mushroom with spines or "teeth"--either on the underside of a cap, or hanging from a branched structure, or clumped in an indistinct mass----- *Toothed Mushrooms*
8. Mushroom covered in some part with a foul-smelling slime; arising from a soft underground "egg"; variously shaped (like a club or stick, like crab claws, like a lantern, like a Wiffle ball, etc.); frequently found in woods----- *Stinkhorns*
9. Mushroom more or less shaped like a ball, or like a ball raised up on a stem, or like a ball set on a starfish----- *Puffballs*
10. Cap shape convex to centrally depressed or vase-shaped; undersurface, smooth, wrinkled, or gill-like; fruiting embedded ----- *Chanterelles*
11. Cap shape oval, pointed, lobed, saddle-shaped, irregular, or thimble-like (never vase-shaped or convex); undersurface absent, or hard to see or define; many (but definitely not all) species fruiting-----
Trumpets
12. Stem completely hollow, or hollow with cottony fibers inside; cap with pits and ridges, or longitudinally wrinkled, or fairly smooth (never lobed or convoluted); without reddish or reddish brown shades; found in spring----- *Morels & Verpas*
13. Found in summer and fall (or spring in warm coastal areas); cap lobed, saddle-shaped, or irregular and whitish, grayish, brownish, or black; stem surface ribbed or "pocketed" in some species ----- *Saddles*
14. Found in summer and fall (or spring in warm coastal areas); cap lobed, saddle-shaped, or irregular and whitish, grayish, brownish, or black----- *Oddballs & Misfits*

12. Identification of Mammals, Birds, Reptiles, Amphibians and Termites

Birds were observed by visual sightings and by calls also the avifaunal data were observed through the Nikon 8 x 40 binoculars and photographs were taken by Canon 600 D camera (55 – 250 mm). The recorded data was noted in the field work note. Later, the birds were identified with the help of field guide- "Birds of Indian subcontinent" by Richard Grimmett, and the IUCN category of the birds were also noted with the same. The point count and transect line methods were used to record the number of bird species in the study area in which regular visits and personal visits were carried out (Ferenc *et al.*, 2014). The surveys were conducted to understand the distribution of bird species in relation to habitats and nesting behavior of birds in the study area. Based on survey richness and abundance of bird species were calculated using Shannon-weaver diversity index. Based on available data and species were selected for nest site selection study. Selected species of birds was analyses for its nest site characteristics between the habitats and also plant species preference was enumerated and assessed. The number of breeding bird species and nests found in different habitats as depend variables such as biotic and biotic factors as the indepent variable (Jayson and Mathew, 2000).

Reptiles and Amphibians are identified based on colourtion, markings on the skin,background colour generally brown, Males often have a flecked pattern on back. Occasionally they are in green, leading to mistaken identification as sand lizard, Males have thicker base to tail and brighter, speckled underside. Newborn young are dark in colour, almost black. A rare species, almost entirely confined to heathland sites in Dorset, Hampshire and Surrey, and sand dunes on the Mersey and Welsh Coast. The most common reptile found in a variety of habitats, including gardens. Spends most of its time underground or in vegetation litter. Most likely to be found underneath objects lying on the ground, or in compost heaps. Snakes are identified based on cream, yellow or white collar behind the head, bordered to the rear by black marks. Body colour ranges from bright green to dark olive, but mostly the latter. Darker specimens can appear black from a distance. Truly black grass snakes are rare. Males are predominately brown, females are grey. Dark butterfly shape on top of head may be noted. Pairs of spots, sometimes fused as bars, running along back with black line running through eye are recorded. Males typically grey with a black zigzag stripe, females generally brown with a dark brown zigzag stripe (Beebee and Griffiths, 2000).

13. Green Campus Audit Observations

It covers both qualitative and quantitative measurements including physical observation of greeneries in terms of growing of terrestrial and aquatic plants, animals and microflora in natural and planted vegetation and their maintenance. Topography, landscape management design and soil erosion control are playing important role in environment sustainable development in the campus. An account of a large number of Oxygen producing and Carbon-di-oxide absorbing plants planted in the Campus are taken into consideration to give pure atmosphere to the stakeholders. Establishment of different types of gardens in the campus, rainwater harvesting system, operation of water irrigation, drip and sprinkler irrigation methods may be adopted to improve the green campus. Similarly, biodiversity conservation strategies are very essential to conserve a variety of plant and animal species in the campus ecosystem. Biofertilizers, organic and green manures, cow dung manures and farmyard manures may be used for

the cultivation of plants which may be protected the environmental health that will not cause any air, water and soil pollution. The various Clubs, Forums, Cells, Associations and Student / Staff Chapters such as Eco club, Nature club, Science club, Fine Arts club, Flora and Fauna club, Youth Red Cross, NCC and NSS bodies may be involved in green campus initiatives, planning and efforts among stakeholders. Outreach programmes may be conducted for dissemination of Green Campus motto and Green pledge initiatives to rural, tribal and urban people. Academic credentials like taking up major and minor Projects, Dissertations and Thesis work by the students and staff members may be taken into account towards green campus initiatives, planning and efforts. Best practices followed on green campus initiatives in the Organization and recommendations for greening are illustrated in the audit report as well.

13.1. Qualitative Measurements

S.No	Requirements and checklists of the audit	Conformity		
		Yes	No	NA
1.	Have internal Green campus audit procedures been developed and implemented in the Organization?	✓		
2.	Have programmes for the achievement of Green campus objectives and targets been established and implemented as on today?	✓		
3.	Whether Green campus audit and Environment audit are simultaneously carried out or separately carried out?	✓		
5.	Have responsibilities been assigned for programmes at each appropriate function and level? (Environmental Engineer & Agriculture Staff working for environment monitoring)	✓		
	Are the following environmental aspects considered in sufficient detail?			
	a. Drinking water / RO water / Borewell water / Open well water / Pond water / Municipal or Corporation water use	✓		
	b. Wastewater treatment facility	✓		
	c. Sufficient number of trees, shrubs, herbs and lawns	✓		
	d. Solid waste management facility	✓		
	e. Availability of Biogas plant		✓	
	f. Rain harvesting system, water reservoirs, etc	✓		
	g. Establishment of terrace garden, herbal garden, kitchen, zodiac, ornamental gardens, etc.	✓		
	h. Natural Topography or Forest, Planted vegetation	✓		
	i. Water well, Bore well, lake, water reservoir facility	✓		
	j. Water consumption towards plant cultivation, canteen, hostel, machinery cleaning, transport, toilet use	✓		
	k. Treated water consumption towards plant cultivation, machinery cleaning, transport, toilet use and etc.	✓		
	l. Per capita water consumption per day calculated	✓		

7.	Whether plants are tagged properly with their common name and Botanical name for stakeholders?	✓		
8.	Signing of MoU with Govt. and NGOs to disseminate Green campus motto and pledge	✓		
9.	Biodiversity conservation of plants, animals and wildlife, genetic resources (Endangered and endemic species) at each appropriate function and level?		✓	
10.	Are any biofertilizers, organic manures, farmyard manures, vermicompost, green manures and chemical fertilizers used for maintaining plants?	✓		
11.	Establishment of herbal garden, zodiac garden, medicinal garden, kitchen garden, terrace garden and ornamental plants garden in the campus	✓		
12.	Implementation of Government schemes (Swatch Bharath Abhiyan under Clean India Mission)	✓		
13.	Functioning of Nature club, Eco club, Cell, Forum, Association, NCC, NSS bodies and Social Service League for students and staff members on biodiversity conservation, green campus development, etc.	✓		
14.	Conduction of awareness programmes and cultural activities on global warming, environmental changes and ecosystem maintenance to the stakeholders	✓		
15.	Conduction of outreach programmes for dissemination of green campus initiatives, natural resources, environmental pollution and biodiversity conservation to rural, tribal and urban people	✓		
16.	Implementation of composting pits, vermicompost unit, recycling of kitchen wastes collected from Hostels, Canteens, Cafeteria, Food court and other places	✓		
17.	Maintenance of plantations in the campus and steps taken for water scarcity during summer season to maintain plants	✓		
18.	Steps taken for organic, inorganic, toxic, e-waste, biomedical, food, sewage waste management, segregation of wastes and reuse methods	✓		
19.	Public transport, low-emitting vehicles and control of car smokes and exhaust towards environment monitoring	✓		
20.	Observation on the site preservation, soil erosion control and landscape management			✓
21.	Projects and Dissertation works and Scholarly publications on environmental science and management carried out by students and staff members	✓		
22.	Implementation of advanced methods for watering plantations (Drip irrigation, Sprinkler irrigation, etc.)	✓		
23.	Use of metering for water utility, IoT based watering, automation, water device, remote water lines, etc.		✓	

24.	Percentage of Organization's budget for environment sustainability efforts	✓		
25.	Campus facilities for disabled, special needs and or maternity care including security, safety and health infrastructure facilities for stakeholder's wellbeing	✓		

13.2. Quantitative Measurements

S.No.	Details of Plant and animal species	Numbers / Percentage
1.	Total number of Flowering plant species inside the Campus	63 species belonging to 52 Genera under 35 families
2.	Total Number of medicinal species inside the Campus	27 species belonging to medicinal plants
2.	Total number of Non-Flowering plant species inside the Campus	3 species belonging to Pteritophyte
3.	Total number of living Mammals inside the Campus	6 species belonging to four Genera under three families
4.	Total number of visiting Mammals inside the Campus	7 species belonging to five Genera under four families
5.	Total number of living Birds inside the Campus	18 species belonging Peacock, Crow, Pigeon, Woodpecker, Hen, Sparrows, Myna, Parrot, Pelican
6.	Total number of visiting Birds inside the Campus	11 species belonging Owl, Vulture, Eagle, Finch, Swan
9.	Total number of Grasshoper and Termites	Grasshoper: 5 species Termites: 3 species
10.	Total number of Ambhians and Reptiles	3 species each
11.	Total number of Butterflies and Mosquitos	Butterflies : 11 species Mosquitos: 02 species
12.	Percentage of Forest Vegetation	-
13.	Percentage of Planted Vegetation	55%
14.	Percentage of Water consumption to total human population	
15.	Percentage of Water consumption to total flora and fauna	
16.	Per capita water consumption per day	

13.3. Flora and Fauna diversity in Dr.N.G.P Arts and Science College Campus

13.3.1. Flora diversity in Dr.N.G.P Arts and Science College Campus

Ensuring the rich biodiversity in the green campus is an important parameter which reflects the real-time ecosystem. Plants are indicators for assessing the varying levels of environmental quality. In general, plants improve the outdoor air quality with increased oxygen levels and reduced temperature and carbon-di-oxide. The green and varying colour of the flowering plants improve the ambience of the Organization environment. The record on maintenance of the plant biomass and its management are important with respect to green campus initiatives. The existence of such plants and

birds in the green campus may be recorded for the rich flora and fauna which are being considered as a value addition to the campus.

The observations indicated that Dr. N.G.P College of Arts and Science College campus has more than 75-80% of native plant species and the other 15-20% plant species are ornamental in nature coming under the planted vegetation. The native plant traits promote the indigenous fauna at the site area.

The most plants recorded are *Annona squamosa* L., *Aralia spinosa* L., *Bambusaarundinacea* (L.) Voss., *Borassus flabellifer* L., *Cassia fistula* L., *Ficus microcarpa* L.f., *Livistona chinensis* L., *Mimusops elengi* L., *Moringa oleifera* Lam., *Phoenix dactylifera* L., *Phyllanthus Acidus* (L.) Skeels., which are dominant trees species characteristic to the vegetation of the campus. Some of the shrub species like *Abutilon indicum* L., *Caesalpinia Pangaed* L., *Clerodendrum inerme* (L.) Gaertn., *Eranthemum bicolor* (Sims) Schrank., *Hibiscus rosa-sinensis* L., *Justica adhatoda* L., *Lantana camara* L., *Parthenium hysterophorus* L., *Pentalinon luteum* L., *Solanum torvum* Sw., *Tecoma Capensis* (Thunb.) Lindl., *Vitex negundo* L., are also rather common in the campus.

The ground flora here is comparatively sparse, but fairly rich in undistributed areas. Some of the common weeds like *Achyranthus aspera* L., *Agave americana* L., *Alysicarpus longisima* (L.) DC., *Andropogon pumilus* Roxb., *Boerhavia erecta* L., *Cardiospermum halicacabum* L., *Chloris barbata* Sw., *Corchorus aestuans* L., *Cyperus alternifolius* Rottb., *Digera muricata* L., *Eragrostis minor* Wolf., *Euphorbia hirta* L., *Hymenocallis littoralis* (Jacq.) Salisb., *Iseilema laxum* Hack., *Mimosa pudica* L., *Pavonia zeylanica* (L.) Can., *Peristrophe bicalyculata* (Retz.), *Phyllanthus maderaspatensis* L., *Setaria pumila* (Poir.) Roem. & Schult., *Tradescantia spathacea* Sw., are found to be predominant. The species such as *Chloris barbata* Sw., *Corchorus aestuans* L., *Cyperus alternifolius* Rottb., *Digera muricata* L., *Eragrostis minor* Wolf., *Euphorbia hirta* L., *Hymenocallis littoralis* (Jacq.) Salisb., *Iseilema laxum* Hack., *Mimosa pudica* L., *Pavonia zeylanica* (L.) Can., are some common herbs in the campus. Very few climbers found among the shrubs are *Coccinia indica* Wight & Arn., *Parsonsia alboflavescens* (Dennst.) Mabb., *Tylophora indica* (Burm.f.).

This campus is rich in grass species like *Alpuda mutica* L., *Cymbopogon caesius* (Nees ex Hook. & Arn.), *Heteropogon contortus* L. P.Beauv. Ex Roemer & Schlt., *Rottboellia cochinchinensis* (Lour.), *Vetiveria zizanioids* L., *Chloris inflata* Link., *Cynodon dactylon* (L.) Pers., *Tragus roxburghii* Panigrahi, *Dactyloctenium aegyptium* (L.) P.Beauv., *Eragrostis aspera* (Jacq.), *Setaria pumila* (Poir.) Roemer & Schultes, *Setaria verticillata* (L.) P.Beauv., along with *Agave Americana* L., *Asparagus racemosus* Wild., *Commelina benghalensis* L., *Cyanotica cristata* (L.) D.Don and *Cyperus rotundus* L.

Most of the species found are common in the campus, some of the species *Cucumis dipsaceus* Ehrenb., *Caralluma bicolor* Ramach., *Hybanthus puberulus* M. Gilbert are rare species. Some endemic grass species like *Andropogon pumilus* Roxb., *Bothriochloa compressa* (Hook.F.), *Chloris bournei* Rang & Tadul.,

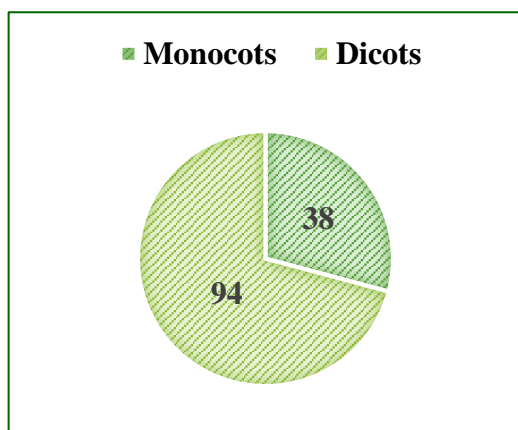
Panicum psilopodium Trin., and *Perotis indica* (L.) Kuntze are also occurring in the campus. Number of these species decreased and some even face the danger of going extinct due to regular clearing and construction activities. Therefore in terms of preserving the floral biodiversity, it is importance to set up a botanical garden in the confines of the campus and cultivate these plants and protect the ones that grow naturally on the grounds upon the vegetation maintenance.

Invasive species

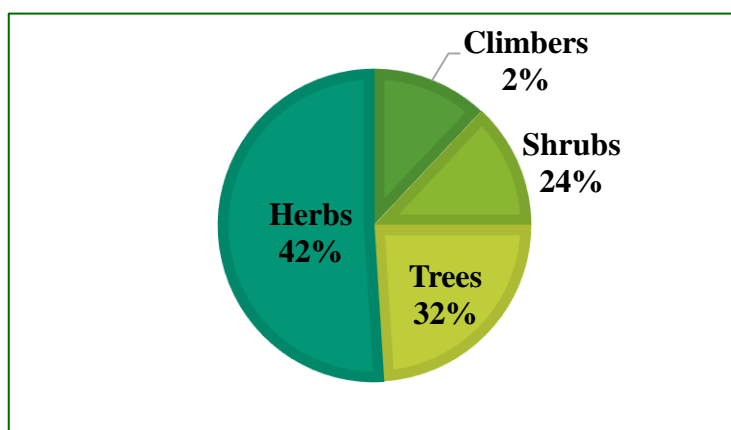
The campus has 24 invasive species such as *Alternanthera pungens* H.B.K., *Alternanthera sessilis* (L.) R.Br. ex Dc., *Argemonemexicana* L., *Bidens pilosa* L., *Borassus flabellifer* L., *Calotropis gigantea* (L.) R.Br., *Catharanthus roseus* (L.) Don, *Crotalaria verrucosa* L., *Croton bonplandianum* Baill., *Cyperus difformis* L., *Datura metal* L., *Euphorbia cyathophora* Murr., *Euphorbia hirta* L., *Evolvulus alsinoides* L., *Lantana camara* L., *Leonotis nepetiifolia* (L.) R. Br., *Malvastrum coromandelianum* (L.) Garcke., *Martynia annua* L., *Melia azedarach* L., *Pedaliium murex* L., *Portulaca oleracea* L., *Tribulus lanuginosus* L., *Tridax procumbens* L., and *Waltheria indica* L. This is clearly indicated disturbances to the natural setting in the vegetated areas.

The alien / exotic species viz., *Annona squamosa* L., *Asparagus racemosus* Wild., *Borassus flabellifer* L., *Cassia siamea* Lam., *Casuarina equisetifolia* J. R & G. Forst., *Delonix regia* (Hook.) Raf., *Eucalyptus tereticornis* SM., *Holoptelea integrifolia* (Roxb.) Planchon, *Jatropha gassypifolia* L., *Manilkara achras* (Mill.), *Millingtonia horensis* L.F., *Peltophorum pterocarpum* (DC.), *Pithecellobium dulce* (Roxb.) Benth., *Plumeria rubra* L., *Sesbania grandiflora* (L.) Poiret, *Tamarindus indica* L., *Tecomastans* (L.) Kunth and *Zizyphus mauritiana* Lam. are occur in the campus. The only plantation on the campus is of *Acacia auriculiformis*, *Acacia ferruginea* DC., *Crescentia cujetea* L., *Cycas circinalis* L., *Kigelia pinnata* (Jacq.) and *Markhamia platycalyx* (Baker). There are several avenue trees on the campus such as *Bauhinia purpurea* L., *Callistemon cirtinus* (Curtis) Skeels., *Cassia fistula* L., *Cassia siamea* Lam., *Casuarina equisetifolia* J.R & G. Frost., *Delonix regia* (Boj. ex Hook.), *Eucalyptus tereticornis* Sm., *Guaiacum officinalae* L., *Parkia biglandulosa* Wight & Arn., *Polyalthialongiflora* (Sonn.), *Peltophorum pterocarpum* (DC.) Backer ex K. Heyne., *Pterocarpus marsupium* Roxb., *Samanea saman* (Jacq.) Merr., *Santalum album* L., *Thespesia populanea* (L.) Sol. Ex Corr. Serr. and *Roystonea regia*, Kunth.

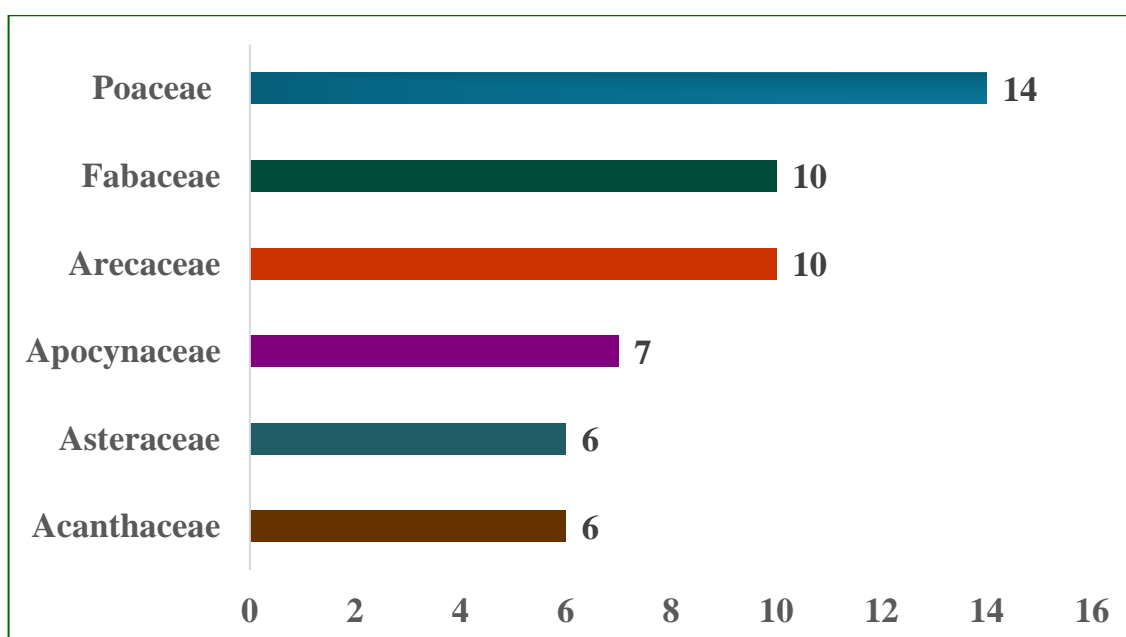
Some of the species are utilized as fruit yielding like *Annona squamosa* L., (Seetha), *Artocarpus heterophyllus* Lam., (Pala), *Mangifera indica* L. (Maa) Thwaites., *Moringa pterygosperma* Gaertn. (Murungai), *Phyllanthus acidus* (L.) Skeels. (Aranelli), *Phyllanthus emblica* L. (Nelli), *Psidium guajava* L., (Koyya) and *Syzygium cumini* (L.) Skeels. (Naval). Species such as *Cordia sebestena* L., *Jacarandamimosifolia* D., *Millingtonia hortensis* L.F., *Plumeria alba* L., *Plumeria rubra* L., *Tabebuia rosea* (Bertol.) DC. and *Tecoma stans* (L.) Kunth. are also utilized for their attractive flowers.



**Systematic groups of the plants
in Dr. N.G.P College campus**



**Analysis of habit-wise distribution
of plant species in the campus area**



Plant families with higher number of species in the campus area

The biodiversity of Dr. N.G.P Arts and Science College Campus comprises a total of 135 species belonging to 122 genera under 51 families. Of these, Dicots are dominating with 41 families whereas, monocots with 10 families. Over all the herbs were the most dominant flora 57 (42%) followed by Trees 43 (32%), Shrubs 32 (24%) and Climbers 3 (2%). Among dicots, Polypetalae formed a larger percentage with 28 families, 50 genera and 62 species, Gamopetalae with 19 families, 41 genera and 46 species and Monochlamydeae with 4 families, 31 genera and 27 species. In monocots 5 families are spreading over 32 genera belonging to 28 species. Poaceae is the first dominant family with 14 species followed by Fabaceae and Arecaceae each with 10 species, Apocynaceae with 7 species and Asteraceae and Acanthaceae each with 6 species. During the study in the campus, a total of 6 alien and 12 invasive floral species

were recorded. This clearly indicated disturbances to the natural setting in the vegetated sector.

List of Flowering plants in the Dr. N.G.P Arts and Science College campus, India

S.No	Common Name	Botanical Name	Family	Habit
1.	Sixweeks threeawn	<i>Aristida adscensionis</i> L.	Poaceae	Herb
2.	Crab grass	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Herb
3.	Swollen fingergrass	<i>Chloris barbata</i> Sw.	Poaceae	Herb
4.	Little Lovegrass	<i>Eragrostis minor</i> Wolf	Poaceae	Herb
5.	Asian Crabgrass	<i>Digitaria bicornis</i> Haller	Poaceae	Herb
6.	Creeping Panic Grass	<i>Bracharia reptans</i> (L.) C.A.Gardner & C.E.Hubb.	Poaceae	Herb
7.	Yellow foxtail	<i>Setaria pumila</i> (Poir.) Roem. & Schult.	Poaceae	Herb
8.	Egyptian crowfoot grass	<i>Dactyloctenium aegyptium</i> (L.) Willd.	Poaceae	Herb
9.	Musal grass	<i>Iseilema laxum</i> Hack.	Poaceae	Herb
10.	Buffel Grass	<i>Cenchrus setiger</i> Vahl	Poaceae	Herb
11.	Kaavattam Pillu	<i>Andropogon pumilus</i> Roxb.	Poaceae	Herb
12.	Purple nut sedge	<i>Cyperus rotundus</i> L.	Cyperaceae	Herb
13.	Umbrella Sedge	<i>Cyperus alternifolius</i> Rottb	Cyperaceae	Herb
14.	Prickly chaff flower	<i>Achyranthus aspera</i> L.	Amaranthaceae	Herb
15.	Muskmelon	<i>Cucumis maderaspatanus</i> (L.) M.Roem.	Cucurbitaceae	Herb
16.	Aloe	<i>Aloe vera</i> (L.) Burm.f.	Asphodelaceae	Herb
17.	Indian acalypha	<i>Acalypha indica</i> L.	Euphorbiaceae	Herb
18.	Neem Tree	<i>Azadiracta indica</i> A.Juss.	Meliaceae	Tree
19.	Sensitive plant	<i>Mimosa pudica</i> L.	Fabaceae	Herb
20.	Spreading hogweed	<i>Boerhavia diffusa</i> L.nom. cons.	Nyctaginaceae	Herb
21.	Erect spiderling	<i>Boerhavia erecta</i> L.	Nyctaginaceae	Herb
22.	Holy basil	<i>Ocimum tenuifolium</i> L.	Lamiaceae	Herb
23.	European black nightshade	<i>Solanum nigrum</i> L.	Solanaceae	Shrub
24.	Turkey Berry	<i>Solanum torvum</i> Sw.	Solanaceae	Shrub
25.	Purple Fruited Pea Eggplant	<i>solanum trilobatum</i> L.	Solanaceae	Shrub
26.	Gale of Wind,	<i>Phyllanthus amarus</i> Schumach. & Thonn.	Phyllanthaceae	Herb
27.	Madras Leaf- Flower	<i>Phyllanthus maderaspatensis</i> L.	Phyllanthaceae	Herb
28.	Asthma Weed	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Herb

29.	Air plant	<i>Bryophyllum pinnatum</i> L.	Crassulaceae	Herb
30.	Willow-leaved justicia	<i>Justicia gendarussa</i> Burm.f.	Acanthaceae	Shrub
31.	Madagascar periwinkle	<i>Catharanthus roseus</i> (L.) G.Don	Apocynaceae	Shrub
32.	Pilabhamgara	<i>Wedelia chinensis</i> L	Asteraceae,	Herb
33.	Chinese chaste Tree	<i>Vitex negundo</i> L	Lamiaceae	Shrub
34.	Chinese chaste Tree	<i>Hibiscus nicranthus</i> L	Lamiaceae	Shrub
35.	False Amaranth	<i>Digera muricata</i> L	Amaranthaceae	Herb
36.	Paperflower	<i>Bougainvillea sterula</i> Choisy	Nyctaginaceae	Shrub
37.	Crested fever nut	<i>Caesalpinia pangaea</i> L.	Fabaceae	Shrub
38.	White lead Tree	<i>Leucaena leucocephala</i> (Lam.) de Wit	Fabaceae	Tree
39.	Golden shower Tree	<i>Cassia fistula</i> L	Fabaceae	Tree
40.	Buffalo clover	<i>Alysicarpus longisima</i> (L.) DC.	Fabaceae	Herb
41.	Indigo savage	<i>Tephrosia pumila</i> Pers.	Fabaceae	Herb
42.	Birdsville Indigo	<i>Indigofera linnaei</i> Ali	Fabaceae	Shrub
43.	Indian elm	<i>Holoptelea integrifolia</i> (Roxb.) Planch	Ulmaceae	Tree
44.	Stinking passionflower	<i>Passiflora foetida</i> L.	Passifloraceae	Shrub
45.	Threelobe false mallow	<i>Malvastrum coromandelianum</i> (L.) Garcke	Malvaceae	Shrub
46.	Panicled Foldwing	<i>Peristrophe bicalyculata</i> (Retz.)	Acanthaceae	Herb
47.	Tamarind	<i>Tamarindus indica</i> L.	Fabaceae	Tree
48.	Cupid's Shaving Brush	<i>Emilia sonchifolia</i> L.) DC.	Asteraceae	Herb
49.	Black plum	<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	Tree
50.	Castor oil plant	<i>Ricinus communis</i> L.	Euphorbiaceae	Shrub
51.	Giant Mexican Sunflower	<i>Tithonia diversifolia</i> (Hemsl.) A.Gray	Asteraceae	Shrub
52.	Spanish flag	<i>Lantana camara</i> L.	Verbenaceae	Shrub
53.	Carrot grass	<i>Parthenium hysterophorus</i> L.	Asteraceae.	Shrub
54.	Spanish Cherry	<i>Mimusops elengi</i> L.	Sapotaceae	Tree
55.	Gold shower	<i>Galphimia gracilis</i> Bartl.	Malpighiaceae	Shrub
56.	River red gum	<i>Eucalyptus camaldulensis</i> L.	Myrtaceae	Tree
57.	Madagascar Dragon	<i>Dracena termicora</i> L.	Asparagaceae	Tree
58.	Palkodi	<i>Psudathria visda</i> , L.	Fabaceae	Tree
59.	Spider ivy	<i>Hlorophytum comosum</i> (Thunb.) Jacques[Asparagaceae	Herb

60.	Christmas Tree	<i>Araucaria columnaris</i> J.R.Forst. Hook.	Araucariaceae	Tree
61.	Century Plant	<i>Agave americana</i> L.	Asparagaceae	Herb
62.	Mountain knotgrass	<i>Aerva lanata</i> (L.) Juss. ex Schult.	Amaranthaceae	Herb
63.	Boat Lily	<i>Tradescantia spathacea</i> Sw.	Commelinaceae	Herb
64.	Physalis minima	<i>Physalis minima</i> L.	Solanaceae	Herb
65.	Malabar nut	<i>Justica adhatoda</i> L.	Acanthaceae	Shrub
66.	Beach Spiderlily	<i>Hymenocallis littoralis</i> (Jacq.) Salisb.	Amaryllidaceae	Herb
67.	Golden Pothos	<i>Epipremnum aureum</i> Linden & André) G.S.Bunting,	Araceae	Tree
68.	Jute	<i>Corchorus aestuans</i> L.	Sparrmaniaceae	Herb
69.	Croton	<i>Codiaeum variegatum</i> (L.) A.Juss.	Euphorbiaceae	Herb
70.	African locust bean	<i>Parkia biglobosa</i> (Jacq.) R.Br. ex G.Don	Fabaceae	Tree
71.	Star gooseberry	<i>Phyllanthus acidus</i> (L.) Skeels	Phyllanthaceae	Tree
72.	Monkey Bush	<i>Abutilon indicum</i> L.	Malvaceae	Shrub
73.	East Indian sandalwood	<i>Santalum album</i> L.	Santalaceae	Tree
74.	Desert horsepurslane	<i>Trianthema portulacastrum</i> L.	Aizoaceae	Herb
75.	Lady Palm	<i>Rhapis excelsa</i> (Thunb.) A.Henry	Arecaceae	Tree
76.	Palmyra palm	<i>Borassus flabellifer</i> L.	Arecaceae	Tree
77.	Silver Bismarck Palm	<i>Bismarckia nobilis</i> Hildebr.& H.Wendl.	Arecaceae	Tree
78.	Solitary fishtail palm	<i>Caryota urens</i> L.	Arecaceae	Tree
79.	Chinese Fan Palm	<i>Livistona chinensis</i> L.	Arecaceae	Tree
80.	Date Palm	<i>Phoenix dactylifera</i> L.	Arecaceae	Tree
81.	Cabbage palm	<i>Sabal palmetto</i> (Walt.) Lodd.	Arecaceae	Tree
82.	Foxtail Palm	<i>Wodyetia bifurcate</i> A.K.Irvine	Arecaceae	Tree
83.	Ceylon date palm	<i>Phoenix pusilla</i> Roxb.	Arecaceae	Tree
84.	Ruffled fan palm	<i>Pichodia Grandis</i> (hort. ex W. Bull) H. Wendl.	Arecaceae	Tree
85.	Common Bamboo	<i>Bambusa arundinacea</i> (L.) Voss	Poaceae	Tree
86.	Punting pole bamboo	<i>Bambusa tuldoidea</i> (L.) Voss	Poaceae	Tree
87.	Belatana	<i>Pennisetum triflorum</i> Rich	Poaceae	Herb
88.	Fragrant Pandan	<i>Pandanus amaryllifolius</i> Roxb.	Pandanaceae	Herb
89.	Golden trumpet	<i>Allamanda cathartica</i> L.	Apocynaceae	Shrub
90.	Paradise Tree	<i>Imarouba glauca</i> - DC.	Simaroubaceae	Tree
91.	Champaca	<i>Magnolia champaca</i> (L.) Figlar	Magnoliaceae	Tree

92.	Black pearl Tree	<i>Majidea zangueberica</i> Kirk ex Oliv.	Sapindaceae	Tree
93.	Indian mulberry	<i>Morinda pubescens</i> Roxb.	Rubiaceae	Tree
94.	Ammock viper's-tail	<i>Pentalinon luteum</i> L.	Apocynaceae	Shrub
95.	Mexican Mint	<i>Plectranthus amboinicus</i> Lour.	Lamiaceae	Herb
96.	Pomegranate	<i>Punica granatum</i> L.	Lythraceae	Tree
97.	Cape Honeysuckle	<i>Tecoma capensis</i> (Thunb.) Lindl.	Bignoniaceae	Shrub
98.	Madagascar almond	<i>Terminalia mantaly</i> H.Perrier	Combretaceae	Tree
99.	Curry leaf	<i>Murraya koenigii</i> (L.) Sprengel	Rutaceae	Tree
100.	Bastard myrobalan	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Combretaceae	Tree
101.	Green chiretta	<i>Andrographis paniculata</i> (Burm.f.) Nees	Acanthaceae	Herb
102.	Henna tree	<i>Lawsonia inermis</i> L.	Lythraceae	Tree
103.	Indian pennywort	<i>Centella asiatica</i> (L.) Urban	Apiaceae	Herb
104.	Crown flower	<i>Calotropis gigantea</i> (L.) Dryand.	Apocynaceae	Shrub
105.	Lemon	<i>Citrus limon</i> (L.) Osbeck	Rutaceae	Tree
106.	Angel's trumpet	<i>Datura innoxia</i> Mill.	Solanceae	Shrub
107.	Balloon vine	<i>Cardiospermum halicacabum</i> L.	Sapindaceae	Herb
108.	Chensis Hibiscus	<i>Hibiscus rosa-sinensis</i> L.	Malvaceae	Shrub
109.	Kidney leaf morning glory	<i>Merremia emarginata</i> (Burm.f)	Convolvulaceae	Herb
110.	Puncture vine	<i>Tribulus terrestris</i> L.	Zygophyllaceae	Herb
111.	Heart-leaved moon seed	<i>Tinospora cordifolia</i> (Willd.) Hoof.f.	Menispermaceae	Herb
112.	Slender dwarf morning glory	<i>Evolvulus alsinoides</i> (L.) L.	Convolvulaceae	Herb
113.	Jack fruit	<i>Artocarpus integrifolia</i> L.	Moraceae	Tree
114.	Drum stick tree	<i>Moringa oleifera</i> Lam.	Moringaceae	Tree
115.	Coco grass	<i>Cyperus rotundus</i> L.	Cyperaceae	Herb
116.	Indian Borage	<i>Trichodesma indicum</i> (L.)R.Br.	Boringaceae	Shrub
117.	Indian Ipecac	<i>Tylophora indica</i> (Burm.f.)	Apocynaceae	Climber
118.	Diamond flower	<i>Oldenlandia corymbosa</i> L.	Rubiaceae	Herb
119.	Glory bower	<i>Clerodendrum inerme</i> (L.) Gaertn.	Lamiaceae	Shrub
120.	Ivy gourd	<i>Coccinia indica</i> Wight & Arn.	Cucurbitaceae	Climber
121.	Coastal morning glory	<i>Ipomoea carica</i> (L.) Sweet	Convolvulaceae	Herb
122.	Indian laurel	<i>Ficus microcarpa</i> L.f.	Moraceae	Tree
123.	Sugar apple	<i>Annona squamosa</i> L.	Annonaceae	Tree
124.	Asian spider	<i>Cleome viscosa</i> Linn.	Cleomaceae	Herb

	flower			
125.	Shaggy Button Weed.	<i>Borreria hispida</i> (L.) K. Schum.	Rubiaceae	Herb
126.	Ceylon leadwort	<i>Pavonia zeylanica</i> (L.) Can.	Malvaceae	Herb
127.	Jungle flame	<i>Ixora singaporensis</i> (Linn.)	Rubiaceae	Shrub
128.	Ming aralia	<i>Aralia polycnias</i> Spreng.ex Seem.	Araliaceae	Tree
129.	Scarlet Fuchsia	<i>Eranthemum bicolour</i> (Sims) Schrank	Acanthaceae	Shrub
130.	Purple False Eranthemum	<i>Pseuderanthemum carruthersii</i> (Seem.) Guillaumin	Acanthaceae	Shrub
131.	Devil's walkingstick	<i>Aralia spinosa</i> L.	Araliaceae	Tree
132.	Spiral-Vined Silkpod	<i>Parsonsia alboflavescens</i> (Dennst.) Mabb.	Apocynaceae	Climber
133.	Assamese	<i>Erigeron sublyratus</i> Roxb. ex DC.	Asteraceae	Herb
134.	Oleander	<i>Nerium oleander</i> L.	Apocynaceae	Shrub
135.	Large-Flower Kleinia	<i>Kleinia grandiflora</i> (Wall. ex DC.) N.Rani.	Asteraceae	Shrub

The institution has rich diversity of plants and trees contributing to the greenery of the campus and serves as a habitat for various fauna. The following are the details related to the plants and trees present in the campus.

List of Plants and Trees in the Campus

S.No	Botanical Name	Family
1	<i>Cocos nucifera</i> Linn.	Areaceae
2	<i>Peltophorum ferrugineum</i> (DC.) Hayne	Fabaceae
3	<i>Tectona grandis</i> L.f.	Lamiaceae
4	<i>Azardiracta indica</i> A.Juss	Meliaceae
5	<i>Delonix regia</i> (Boj. Ex Hook.) Raf.	Fabaceae
6	<i>Samanea saman</i> Jacq.	Fabaceae
7	<i>Pongamia glabra</i> (Vent.)	Fabaceae
8	<i>Eugenia jambolana</i> Lam.	Myrtaceae
9	<i>Dalbergia latifolia</i> Roxb	Fabaceae
10	<i>Michelia champaca</i> Linn.	Magnoliaceae
11	<i>Bassia longifolia</i> Linn.	Sapotaceae
12	<i>Artocarpus integrifolia</i> L.f.	Moraceae
13	<i>Meliadubia</i> Cav.	Meliaceae
14	<i>Eucalyptus grandis</i> L.	Myrtaceae
15	<i>Bambusa denrocalamus</i>	Poaceae
16	<i>Ficus religiosa</i> Linn	Moraceae

17	<i>Mimusops elengi</i> Linn.	<i>Sapotaceae</i>
18	<i>Polyalthia longifolia</i> Benth.	<i>Annonaceae</i>
19	<i>Calophyllum inophyllum</i> Linn.	<i>Clusiaceae</i>
20	<i>Araucaria excelsa</i> Lamb.	<i>Araucariaceae</i>
21	<i>Schefflera actinophylla</i> (Endl.)	<i>Araliaceae</i>
22	<i>Cassia fistula</i> L.	<i>Fabaceae</i>
23	<i>Nerium oleander</i> L.	<i>Apocynaceae</i>
24	<i>Nerium indicum</i> Mill	<i>Apocynaceae</i>
25	<i>Plumeria alba</i> Linn.	<i>Apocynaceae</i>
26	<i>Plumeria rubra</i> Linn.	<i>Apocynaceae</i>
27	<i>Ficus benjamina</i> L.	<i>Moraceae</i>
28	<i>Ficus elastica</i> L.	<i>Moraceae</i>
29	<i>Casuarina equisetifolia</i> L.	<i>Casuarinaceae</i>
30	<i>Phoenix dactylifera</i> L.	<i>Arecaceae</i>
31	<i>Vinca rosea</i> L.	<i>Apocynaceae</i>
32	<i>Bougainvillea spectabilis</i> Wild	<i>Nyctaginaceae</i>
33	<i>Allamanda schottii</i>	<i>Apocynaceae</i>
34	<i>Musa paradisiaca</i> Linn.	<i>Musaceae</i>
35	<i>Ixora coccinea</i> Linn.	<i>Rubiaceae</i>
36	<i>Quisqualis indica</i>	<i>Combretaceae</i>
37	<i>Hibiscus rosa-sinensis</i> L.	<i>Malvaceae</i>
38	<i>Heliconia brasiliensis</i>	<i>Heliconiaceae</i>
39	<i>Morinda tinctoria</i> Roxb.,	<i>Rubiaceae</i>
40	<i>Psidium guajava</i> L.	<i>Myrtaceae</i>
41	<i>Carica papaya</i> L.	<i>Caricaceae</i>
42	<i>Punica granatum</i> Linn.	<i>Punicaceae</i>
43	<i>Moringa oleifera</i> Linn	<i>Moringaceae</i>
44	<i>Tamarindus indica</i> Linn	<i>Caesalpinaceae</i>
45	<i>Gomphrena globosa</i> L.	<i>Amaranthaceae</i>
46	<i>Aibizia lebeck</i> (L.)Benth	<i>Fabaceae</i>
47	<i>Ficus benghalensis</i> L.	<i>Moraceae</i>
48	<i>Plectranthus barbatus</i> Andrews	<i>Lamiaceae</i>
49	<i>Celosia argentea</i> L.	<i>Amaranthaceae</i>
50	<i>Phyllanthus acidus</i> L.	<i>Euphorbiaceae</i>
51	<i>Millingtonia hortensis</i> L.f.	<i>Bignoniaceae</i>
52	<i>Borassus flabellifer</i> L.	<i>Arecaceae</i>
53	<i>Cascabela thevetia</i>	<i>Apocynaceae</i>
54	<i>Thespesia populnea</i> L Sol ex Correa	<i>Malvaceae</i>
55	<i>Citrus limon</i> (L.) Burm.f.	<i>Rutaceae</i>
56	<i>Acalypha hispida</i> L	<i>Euphorbiaceae</i>
57	<i>Tithonia diversifolia</i> (Hemsl.) A.Gray	<i>Asteraceae</i>
58	<i>Cycas revolute</i> Thunb.	<i>Cycadaceae</i>
59	<i>Pisonia alba</i> Span	<i>Nyctaginaceae</i>

60	<i>Caryota urens</i> L.	Arecaceae
61	<i>Lantana camara</i> l	Verbenaceae
62	<i>Wodyetia bifurcata</i>	Aracaceae
63	<i>Swietenia macrophylla</i>	Meliaceae



Agave sisalana



Ixora sigaporensis



Iselima laxum



Pavonia zeylanica



Moringa oleifera



Amarathus sp



Ficus benghalensis



Parsonsia alboflavescens



Tithonia diversifolia



Clerodendrum inerme



a view of nursery maintained in the garden



Azadirachta indica



Polyalthia longifolia



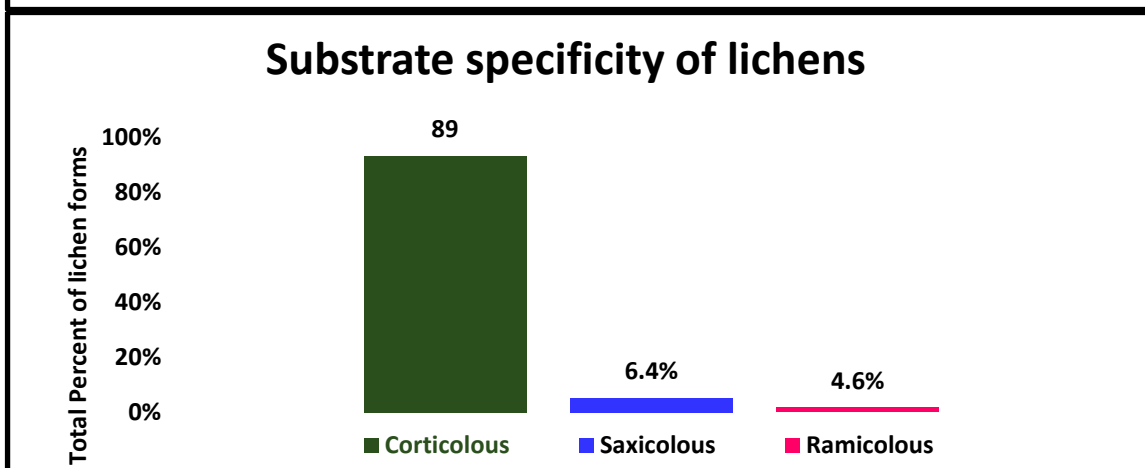
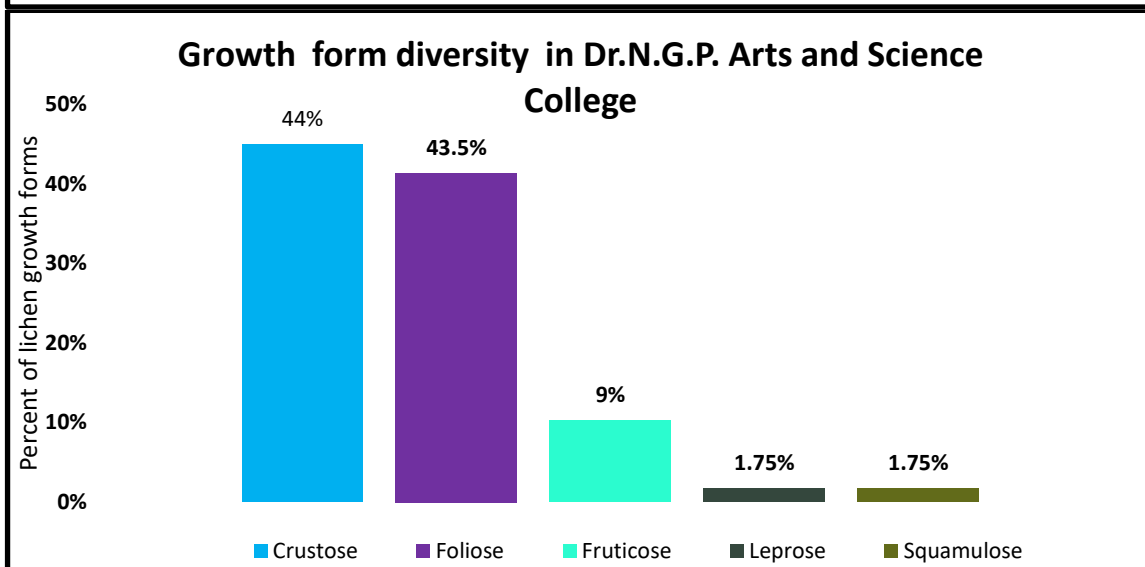
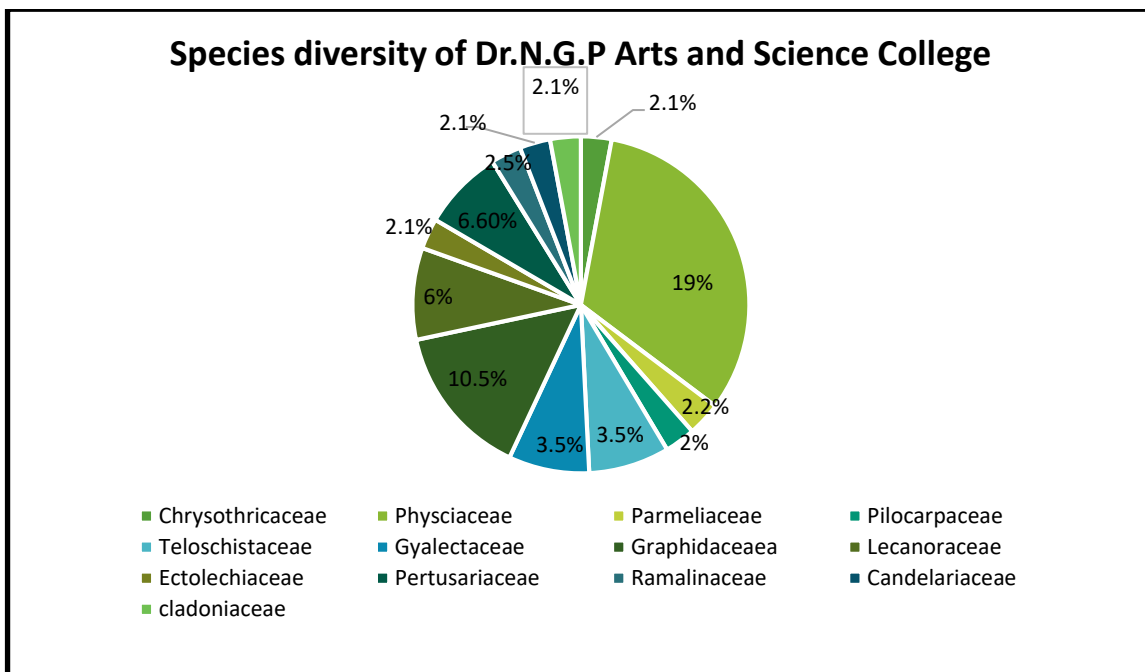
Moringa oleifera

13.3.2. Lichen diversity at Dr. N.G.P Arts and Science College campus

Lichens are one of the most fascinating symbiotic organisms found worldwide. The lichens species are ubiquitous and common inhabitants of the bark of the tree, rock surface, soil etc. They are a lower group of plants coming under non-flowering plants that live in a variety of substrates under a wide range of environmental conditions with or without causing harm to the hosts. Ecologically, lichen plays important roles in soil formation; re-establishes life on earth; fixes atmospheric nitrogen; plant's health, ecology distribution, and in the formation of organic matter of habitat which in turn benefitting mosses in nutrient availability. A unique symbiotic association between a fungal and an algal partner results in a species called lichens in plant kingdom. In this relationship both the organisms are mutually benefited. The algal partner may be cyanobacteria or the blue green algae and this is responsible for the process of photosynthesis. The algae thus provide food or nutrition for the fungi too. The fungal partner in turn provides space and protection for the algae. The lichen is an autotrophic organism in the sense that they can produce their own food by the process of photosynthesis. Even though the lichen is made up of two different organisms, the characteristics of the lichen are entirely different from the original characteristics of the algal and the fungal partner. Lichens are classified as micro lichens and macro lichens in which the microlichens cover the substrate on which they grow in the form of a crust whereas macro lichens grow in the form of a bush or a leaf like structure. The major forms of lichens are a) Foliose lichens exhibit a flat leaf like thallus, b) Fruticose lichens exhibit erect, pendulous and bushy thallus, c) Squamulose lichens exhibit thallus with minute, scale like squamules and d) Crustose lichens exhibit flat crust shaped thallus.

Lichen diversity at Dr.N.G.P Arts and Science College campus showed a total of 15 different lichens species belonging to 9 genera and 6 families. Three species accounted for 5% of total lichen diversity were identified up to species level and 14 were identified to genus level. The observation on lichen diversity revealed that three types of lichens genus belonging to *Buellia* spp., *Lecanora* spp. and *Parmotrema* spp. were accounted 6% diversity and two types of lichens genus belonging *Caloplaca* spp., *Dimeralla* spp., *Graphis* spp. and *Pertusaria* spp. were accounted 6% and about 20% lichens were found to be one single species in each genus. Among 18 species of lichens, crustose growth form of lichens was leading with 20 species (38%) followed by foliose growth forms with 8 species (16%) and leprose type with one species (2%).

Around 16 % representative specimens belonged to Physciaceae were found to be leading among 8 families. One quarter (11%) lichen species was belonged to Parmeliaceae. and most of the species belonged to Physciaceae Parmeliaceae were *Parmotrema praesorediosum*, *P.grayanum*, *Parmotrema austrosinense*, *Flavoparmelia caperata* and *Dirinaria* spp., *Heterodermia leucomelos*, *Heterodermia speciosa*., *Phaeophyscia hirsuta* and *Physcia tribacia* respectively. On the basis of substrate specificity, lichens were categorized under three major types. It was illustrated that 3 species were identified occurring on rock followed by 18 species found attached to bark of the tree, 1 species *Heterodermia obscurata* collected from both the rock (saxicolous) and bark of the tree (corticolous).



Lichen diversity of Dr.N.G.P Arts and Science College campus with respect to family, substratum and growth forms in genus and family wise classification

S.No	Lichen diversity of Dr.N.G.P Arts and Science College campus	Family	Growth forms
1.	<i>Chrysothrix chlorine</i> (Ach.) J.R.Laundon	Chrysothricaceae	Leprose
2.	<i>Buellia spp.</i> ,	Physciaceae	Crustose
3.	<i>Buellia confuse</i> Awasthi	Physciaceae	Crustose
4.	<i>Ramalina celestri</i> (Spreng.) Krog & Swinsc.	Ramalinaceae	Fruticose
5.	<i>Heterodermia hypocaesia</i> (Yasuda ex Rasanen) D.D. Awasthi	Physciaceae	Foliose
6.	<i>Heterodermia dissecta</i> (Kurok.) Awasthi	Physciaceae	Foliose
7.	<i>Parmotrema tinctorum</i> (Deliseex Nyl.) Hale	Parmeliaceae	Foliose
8.	<i>Parmotrema andinum</i> (Mull.Arg) Halee	Parmeliaceae	Foliose
9.	<i>Heterodermia speciose</i> (Wulfan) Trevis	Physciaceae	Foliose
10.	<i>Parmotrema pseudocrinitum</i> (des Abb) Hale	Parmeliaceae	Foliose
11.	<i>Usnea coralline</i> Mot	Parmeliaceae	Furticose
12.	<i>Parmotrema reticulatum</i> (Taylor) Choisy	Parmeliaceae	Foliose
13.	<i>Pertusaria amara</i> (Ach.) Nyl	Pertusariaceae	Crustose
14.	<i>Usnea spinosula</i> Stirt	Parmeliaceae	Furticose
15.	<i>Parmotrema reticulatum</i> (Taylor) M. Choisy	Parmeliaceae	Foliose



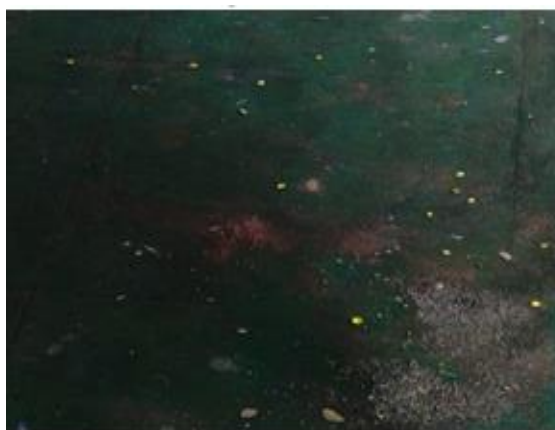
Parmotrema tinctorum



Usnea spinosula

13.3.3. Algal diversity at Dr. N.G.P Arts and Science College campus

Chlamydomonas ovoidae, *Scytonema varium*, *Oscillatoria curviceps*, *Oedogonium microgonium*, *Spirogyra porticalis*, *Volvox aureus*, *Microcystis elongate* and *Cladophora albid* belonging to the class of Cyanophyceae, Chlorophyceae and Bacillariophyceae. The families Chlorellaceae, Closteriaceae, Desmidiaceae, Radiococcaceae, Ulotrichaceae, Uronemataceae and Oedogoniaceae were represented by single genus and species. Chlorophyceae plays an important role in both terrestrial and aquatic ecosystem as most of the members are found to be ecologically important. The highest diversity of Chlorophyceae indicated relatively good health of atmosphere. The presence of these algal species in abundance can be concluded that the Institution ecosystem has high amount of organic nutrients in soil and rock. The occurrence of rich algal flora results generally at a place with high level of nutrient together with favourable environmental conditions.



Spirogyra porticalis



Microcystis elongata

13.3.4. Fauna Diversity in Dr. N.G.P CAS campus

13.3.4.1. Birds Diversity in Dr. N.G.P CAS campus

The observations on fauna diversity indicated that the Dr. N.G.P CAS campus has a large number of living as well as visiting animals, birds, reptiles and insects including termites. A total number of 32 birds belonging to the 12 species were recorded from different habitats during winter and summer, of them one of which were endemic to the western Ghats like purple rumped sunbird. Total number of 32 bird species, out of them 3 species were migrant, 6 species were local migrant during winter and summer season because of unfavourable environment and low availability of food resources. Migratory bird species like Red winged crested cuckoo, Indian cuckoo, forest wag tail, Yellow browed bulbul, Paddy field warbler, small green billed malkhoa, Alexandrine parakeet, Rose ringed parakeet and red whiskered bulbul.

Birds Diversity in Dr. N.G.P CAS campus

S.No	Common Name	Scientific Name
1.	Golden oriole	<i>Oriolus oriolus</i>
2.	Green bee eater	<i>Merops orientalis</i>
3.	Blue face malhova	<i>Phaenicophaeus viridirostris</i>
4.	Red wattled Lapwing	<i>Vanellinae</i>
5.	Chestnut bee eater	<i>Merops leschenaultia</i>
6.	Common Kingfisher	<i>Alcedinidae</i>
7.	Bay backed shrike	<i>Laniidae</i>
8.	Eurasian collared dove	<i>Streptopelia decaocto</i>
9.	House crow	<i>Corvus splendens</i>
10.	Large billed crow	<i>Corvus macrorhynchos</i>
11.	Common myna	<i>Acridotheres tristis</i>
12.	House crow	<i>Corvus splendens</i>

13.	Grey wagtail	<i>Motacilla cinerea</i>
14.	Purple sunbird	<i>Cinnyris asiaticus</i>
15.	Purple rumped sunbird	<i>Leptocoomo zeylonica</i>
16.	Black drango	<i>Dicrurus macrocercus</i>
17.	Spotted owlet	<i>Strix occidentalis</i>
18.	Indian Paradise flycatcher	<i>Terpsiphone paradise</i>
19.	Indian roller	<i>Coracias benghalensis</i>
20.	Indian peafowl	<i>Pavo cristatus</i>
21.	Rufous treepie	<i>Dendrocitta vagabunda</i>
22.	White wagtail	<i>Motacilla alba</i>
23.	Yellow wattled lapwing	<i>Vanellus indicus</i>
24.	Jungle myna	<i>Acridotheres fuscus</i>
25.	Rock pigeon	<i>Columba livia</i>
26.	Rose ringed parakeet	<i>Psittacula krameri</i>
27.	Common Iora	<i>Aegithina tiphia</i>
28.	Laughing dove	<i>Spilopodia senegalensis</i>
29.	Asian swift	<i>Cypsiurus balasiensis</i>
30.	Red rumped swallow	<i>Hirundinidae</i>
31.	Oriental magpie robin	<i>Copsychus saularis</i>
32.	Lotens sunbird	<i>Cinnyris loteniusduc</i>

Dr.N.G.P Arts and Science College campus has three family level diversities such as Papilionidae, Pieridae and Hesperidae in which Common butterfly species such as Mormon, Rose, Birdwing, Emigrant, Grassyellow, Gull Wanderer, Emigrant, Small Orange Tip, Plain Orange Tip, White Orange Tip, Yellow Orange Tip, Pioneer Chocolate, Pansy, Baron, Palmfly, Bush, Brown, Eggfly, Sailer, Evening, Brown, Eggfly, Pansy, Grey and Pansy are commonly found.

List of Butterflies recorded in Dr. N.G.P Arts and Science College campus

S.No	Common Name	Scientific Name
1	Crimson Rose	<i>Pachliopta hector</i>
2	Small Salmon Arab	<i>Colotis amata</i>
3	Common Sailor	<i>Neptishylasinara</i>
4	Common banded peacock	<i>Papilio crino</i>
5	Silver Line	<i>Spindasis vulcanus</i>
6	Red Pierrot	<i>Talica danyseus</i>
7	Tiny Grass Blue	<i>Zizula hylax</i>
8	Stripped Tiger	<i>Danaus genutia</i>
9	Common Emigrant	<i>Catopsilia pomona</i>
10	Common Grass Yellow	<i>Eurema hecabe</i>
11	Tamil Yeoman	<i>Cirrochroa thais</i>

13.3.4.2. Mammals diversity in Dr. N.G.P Arts and Science College campus

Mammals are a group of vertebrate animals constituting the class Mammalia, and characterized by the presence of mammary glands which in females produce milk for feeding (nursing) their young, a neocortex (a region of brain), fur or hair, and three middle ear bones. These characteristics distinguish them from reptiles and birds, from which they diverged in the Carboniferous. The largest orders are the rodents, bats and Eulipotyphla (hedgehogs, moles and shrews). The observation on diversity of mammals in Dr. N.G.P Arts and Science College indicated that around 5 species are Mammals are commonly distributed. The commonly found mammals are Black-naped Hare, Three-striped Palm Squirrel, Commonor Grey Mongoose, Indian Flying Fox, Short-nosed Fruit Bat, House Rat and Indian Mole-rat.

S.No.	CommonName	ScientificName	CommonName
1.	Three-striped Palm Squirrel	<i>Funambuluspalmarum</i>	Anil
2.	Indian Flying Fox	<i>Pteropusgiganteus</i>	PeriyaVowaal
3.	Short-nosed Fruit Bat	<i>Cynopterussphinx</i>	Vowaal
4.	House Rat	<i>Rattusrattus</i>	Sundeli
5.	Indian Mole-rat	<i>Bandicotabengalensis</i>	Peruchali

Mammalsdiversity inDr.N.G.P Arts and Science Collegecampus

13.3.4.3. Amphibians diversity in Dr.N.G.P Arts and Science College campus

Amphibians are ectothermic, tetrapod vertebrates of the class Amphibia. All living amphibians belong to the group Lissamphibia. They inhabit a wide variety of habitats, with most species living within terrestrial, fossorial, arboreal or freshwater aquatic ecosystems. Thus amphibians typically start out as larvae living in water, but some species have developed behavioural adaptations to bypass this. The observation on diversity of Amphibiansin Dr. N.G.P Arts and Science College indicated that around 14 species are Amphibiansare commonly distributed. The commonly found amphibiansare listed.

The young amphibiansgenerally undergo metamorphosis from larva with gills to an adult air-breathing form with lungs. Amphibians use their skin as a secondary respiratory surface and some small terrestrial salamanders and frogs lack lungs and rely entirely on their skin. They are superficially similar to lizards but, along with mammals and birds, reptiles are amniotes and do not require water bodies in which to breed. With their complex reproductive needs and permeable skins, amphibians are often ecological indicators; in recent decades there has been a dramatic decline in amphibian populations for many species around the globe.

The earliest amphibians evolved in the Devonian period from sarcopterygian fish with lungs and bony-limbed fins, features that were helpful in adapting to dry land. They diversified and became dominant during the Carboniferous and Permian periods, but were later displaced by reptiles and other vertebrates. Over time, amphibians shrank in size and decreased in diversity, leaving only the modern subclass Lissamphibia. The three modern orders of amphibians are Anura (the frogs), Urodela (the salamanders), and Apoda (the caecilians). The number of known amphibian species is nearly 90% are frogs. The smallest amphibian (and vertebrate) in the world is a frog from New Guinea (*Paedophryne amauensis*). The study of amphibians is called Batrachology, while the study of both reptiles and amphibians is called herpetology. The observation on diversity of Amphibians in Dr.N.G.P. Arts and Science College indicated that around 14 species are Amphibians commonly distributed. The commonly found amphibians are listed.

13.3.4.4. Grasshopper diversity in Dr.N.G.P Arts and Science College Campus

Grasshoppers are a group of insects belonging to the suborder Caelifera. They are among what is probably the most ancient living group of chewing herbivorous insects. They are typically ground-dwelling insects with powerful hind legs which allow them to escape from threats by leaping vigorously. As hemimetabolous insects, they do not undergo complete metamorphosis; they hatch from an egg into a nymph or "hopper" which undergoes five moults, becoming more similar to the adult insect at each developmental stage. The grasshopper hears through the tympanal organ which can be

S.No	Common Amphibians Name	Scientific Name
1.	Indus Valley Toad	<i>Firouzophrynus stomaticus</i>
2.	Marbled Balloon Frog	<i>Uperodon systoma</i>
3.	Anamalai Dot Frog	<i>Uperodon anamalaiensis</i>
4.	Sri Lankan Bullfrog	<i>Uperodon taprobanicus</i>
5.	Bicolored Frog	<i>Clinotarsu scurtipes</i>
6.	False Malabar Gliding Frog	<i>Rhacophorus pseudomalabaricus</i>
7.	Anil's Bush Frog	<i>Raorchestes anili</i>
8.	Ochlandra Shrub Frog	<i>Raorchestes ochlandrae</i>
9.	Large Ponmudi Bush Frog	<i>Raorchestes ponmudi</i>
10.	Variable Bush Frog	<i>Raorchestes akroparallagi</i>
11.	Jayaram's Bush Frog	<i>Raorchestes jayarami</i>
12.	Spinular Night Frog	<i>Nyctibatrachus acanthodermis</i>
13.	Pillai's Night Frog	<i>Nyctibatrachus pillaii</i>
14.	Meowing Night Frog	<i>Nyctibatrachus poocha</i>

found in the first segment of the abdomen attached to the thorax; while its sense of vision is in the compound eyes, the change in light intensity is perceived in the simple eyes (ocelli). At high population densities and under certain environmental conditions, some grasshopper species can change colour and behavior and form swarms. Grasshoppers are plant-eaters, with a few species at times becoming serious pests of cereals, vegetables and pasture, especially when they swarm in their millions as locusts and destroy crops over wide areas. Grasshoppers have had a long relationship with humans. Swarms of locusts can have devastating effects and cause famine, having done so since Biblical times. The study of grasshopper species is called Acridology.

The observation on diversity of Grasshoppers in Dr. N.G.P Arts and Science College indicated that around 18 species are commonly distributed. The commonly found Grasshoppers are *Acrida exaltata*, *Acrida turrita*, *Diabolocatantops pinguis*, *Eyprepocnemis alacris*, *Crucinotacris decisa*, *Aulacobothrus luteipes*, *Acrotylus insubricus*, *Acrotylus humbertianus*, *Ditopternis venusta*, *Gastrimargus africanus*, *Oedaleus abruptus*, *Atractomorpha crenulata*, *Tagsta indica*, *Orthacris maindroni*, *Neorthacris acuticeps*, *Holochlora spectabilis*, *Phaneroptera gracilis*, *Sathrophyllia rugosa*

13.3.4.5. Termites Diversity in Dr.N.G.P Arts and Science College Campus

Termites are eusocial insects that are classified at the taxonomic rank of infraorder Isoptera, or alternatively as epifamily Termitoidae, within the order Blattodea (along with cockroaches). Termites were once classified in a separate order from cockroaches, but recent phylogenetic studies indicate that they evolved from cockroaches, as they are deeply nested within the group, and the sister group to wood eating cockroaches of the genus *Cryptocercus*. More recent estimates suggest they have an origin during the Late Jurassic with the first fossil records in the Early Cretaceous. Although these insects are often called "white ants" they are not ants, and are not closely related to ants. Termites mostly feed on dead plant material and cellulose, generally in the form of wood, leaf litter, soil, or animal dung. Termites are major detritivores, particularly in the subtropical and tropical regions, and their recycling of wood and plant matter is of considerable ecological importance.

Termites are among the most successful groups of insects on earth, colonising most landmasses. Their colonies range in size from a few hundred individuals to enormous societies with several million individuals. The observation on diversity of Termites in Dr. N.G.P Arts and Science College indicated that around 4 species are commonly distributed. The commonly found Termites are *Odontotermes anamallensis*, *O. ceylonicus*, *Trivitermes fletcheri* and *Nasutitermes indicola*. These Termites are belonging to three different Genera such as *Odontotermes*, *Trivitermes* and *Nasutitermes* recorded in Dr. N.G.P Arts and Science College campus.

13.4. An account of more Oxygen producing and Carbondioxide absorbing plants in the Campus

There are some plants which are being considered highly efficient in oxygen production and carbondioxide absorption which in turn reflected the quality of the green campus. If more oxygen is made available in the campus naturally, the stakeholders may be free from various cardiovascular and pulmonary problems and breathing troubles. The snake plant (*Sansevieria zeylanica*) otherwise known as the mother-in-law's tongue and Gerbera Daisy (*Gerbera jamesonii*) plant are unique for its night time oxygen production, and ability to purify air through the removal of various toxic gases in the atmosphere. Although there are options available for increasing oxygen by reducing CO₂ through means such as oxygenators and air purifiers, there are a variety of natural alternatives for increasing air quality that are beneficial for both body and mind. Dr.N.G.P. Arts and Science College campus has a maximum number of more oxygen producing and CO₂ absorbing plants such as *Areca Palm*, *Money plant*, *Neem*

tree, Tamarind tree, Ficus, Bamboo, Arjun tree, Magizhamboo, Marudhu, Maramalli, Nettilingam, Manja arali, Puvarasu and Pongam trees.



Oxygen producing and Carbon dioxide absorbing plants in the Campus

13.5.Lawns, Trees, Herbs, Shrubs,Climbers and Lianas in Dr. N.G.P Arts and Science College Campus

Lawns are gazing features of unutilized land made to cover the soil with green grass for the ambience of the place to have a greenish look. Lawn provides a hollow space among the building structures. The shaded trees in between the grass lawn, pathways and garden benches are meaningful lineaments to the green campus. The advantage of lawn is that it prevents the unintended weeds growth in the unutilized landscape areas. Trees that are native to land with medicinal value, ethnicity and environmental value add an advantage to green building. Purpose of trees is to provide shade, atmospheric CO₂ sequestration and supply of oxygen that serves the purpose of a green campus. Herbs are small plants with medicinal values and shrubs are small plants with thick stems and can hold soil to some extent than the herbs and serve the purpose of soil erosion. Climbers can grow with the support of wall structures and the climbers can enhance the wall value with greeneries.

Dr.N.G.P Arts and Science Collegecampus has a large number of trees, herbal plants, shrubs, climbers, lianas, twiners and lawns. It is further observed that all the plants are growing profusely and showing healthier free from pests and diseases attack. A total of 21 type of shrub species are available in the campus. The commonly available native as well as wild shrub species in the Dr. N.G.P Arts and Science Collegecampus are Kakithapoo (*Bougainvillea spectabilis*), Madhanakamaboo (*Cycas revolute*), Pigeon-berry (*Duranta plumieri*), Nilamulli (*Eranthemum roseum*), Sembaruthi (*Hibiscus rosa-sinensis*), Vetchi (*Ixora coccinea*), Malli (*Jasminum sambac*) and Arali (*Nerium odorum*).

Similar to that of shrubs, there are 34 kinds of herbs available in the Dr.N.G.P Arts and Science Collegecampus. The predominant species of herbs available in the Dr.N.G.P Arts and Science College campus are Kunukkuth thukki (*Micrococca mercurialis*), Melaanelli (*Phyllanthus maderaspatensis*), Keelanelli (*Phyllanthus niruri*), Otramullu (*Priva leptostachya*), Adai-otti (*Pupalia lappacea*), Kirantinayan (*Ruellia prostrata*), Pattasukai (*Ruellia tuberosa*), Vettukayathalai (*Tridax procumbens*) and Kattu paruthi (*Turnera ulmifolia*).

The existence of climber, creepers, twiners and lianas species available which accounted more than 28 species in the Dr.N.G.P Arts and Science College campus are Kayathalai (*Allamanda cathartica*), Kovai (*Coccinia indica*), Kattu-kodsi (*Cocculus hirsutus*), Amirtaval (*Tinospora cordifolia*) and Sinthal (*Monstera deliciosa*). The major grasses are Periapullu (*Aristida pinnata*), Chevvarakupul (*Chloris barbata*), Arugam Pillu (*Cynodon dactylon*), Korai Pollu (*Cyperus rotundus*) and Crowfoot grass (*Dactyloctenium aegyptium*). Creepers are plants with weak stem that grow along the ground, around another plant, or up a wall by means of extending stems or branches. Climbers are plants whose stems are weak, so they climb up trees and walls for support to grow. They are the type of herbs and shrubs which are green in colour and grow vigorously without any pest and disease attach which are observed in Dr.N.G.P Arts and Science College campus.



Establishment of lawns, trees, herbs, shrubs, climbers and lianas in the Campus

13.6. Establishment of Herbal Garden in Dr.N.G.P Arts and Science College Campus

Growing herbal plants having medicinal importance in the campus becomes more attractive and useful if concept gardens are maintained. Medicinal plant gardens can contain the locally available medicinal plants, RET (Rare Endangered Threatened) listed plants and those plants are most useful in terms of economic importance. The tree garden / arborea can be planted based on the zodiac signs which would attract the public and students, faculties, staff members, employees and educate them based on their uses. In the tree gardens, trees as linings all over the campus can act as oxygen corridors. Native trees along with trees like *Azadirachta*, *Pongamia* and *Ficus* species can be cultivated at the maximum as these plants are used to remove the dust particles and carbon lead from the air and purifies the air considerably. Similarly, the ornamental plants with beautiful flowers can be maintained in the frontage gardens of campus for attraction and good ambience. This will give an overall aesthetic look and also provide fresh air for healthy respiration to the stakeholders.



13.7. Rainwater Harvesting System

Rainwater harvesting system is a traditional old practice not only in drought prone areas and also in areas having seasonal rainfall. The Indian traditional rainwater harvesting is being practiced in various parts of the country to improve the ground water status. Now the threatening features of the lower ground level of water has created a revamp of newly featured rainwater harvesting systems. Indian traditional rainwater harvesting systems are constructed based on three modes either direct pumped, indirect pumped or by gravity alone in the campus. In addition, lakes, bonds, water channels and any other water reservoir methods are considered as the rainwater harvesting system. The green campus should have adopted any of the above said modes of rainwater harvesting or any new methods that has the benefit of conserving the water resource as well. A small square shaped pit containing gravels and sands may be constructed near the building in which rainwater will be harvested from the roof of the building using a pipe. During the audit, there are two well developed rain harvesting systems such as water channels connected with a square shaped pit observed with

Dr.N.G.P Arts and Science College campus. Rainwater harvesting structures and recharge wells have been commissioned in the campus at different locations.

13.8. Operation of Water irrigation, Drip and Sprinkler Irrigation methods

Maintaining the green campus and water conservation mechanisms should be applied efficiently in the campus. Well planned water irrigation systems like sprinklers and drip should be implemented in the entire green area of the campus for an effective water management system. This can be implemented only when the plantations are well planned. The tree growing areas can be connected with drip irrigation and medicinal plants growing areas and flower gardens can be connected with sprinkler irrigation. Dr.N.G.P Arts and Science College has taken sufficient efforts to maintain the plants greenish and frequency of watering to the plants.



13.9. Importance of Biodiversity Conservation

The campus should be a mini biodiversity conservation area, wherein, more greenery due to native plant species, medicinal plant garden, concept gardens, flowering plants that attract bees, birds, beetles and other animals like squirrels should be monitored as ecosystems. Shade giving trees in the paths, flowering trees in the avenues and fruit trees at the back yards also would attract birds, bees, butterflies and squirrels. Open water sources and reservoirs will attract these small harmless animals to the campus. Dr.N.G.P Arts and Science College campus is free of exotic plants that cause threat to the natural vegetation. It is like a mini bio-reserve rich in native species and endemic plants. A complete data on the soil type, water holding capacity and soil nutrition in the campus is being thoroughly studied internally or with the Government agriculture departments. It is useful for cultivation of various native and wild plant species and also helps in choosing the proper irrigation system.

13.10. Pedestrian Path facility at Dr.N.G.P Arts and Science College campus

The concept of pedestrian path is to give safe space to walk freely by the pedestrian. It is very important in the green campus in terms of freely walk pedestrians or people going on foot without any obstacles. The pedestrian path is otherwise called as zebra crossing by the combination of black and white stripes remained to characterize the zebra. This path is specially designed space to the stakeholders to walk freely without any disturbance. It is useful for cross walk and easy to recognize to walk by

means of wide black and white colour combination of lines and authorize to walk while crossing and walking on the foot. In addition, pedestrian path are created in the green campus along with road side which meant for walking only using special cement bricks and stones. The pedestrian path aims to end circulation not only cars, buses, vans, trucks and other vehicles but also giving safe space to the pedestrians, where cross and pass through blocks and also forcing vehicles to comply with it. Dr.N.G.P Arts and Science College campus is having very good facility in creating pedestrian path for stakeholders.



13.11. Use of Biofertilizers, Organic and Green manures

Natural or eco-friendly methods should be used to grow plants vigorously in the campus which could reduce the environmental pollution. Use of biofertilizers, organic manures (cow dung, vermicompost and plant wastes and litters) and green manure to grow healthy plants in the medicinal plant garden, kitchen garden and terrace garden should be ensured to keep the campus organic. The plant waste such as fallen leaves, stems, fruits, nuts, seeds and other plant parts should be used to make green manures. A concrete or ground level green manure production unit and vermicomposting units will help to convert all the plant and animal based wastes into green/organic manures. This will be a healthy way of solid litter waste management in the campus. Minimal use of chemical fertilizers as part of integrated nutrient management system is acceptable but nil use of chemical fertilizers is highly appreciable and also helps to keep the campus more of an organic ecosystem. The soil, air, water and sunlight are the four major natural resources any campus gets. Proper use and conservation of these resources are mandatory in green campus audit sites. The available resources and their utilization should be accounted for from time to time. Management of the right way of utilization of these resources with the vision of sustainability should be carried out by framing a committee led by the Head of the Institution concerned. Biofertilizers such as Nitrogen fixing bacteria, Potassium and Phosphorus solubilizing bacteria, Potassium mobilizing fungi (VAM), farm yard manure, dried cow dung manure, vermicompost manures and biofungicides and biopesticides are extensively used in Dr.N.G.P. Arts and Science College to cultivate plants. Agrochemicals, chemical fertilizers (urea, murate of potash, sulphate of potash, rock phosphate, etc.), pesticides and fungicides are not used. These practices are very well appreciated because air, water and soil

pollution due to use of agrochemicals is eradicated which in turn to improve the soil health significantly.

13.12. Conduct of Outreach programmes for dissemination of Green Campus motto and Green pledge initiatives by Eco club, Nature club, Associations, Cells, Forums, NCC and NSS bodies in Green Campus initiatives

Professional implementation of all the Eco plans in the campus should be done through the Eco clubs, Nature clubs, Science clubs, Youth Red cross units, Fine Arts clubs, Women cell, Associations, Forums, SSL, NCC (National Cadet Corps) and NSS (National Service Scheme). All the students, members of staff and employers should be mandatory members of the club and should do tree planting and maintenance of greenery in the campus periodically. Conducting frequent seminars, conferences, workshops, awareness rallies, etc. on topics relevant to the environment is necessary to educate and create awareness among the students and staff members. In addition, student's associations, cells, clubs and forums should be the first hand receivers of all the new plans proposed by the Government such as Swachh Bharath Abhiyan and Jal Shakti Abhiyan under Clean India Mission and implement the same in the campus. The Dr.N.G.P Arts and Science College has well developed NSS, Swachh Bharath Abhiyan under Clean India Mission. These bodies are actively involved in tree planting programmes and cleaning the surrounding areas of rural and urban people across Coimbatore, Erode and Nilgiris Districts of Tamil Nadu. Dr.N.G.P Arts and Science College is conducting a large number of activities to conserve the nature and to teach about the importance of environment to rural, tribal and urban people.



Awareness programmes on the green campus initiatives and dissemination of green motto and pledges are accounted in a sustainable manner. Its benefits and self-sustainability are being projected for wider centric on earth and Ecology conservation. Innovative practices that add up credentials in implementing the green campus which needs to be promoted in the awareness programme to the students and staff members including public domain. Technology driven solutions initiated by the green campus organization are periodically disseminated and documented successively for propagating the attitude of the green campus in wider masses. Dr.N.G.P Arts and Science College has taken sufficient attempts to disseminate the green campus motto and green pledge such as 'Don't cut trees', 'Don't use plastic bags', 'Don't waste waters', 'Plastic Free Zones' and 'Preserve the Natural Resources' and etc. among the students and staff members in the campus.

Dr.N.G.P Arts and Science College helps to develop social commitment and to expose the students to get sensitized to social realities and to build a link between the student community and the wider community. It enhances the social interaction, interpersonal communication skills and develop emotional maturity of students. It also helps students in total and integrated personality development. Dr.N.G.P Arts and Science

College facilitates to prepare the students for future life, by developing qualities such as cooperation, team spirit, leadership, discipline and development of creative talents including to boost the self-confidence of students.

13.13. Academic credentials: Projects, Dissertations and Thesis work

Project, Dissertation and Thesis works are academic effort credentials that always fosters the innovative ideas on thinking and implementation of new innovative approaches. Applied research work of the faculties, staff and student members should be implemented within the campus owing to the credential of the research. Those works indicating the significance of empowering the green campus can be implemented or adopted in other organizations. If the innovation is capable of developing into entrepreneurship, then it is highly appreciable. The Report of projects and dissertations which are productive in methodologies should be disseminated through presentation and publication in social media, books, magazines and journals so as to spread the innovative ideas and methods to the broad public. Dr. N.G.P. Arts and Science College faculty members and students from various subject domains are doing extensive project work related to nature conservation, environmental pollution, soil and water analysis.

The Institution has student projects at undergraduate and post graduate levels which is a part of their curriculum. The students will do their projects on different specializations concerned with their disciplines. Many of the students have done their projects related to environment issues and concern. The following are the details of the student projects related to the environment.

Post Graduate Projects

S.No.	Reg. No.	Name of the Student	Name of the Guide	Title of The Project
1.	182BT002	Alice Keerthana .S	Dr. K. Arungandhi	Isolation And Characterization Of Metallic Resistant Bacteria From Heavy Metal Polluted Soil
2.	182BT004	Aparna N R	Dr. K. Arungandhi	Safe Drinking Herbal Water
3.	182BT007	Dhananandhini M	Dr. M. Poongothai	Formulation Of Mosquito Repellent Cream Using Herbs
4.	182BT011	Karthika M	Dr. P.Chidambararajan	Isolation Characterization And Extraction Of Pigment Producing Bacteria And Its Applications
5.	182BT015	Keerthana. S	Dr. V. Shanmugaraju	Composite Bioplastic Synthesis Using Corn Starch With Silver Nanoparticles From <i>Murraya Koenigii</i> (Curry Leaves) For Groundnut Storage

6.	182BT018	Lavanya M	Dr. P. Chidambararajan	Production Of Bioplastic From Milk Casein
7.	182BT020	Logeshwaran V	Dr.P. Arun	Bioplastic From Cassava Starch
8.	182BT031	Sanjana Sudhakaran	Dr. M.N.Kathiravan	Production Of Reducing Sugar From Lignicellulosic Biomass
9.	182BT032	Shri Rakshaya S S	Dr. M. Poongothai	Bioplastic Production From Peduncle And Peel Of <i>Musa Paradisiaca</i> - An Ecofriendly Approach
10.	182BT033	Soundarya D	Dr. M.N.Kathiravan	Extraction And Characterization Of Gelatin From Jelaebi Fish Scales As An Alternate Source For Mammalian Gelatin
11.	182BT035	Sundar M	Dr.K. Arungandhi	Formulation Of Biocontrol Agent Against Fungi Causing Blight Disease In Guava
12.	182BT039	M. Vignesh	Dr. M. Poongothai	Production Of Biofertilizer Enriched With Eggshell Powder Nutrients And Cocopeat For The Effective Growth Of Plants
13.	182BT042	Amritha V	Dr. V. Shanmugaraju	Utilization Of Seaweed Liquid Fertilizer For Enhancement Of Growth And Nutritive Status In Spinacia Oleracea L. And Amaranthus Tricolour L.
14.	182BC017	Ritty Joseph	Dr.K.Rajathi	Synthesis Of Starch-Based Bioplastic From <i>Plectranthus Rotundifolius</i>
15.	182BC019	Shalini.T	Dr.T.Indhumathi	Screening Of Larvicidal Activity Of Silver Nanoparticle Synthesis From Leaves Extract Of <i>C.Gigantea</i> Against Dengue Vector (<i>Aedes Aegypti</i>)
16.	182BC022	Soundarya.P	Dr.N.Kannikaparameswari	Phytoremediation Potential Of Noyyal Water Using Chlorococcum Species
17.	182MB007	Celin Monisha A.	Dr. D. Geetharamani	Prevalent of microbial community at different locations in Dr. N.G.P. Arts and Science college.
18.	182MB008	Deep Raghul K.	Mrs. C. Sasikala	Fermented coconut sap as bio herbicide and its effect on soil

				pathogens.
19.	182MB011	Evetha K.	Mrs. C. Sasikala	Isolation and growth parameters of algae from dairy effluent and its use as biofertilizer.
20.	182MB019	Malarvizhi V.	Dr. N. Vidhya	Exploration of fruit waste for the pectinase application and cellulose production from fungi.
21.	182MB020	Mallikaarjunan P.	Dr.S. S. Sudha	Development of a new bio fertilizer with a capacity of nitrogen fixation, phosphate and potassium solubilization using microbes.
22.	182MB023	Menaka R.	Dr. Karthick Sundram	Production of biodiesel based on the bioremediative potential of algae on industrial effluent.
23.	182MB030	Praveena R.	Dr. Karthick Sundram	Bioremediation of preprocessed plastic waste through microbial consortium.
24.	182MB035	Sarah Evangeline M.	Dr. N. Vidhya	Study on decolourisation of textile dye by using microorganisms from contaminated effluent soil samples of Tirupur.
25.	182MB037	Shalini S.	Dr. Senthil Prabu	Natural pigment extraction from fungi isolated from soil sample for industrial application and dyeing.

Guidelines for Programmes offering Part I & Part II for Four Semesters:

Part	Subjects	No. of Papers	Credit	Semester No.
I	Tamil / Hindi / French/Malayalam	4	4 x 3 = 12	I to IV
II	English	4	4 x 3 = 12	I to IV
III	Core (Credits 2,3,4)	14-16	58	I to VI
	Inter Departmental Course (IDC)	-	16	I to IV
	Discipline Specific Elective (DSE)	3	3 x 4 =12	V & VI
	Skill Enhancement Course (SEC)	4	4 x 3=12	III ,IV,V& VI
	Generic Elective (GE)	2	2 x 2=4	III & IV
	Lab on Project (LoP)	1	1	III to V
IV	Environmental Studies(AECC)	1	2	I
	Value Education (VE) (Human Rights, Womens' Rights) (AECC)	2	4	II and III
	General Awareness(On-Line Exam) (AECC)	1	2	IV
	RM (AECC)	1	2	V
	Innovation, IPR, Entrepreneurship (AECC)	1	2	VI
V	Extension Activity NSS / Sports / Department Activity	-	1	I to VI
TOTAL CREDITS			140	




CURRICULUM

B.Sc. BIOTECHNOLOGY

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
First Semester										
Part - I										
211TL1A1TA	Language - I	Tamil-I	4	1	-	3	25	75	100	3
201TL1A1HA		Hindi-I								
201TL1A1MA		Malayalam-I								
201TL1A1FA		French - I								
Part - II										
191EL1A1EA	Language - II	English - I	4	-	1	3	25	75	100	3
Part - III										
193BT1A1CA	Core I	Cell Biology	4	1	-	3	25	75	100	3
193BT1A1CB	Core II	Biodiversity	4	1	-	3	25	75	100	3
193BT1A1CP	Core Practical - I	Cell Biology & Biodiversity	-	-	4	5	40	60	100	2
192CE1A1IB	IDC - I	Chemistry for Biologists	3	1	-	3	25	75	100	4
Part - IV										
193MB1A1AA	AECC - I	Environmental Studies	2	-	-	2	-	50	50	2
Total			21	4	5	-	-	-	650	20


 17/15/21
 BoS Chairman/HoD
 Department of Biotechnology
 Dr. N. G. P. Arts and Science College
 Coimbatore - 641 048

 Dr. N.G.P. Arts and Science College		
APPROVED		
BoS - 11H 17/05/21	AC - 11H 09/08/21	GB - 15H 17/08/21




Dr. N.G.P. Arts and Science College
 COIMBATORE | INDIA


B.Sc. Biotechnology (Students admitted during the AY 2021-22)

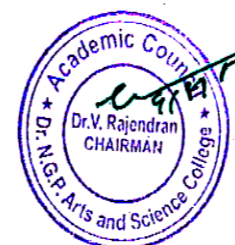
CURRICULUM

M.Sc. PHYSICS PROGRAMME

Course Code	Course Category	Course Name	L	T	P	Exam (h)	Max Marks			Credits
							CIA	ESE	Total	
First Semester										
192PY2A1CA	Core - I	Mathematical Physics	4	1	-	3	25	75	100	4
192PY2A1CB	Core - II	Thermodynamics and Statistical Mechanics	4	1	-	3	25	75	100	4
192PY2A1CC	Core - III	Classical Mechanics	4	-	-	3	25	75	100	4
192PY2A1CD	Core - IV	Electronics	4	-	-	3	25	75	100	4
202PY2A1CP	Core Practical - I	Thermodynamics and Optics	-	-	4	4	40	60	100	2
202PY2A1CQ	Core Practical - II	Electronics - I	-	-	4	4	40	60	100	2
192PY2A1DA		Environmental Physics								
192PY2A1DB	DSE - I	Crystal Growth and Thin Film Physics	4	-	-	3	25	75	100	4
192PY2A1DC		Laser Physics and Non-linear Optics								
Total			20	2	8	-	-	-	700	24


 BoS Chairman/HoD
 Department of Physics
 Dr. N. G. P. Arts and Science College
 Coimbatore - 641 048

 Dr. N.G.P. Arts and Science College		
APPROVED		
P - 11/15 19/05/21	AC - 11/15 09/08/21	GB - 15/15 17/08/21



Dr. NGPASC
COIMBATORE | INDIA

M.Sc. Physics (Students admitted during the AY 2021-22)

14. Best practices followed on Green Campus initiatives in the Organization

1. It is observed that Dr.N.G.P Arts and Science College is maintaining more than 55% of the green cover area after building construction as per the guidelines of World Green Building Council and Indian Green Building Council to provide a healthy environment and ecofriendly atmosphere to the stakeholders.
2. Dr.N.G.P Arts and Science College campus is located in the Central part of the Coimbatore city belonging to Tamil Nadu which provide pure atmosphere to the stakeholders under natural environment, topology, landscape and soil erosion. The campus is established with the artificially created topography like pathways and parking areas.
3. In view of floral biodiversity in Dr. N.G.P Arts and Science College campus, a sum 135 species belonging to 122 Genera under 51 families covering trees, herbs, shrubs, climbers, lianas, twiners and lawns. It is observed that all the plants are growing profusely and showing healthier free from pests and diseases.
4. In view of faunal biodiversity in Dr.N.G.P Arts and Science College campus, a total of 7 living Mammals species belonging to three Genera under three families, visiting Mammals about 4 species belonging to four Genera under three families, 12 species of birds, 4 species of Grasshopper, 4 species of Termites, 14 species of Amphibians, 11 species of Reptiles, 43 species of Butterflies and 3 species Mosquitos were recorded.
5. Dr.N.G.P Arts and Science College has established rainwater harvesting models to recharge the borewells by collecting rainwaters from the building roofs, open areas and playgrounds including unexplored areas which are channelized to flow of rainwaters to increase the ground water level.
6. The campus has a maximum number of more oxygen producing and carbon-di-oxide absorbing plants such as *Areca* Palm, Money plant, Neem tree, Arjun tree and Pongam trees including some of the shrub and herbal plants.
7. Department of Biotechnology and Microbiology, Dr.N.G.P Arts and Science College is being offering various courses related to biodiversity conservation, environmental safety and safeguard, environmental pollution, natural disaster management and waste management and environmental impact assessment and green auditing to the students and research scholars.

15. Recommendations for Greening

- The name board may be kept in each plant species in which the common name along with binomial name may be mentioned. The year of planting and economic importance with medicinal values if any may be mentioned in some plants so that the oldest as well as useful herbal plants may be identified in the campus.
- Honey Bee hives may be kept in the campus which is free from student's mobilization. Honeybees are natural pollinators helps to increase the yield potential of plants (flowers, fruits and vegetables).
- A complete data on the soil parameters such as pH, electrical conductivity, water holding capacity, total organic carbon, available nitrogen, exchangeable potassium, available phosphorus in the campus may be studied which may be useful for the cultivation of various native and wild type plant species.
- A complete data on the water quality parameters such as pH, TSS, BOD, COD, dissolved oxygen and dissolved carbon dioxide and macro and micro elements like iron, nickel, chromium, ferric and ferrous ion concentrations may be studied for which bore well, open well, corporations, municipal RO, Aquaquad, Millipore. Distilled water rain water and may be used. It may be analysed which may be useful for the plant growth as well as to the stakeholders.
- Vermicompost production may be increased substantially using tree leaf litter, kitchen wastes and biodegradable waste materials available in the campus. The vermicompost manure can be used for plant cultivation and the excess amount of vermicompost may be sold in the local market as consultation work.
- The matured trees may be subjected to do white wash upto 3 feet height with limestone and neem oil mix to prevent the pests and diseases attack.
- Automatic water irrigation systems like drip and sprinkler irrigation methods adopted may be extended in the entire green area of the campus which in turn are useful to reduce the operation costs under energy conservation policy.
- It is recommended to develop 'Purchase Policy' for not allowing the non-degradable plastic covers during the paking of goods with respect to nature conservation and environmental protection.
- The Management has to take smart initiatives towards creating a Green campus in the areas of green computing and waste management. The desktop infrastructure is virtualized through VMW or virtualization technology.

16. Steps undertaken to amend the suggestions given in the previous Green Campus Audit Report

As per the previous Green Campus Audit report, the following steps were undertaken to amend the suggestions and recommendations. The last Green campus audit was conducted on 27.06.2018 by the M/s. Nature Science Foundation, Coimbatore, TamilNadu.

S.No.	Suggestions made during the previous Green Audit Report	Steps taken to amend the suggestions of the previous Green Audit Report
1.	Suggested to create a 'Herbal Garden' to increase the amount of medicinal plants that are used for various types of illnesses and also to maintain the environment's sustainability.	The institution has created a herbal garden where 27 medicinal plants are maintained
2.	Suggested to conduct a survey of non-flowering plants in the campus.	It is recorded that 15 species belonging to Lichens, Pteridophytes, Bryophytes and which are showing a healthier environment to flora and fauna.
3.	Suggested to conduct a survey of faunal biodiversity in the campus other than Mammals, Birds, Butterflies and Mosquitos which were already completed a brief survey.	It is documented that 18 species of Grasshopper, 4 species of Termites, 14 species of Amphibians, 17 species of Reptiles, 11 species of Butterflies and 2 species Mosquitos were recorded in the campus. It is similar to that of floral diversity, the campus ecosystem support the fauna diversity too.

17. Conclusion

In the two decades of service to higher education, Dr.N.G.P Arts and Science College, Coimbatore, Tamil Nadu has made significant progression in teaching learning, research and consultancy, innovation and transfer of technology, community service and value education. Dr.N.G.P Arts and Science College is a well-established self supporting Institute in Tamil Nadu which imparts quality education to rural, tribal and urban people across the Country. This Organization is excellent in terms of academic activities and providing an eco-friendly atmosphere to the stakeholders. The Organization has taken enormous efforts to maintain green campus to the students, research scholars, staff members and parents in a sustainable manner which reflects the importance of the environment and stakeholders. It is conducting a large number of activities for the benefit of rural and tribal community people without disturbing the environment, topology, landscape management and vegetation. Dr.N.G.P Arts and Science College has their own Green Campus and Environment policy with respect to nature conservation and environmental protection. This Organization is maintaining more than 55% of the green cover area.

The natural topography and very good landscape design without disturbing the artificial vegetation are being maintained by the Dr.N.G.P. Arts and Science College. A maximum number of more oxygen producing and carbon-di-oxide absorbing plants

are being maintained to provide pure atmosphere to the stakeholders. The installation of a rainwater harvesting system, and drip irrigation system to conserve rainwater and ground water are noteworthy in the campus. Dr.N.G.P. Arts and Science College has created 'Herbal Gardern'. This Organization has very good floral biodiversity with 135 flowering plant species belonging to 122 Genera under 51 families and 21 species of non-flowering plant species. Similarly, very good faunal biodiversity with 18 living and visiting Mammals belonging to 11 Genera under eight families, 32 bird species, 25 Grasshopper species, 4 Termites species, 32 Amphibians species, 17 Reptiles species, 11 Butterflies species and 2 Mosquitos species were recorded. This may lead to a prosperous future in the context of a significant Green campus and providing a sustainable environment to the stakeholders.

18. Acknowledgement

Nature Science Foundation, Coimbatore, Tamil Nadu, India is grateful to the Management and Principal and IQAC Coordinator of Dr.N.G.P Arts and Science College, Coimbatore, Tamil Nadu for providing us necessary facilities and co-operation during the Green Campus Audit. This helped us in making the audit a magnificent success. Further, we hope this will boost the new generation to take care of the environment and propagate these views for many generations to come by the Institution Management.

19. References

- Adeniji, A.A. 2008. *Audit and Assurance Services. Lagos: Value Analyst Concept of Green Audit*. New Age International, New Delhi, India.
- AOAC, 1990. *Official Methods of Analysis of the Association of Official Analytical Chemists*, Ed, Helrich, K. 15th Edition, AOAC Inc., USA, Vol 1 & 2, pp. 2246-2248.
- Aparajita, G. 1995. Environmental Audits- a Mean to Going Green. *Development Alternatives* 5 (4): 7-9.
- APHA, 1981. *Standard methods for the estimation of water and wastewater*. Vol. II, 15th edn, Washington, US.
- Arora, D.P. 2017. Environmental Audit–need of the hour. *International Journal of Advanced Research in Engineering & Management* 3 (4): 25-31.
- Aruninta, A., Kurazumi, Y., Fukagawa, K. and Ishii, J. 2017. The integration of human thermal comfort in an outdoor campus landscape in a tropical climate. *International Journal of GEOMATE* 14(44): 26-32.
- Awasthi, D.D. 2007. *A Compendium of the macrolichens from India, Nepal and Sri Lank*. Bishen Singh Mahendra Pal Sin, Dehradun, Uttar Pradesh, India, 278p.
- Beebee, T.J.C. and Griffiths, R.A. 2000. Amphibians and Reptiles. A Natural History of the British Herpetofauna. The New Naturalist Library, London, UK.
- Brindusa M. Sluser, Caliman, F.A., Betianu, C. and Gavrilesco, M. 2007. Methods and procedures for environmental risk assessment. *Environmental Engineering and Management Journal* 6 (6): 573-592.
- Carbon footprint calculation. www.carbonfootprint.com.
- Cardozo, N.H., da Silveira Barros, S.R., Quelhas, O.L.G., Filho, E.R.M. and Salles, W. 2019. Benchmarks analysis of the higher education institutions participants of the GreenMetric World University Ranking. Springer, Universities and Sustainable Communities: Meeting the Goals of the Agenda 2030, World Sustainability Series. pp. 667-683.

- Chandrabose, M. and Nair, N.C. 1988. Flora of Coimbatore, Bishen Singh and Mahendra Pal Singh, Dehra Dun, India.
- Choy, Er.A. and Karudan, R. 2016. Promoting campus sustainability: A conceptual framework for the assessment of campus sustainability. *Journal of Social Sciences and Humanities* **11**(2): 112-118.
- Culberson, C.F. and Kristinsson, H.D. 1970. A standardized method for the identification of lichen products. *Journal of Chromatography A*. **46**: 85-93.
- Fachrudin, H.T., Fachrudin, K.A. and Utami, W. 2019. Education activities to realize green campus. *Asian Social Science* **15**(8): 18-27.
- Ferenc, M., Sedlacek, O., Fuchs, R., Dinetti, M., Fraissinet, M. and D. Storch 2014. Are cities different?. Patterns of species richness and beta diversity of urban bird communities and regional species assemblages in Europe. *Global Ecology and Biogeography* **23**: 479-489.
- Freidenfelds, D., Kalnins, S.N. and Gusca, J. 2018. What does environmentally sustainable higher education institution mean?. *Energy Procedia* **147**: 42-47.
- Gamble, J.S. and Fischer, C..E.C 1915-1936. *The Flora of the Presidency of Madras*. Vols. 1 - 3. Rep. Ed. 1957. Adlard and Sons Ltd., London, UK.
- Gnanamangai, B.M., Muruganath, G. and Rajalakshmi, S. 2021. *A Manual on Environment Management Audits to Educational Institutions and Industrial Sectors*. Laser Park Publishing House, Coimbatore, Tamil Nadu, India, p. 127.
- Gowri, S. and Harikrishnan, V. 2014. Green computing: Analyzing power consumption using local cooling. *International Journal of Engineering Trends and Technology* **15** (3): 105-107.
- Goyal, E. and Gupta, M. 2014. Moving toward socially and environmentally responsible management education-Case study of Mumbai. *Journal Applied Environmental Education & Communication* **13**: 146-161.
- Henry, A.N., Chitra, V. and Balakrishnan, N.P. 1989. Flora of Tamil Nadu. Vol. 3. Botanical Survey of India, Coimbatore, Tamil Nadu, India.
- IGBC, 2021. Indian Green Building Council. <https://igbc.in/igbc/>
- ISO, 2021. International Organization for Standardization. <https://www.iso.org/home.html>.
- Jayson, E.A. and D.N. Mathew, 2000. Diversity and species-abundance distribution of birds in the tropical forests of Silent Valley, Kerala. *Journal of the Bombay Natural History Society* **97** (3): 390–399.
- Lauder, A., Sari, R.F., Suwartha, N. and Tjahjono, G. 2015. Critical review of a global campus sustainability ranking: GreenMetric. *Journal of Cleaner Production* **108**: 852–863.
- Leal Filho, W., Muthu, N., Edwin, G. and Sima, M. 2015. Implementing campus greening initiatives: approaches, methods and perspectives. Springer, London, UK.
- León-Fernández, Y. and Domínguez-Vilches, E. 2015. Environmental management and sustainability in higher education: The case of Spanish Universities. *International Journal of Sustainability in Higher Education* **16**: 440-455.
- Marrone, P., Orsini, F., Asdrubali, F. and Guattari, C. 2018. Environmental performance of universities: Proposal for implementing campus urban morphology as an evaluation parameter in Green Metric. *Sustainable Cities and Society* **42**: 226-239.
- Matthew, K.M. 1983. The flora of Tamilnadu Carnatic. The Repinat Herbarium, Tiruchirapalli, Tamil Nadu, India.
- Nair, N.C. and Henry, A.N. 1983. Flora of Tamil Nadu, India. Ser. 1: Analysis. Vol. 1.

- Botanical Survey of India, Coimbatore, Tamil Nadu, India.
- NCP, 2006. *National Environmental Policy-2006*, Government of India, Ministry of Environment and Forest, New Delhi.
- Nunes, B.T., Pollard, S.J.T., Burgess, B.J., Ellis, G., de los Rios, I.C. and Charnley, F. 2018. University contributions to the circular economy: Professing the hidden curriculum: Professing the hidden curriculum. *Sustainability* **10**(8): 112-119.
- Orange, A., James, P.W. and White, F.J. 2001. *Microchemical methods for the identification of lichens*. British Lichen Society, London, UK, 375p.
- Ounsaneha, W., Chotklang, N., Laosee, O. and Rattanapan, C. 2017. Predictors of behavior intention to develop a green university: A case of an undergraduate university in Thailand. *International Journal of GEOMATE*. **15**(49): 162-216.
- Ponmurugan, P. 2018. *Biotechnology Techniques in Biodiversity Conservation*. New Age International, New Delhi, India.
- Ponmurugan, P. and Senthilkumar, J. 2020. *Microbial Diversity*. Cambridge University Press, Cambridge, UK.
- Pradip, J.S. and Patil, P.D. 2014. Green Audit - A tool for attaining sustainable development and achieving competitive advantage. *IBMRD's Journal of Management & Research*, **3** (1): 85-93.
- Rajalakshmi, S., Sreenivasan, P.V., Vinoth kumar, D., Athulya, K., Yaazhini, J., Kavimalar, S., Gnanamangai, B.M. Robinson, J.P. and Kavitha, G. 2021. Importance of Environment and Green Campus Audits to Educational Institutions. AkiNik Publishing, New Delhi. In Press.
- Report of Green Audit, 2018. *Report of Green Audit Nitte Meenakshi Institute of Technology, Chennai, Tamil Nadu, India*. <https://www.google.com/search?q=Green+Audit+Report+Nitte+Meenakshi+Institute+Of+Technology&sxsrf>
- Ribeiro, J.M.P., Barbosa, S.B., Casagrande, J.L., Sehnem, S., Berchin, I.I., da Silva, C.G., da Silveira, A.C.M., Zimmer, G.A.A., Faraco, R.A. and de Andrade Guerra, J.B.S. 2017. Promotion of sustainable development at universities: The adoption of green campus strategies at the University of Southern Santa Catarina, Brazil. Springer Nature, Handbook of Theory and Practice of Sustainable Development in Higher Education. pp. 471-486.
- Satean, G. 2017. The need to go beyond “Green University” ideas to involve the community at Naresuan University, Thailand. Springer Nature, Sustainability Through Innovation in Product Life Cycle Design. pp. 841-857.
- SCSR, 2018a. Sustainability Curriculum in UK University Sustainability Reports by Katerina Kosta, Springer, Implementing Sustainability in the Curriculum of Universities. World Sustainability Series, pp. 79-97.
- SCSR, 2018b. Sustainable Campus in Brazilian Scenario: Case Study of the Federal University of Lavras by Cristiane Criscibene Pantaleão and Tatiana Tucunduva Philippi Cortese, Springer, Towards Green Campus Operations. World Sustainability Series, pp. 503-517.
- SCSR, 2018c. An Experience of Participatory Construction of Solid Waste Management and Environmental Education Indicators on a University Campus by Antonio Carlos Merger, Daniela Cássia Sudan, and Evandro Watanabe, Springer, Towards Green Campus Operations. World Sustainability Series, pp. 763-775.
- Staniskis, J.K. and Katiliute, E. 2016. Principles, implementation and results of the new assessment and accreditation system “Engineering education for sustainable industries”. Springer Nature, New Developments in Engineering Education for

- Sustainable Development. pp. 283-294.
- Suwartha, N. and Sari, R.F. 2013. Evaluating UI GreenMetric as a tool to support green universities development: Assessment of the year 2011 Ranking. *Journal of Cleaner Production***61**: 46–53.
- Tiyarattanachai, R. and Hollmann, N.M. 2016. Green Campus initiative and its impacts on quality of life of stakeholders in Green and Non-Green Campus universities. *SpringerPlus*, **5**(1): 1-17.
- Verma, S., Ahmad, M. and Parwal, R. 2012. Green audit - A Boom to human civilization. *International Journal of Trends in Economics Management & Technology*, **1** (6): 82-86.
- Venkataraman, K. 2009. India's Biodiversity Act 2002 and its role in conservation. *Tropical Ecology***50** (1): 23-30.
- Vinoth kumar, D., Sreenivasan, P.V., Rajalakshmi, S., Vanitha, S. and Gnanamangai, B.M. 2021. Environment and Green Campus Audits. AkiNik Publishing, New Delhi. In Press.
- Wang, Y., Shi, H., Sun, M., Huisingh, D., Hansson, L. and Wang, R. 2013. Moving towards an ecologically sound society? Starting from green universities and environmental higher education. *Journal of Cleaner Production***61**: 1-5.
- WGBC, 2021. World Green Building Council. <https://www.worldgbc.org>.
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Certificates of
Nature Science Foundation,
Coimbatore, Tamil Nadu.

1. ISO Certificate
2. 12A Certificate
3. 80G Certificate
4. Form No. 10AC

QUALITY MANAGEMENT SYSTEM

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PROCEEDINGS OF THE COMMISSIONER OF INCOMETAX (EXEMPTIONS),
III FLOOR, ANNEXE BLDG, NO.121, MAHATMA GANDHI SALAI, CHENNAI-34

Present : G.M.DOSS, I.R.S
Commissioner of Income Tax (Exemptions)

** URNo. AACTN7857J/05/18-19/T-1105

Dated:03/09/2018

Sub: Registration u/s. 12AA of the Income tax Act 1961 - in the case of

"Nature Science Foundation"

LIG-II, 2669, Gandhimaa Nagar, Peelamedu, Coimbatore – 641 004.

Ref : Application in form 10 A filed on 28/03/2018

ORDER UNDER SECTION 12AA OF THE INCOME TAX ACT 1961.

1. The above Trust/Society/Association/Company/others, bearing FAN AACTN7857J was constituted by Trust Deed / Memorandum-of-Association dated 29/11/2017 registered with Sub-Registrar's Office/Registrar of Societies/Registrar of Companies/others on 29/11/2017.
 2. ~~The Trust Deed / Memorandum of Association has subsequently been amended / modified / altered by a Codicil / Supplementary Deed / Amendment Deed / Alteration to Memorandum of Association/others dated XX/XX duly registered on XX/XX.~~
 3. The above TRUST filed an application seeking Registration u/s 12 AA of the Income tax Act, 1961.
 4. On going through the objects of the TRUST and its proposed activities as enumerated in the Trust Deed / Memorandum of Association, I am satisfied about the genuineness of the TRUST as on date.
 5. The application has been entered at Sl.No.1105 maintained in this office. The above Trust is accordingly registered as a PUBLIC CHARITABLE TRUST u/s 12 AA of the Income Tax Act, 1961 with effect from 29/11/2017.
 6. It is hereby clarified that the Registration so given to the Trust/Institution is not absolute. Subsequently, if it is found that the activities of the Trust/Institution are not genuine or are not being carried out in accordance with the objects and clauses of the Trust Deed / Memorandum of Association submitted at the time of registration or modified with the approval of the Commissioner of Income-tax (Exemptions), Chennai or there is a violation of the provisions of Section – 13, the Registration so granted shall be cancelled as provided u/s 12 AA (3) or 12AA(4) of the Income Tax Act. Further, this approval is also subject to the Trust/Society/Association/Company/Others/ complying to the provisions of the proviso to sec 2(15) of the Income Tax Act 1961.
 7. Granting of Registration u/s 12AA does not confer any automatic exemption of income from taxation. The Trust/Institution should conform to the parameters laid down in Sections 11, 12, 13 and 115 BBC of the I.T. Act, 1961, to claim exemption of its income on year to year basis before the Assessing Officer.
- ** This Unique Registration No. URNo. AACTN7857J/05/18-19/T-1105 Should be mentioned in all your future correspondence.



Sd/-
(G.M.DOSS, I.R.S)
Commissioner of Income-tax(Exemptions), Chennai.

- Copy to:
1. The Assessee.
 2. The ACIT(Exemptions), Coimbatore Circle.
 3. Office Copy.

//CERTIFIED TRUE COPY//

(N SRINIVASA RAO)
Asst. Commissioner of Income-tax (H.Qrs)(Exemptions),
Chennai.



GOVERNMENT OF INDIA
INCOMETAX DEPARTMENT
OFFICE OF THE COMMISSIONER OF INCOME TAX (EXEMPTIONS)
Aayakar Bhawan, Annexe III Floor, 121 M.G. Road, Chennai 600 034

URNo. AACTN7857J/05/18-19/T-1105/80G

Date: 10.04.2019

Name of the Trust-/Society /Company/Institution : NATURE SCIENCE FOUNDATION
Address : LIG II 2669, GANDHIMAA NAGAR, PEELAMEDU, COIMBATORE - 641 004
PAN : AACTN7857J
Date of Application : 12.11.2018

Received
Raj. S. Ramani
17/07/19

APPROVAL UNDER SECTION 80G(5)(vi) OF THE INCOME TAX ACT, 1961

The aforesaid Trust-/Society/Company/Institution has been registered u/s.12AA of the Income Tax Act with effect from 29.11.2017 vide AACTN7857J/05/18-19/T-1105 dated 03.09.2018. It is certified that donation made to **NATURE SCIENCE FOUNDATION at LIG II 2669, GANDHIMAA NAGAR, PEELAMEDU, COIMBATORE - 641 004** shall qualify for deduction u/s 80G(5)(vi) of the Income Tax Act, 1961, subject to the fulfilment of conditions laid down in clauses [i] to [v] of sub-section (5) of section 80G of the I.T Act, 1961.

- This approval shall be valid in perpetuity with effect from **A.Y. 2019-20** unless specifically withdrawn. **The details and validity of the certificate is available @ office.incometaxindia.gov.in**
- The Return of Income along with the Income & Expenditure Account, Receipts and Payments Account and Balance Sheet should be submitted annually to the Assessing Officer having jurisdiction over the case.
- No change in the Trust Deed/Memorandum-of-Association shall be effected without the prior approval of the undersigned i.e. **Commissioner of Income Tax (Exemptions), Chennai**.
- Every receipt issued to a donor shall bear the **Unique Registration Number** i.e. **URNo. AACTN7857J/05/18-19/T-1105/80G** and date of this order i.e. **10.04.2019**.
- Under the provisions of section 80G(5)(i)(a), the institution/fund registered u/s.12A, u/s.12AA(1)(b) or approved u/s.10(23C), 10(23C)(vi)(via), etc., shall have to maintain separate books of accounts in respect of any business activity carried on and shall intimate this office within one month about commencement of such activity.



Sd/-
(G.M.DOSS, I.R.S)
Commissioner of Income Tax (Exemptions)
Chennai.

Copy to:

- The applicant
- Guard File
- The DCIT(Exemptions) Coimbatore Circle.

//Certified True Copy//

N. Srinivasa Rao
(N. SRINIVASA RAO)
Assistant Commissioner of Income-tax (H. Qrs)
(Exemptions), Chennai.

FORM NO. 10AC

(See rule 17A/11AA/2C)

Order for registration

1	PAN	AACTN7857J
2	Name	NATURE SCIENCE FOUNDATION
2a	Address	
	Flat/Door/Building	LIG-II, 2669
	Name of premises/Building/Village	GANDHIMAA NAGAR
	Road/Street/Post Office	Coimbatore South
	Area/Locality	COIMBATORE
	Town/City/District	Gandhimaanagar S.O
	State	Tamil Nadu
	Country	INDIA
	Pin Code/Zip Code	641004
3	Document Identification Number	AACTN7857JE2021501
4	Application Number	739995830271021
5	Unique Registration Number	AACTN7857JE20215
6	Section/sub-section/clause/sub-clause/proviso in which registration is being granted	01-Sub clause (i) of clause (ac) of sub -section (1) of section 12A
7	Date of registration	03-11-2021
8	Assessment year or years for which the trust or institution is registered	From AY 2022-23 to AY 2026-2027
9	Order for registration:	
	a. After considering the application of the applicant and the material available on record, the applicant is hereby granted registration with effect from the assessment year mentioned at serial no 8 above subject to the conditions mentioned in row number 10.	
	b. The taxability, or otherwise, of the income of the applicant would be separately considered as per the provisions of the Income Tax Act, 1961.	
	c. This order is liable to be withdrawn by the prescribed authority if it is subsequently found that the activities of the applicant are not genuine or if they are not carried out in accordance with all or any of the conditions subject to which it is granted, if it is found that the applicant has obtained the registration by fraud or misrepresentation of facts or it is found that the assessee has violated any condition prescribed in the Income Tax Act, 1961.	
10	Conditions subject to which registration is being granted	
	The registration is granted subject to the following conditions:-	

	<p>a. As and when there is a move to amend or alter the objects/rules and regulations of the applicant, prior approval of the Commissioner of Income Tax shall be sought along with the draft of the amended deed and no such amendment shall be effected until and unless the approval is accorded.</p>
	<p>b. In the event of dissolution, surplus and assets shall be given to an organization, which has similar objects and no part of the same will go directly or indirectly to anybody specified in section 13(3) of the Income Tax Act, 1961.</p>
	<p>c. In case the trust/institution is converted into any form, merged into any other entity or dissolved in any previous year in terms of provisions of section 115TD, the applicant shall be liable to pay tax and interest in respect of accreted income within specified time as per provisions of section 115TD to 115TF of the Income Tax Act, 1961 unless the application for fresh registration under section 12AB for the said previous year is granted by the Commissioner.</p>
	<p>d. The Trust/ Institution should quote the PAN in all its communications with the Department.</p>
	<p>e. The registration u/s 12AB of the Income Tax Act, 1961 does not automatically confer any right on the donors to claim deduction u/s 80G.</p>
	<p>f. Order u/s 12AB read with section 12A does not confer any right of exemption upon the applicant u/s 11 and 12 of Income Tax Act, 1961. Such exemption from taxation will be available only after the Assessing Officer is satisfied about the genuineness of the activities promised or claimed to be carried on in each Financial Year relevant to the Assessment Year and all the provisions of law acted upon. This will be further subject to provisions of section 2(15) of the Income Tax Act, 1961.</p>
	<p>g. No change in terms of Trust Deed/ Memorandum of Association shall be effected without due procedure of law and its intimation shall be given immediately to Office of the Jurisdictional Commissioner of Income Tax. The registering authority reserves the right to consider whether any such alteration in objects would be consistent with the definition of "charitable purpose" under the Act and in conformity with the requirement of continuity of registration.</p>
	<p>h. The Trust/ Society/ Non Profit Company shall maintain accounts regularly and shall get these accounts audited in accordance with the provisions of the section 12A(1)(b) of the Income Tax Act, 1961. Separate accounts in respect of each activity as specified in Trust Deed/ Memorandum of Association shall be maintained. A copy of such account shall be submitted to the Assessing Officer. A public notice of the activities carried on/ to be carried on and the target group(s) (intended beneficiaries) shall be duly displayed at the Registered/ Designated Office of the Organisation.</p>
	<p>i. The Trust/ Institution shall furnish a return of income every year within the time limit prescribed under the Income Tax Act, 1961.</p>
	<p>j. Separate accounts in respect of profits and gains of business incidental to attainment of objects shall be maintained in compliance to section 11(4A) of Income Tax Act, 1961.</p>
	<p>k. The registered office or the principal place of activity of the applicant should not be transferred outside the jurisdiction of Jurisdictional Commissioner of Income Tax except with the prior approval.</p>
	<p>l. No asset shall be transferred without the knowledge of Jurisdictional Commissioner of Income Tax to anyone, including to any Trust/ Society/ Non Profit Company etc.</p>
	<p>m. The registration so granted is liable to be cancelled at any point of time if the registering authority is satisfied that activities of the Trust/ Institution/ Non Profit Company are not genuine or are not being carried out in accordance with the objects of the Trust/ Institution/ Non Profit Company.</p>
	<p>n. If it is found later on that the registration has been obtained fraudulently by misrepresentation or suppression of any fact, the registration so granted is liable to be cancelled as per the provision u/s section 12AB(4) of the Act.</p>

o. This certificate cannot be used as a basis for claiming non-deduction of tax at source in respect of investments etc. relating to the Trust/ Institution.	
p. All the Public Money so received including for Corpus or any contribution shall be routed through a Bank Account whose number shall be communicated to Office of the Jurisdictional Commissioner of Income Tax.	
q. The applicant shall comply with the provisions of the Income Tax Act, 1961 read with the Income Tax Rules, 1962.	
r. The registration and the Unique registration number has been instantly granted and if, at any point of time, it is noticed that form for registration has not been duly filled in by not providing, fully or partly, or by providing false or incorrect information or documents required to be provided under sub-rule (1) or (2) of rule 17A or by not complying with the requirements of sub- rule (3) or (4) of the said rule, the registration and Unique Registration Number (URN), shall be cancelled and the registration and URN shall be deemed to have never been granted or issued.	
Name and Designation of the Registration Granting Authority	Principal Commissioner of Income Tax/ Commissioner of Income Tax (Digitally signed)



Certificates of Green Campus Auditors.

1. ISO Environment Management System (14001:2015) of Mrs. S. Rajalakshmi, Founder & Chairman of NSF.
2. ISO Environment Management System (14001:2015 TUV NORD) of Dr. A. Geethakarathi, NSF Environment Auditor.
3. Indian Green Building Council (IGBC AP) Accredited Professional of Dr. B. Mythili Gnanamangai, Vice-Chairman of NSF.
4. Associated Chambers of Commerce and Industry of India (ASSOCHAM), of Dr. B. Mythili Gnanamangai, Vice-Chairman of NSF.
5. Associated Chambers of Commerce and Industry of India (ASSOCHAM), of Er. Ashutosh Kumar Srivastava, Board of Directors (North Zone) of NSF.
6. Botanist and Subject Expert of Plant Taxonomy of Dr. D. Vinoth kumar, Joint Director of NSF.
7. Energy and Environment Engineering (EEE Auditor) of Er. B. Vijayalakshmi, Deputy Director of NSF.



Certificate of Training

TNV hereby certifies that

S. Rajalakshmi

has successfully completed the 5 days

Auditor / Lead Auditor Training Course which meets the training requirements of the Exemplar Global and has been declared as competent in the following competency units

- EM: Environmental Management System
- AU: Management Systems Auditing
- TL: Leading Management Systems Audit Teams

ISO 14001:2015

Issue Date: 17th Jun. 2021

Training Date : 20th to 24th May. 2021

Certificate Number : 2106170721010105

Authorised Signatory
(Pragya Singh)

This course is certified by Exemplar Global vide registration number TN006669

Note: The course conforms to the principles and practice of audits of Management Systems for compliance with standards. This certificate remains the property of TNV and this certificate is recognized by Exemplar Global. For verification of this certificate, please write to Mail: info@isoindia.org



**PR315: ISO 14001:2015 Lead Auditor
(Environmental Management Systems)
Training course**

Certificate of Achievement

Geethakarathi Alagarsamy

has successfully completed the above mentioned course and examination.

23rd - 27th March 2019

COIMBATORE, INDIA

Certificate No. 35242817 02

Delegate No. 171136

A handwritten signature in black ink, appearing to be "G. Alagarsamy".

for TÜV NORD CERT GmbH

Essen, 2019-04-26

The course is certified by CQI and IRCA (Certification No. 18125). The learner meets the training requirements for those seeking certification under the IRCA EMS Auditor certification scheme.

TÜV NORD CERT GmbH

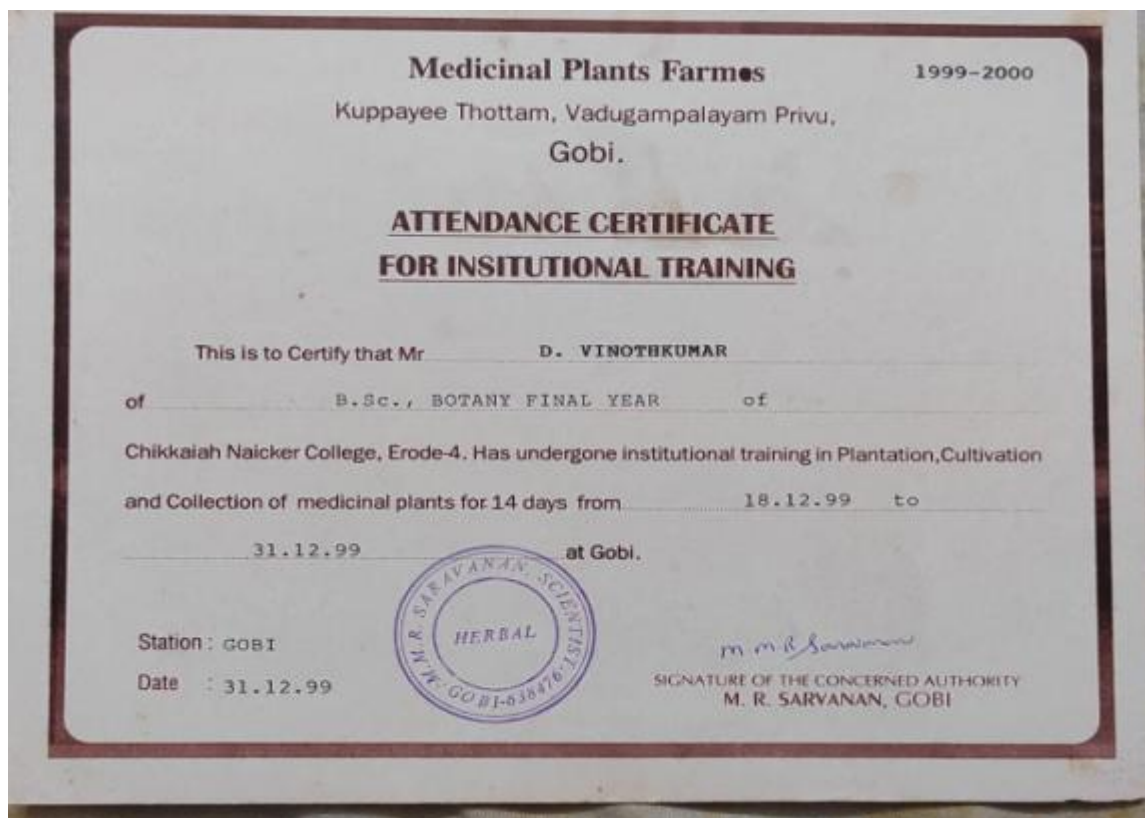
Langemarckstraße 20

45141 Essen

www.tuev-nord-cert.com











SI.No.: 0010669

TAMIL NADU AGRICULTURAL UNIVERSITY COIMBATORE

On the recommendation of the
Academic Council and the Board of Management
hereby admits

VIJAYALAKSHMI, B.
to the degree of
Bachelor of Technology
(Energy and Environmental Engineering)



he / she having qualified to receive the same
securing an Overall Grade Point Average
of **7.61** out of **10.00** in the year **2017**
together with all the honours and distinctions belonging
to this degree given under the seal of the University



COIMBATORE
Date : 26.02.2019




N. KUMAR
Vice Chancellor

ANNA UNIVERSITY
CHENNAI - 600 025


PROGRESS THROUGH KNOWLEDGE

PROVISIONAL CERTIFICATE

Folio No.: **AUO2359635**

This is to certify that the following candidate has qualified for the award of Degree as detailed below:

Name : **VIJAYALAKSHMI B**

Registration Number : **412718416013**

Degree : **M.E.**

Branch/Specialization : **Environmental Engineering**

Month and Year of Passing: **April 2020**

Classification : **FIRST CLASS WITH DISTINCTION**



Chennai - 600 025.
Date : **02/11/2020**
V122065190828B


Controller of Examinations i/c