**PROFARMA**

**ACADEMIC AUDIT: 2020-21**

|  |  |  |
| --- | --- | --- |
|  | Name of the Department | **Biotechnology** |
|  | Name & Address of External Expert |  |
|  | Address of External Expert |  |
|  | **Special Feature of The Department****The Department of Biotechnology was established in the year 2000 with seven UGC sanctioned posts namely Professor (01), Associate Professor (02) and Assistant Professor (04). The department is presently offering M.Sc. and Ph.D. degree in Biotechnology. In the past, Prof. Anil Kumar Tripathi, Ex-Director CSIR-CIMAP, Dr. Dinesh Raj Modi, Ex-Dean, Faculty of Life Sciences, BBAU, Lucknow and Dr. Jagtar Singh, Coordinator, Biotechnology, Punjab University, Chandigarh and Dr. Kirti Srivastava have served the department. Prof. N.B. Singh, Dr. D.R. Modi, Prof. M.L. Srivastava, Prof. A.K. Tripathi, Prof. C.P.M. Tripathi, Prof. Dinesh Yadav, Prof.. Sarad K. Mishra, Prof. Kaushal Kumar, Prof. J.P. Chaturvedi, Prof. Rajendra Prasad and Dr. Jonnada A.V. Prasada Rao, Prof. Rajendra Singh has contributed as Head of the Department.****The Department has seven independent research labs, M.Sc. Labs, Smart class rooms, Conference hall, Library and all basic facilities to cater the needs of M.Sc. and Ph.D. students.** A large number of students have qualified UGC/CSIR-JRF fellowship, UP-SLET, DRDO, ICMR & DBT-JRF and GATE till date. Several students have pursued their higher education abroad especially countries like in USA, Germany, Canada, China, France, Israel and Korea etc. A good number of students from the department are serving as scientist/faculty in various universities/institutes of our country as well as abroad. The Department of Biotechnology has an independent library facility with more than 1300 textbooks and reference books exclusively on diverse areas of biotechnology for the benefit of students of Biotechnology. Recently, MoU was signed between DDU Gorakhpur University and ICMR-RMRC, Gorakhpur for training and research related to health sector. |
|  | Major Achievements |  |
|  | **Main Strengths of Department**The Department of Biotechnology, D.D.U. Gorakhpur University was established in the year 2000 with a Vision of Attaining a new height of Biotechnology Research and shaping a tool for the benefit of society & environment. The mission of Biotechnology Department is to generate a high quality of professionals and researchers to cater the needs & challenges of the region and the country. The mission of the department is:1. To create opportunities for multi-disciplinary education, training and research in biotechnology.2. To spread the knowledge for generation of products, processes and technologies.3. To nurture the leads the biotechnology potential, bringing the bioproducts to the marketplace.4. To explore the biodiversity of the region and utilizes it for human welfare.5. Socio-economic development of Biotechnology for upliftment of women, rural and poor populations.As the result of the availability of the University and department funds, a number of infrastructural support facilities have been established since 2000:* Research and industry applications-oriented courses are been taught.
* Satisfactory infrastructure of research & teaching is available.
* Research output in the form of publications in journals of international repute.
* Eminent personalities are being invited for lectures in the academic year.
* Active interaction with social organizations.
* Several conferences/ meeting/symposium/workshop relevant to diverse themes of biotechnology has been conducted over the years
 |
|  | Weakness/Limitations | ♣Number of national/international journals in the department library need to be increased. ♣ The activities through Industry Institution Interaction Cell are to be improved. ♣ ICT facilities in each and every classes ♣strengthen the research facilities |
|  | **Future Plans**The Deen Dayal Upadhaya Gorakhpur University is situated in the North eastern belt of Uttar Pradesh. This terrain region is very fertile and good for agriculture but due to less knowledge and right approaches the people are not able to give their best. Agricultural practices are not always easy in Gorakhpur District due to economic and climatic conditions. For example, high temperatures and drought hinder crop farming as well as livestock farming. The terrain of the area is low-lying to flat, which leads to problems of waterlogging and flooding during high-rainfall months of June to August. Similarly, health issues are again a challenge for this region. Diseases like [Japanese Encephalitis](https://r.search.yahoo.com/_ylt%3DAwr9J.pgbM5eV.wA.QMM34lQ%3B_ylu%3DX3oDMTByb2lvbXVuBGNvbG8DZ3ExBHBvcwMxBHZ0aWQDBHNlYwNzcg--/RV%3D2/RE%3D1590615264/RO%3D10/RU%3Dhttps%3A//www.thehindu.com/sci-tech/health/japanese-encephalitis-a-deadly-disease-explained/article19486806.ece/RK%3D2/RS%3DdFZbi41kpZ9YvdaFuA5Hvy33.bk-), Acute Encephalitis Syndrome, dengue, malaria is very much prominent and making a beeline for some of the hospitals.With this our Strategic Plan has been shaped by team at the department to help us to realize our aim of pioneering distinctive elite of research-intensive universities which are open to anyone with talent. We are planning to develop laboratories in the potential area of research such as genomics, proteomics, bioinformatics and virology. Along with this we are also restructuring our facilities of : 1. Bioinformatics Centre
2. Plant Clinic Centre
3. Upgradation of Plant Tissue culture lab and
4. Animal cell culture

We will also focus on some of the research area which include* Identification of potential transcription factor gene families showing desired agronomic traits (biotic and abiotic stress tolerance) based on genome-wide studies of sequenced genomes of different crops.
* Identification of novel microbial sources of industrially important pectinases enzymes and its applicability in food industries
* Understand the layered nature and variety of plant defenses and to convert that knowledge into improved disease resistance.
* May develop some simulation techniques for better understanding the protein-DNA interaction or protein ligand interaction
 |
|  | Suggestions for Improvement or Future Scope |  |

 (Signature)

Name of External Expert

**Departmental Academic Audit**

**ACADEMIC YEAR: 2020-2021**

The Department of Biotechnology was established in 2000 under the faculty of Science, D.D.U Gorakhpur University as one of the centres of post- graduate teaching and research. In the last two decades the department has grown as one of the pioneering departments in teaching and research. The department has excellent infrastructure for research in Biotechnology and allied sciences. The Department offers a unique blend of high-quality teaching and rigorous student training. The Department offers M.Sc and PhD Biotechnology programme since inception. It has seven UGC-sanctioned teaching posts Professor (01), Associate Professor (02) and Assistant Professor (04). The Department has seven independent research labs, MSc Labs, Class rooms, Conference hall, Library and all basic facilities to cater the needs of M.Sc and Ph.D students. The Department has recently been recognized as “Centre for Excellence in Genomics and Bioinformatics” by Uttar Pradesh Government in 2021.

1. a) Name of the Department & Year of Establishment : Department of Biotechnology Estb. Year 2000

b) Name of the University/Institution : Deen Dayal Upadhyaya

 Gorkhapur University

 c) Address for correspondence including Telephone, Telegram, FAX, e-mail etc.

 Department of Biotechnology, Deen Dayal

 Upadhyaya Gorakhpur University, Civil Lines,

 Gorakhpur-273009, U.P.

d) Its Financial Status (General/ Self-financed) : Self-financed

2. Status of the Institute/ University (attach supporting documents)

 √

a) Academic Status [Autonomous Institute/ University/ Deemed University] University

 √

 b) Financial Status [Government (Central or State Govt.)/ Govt. Aided/ Private] Sate Govt.

1. Upload the copy of 2f and 12B Certificate issued by UGC along with the online submitted proposal.

 c) Examination System: Annual/ Semester/Choice Based Credit System/ Credit and Grading system/ any other

 system, specify: Semester/CBCS

3. a) Name & Number of Faculty members in position: a) Professors, b) Readers & c) Lecturers

(List only **Core & Permanent** Faculty Members in Department/ Centre/School with their academic qualifications)

|  |  |  |
| --- | --- | --- |
| **Name of Faculty Member** | **Designation** | **Highest Qualification** |
| Dr. Jonnada A.V. Prasada Rao | Professor | Ph.D |
| Dr. Sarad Kumar Mishra | Professor & Head | Ph.D |
| Dr. Dinesh Yadav | Professor | Ph.D |
| Dr. Rajarshi Kumar Gaur | Professor | Ph.D |
| Dr. Farrukh Aqil | Associate Professor | Ph.D |

b) Sanctioned Strength 07 (Seven)

5. a) Actual Current student strength at:

 (i) PG level - M. Sc, (only Regular Students ) : 39

(ii) Total No. of Full Time Ph. D scholars in each sub-discipline. : 09

b) Degree-wise actual number of passing out students in last year: :20

c) i) Number of Students (year-wise) who qualified in NET in M. Sc Program or GATE (more than 90% percentile) qualified in ME/ M Tech Program

 ii) Number of Full Time Ph. D research scholars with fellowships awarded from any agency in the department

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S No. | Name of PhD scholar | Date of joining | Fellowship awarding agency | Fellowship amount (Rs)/P.M. |
| 6 | Sonali | 2018 | CSIR-NET/JRF | 25,000 |
| 8 | Kanchan | 2019 | DST-INSPIRE | 25,000 |

d) Placement of graduating post-graduate & Ph D students in the Department.

7. What is the annual grant available to the department from your university/institution during the last two years?

|  |  |  |
| --- | --- | --- |
| **Year** | **For Research (Rs.)** | **For Teaching (Rs.)** |
| **2020-21** | **6,00,000.00** | **4,00,000.00** |

8. Research Grant received from different agencies during the last five years:

* 1. Total Amount (Rs) and Number of Research Projects
	2. Details thereof:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.no.** | **Name of the Investigator**  | **Title of the project and duration** | **Amount sanctioned (Rs. Lakhs)** | **Funding Agency** |
| 1 | Dr. Aiman Tanveer; Mentor Prof. **Dinesh Yadav** | Application of microbial enzymes isolated from environmental samples for preparation of hand made paper15/10/2019 to 14/10/2022 | 36.48 | DST-Women Scientist-B fellowship |
| 2 | Dr. Anupama Ojha ; Mentor –Prof. Sarad Kumar Mishra | Study of correlation between pesticide exposure and cancer development through pesticide exposure marker in cancer patients of Eastern Uttar Pradesh region | 21.00 | UGC-Dr. D.S Kothari Post- Doctoral Fellowship |
| 3. | Prof. Sarad Mishra | To Study the Arsenic content of soil and water and role of Arsenic metabolizing microorganisms as bioremediation, in different region of Eastern Uttar Pradesh (2021-22) |  | UPHED, Lucknow |
| 4. | Dr. Rupali Gupta; Mentor Prof. Dinesh Yadav). | Mechanistic insights into priming mediated by chemical elicitors in chickpea against wilting caused by *Fusarium oxysporum F. sp. ciceris* |  | SERB-National PDF |

11. **a) List of Research Publications only in SCI Journals coming from the Department during the last five**

 **years (Authors Names, Title of Paper, Name of the Journal, Volume, Page nos., Year)**

 *[Publications in other than SCI Journals as well as publications from the work done elsewhere shall not be included]*

**Research Article:**

**2020-21**

1. Richa Raizada, **R.K. Gaur** and Benedicte Albrectsen (2021). Recursive partitioning to priorities morphometric traits that separate Aspen specialist *Chaitophorus* aphid species and stages. *International Journal of Tropical Insect Science* (DOI: 10.1007/s42690-021-00620-6 ). **(IF: 0.774)**
2. P. Saraswat, T. Gulia, R.K. Verma, **R. K. Gaur,** K.P.Sharma (2021) Assessment of *In-vitro* Acid and Bile Tolerance of Lactic Acid Bacteria Isolated from Goat and Camel Milk. *Journal of Microbiology, Biotechnology and Food Science*. (Accepted)
3. Avinash Marwal, Chitra Nehra, Rakesh Verma, Megha Mishra, Deepika Srivasatava, Priyanka Choudhary and **Rajarshi Kumar Gaur** (2021) First report of papaya leaf curl virus and its associated papaya leaf curl betasatellite infecting Catharanthus roseus plants in India. *The Journal of Horticultural Science and Biotechnology* (DOI:10.1080/14620316.2021.1912646) (**IF 1.160**)
4. Avinash Marwal, Mukesh Meena and **R.K.Gaur** (2021) Molecular Docking Studies of Coronavirus Proteins with Medicinal Plant-Based Phytochemicals. *Def. Life SCI. J*., Vol. 6, No. 1, January 2021, DOI : 10.14429/dlsj.6.(**IF 0.703**)
5. Vineeta Pandey, Aarshi Srivastava and **R. K. Gaur** (2021).Begomovirus: a curse for the agricultural crops. *Archives of Phytopath. and Plant Protection*. [doi.org/10.1080/03235408.](https://doi.org/10.1080/03235408.2020.1868909) (**IF 0.506**).
6. Avinash Marwal Akhilesh Kumar Srivastava and **R.K. Gaur** (2020). Improved plant tolerance to biotic stress for agronomic. Management. *Agrica*. Vol. 9, Dec 2020 Page No. 84-100.
7. Megha Mishra, Rakesh Kumar Verma, Avinash Marwal, Pradeep Sharma and **R.K. Gaur** (2020). Biology and interaction of the natural occurrence of distinct monopartite begomoviruses associated with satellites in *Capsicum annum* from India. *Frontiers in Microbiology*. doi: 10.3389/fmicb.2020.512957 (**IF 5.640**)
8. Poornima Saraswat, **R.K.Gaur** and K.P. Sharma (2020). Effect of *Prosopis cineraria* (L) Druce Pods and Camel Milk for Nutritional Enrichment in Traditionally Fermented Minor Millet's Drink. *International J. of Gastronomy & Food Sci.* (<https://doi.org/10.1016/j.ijgfs.2020.100251>) ( **IF 2.537**)
9. Avinash Marwal and **R.K.Gaur** (2020). Host Plant Strategies to Combat Against Viruses Effector Proteins. *Current Genomics* 21(6). Doi. 10.2174/1389202921999200712135131 (**IF 2.236**)

**Book Chapter**

1. Avinash Marwal and **R.K.Gaur** (2021). Disease causing seed pathogenic microorganisms and their management practices. In: Seed production and management (Ed: A.K.Tiwari), Springer Nature Singapore Ptv Ltd, (ISBN: 978-981-15-4197-1) pages 185-200.
2. Anurag Kumar Sahu, Neeti-Sanan Mishra, and **Rajarshi Kumar Gaur** (2021). Suppressor to Survival: RNAi as a Molecular Weapon in Arms Race between Virus and Host. G. Tang et al. (eds.), RNA-Based Technologies for Functional Genomics in Plants, Concepts and Strategies in Plant Sciences.Springer Pvt. Ltd, (ISBN 978-3-030-64993-7), pages 131-154.

# Avinash Marwal and **R.K.Gaur** (2020). Molecular diversity of begomoviruses and DNA satellite molecules infecting ornamental plants in India. In: Applied Plant Virology Advances, Detection, and Antiviral Strategies (Editor: L.P.Awasthi) Academic Press, Elsevier (ISBN:9780128186541), Chapter no. 34.

**b) List of Publications in Conference Proceedings during last five years (Authors Names, Title of Paper, Name of the Conference, Volume, Page nos., Year).**

 **c) List of Patents obtained or applied for during last five years. : NIL**

 **d) List of patents commercialized, and its profitability earned out of commercialization (in last 15 years): NIL**

 **e) List of scientific/ technical Books written by Faculty Members in the Department.**

1. Plant Virus-Host Interaction: Molecular Approaches and Viral Evolution (2021). **R.K. Gaur**, S.M. Paul Khurana, Pradeep Sharma and Thomas Hohn, 2nd Edition. (ISBN: 9780128216293) Imprint: Academic Press (Elsevier

12. Distinction earned by faculty members like National and International Awards/ Professional Societies/ Editorial Board members

* + 1. Life Member of Indian Science Congress
		2. Life Member of Biotechnology Research Society of India
		3. Life Member of Indian Virological Society
		4. Life Member of Society of Mycology and Plant Pathology
		5. Life member of Association of Microbiologists of India, New Delhi (AMI)
		6. Life member of Society of Plant Biochemistry and Biotechnology, IARI, New Delhi
		7. Life member of Uttar Pradesh Academy of Agricultural Sciences (UPAAS), Lucknow.
		8. Life member of Biological Chemist of India, Bangalore
		9. Life Member of Indian Phytopathological Society.
		10. Awarded Dr. Pushpendra Kumar Gupta Vishisht Krishi Vaigyanik Puraskar-2015 in the field of Agricultural Sciences by Uttar Pradesh Academy of Agricultural Sciences (UPAAS). (**Prof. Dinesh Yadav**)
		11. DST-BOYSCAST Fellowship 2010-11 by Department of Science and Technology, Govt. of India in the area of “Molecular Biology of Biotic and Abiotic stress in Plants” at Australian Centre for Plant Functional Genomics (ACPFG), The University of Adelaide, South Australia (3 rd May 2012 to 12th April 2013). (**Prof. Dinesh Yadav**)
		12. Young Scientist Award-2008 by Uttarakhand Sate Council of Science & Technology in the discipline Biotechnology, Biochemistry and Microbiology. (**Prof. Dinesh Yadav**)
		13. South-East Asia International Joint Research and Training Program on Low carbon, Green Energy and Environment sustainability held at National Chino Tung University and National Tsing Huq University, Taiwan (**Prof. Sarad Kumar Mishra**)
		14. Prof. B.M. Johri memorial Award, Society of Plant Research (**Prof. R.K.Gaur**)
		15. Best Professor, Peral Foundation (**Prof. R.K.Gaur**)
		16. Guest Editor (Topic Editor), Frontiers of Microbiology (Virology) **(IF 5.640)**
		17. Editorial Board Members-BMC Plant Biology **(IF 4.215) (2021-till date)**
		18. Editor-in-Chief-Asian Journal of Plant Sciences (Scialert) (**IF 0.840) (2019-till date)**
		19. Academic Editor-Plos One (**IF 2.776**) (**2020-till date**)
		20. Associate Editorial Board Members-The Open Bioinformatics Journal (**IF 1.500) (2020-till date)**
		21. Academic Editor- Plant Cell Biotechnology and Molecular Biology **(IF 0.240) (2018-till date)**
		22. Academic Editor-Microbiology Research Journal International (British Microbiology Research Journal)
		23. Regional Editor- [Journal of Applied Sciences](https://scialert.net/jhome.php?issn=1812-5654) (Scialert) **(2019-till date)**

13. **Library facilities - List the Journals received in your Department/ University library in the concerned discipline.**

The Central Library of Deen Dayal Upadhyaya, Gorakhpur University was instituted in the very first year of establishment of the university. This library building is set up in about four thousand square meters area where approximately four lakhs of text material is stored. It works for the services of more than fifteen thousand students of the five faculties of the University, teachers, employees and researchers coming here for their research work. There is a huge reference room on the first floor which is also known as Gandhi Hall. Excellent reference books like dictionaries, Encyclopedias, Directories, Bibliographies, Yearbooks, Almanacs, Gazetteers, guidebooks, maps, atlases, Handbooks, manuals and statistical sources etc are placed here. There is also a research Journal Section on this floor. Internet-equipped computers for teachers and researchers and special Braille enabled computers to have also been installed for visually impaired people in the library.

Our University is well connected with the National Digital Library, Ministry of Human Resource Development (MHRD) under its National Mission on Education through Information and Communication Technology (NMEICT). This gives a wide range of journal access for the research and project work in the department.

 **The Department of Biotechnology has an independent library facility with more than 1300 textbooks and reference books exclusively on diverse areas of biotechnology for the benefit of students of Biotechnology.**

14. **Details of computing and networking facilities available in your department and institution.**

The Computer Centre is main hub of Computerization in DDU Gorakhpur University. The Centre is providing the whole Computer Networking (Including main Administrative building, All the departments and other students-based facilities etc.) since 2013 and till Continue. In this continuation, The mission of National Knowledge Network (NKN), The The Computer Teaching and Lab Assistance supports of Ph.D Scholars and Computer typing test for Promotion of University Employees and other miscellaneous works are going regularly. The Objective of the Scheme to set-up a Computer Centre as a central facility for the growth and development of supporting of Computerization, Research, supporting of Teaching, Training and other related activities in addition to the work relating to the Administration, Finance, Examination, Admissions are running nicely. **The Department of Biotechnology is in the process of establishing Bioinformatics centre for conducting teaching and research in the area of bioinformatics. The space for the same is available in the Department and only needs computers and internet facility to start with.**

15. **Details of facilities in Central Instrumentation Centres such as RSIC, USIC etc., if any.**

Department of Biotechnology, D.D. U. Gorakhpur University, Gorakhpur has Central Instrumentation Facility (CIF), with its aim to uplift the quality of research in basic as well as applied field of science carried out by the faculty members of this University. Our University authority with the able leadership of our Vice-Chancellor has taken initiative to enhance the infrastructure of the centre. Centre has come out from its initial bottle neck of infrastructure and fund. During last few years instruments were purchased keeping in mind the need of the research fraternity of the University. So far centre possesses 15 different instruments for helping cutting edge research in different field of biological sciences. All the faculty members are highly benefitted from the service provided by the centre. At present the following instrumental facilities are provided by the USIC.

Gel Doc XR system PC version, Compound microscope, UV-VIS-NIR Spectrophotometer, PCR system, cooling centrifuge, ice-flaking machine, colony counter, BOD, lyophilizer, milliQ, Incubator shaker, Autoclave, digital weighing balance, -20oC deep freezer, RT centrifuge.

16. **Details of Academic Curricular Activities in the Department.**

Seminars/Conferences/Symposium organized by the department are listed below:

|  |  |  |
| --- | --- | --- |
| **S.No.** | **Name of workshop/lecture series** | **Date or Duration** |
| **1** | Online Lecture Series on Intellectual Property Rights (IPR) Issues | 25th Sep.-01st Oct. 2020 (seven days) |
| **2** | 7Day Workshop ON Research Methodology & Innovations in Life Sciences | 25th June -1st July, 2021 (seven days) |

**17. Future Plan for the next Five (5) Year**

The Deen Dayal Upadhaya Gorakhpur University is situated in the North eastern belt of Uttar Pradesh. This terrain region is very fertile and good for agriculture but due to less knowledge and right approaches the people are not able to give their best. Agricultural practices are not always easy in Gorakhpur District due to economic and climatic conditions. For example, high temperatures and drought hinder crop farming as well as livestock farming. The terrain of the area is low-lying to flat, which leads to problems of waterlogging and flooding during high-rainfall months of June to August. Similarly, health issues are again a challenge for this region. Diseases like [Japanese Encephalitis](https://r.search.yahoo.com/_ylt%3DAwr9J.pgbM5eV.wA.QMM34lQ%3B_ylu%3DX3oDMTByb2lvbXVuBGNvbG8DZ3ExBHBvcwMxBHZ0aWQDBHNlYwNzcg--/RV%3D2/RE%3D1590615264/RO%3D10/RU%3Dhttps%3A//www.thehindu.com/sci-tech/health/japanese-encephalitis-a-deadly-disease-explained/article19486806.ece/RK%3D2/RS%3DdFZbi41kpZ9YvdaFuA5Hvy33.bk-), Acute Encephalitis Syndrome, dengue, malaria is very much prominent and making a beeline for some of the hospitals.

This region lacks the scientific approaches in for solving the issues related to agriculture and health problems. With this DST-FIST project we may develop some facility for disease diagnosis and its management. We may also train some young and budding scientist in the concern area.

**RESEARCH:**

1. **Plant Biotechnology**
2. **Plant transcription factor** : genome wide identification of DOF (DNA binding with One Finger) and Nuclear Factor-Y (NF-Y) transcription factor genes from sequenced genomes of different crops, presently targeting legumes, followed by PCR based amplification, cloning and sequencing of identified transcription factor genes and finally elucidating its diverse application in biotic and abiotic stress tolerance after subjecting it to real time expression profiling. Earlier studies in this area has several leads and using bioinformatics tools *Dof* genes of sorghum, pigeonpea, chickpea and sugarcane have been identified and many of them have been cloned and sequenced. Three of the Dof genes of sorghum reveal great potential for developing drought and salt tolerant crops. Extensive characterization of identified *Dof* genes of chickpea and pigeonpea needs to be investigated in light of identifying potential *Dof* genes showing biotic and abiotic stress tolerance.
3. **Plant Signaling in Response to Symbionts and Pathogens**

Work on resistance signaling addresses systemic acquired resistance, basal innate immunity, and defenses mediated by resistance genes. Work on mechanisms of plant susceptibility emphasizes the characterization of plant factors targeted by pathogens. An overarching goal of our research on plant responses to pathogens is to unravel and understand the layered nature and variety of plant defenses and to convert that knowledge into improved disease resistance.

1. **Functional Genomics and Proteomics**

We will use sequenced genomes in a variety of functional genomics projects aimed at understanding the mechanisms and regulatory signaling underlying virulence and developing more effective plant resistance.

1. **Plant viruses:** Emerging of plant viruses are affecting several economically important crops resulting a huge economic loss. Characterization of plant viruses will facilitate the management of these virus through RNAi technology or CRISPR tools.
2. **Active biomolecules from Endophytes:** Reservoir of endophytes inhabiting plants are the source of plant growth promoting molecules like hormones, stress resistant molecules etc. Endophytes isolated from heat resistant and draught resistant plants can be inoculated in normal plants to impart such properties. Moreover, endophytes isolated from medicinal plants are being studied for having molecules with therapeutic potential.
3. **Enzyme Technology**
4. Pectinases: represents an important group of enzymes of industrial importance and includes mainly pectin lyases, pectate lyases, polygalacturonases. Efforts have been made to identify potential fungal strains producing pectin lyases and polygalacturonases and many of potential fungal strains have been deposited in culture collection centre like MTCC and Gene Bank, IMTECH, Chandigarh. Pectin lyases and polygalcturonases from several fungal strains including both indigenous strains and those procured from culture collection centres have been purified and biochemically characterized. Application of these purified pectin lyases and polygalcturonases especially in fruit juice clarification and retting of natural fibers have been elucidated. Molecular cloning and bioinformatics studies of pectin lyase and polygalctuonases genes have also been conducted and several gene sequences have been submitted in the NCBI GenBank. Using metagenomics approach initial efforts have been made to identify novel microbial sources for the pectinases but still needs extensive studies. The future plan in this direction is to target the purified pectin lyase and polygalcturonases for industrial application and utilize the mategenomics approach for identifying novel sources. Efforts are also planned to subject some of the promising pectinases for directed evolution to enhance thermal stability and kcat value, which is a major limitation.
5. Application of Microbial Enzymes Isolated From Environmental Samples for Preparation of Handmade Paper: Following objectives have been proposed namely (i) Screening of soil samples for isolation of potential microbes for production of novel enzymes capable of degrading the raw materials needed for preparation of handmade paper, (ii) Identification and characterization of microbes from environmental samples using molecular tools like 16S rRNA/18S rRNA sequencing. (iv)Production and characterization of enzymes associated with hand-made paper preparation from characterized microbial sources. (v) Elucidating the application of the microbial enzymes in preparation of handmade paper.
6. Microbial reservoir of this terai region of Eastern Uttar Pradesh is being screened for industrially important enzymes like L-asparaginase. L-asparaginase enzyme is known as anti-cancer (particularly anti-leukemic) molecule. Endophytes from the plants known to possess anti-cancer activity are being isolated and their efficacy as source of anti-cancer molecule is being studied.
7. **Bioinformatics**
8. Bioinformatics based assessment of protein sequences of several industrially important enzymes like pectinases, xylanases, lipases, amylases, proteases, arsenate reductases, Mn peroxidases, α-L rhamnosidases etc. have been conducted for homology search, multiple sequence alignment, motif search and phylogenetic tree construction. Further in-silico 3-D structural prediction and validation of pectinases has been attempted. Using bioinformatics approach 3D structural prediction of cloned pectinases and docking studies of different ligands needs to be investigated in near future. Extensive studies on Genome-Wide Identification, Structural and Functional Characterization Of Pectin Lyase Genes Of *Fusarium* sp. will be carried out in near future. The objectives for the same will be *(a) In-silico* identification and characterization of pectin lyase genes from sequenced genomes of *Fusarium* genera, (b) PCR amplification, molecular cloning and sequencing of identified pectin lyase genes from different species of *Fusarium*, (c) Expression of few cloned pectin lyase genes in suitable host and elucidating its industrial applications.
9. Drug discovery- Molecular modeling and *in silico* screening of molecules against various types of viruses like Dengue and Zika. Identification of lead molecules against these having anti-viral activity. Their *in- vitro* and *in-vivo* validation to develop as drug. Potential molecules identified from Neem (*Azadirachta indica*) against Dengue virus can be further studied for their potential as anti-viral drug.
10. Our goal is to create a powerhouse of bioinformatics research which produces high quality research papers, develops novel bioinformatics tools, and attracts a large amount of research funding from various sources. The research effort will integrate with the educational mission to produce well-trained bioinformatics professionals and substantively contribute to the service mission. The result will be a bioinformatics
research community involving extensive collaborations between the bioinformaticians
and life sciences experimentalists across this campus, the state, and the globe. Using bioinformatics approach genome wide identification and characterization of *Dof* and *NF-Y* transcription factor gene families of newly sequenced crops will be carried out to identify potential genes for desired agronomic traits.
11. **Molecular and Cell Biology of Interaction Molecules**

Interactions between microbe and host molecules (and associated cell structures) ultimately determine whether an encounter between organisms results in disease, resistance, or symbiosis. Our investigations of these molecular events focus on key virulence molecules such as toxins, siderophores, hormones, quorum-sensing molecules, degradative enzymes, and effector proteins, as well as important plant molecules such as antimicrobial compounds, receptor proteins, and cell wall polymers. We will also explore the respective secretion and vesicle trafficking pathways that deliver these microbe and plant molecules. Our molecular/cellular research utilizes state-of-the art approaches in structural biology, chemistry, and biological imaging; and it features collaborations with other researchers across campus.

1. Mic**robiology**

**(a)** Mining of Soil Metagenomes Of North Eastern Terai Region Of Uttar Pradesh For Pectinases. Following objectives namely (i) Assessment of microbial diversity from different soil samples collected from North- Eastern terai region of Uttar Pradesh.(ii) Isolation, qualitative and quantitative estimation of different soil metagenomic DNA,(iii) Sequences/function based screening of pectinases (*pectin lyases, polygalacturonases, pectate lyases or pectin methyl esterases*) using soil metagenomic DNA as template, (iv) Molecular cloning, sequencing and expression of promising pectinases followed by elucidating its industrial applications have been proposed in near future.

5. **Cancer Biology**: To study the most prevalent types of cancer and their possible cause in eastern Uttar Pradesh. Epidemiological study of various types of cancer prevalent in this region. Our aim is to establish the link of cancer with nutritional and socio-environmental factors in this region. As this region is located in foothills of Himalaya and has rich biodiversity, various traditional medicinal plants will be screened for their anticancer potential in search for a potential drug candidate against specific type of cancer.

**6.** **Plant Clinic Centre:**

We will develop the plant clinic centre for the farmer and other research to give them the knowledge of the disease and their management. Regularly we will do the training and workshop will try to make more strategy for the crop improvement.

**FACILITY TO BE ESTABLISH**

1. Bioinformatics Centre
2. Plant Clinic Centre
3. Upgradation of Plant Tissue culture lab
4. Animal cell culture

18. Details of Strength of the Department/ School/ Centre and Deliverables in the proposal:

1. **Existing Faculty and Infrastructure strengths of Deptt/ Centre/ School justifying the Proposal**

The Department of Biotechnology, D.D.U. Gorakhpur University was established in the year 2000 with a Vision of Attaining a new height of Biotechnology Research and shaping a tool for the benefit of society & environment. The mission of Biotechnology Department is to generate a high quality of professionals and researchers to cater the needs & challenges of the region and the country. The mission of the department is:

1. To create opportunities for multi-disciplinary education, training and research in biotechnology.

2. To spread the knowledge for generation of products, processes and technologies.

3. To nurture the leads the biotechnology potential, bringing the bioproducts to the marketplace.

4. To explore the biodiversity of the region and utilizes it for human welfare.

5. Socio-economic development of Biotechnology for upliftment of women, rural and poor populations.

As the result of the availability of the University and department funds, a number of infrastructural support facilities have been established since 2000:

* Research and industry applications-oriented courses are been taught.
* Satisfactory infrastructure of research & teaching is available.
* Research output in the form of publications in journals of international repute.
* Eminent personalities are being invited for lectures in the academic year.
* Active interaction with social organizations.
* Several conferences/ meeting/symposium/workshop relevant to diverse themes of biotechnology has been conducted over the years

**ii). Specific Objectives of the Proposal in relation of above strengths: Based on the department**

  **faculty profiles following are the specific objectives which strengthen our proposal:**

1. **PLANT BIOTECHNOLOGY**
2. Molecular Cloning and Expression Profiling of *Dof* (Dna Binding with One Finger) And Nf-Y (Nuclear Factor-Y) Transcription Factor Gene Family of Different Crops**. (Prof. Dinesh Yadav)**
3. Characterization of Plant viruses and its management through RNAi technology and CRISPR system (**Prof. R.K.Gaur**)
4. Regulation Mechanism of miRNA In Plant Response To Abiotic Stress (Prof. **R.K.Gaur**)
5. Plant stress and its regulation and management. (**Prof. Dinesh Yadav**)
6. Role of endophytes in stress resistance and plant growth promotion in plants. **(Prof. Sarad Kumar Mishra)**
7. **ENZYME TECHNOLOGY**
	* 1. Enzymatic, biochemical, molecular, metagenomics studies on microbial pectinases. (**Prof. Dinesh Yadav**)
		2. Isolation, characterization and anti-cancer properties of L-asparaginase isolated from endophytes of medicinal plants. **(Prof. Sarad Kumar Mishra)**
8. **BIOINFORMATIC**
9. Genome-Wide Identification, Structural and Functional Characterization of Pectin Lyase Genes of *Fusarium* Species (**Prof. Dinesh Yadav**)
10. Molecular modelling and simulation of protein-DNA interactions (**Prof. Sarad Kumar Mishra and Prof. R.K.Gaur**)
11. **MICROBIOLOGY**
12. Isolation of potential microbial sources from different environmental samples for producing diverse enzymes to be used for the preparation of handmade paper (**Prof. Dinesh Yadav**)
13. Identification of bioactive compounds from endophytes and its application (**Prof. Sarad Kumar Mishra**)
14. Plant virus metagenomics (**Prof. R.K.Gaur**)
15. Screening of microbial diversity for industrially important enzymes and novel antibiotics. (**Prof. Sarad Kumar Mishra**)
16. **ANIMAL TECHNOLOGY & MOLECULAR BIOLOGY**
17. DNA barcoding of fish (**Prof. Jonnada A.V. Prasada Rao**)
18. Cancer chemoprevention and treatment primarily of lung, and breast cancers (**Dr. Farrukh Aqil**)
19. Cancer epidemiology and its link with nutrition and socio-environmental factors. (**Prof. Sarad Kumar Mishra**)
20. **Expected Academic Outcomes (experimental facilities to be created, UG/PG programs supported as well as research themes to be enabled by these facilities, publications with impact factor) from the implementation of the proposed proposal**

**Expected Outcomes**

* + 1. Enhancement of practical knowledge of M.Sc/PhD students of Biotechnology especially in the area of plant biotechnology, enzyme technology, bioinformatics and microbiology by conducting research in the said areas in the form of M.Sc dissertation and PhD thesis.
		2. Upgradation of practicals for M.Sc biotechnology students especially for papers like Bioinformatics, Animal and Plant Tissue culture, Microbiology etc. based on the establishment of said facility.
		3. Possibility of patents/ publications in national and International Journal of repute based on the execution of the research proposals proposed.
		4. Possibility of Financial assistance to M.Sc / PhD students in terms of project JRF/SRF in research projects already submitted to different funding agencies by the faculty membes of the Department.
		5. Possibility for Post-Doctoral Fellowship for students after completing PhD degree based on the availability of both basic and advanced facilities for conducting research in diverse areas of Biotechnology as evident from expertise of present faculty members.
		6. Possibility of collaborative research with other University/ Institutes and signing of relevant MOUs with them. This will be of immense benefit for the students of Biotechnology. MoU with ICMR-RMRC, Gorakhpur has been done and MoU with newly established AIIMS, Gorakhpur will be done very soon
1. **Definite Product/Process/Design/Software/System Development efforts that will be added by the proposal**

In view of the specific objectives, we may able to identify the following concept

* Identification of potential transcription factor gene families showing desired agronomic traits (biotic and abiotic stress tolerance) based on genome-wide studies of sequenced genomes of different crops.
* Identification of novel microbial sources of industrially important pectinases enzymes and its applicability in food industries
* understand the layered nature and variety of plant defenses and to convert that knowledge into improved disease resistance.
* May develop some simulation techniques for better understanding the protein-DNA interaction or protein ligand interaction
1. **Potential beneficiaries (specify industry segment and/ or strategic programs) or societal paybacks envisaged at the end of the project, if supported.**
* Potential of identifying novel microbial sources of industrially important enzymes.
* Identification of novel transcription factor genes showing tolerance for biotic and abiotic stresses to be utilized for crop improvement programme.
* Through the fundamental research on the “old” and “new” pathogen and their hosts we may able to develop new, environmentally responsible, and durable control measures which will be communicated to the **farmers** for the better yield.
* By using the simulation techniques, we may develop the concept of **human infectious disease** management.

**Signature of the**

**Head of the Department**