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SUPPORTING DOCUMENTS FOR 3.2.1

INNOVATION ECOSYSTEM

Institution has created an ecosystem for innovation and has initiatives for the creation and transfer of knowledge.

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Index

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Innovative Research under the DBT STAR College Scheme (2021-2022)

1. Report of the Project: To Assess Cardiorespiratory Functions and its Correlation with Quetlet's Index and other Relevant Health Parameters

To assess cardiorespiratory functions & its correlation with Quetlet's Index and other relevant health parameters

A project under DBT Sponsored Star College Scheme

Supervisors: Dr. Darshan Malik & Dr. Jayita Thakur

Student beneficiaries

B.Sc. (H) Biochemistry Sem III

1. **Aditi Rattan**
2. **Vaibhav Sharma**
3. **Sagar Kohli**
4. **Vaibhav Chauhan**
5. **Merlin Mathew**
6. **Parvana P.**
7. **Riya Thomas**
8. **Priyanka Sudan**
9. **Nunglen**
10. **Malem**

B. Sc. (H) Biochemistry Sem V

1. **Vinayak Joshi**
2. **Ritika Kukreja**
3. **Simran**

B. Sc. (H) Biochemistry Sem I

1. **Mehfooz Helal**

In view of the constraints imposed by the Covid pandemic, it was decided to start the project with the literature review and working towards a **survey-based analysis**.

As a part of the Summer Training on "Research Methodology", conducted by the department from June 18-July 30, 2020, the students had been taught various aspects of research work as well as scientific writing. Hence, the students were engaged in preparing a Google form for a survey of anthropometric parameters that can be easily measured at home with basic tools. The survey form was then circulated amongst students of the age group of 17-21. So far **405 responses** have been received.

The data collected will subsequently be analysed for the health status of the students and correlate it with previous studies conducted by Dr Darshan and Dr Jayita. Regular meetings are held to discuss the various aspects of the project and assess the progress made.

The images of submissions of research papers by students, google form created by the students, data collected in excel sheets and the interactions during project meeting are all shared below.

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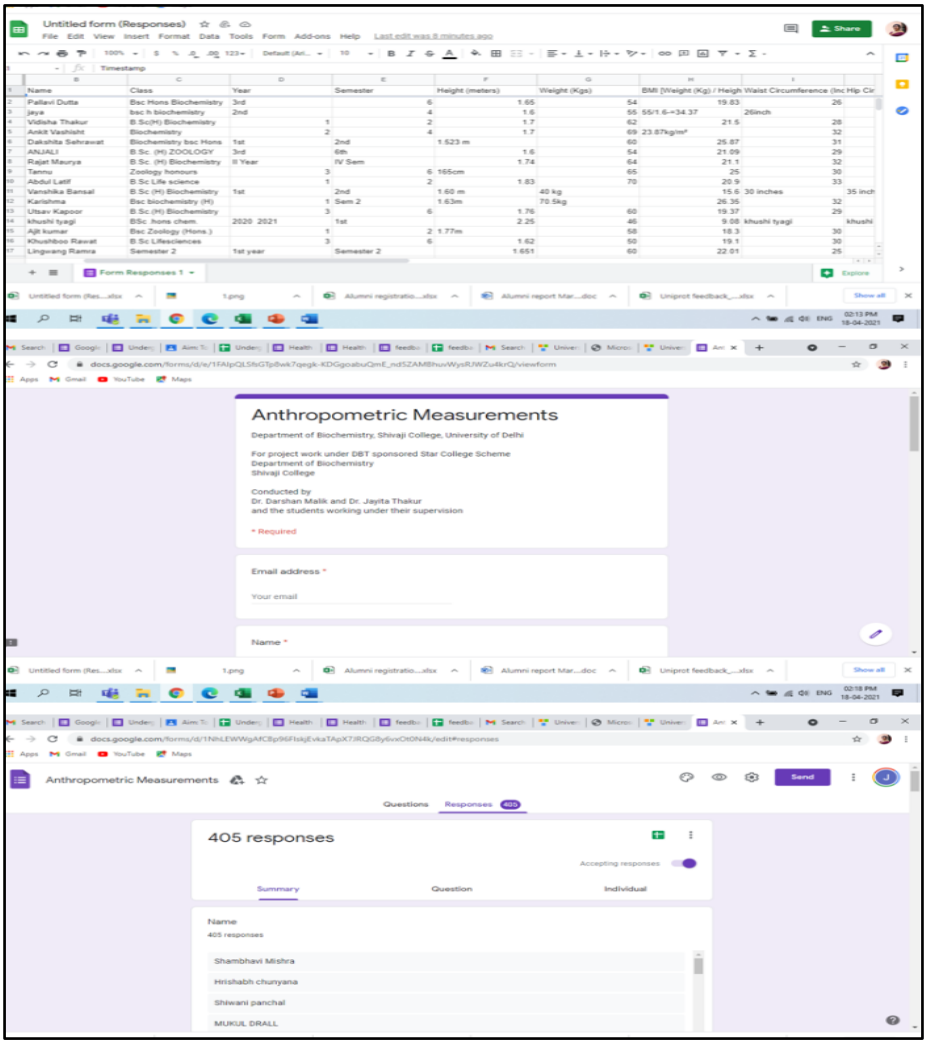

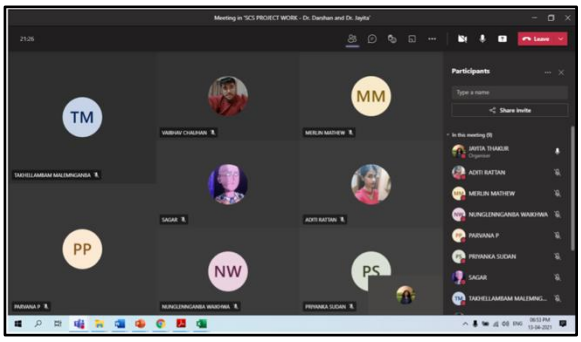

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Fig: Images of Google forms created, data collected in excel sheets, interactions during project meetings by students

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2. Report of the Project: **Relevance of Literature Review as a Research Methodology**

Project Investigators: Dr. Kiran Bamel and Dr. Prabhavathi

Department of Botany, Shivaji College (University of Delhi)

Student members: Ojaswani and Keerti Bhalla (B.Sc. Hons. Botany, Semester VI)

Literature review helps the researcher in finding all that has been done in a particular field. The understanding based on the extensive reading of literature pertaining to a topic helps in setting up a question and use of an appropriate research methodology. Once the research is completed, its findings can be compared or contrasted with the existing data and increases its significance. The work was conceptualized in April 2021 keeping in mind the online mode of teaching. Students were screened based on their interest to do some research-based work. For the first few months the students were acquainted with the various types of research methodologies and thereafter they were assigned a broad area of studying the Effect of Heavy Metals in Plants. They were asked to read scholarly articles and narrow down their literature search to one heavy metal each. Various search engines were introduced to them for literature search such as Google Scholar, Pubmed, Agricola, Cab Abstract, Semantic Scholar etc. After extensive reading, the students selected cadmium and chromium and started a focused literature search using these key words. The students learned to: perform search via various research engines; select/filter the information relevant to their topic of research/interest; analyze the available information and different schools of thought w.r.t. the topic; find the current state of the topic, similarity, differences and gaps in present literature; know the importance of a well written review and use this understanding to fill the gap by doing research and write their own review and identify unexplored areas.

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Based on their learning they wrote a small article and **presented a paper** at the following international conference: 1st International Conference on "**Environment, Economy, Management, Science and Technology**" organized by the Department of Environment Sciences, SIES (Nerul) College of Arts, Science and Commerce, Maharashtra, India in collaboration with RSP conference Hub, Coimbatore, India on 24th and 25th August, 2021 and presented papers entitled "Impact of Cadmium and Chromium toxicity on Plant Health".

Fig: Certificates of Paper Presentation of all the authors

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3. **Report of the Project**: **Immunity Boosting Health Promotion Measures Using Alternative System of Medicine for Covid-19**

Project Investigators: Dr. Prabhavathi and Dr. Kiran Bamel

Department of Botany, Shivaji College, University of Delhi

Student Members: Pooja Kabadwal, Anchita Mishra and Sheilly (B.Sc. Hons. Botany, Semester VI)

Coronaviruses are a group (or family) of viruses that cause different illnesses. COVID-19 is known as **"novel coronavirus"** meaning it's a new type of virus that is not identified previously. People affected by COVID-19 suffer from severe respiratory illnesses ranging from common cold to cough, high fever, respiratory difficulties and is sometimes fatal. This virus is responsible for an ongoing pandemic and more than 2 million deaths so far. Till now, there is no cure for its infection as it does not respond to antibiotics. Therefore, the present study was designed to survey and find the use of different immunity boosting health promotion measures using alternative system of medicine, like Homeopathy, Ayurveda, Yoga, Home-made therapy etc. A group of undergraduate students were selected and trained for this study after explaining to them the importance of alternative system of medicine for COVID-19 with various available reports. They were introduced to survey methods and preparation of questionnaires to collect the data and they also learned the process of academic writing. They analyzed the data to select the best and most preferred alternative system of medicine for COVID-19. Students also learned to use different statistical analysis software for data analysis. Various search engines were introduced to them for literature search such as Google Scholar, Pubmed, Agricola, Cab Abstract, Semantic Scholar etc. After extensive literature survey, students were able to frame relevant questions that could answer the research problem. The results of the study can be used as a tool to understand how COVID-19-induced illness impacts tolerance and how alternative systems of medicine can help boost immunity against COVID-19.

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Based on their learning they wrote a small article and **presented a paper** in the following international conference: 1st International Conference on Environment, Economy, Management, Science and Technology organised by the department of Environment Sciences, SIES (Nerul) College of Arts, Science and Commerce, Maharashtra, India in collaboration with RSP conference Hub, Coimbatore, India on 24th and 25th August, 2021 and presented papers entitled "Mitigating The Impact Of Air Pollutants On Immunity Using Plant Based Immunity Boosters"

Fig: Certificates of Paper Presentation of all the authors

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4. **Report of the Project**: **Effect of soil pH on germination of seeds and plant growth**

This study aimed to investigate the effect of the initial pH levels of the soil on seedling germination, initial stages of growth of the seedling and determining the optimal pH for the germination of seedlings of the main crops grown in Delhi. Students learnt to grow saplings of different crops in soils having varying pH.

Teachers: Dr. N. G. Giri and Dr. Richa Arora of Department of Chemistry and Dr. Ashwani Sharma of Department of Environmental Studies

Place of work: Chemistry Lab I and Analytical Lab, Department of Chemistry, Shivaji College
List of students:

S. No.	Name of the student	Class	Roll No.
1.	Ashish Kumar	B.Sc (H) Chemistry 3rd year	18/10028
2.	Princi Singh	B.Sc (H) Chemistry 3rd year	18/10007
3.	Prince Gupta	B.Sc (H) Chemistry 3rd year	18/10015
4.	Sumit Sharma	B.Sc (H) Chemistry 3rd year	18/10037
5.	Karishma Singh	B.Sc (H) Chemistry 3rd year	18/10011
6.	Deepak	B.Sc (H) Chemistry 3rd year	18/10048
7.	Jai Laxmi Dewal	B.Sc (H) Chemistry 3rd year	18/10009
8.	Arun Kumar	B.Sc (H) Chemistry 3rd year	18/10027
9.	Neha Yadav	B.Sc (H) Chemistry 3rd year	18/10016
10.	Sanjeevani	B.Sc (H) Chemistry 3rd year	18/10039
11.	Vikram Choudhary	B.Sc (H) Chemistry 3rd year	18/10041
12.	Manisha	B.Sc (H) Chemistry 2nd year	19/10032
13.	Priyal Angra	B.Sc (H) Chemistry 2nd year	19/10015
14.	Shivani Panchal	B.Sc (H) Chemistry 2nd year	19/10037
15.	Shruti Kumari	B.Sc (H) Chemistry 2nd year	19/10038
16.	Prerna	B.Sc (H) Chemistry 2nd year	19/10004
17.	Pranjal	B.Sc (H) Chemistry 2nd year	19/10027
18.	Manisha	B.Sc (H) Chemistry 2nd year	19/10032
19.	Umang	B.Sc (H) Chemistry 1st year	20/10042
20.	Shivani	B.Sc (H) Chemistry 1st year	20/10006
21.	Ritika Mehta	B.Sc (H) Chemistry 1st year	20/10010
22.	Tanya Adlakha	B.Sc (H) Botany 3rd year	18/09045
23.	Neha	B.Sc (H) Botany 3rd year	18/09054

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24.	Pooja	B.Sc (H) Botany 3rd year	18/09034
25.	Aakash	B.Sc (H) Botany 3rd year	18/09049
26.	Roshan	B.Sc (P) Physical Science with Chemistry 3rd year	18/62038
27.	Devesh Shukla	B.Sc (P) Physical Science with Chemistry 3rd year	18/62027
28.	Manita	B.Sc (P) Physical Science with Chemistry 3rd year	18/62033
29.	Neetu	B.Sc (P) Physical Science with Chemistry 3rd year	18/62020
30.	Gurudas	B.Sc (P) Physical Science with Chemistry 3rd year	18/62019
31.	Amrik Singh	B.Sc (P) Physical Science with Chemistry 3rd year	18/62030
32.	Anand Kumar Pandey	B.Sc (P) Physical Science with Chemistry 3rd year	18/62014
33.	Shruti Ojha	B.Sc (H) Zoology 3rd year	18/22047
34.	Tanu Dahiya	B.Sc (H) Zoology 3rd year	18/22007
35.	Preet Guliani	B.Sc (H) Zoology 3rd year	18/22049
36.	Muskan Aggarwal	B.Sc (H) Zoology 3rd year	18/22040
37.	Shivani Semwal	B.Sc (H) Zoology 3rd year	18/22037
38.	Sunitha Naina	B.Sc (H) Zoology 3rd year	18/22019
39.	Anjali Tyagi	B.Sc (H) Zoology 3rd year	18/22051
40.	Anjalika Malik	B.Sc (P) Life Science 3rd year	18/23087
41.	Prachi	B.Sc (P) Life Science 3rd year	18/23083
42.	Deepshikha Sharma	B.Sc (P) Life Science 3rd year	18/23016
43.	Namami Bharati	B.Sc (P) Life Science 3rd year	18/23047
44	Gunjita	B.Sc (P) Life Science 3rd year	18/23002
45.	Shruti Pathak	B.Sc (P) Life Science 3rd year	18/23021
46.	Reena Masih	B.Sc (P) Life Science 3rd year	18/23038
47.	Sneha Solanki	B.Sc (P) Life Science 3rd year	18/23071
48.	Khumanthem Sanamacha Chanu	B.Sc (P) Life Science 3rd year	18/23098
49.	Gauri Bansal	B.Sc (P) Life Science 3rd year	18/23016
50.	Kanika	B.Sc (P) Life Science 3rd year	18/23055
51.	Harsh	B.Sc (P) Life Science 3rd year	18/23080
52.	Vikas	B.Sc (P) Life Science 3rd year	18/23100
53.	Kalash Gupta	B.Sc (P) Life Science 2nd year	19/23070

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Fig: Measurement of soil pH, seedling germination in varying soil pH, a student member with the different plant samples.

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DBT STAR Innovator Award 2022

The Star Innovator Award was initiated in 2022 under the DBT Star College Scheme to encourage students to take up innovative research. Shamashree Samanta of B. Sc. (H) Zoology Semester VI won the award for her research on "Biowaste to Personal Protective Equipment (PPEs)

BIOWASTE TO PERSONAL PROTECTIVE EQUIPMENTS (PPEs)

Shamashree Samanta

Department of Zoology, Shivaji College, University of Delhi, New Delhi-110027

Authors for Correspondence: shamashreesamanta@gmail.com

ABSTRACT

Personal Protective Equipment like – 3-ply surgical masks, coveralls, head covers and shoe covers can be made biodegradable by using biodegradable polypropylene which can undergo 96.45% degradation in its weight within 28 days of burial in a landfill, while increasing its tensile strength to 68.41Mpa (9922.03 psi) and maintaining its other mechanical properties; flexural strength, surface hardness (resistance to indentation or penetration), impact strength and also heat and chemical resistance. This biodegradable polypropylene can be manufactured by reinforcing neat polypropylene with chitosan and starch at a ratio of 4:4:2, which will act as plasticizers in the polymer. The chitosan can be extracted from scales of fish and crustaceans at a large scale and starch can be successfully extracted from vegetable and fruit peel (experiment has been done with *Musa paradisiaca* peel) using wet extraction method. The Ministry of Food Processing Industries (MFPI) of India estimated fruit and vegetable losses in form of peels to be 45 million ton, amounting to an approximate value of about INR 33,403 crore. This huge amount of biowaste can be used to generate approximately 366,713 kg of starch which in turn can be used as raw material for our eco-friendly sustainable PPEs. In 2019, a survey recorded that 96 lakh tons of fish was produced in India, which is equivalent to 339511.8 tons of chitosan if it is considered that 1 kg fish produce 35g of fish scale (*Catla catla*). This massive amount of chitosan can produce 1420 crore surgical gowns/PPEs and the fish scales can be collected from local retailers, hotels, restaurants, E- commerce websites like Licious and Fresh to Home. Fabric production from the extracted starch and chitosan reinforced polypropylene can be executed by melt blown spinning technique to produce non-woven Personal Protective Equipment (PPEs) which will meet ISO16603 standards. PPEs (surgical gown) can be manufactured using the biodegradable starch and chitosan reinforced polypropylene fabric at an affordable cost of INR 12.03 only, if the ratio of propylene, starch and chitosan are kept 4:4:2.

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Abstract of proposal for DBT Star Innovator Award

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Fig: Ms. Shamashree Samanta being presented the DBT STAR Innovator Award

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Innovative Intramural Projects Completed under College Research and Innovation Cell (CRIC)

1. **Report of the Project**: **Climate Change and its Impact on Agriculture: A Micro Level Study of Two Villages in Haryana.**

Project Investigators: Prof. Tejbir Singh Rana, Dr. Bharat Ratnu, Department of Geography

Student Members: Khushi Kaushik, Rozina Akhtar, Khushwant Kakran, Manoj Maji, Tamanna, Nikita

The research project was designed to trace climatic change and its effects on cropping system and agrarian society. It identified two villages in Haryana with geographical heterogeneity- **Basaudi in Sonipat district**, located on the levee of river Yamuna with an abundance of surface and groundwater, and **Kultana in Rohtak district** which is water stressed with rich groundwater table of saline water. The research identified **sequent implications of climate change** on soil, water, plants, livestock population, crop diseases, crop production, monoculture, deviating youth dependency from agriculture, rural out-migration, and landless rural communities in both villages. In both villages, the dependency on agriculture is decreasing leading to a decrease in the number of farmers and farmland holding size whereas the number of farmlands is increasing. The small and marginal farmers are forced to outsource their farmlands due to diminishing returns of profit from croplands. **Research will continue** even after the completion of project in the form of publications, community outreach and presentations of research outcomes among researchers at different levels.

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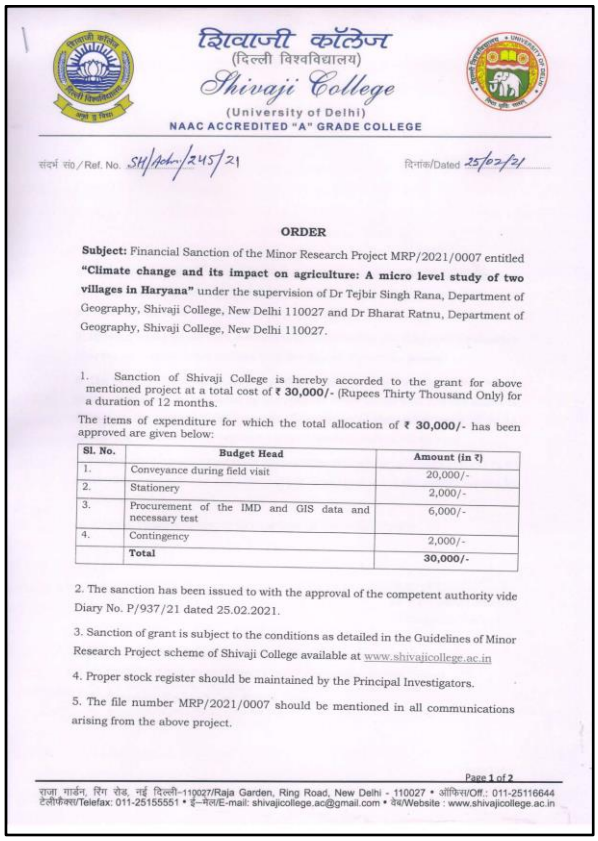
Fig: Students with teachers in the project

Fig: Crop in the farmlands



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संदर्भ सं०/Ref. No. SH/Adm/245/21 दिनांक/Dated 25/02/21

ORDER

Subject: Financial Sanction of the Minor Research Project MRP/2021/0007 entitled **"Climate change and its impact on agriculture: A micro level study of two villages in Haryana"** under the supervision of Dr Tejbir Singh Rana, Department of Geography, Shivaji College, New Delhi 110027 and Dr Bharat Ratnu, Department of Geography, Shivaji College, New Delhi 110027.

1. Sanction of Shivaji College is hereby accorded to the grant for above mentioned project at a total cost of ₹ **30,000/-** (Rupees Thirty Thousand Only) for a duration of 12 months.

The items of expenditure for which the total allocation of ₹ **30,000/-** has been approved are given below:

Sl. No.	Budget Head	Amount (in ₹)
1.	Conveyance during field visit	20,000/-
2.	Stationery	2,000/-
3.	Procurement of the IMD and GIS data and necessary test	6,000/-
4.	Contingency	2,000/-
	Total	**30,000/-**

2. The sanction has been issued to with the approval of the competent authority vide Diary No. P/937/21 dated 25.02.2021.

3. Sanction of grant is subject to the conditions as detailed in the Guidelines of Minor Research Project scheme of Shivaji College available at www.shivajicollege.ac.in

4. Proper stock register should be maintained by the Principal Investigators.

5. The file number MRP/2021/0007 should be mentioned in all communications arising from the above project.

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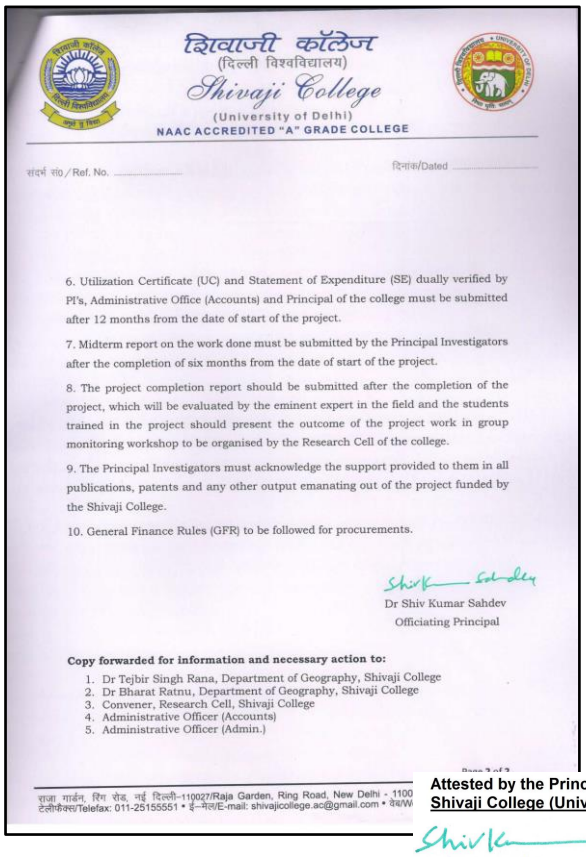
टेलीफैक्स/Telefax: 011-25155551 • ई-मेल/E-mail: shivajicollege.ac@gmail.com • वेब/Website : www.shivajicollege.ac.in



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6. Utilization Certificate (UC) and Statement of Expenditure (SE) dually verified by PI's, Administrative Office (Accounts) and Principal of the college must be submitted after 12 months from the date of start of the project.

7. Midterm report on the work done must be submitted by the Principal Investigators after the completion of six months from the date of start of the project.

8. The project completion report should be submitted after the completion of the project, which will be evaluated by the eminent expert in the field and the students trained in the project should present the outcome of the project work in group monitoring workshop to be organised by the Research Cell of the college.

9. The Principal Investigators must acknowledge the support provided to them in all publications, patents and any other output emanating out of the project funded by the Shivaji College.

10. General Finance Rules (GFR) to be followed for procurements.

Dr Shiv Kumar Sahdev
Officiating Principal

Copy forwarded for information and necessary action to:

1. Dr Tejbir Singh Rana, Department of Geography, Shivaji College
2. Dr Bharat Ratnu, Department of Geography, Shivaji College
3. Convener, Research Cell, Shivaji College
4. Administrative Officer (Accounts)
5. Administrative Officer (Admin.)

राजा गार्डन, रिंग रोड, नई दिल्ली-110027/Raja Garden, Ring Road, New Delhi - 1100
टेलीफैक्स/Telefax: 011-25155551 • ई-मेल/E-mail: shivajicollege.ac@gmail.com • वेब/W

Attested by the Principal,
Shivaji College (University of Delhi)
कार्यवाहक प्राचार्य / Officiating Principal
शिवाजी महाविद्यालय / Shivaji College
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राजा गार्डन, नई दिल्ली-110027
Raja Garden, New Delhi-110027

Fig: Sanction Letter for the project

शिवाजी कॉलेज
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Shivaji College
(University of Delhi)
NAAC ACCREDITED "A" GRADE COLLEGE

2. **Report of the Project**: **Genomic, structural and mutational analysis of SARS-CoV-2 using in silico approach" (**File No. **MRP/2021/0008**)

Project Investigators: Dr. Jitendra Kumar Chaudhary, Ms. Nimita Kant, Department of Zoology

Student members: Adyasha Rout, Abhishek, Ishika Panchal, Shamashree, Lagna

(B.Sc. Hons. Zoology, Semester VI)

This project took off with crystallization of theoretical concepts through in-depth study of scientific literatures, including research and review articles available online. Further, students have also been made aware of various databases/repositories, containing genetic and protein sequences along with various bioinformatics tools/servers to retrieve the data. Having retrieved multiple data, we have carried out multifold analysis, such as incidence of differential rate of mutation across the various SARS-CoV-2 genes, highlighting the varying degree of mutational susceptibility of these genes and its implications. The immediate accomplishment of the project is twofold, i.e. inculcation of research training in selected participants and understanding the genetic and molecular mechanisms of SARS-CoV-2. In the run-up to this project, we also learned the structural and genomic aspects of SARS-CoV-2 and their implications on the pandemic. The long-term benefit of this project entails development of understanding about the research design, methodology of scientific research. In addition, it may also shed some light on genetic and molecular mechanisms underlying infection and pathogenesis. A paper titled, "Genome wide mutation/SNP analysis, biological characteristics, and Pan-India prevalence of SARS-CoV-2 Variants of Concern" was also published in *Chemical Biology Letters*, an international journal.

Attested by the Principal,
Shivaji College (University of Delhi)
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शिवाजी महाविद्यालय / Shivaji College
(दिल्ली विश्वविद्यालय) / (University of Delhi)
राजा गार्डन, नई दिल्ली-110027
Raja Garden, New Delhi-110027

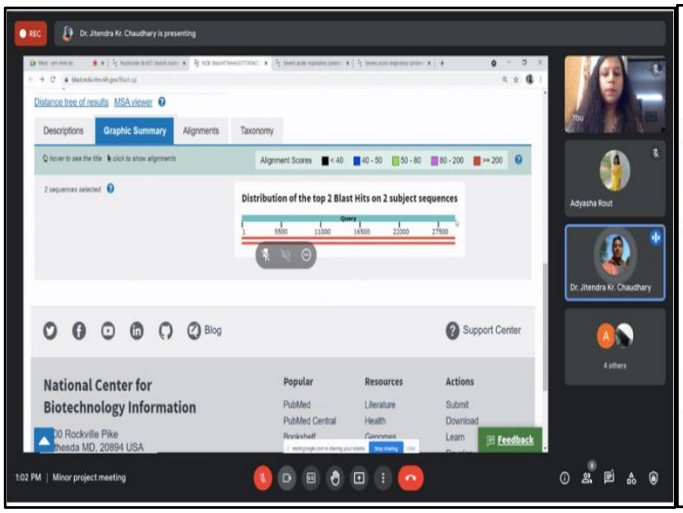
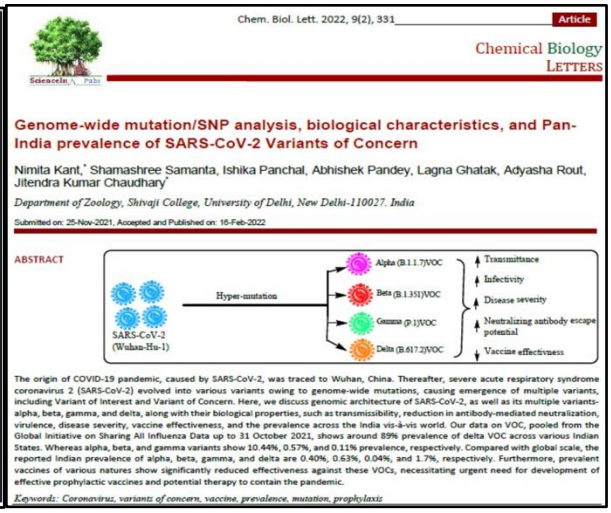


Fig: Screenshot of online analysis of project



Chem. Biol. Lett. 2022, 9(2), 331 — Article

Chemical Biology Letters

Genome-wide mutation/SNP analysis, biological characteristics, and Pan-India prevalence of SARS-CoV-2 Variants of Concern

Nimita Kant,* Shamashree Samanta, Ishika Panchal, Abhishek Pandey, Lagna Ghatak, Adyasha Rout, Jitendra Kumar Chaudhary*

Department of Zoology, Shivaji College, University of Delhi, New Delhi-110027, India

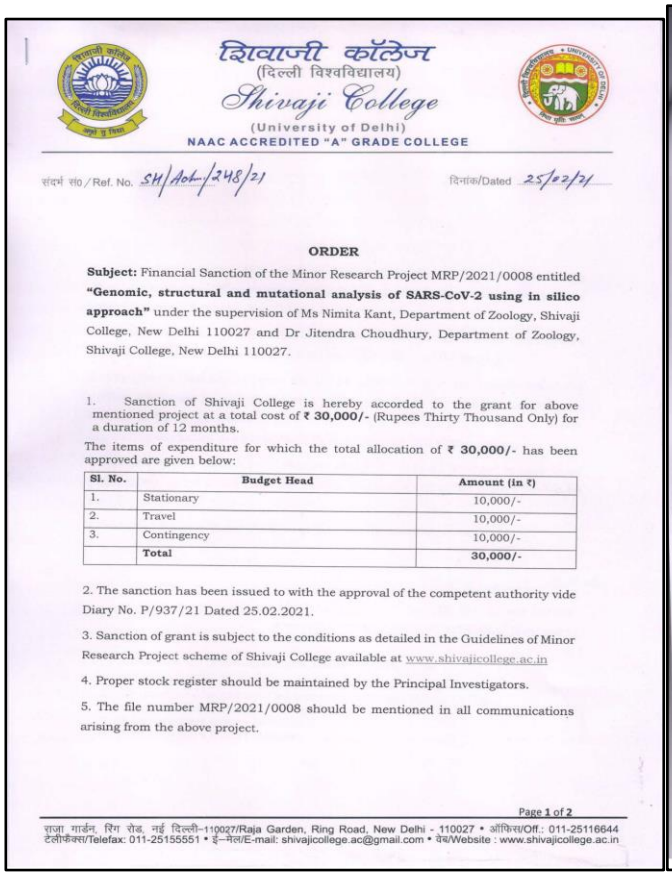
Submitted on: 25-Nov-2021, Accepted and Published on: 16-Feb-2022

ABSTRACT

The origin of COVID-19 pandemic, caused by SARS-CoV-2, was traced to Wuhan, China. Thereafter, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) evolved into various variants owing to genome-wide mutations, causing emergence of multiple variants, including Variant of Interest and Variant of Concern. Here, we discuss genomic architecture of SARS-CoV-2, as well as its multiple variants- alpha, beta, gamma, and delta, along with their biological properties, such as transmissibility, reduction in antibody-mediated neutralization, virulence, disease severity, vaccine effectiveness, and the prevalence across the India vis-à-vis world. Our data on VOC, pooled from the Global Initiative on Sharing All Influenza Data up to 31 October 2021, shows around 89% prevalence of delta VOC across various Indian States. Whereas alpha, beta, and gamma variants show 10.44%, 0.57%, and 0.11% prevalence, respectively. Compared with global scale, the reported Indian prevalence of alpha, beta, gamma, and delta are 0.40%, 0.63%, 0.04%, and 1.7%, respectively. Furthermore, prevalent vaccines of various natures show significantly reduced effectiveness against these VOCs, necessitating urgent need for development of effective prophylactic vaccines and potential therapy to contain the pandemic.

Keywords: Coronavirus, variants of concern, vaccine, prevalence, mutation, prophylaxis

Fig. Screenshot of paper published



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NAAC ACCREDITED "A" GRADE COLLEGE

संदर्भ सं./Ref. No. SH/Acdm/248/21 दिनांक/Dated 25/02/21

ORDER

Subject: Financial Sanction of the Minor Research Project MRP/2021/0008 entitled **"Genomic, structural and mutational analysis of SARS-CoV-2 using in silico approach"** under the supervision of Ms Nimita Kant, Department of Zoology, Shivaji College, New Delhi 110027 and Dr Jitendra Choudhury, Department of Zoology, Shivaji College, New Delhi 110027.

1. Sanction of Shivaji College is hereby accorded to the grant for above mentioned project at a total cost of ₹ **30,000/-** (Rupees Thirty Thousand Only) for a duration of 12 months.

The items of expenditure for which the total allocation of ₹ **30,000/-** has been approved are given below:

Sl. No.	Budget Head	Amount (in ₹)
1.	Stationary	10,000/-
2.	Travel	10,000/-
3.	Contingency	10,000/-
	Total	**30,000/-**

2. The sanction has been issued to with the approval of the competent authority vide Diary No. P/937/21 Dated 25.02.2021.

3. Sanction of grant is subject to the conditions as detailed in the Guidelines of Minor Research Project scheme of Shivaji College available at www.shivajicollege.ac.in

4. Proper stock register should be maintained by the Principal Investigators.

5. The file number MRP/2021/0008 should be mentioned in all communications arising from the above project.

Page 1 of 2

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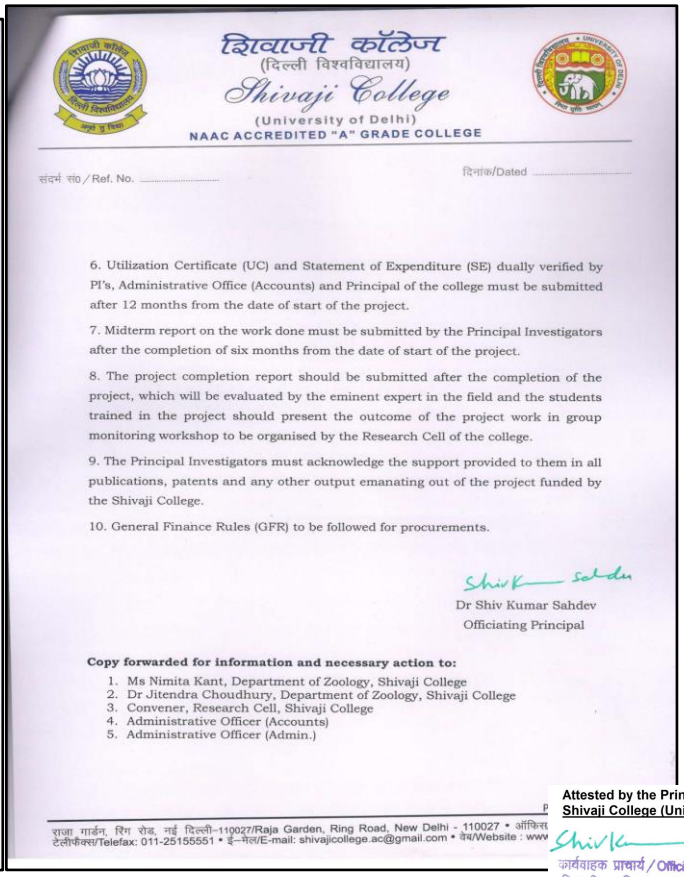
टेलीफैक्स/Telefax: 011-25155551 • ई-मेल/E-mail: shivajicollege.ac@gmail.com • वेब/Website : www.shivajicollege.ac.in



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(University of Delhi)
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संदर्भ सं./Ref. No. ..... दिनांक/Dated .....

6. Utilization Certificate (UC) and Statement of Expenditure (SE) dually verified by PI's, Administrative Office (Accounts) and Principal of the college must be submitted after 12 months from the date of start of the project.

7. Midterm report on the work done must be submitted by the Principal Investigators after the completion of six months from the date of start of the project.

8. The project completion report should be submitted after the completion of the project, which will be evaluated by the eminent expert in the field and the students trained in the project should present the outcome of the project work in group monitoring workshop to be organised by the Research Cell of the college.

9. The Principal Investigators must acknowledge the support provided to them in all publications, patents and any other output emanating out of the project funded by the Shivaji College.

10. General Finance Rules (GFR) to be followed for procurements.

Shiv Kumar Sahdev

Dr Shiv Kumar Sahdev
Officiating Principal

Copy forwarded for information and necessary action to:

1. Ms Nimita Kant, Department of Zoology, Shivaji College
2. Dr Jitendra Choudhury, Department of Zoology, Shivaji College
3. Convener, Research Cell, Shivaji College
4. Administrative Officer (Accounts)
5. Administrative Officer (Admin.)

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टेलीफैक्स/Telefax: 011-25155551 • ई-मेल/E-mail: shivajicollege.ac@gmail.com • वेब/Website : www

Attested by the Principal,
Shivaji College (University of Delhi)
Shiv Kumar Sahdev
कार्यवाहक प्राचार्य / Officiating Principal
शिवाजी महाविद्यालय / Shivaji College
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राजा गार्डन, नई दिल्ली-110027
Raja Garden, New Delhi-110027

Fig. Sanction Letter for the project

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Shivaji College
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3. **Report of the Project**: **Yield estimation of Baby Corn (*Zea mays* L.) using Mathematical Modelling**

Project Investigators: Dr. Kiran Bamel and Dr. Neetu Rani (Dept. of Botany and Dept. of Mathematics)

Student members: Sumit Kumar Pathak (B.Sc. Hons. Botany Semester IV), Sara Gehlot, Rishta Nandini Singh (B.Sc. Hons. Botany Semester VI), Abhinav Shukla, Nandini Singh (B.Sc. Hons. Maths Semester VI)

Through this project students were trained in application of mathematical modelling to estimate the yield of baby corn. Students visited the on-field site of crop growth during various seasons and successfully applied modelling systems to predict size of the corn cobs according to seasonal changes. The highly significant values of various statistical measures for the derived mathematical models for corn volume estimation was a great achievement for the students and motivated them to derive many more significant results. Three papers entitled, "Crop Yield Prediction using Satellite Remote Sensing-based Methods", "Current Approaches and Future Perspectives in Methods for Crop Yield Estimation" and "Analysis of Five Mathematical Models for Crop Yield Prediction" were published in *International Journal of Botany Studies, Bulletin of Environment, Pharmacology and Life Sciences* and *South Asian Journal of Experimental Biology*, respectively.

Fig: Experimental set-up, field and laboratory work

Attested by the Principal,
Shivaji College (University of Delhi)
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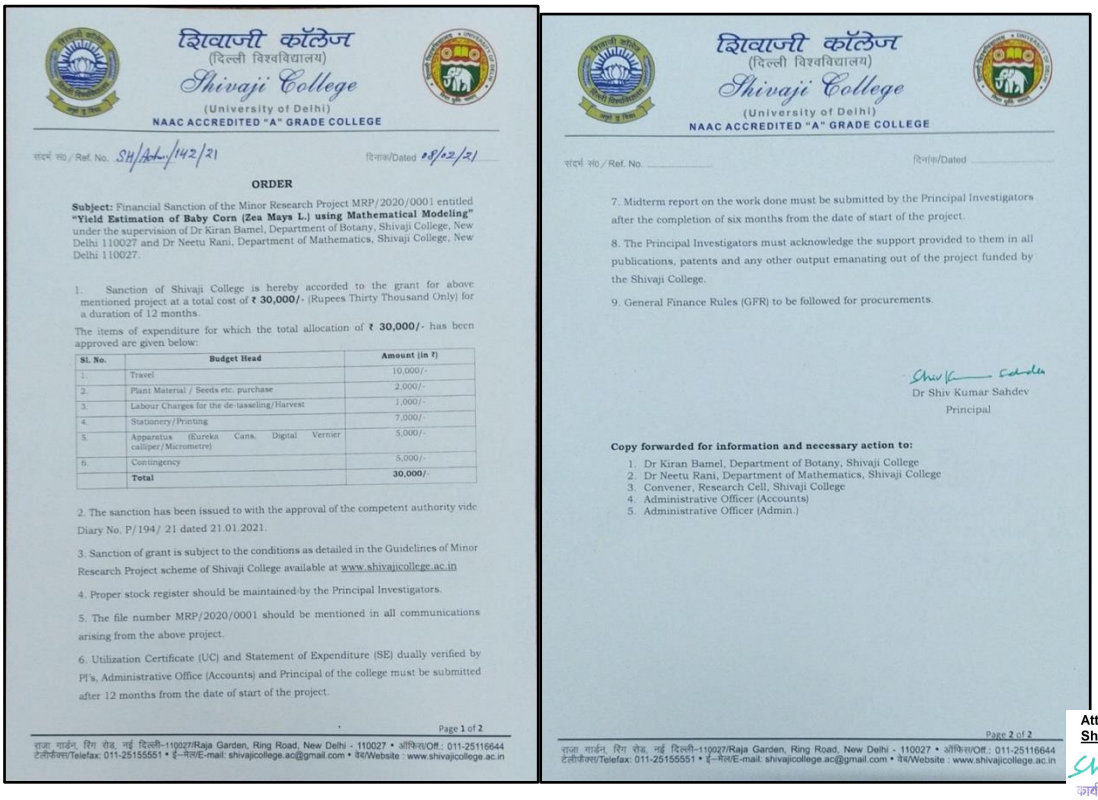
शिवाजी महाविद्यालय / Shivaji College
(दिल्ली विश्वविद्यालय) / (University of Delhi)
राजा गार्डन, नई दिल्ली-110027
Raja Garden, New Delhi-110027

III List of Research publications- 3 (UGC listed and WoS indexed)

S. No.	Authors	Title of Paper	Name of the Journal & ISSN No.	Volume	Pages	Year
1	Kiran Bamel, Jitender Singh Bamel, Neetu Rani, Sumit Kumar Pathak, Sara Gahlot, Rishta Nandini Singh	Crop yield prediction using satellite remote sensing based methods	*International Journal of Botany Studies.* (ISSN: 2455-541X)	7(2)	35-40	2022
2	Kiran Bamel, Neetu Rani, Sumit Kumar Pathak, Sara Gahlot, Rishta Nandini Singh, Abhinav Shukla, Nandini Singh and Jitender Singh Bamel	Current Approaches and Future Perspectives in Methods for Crop Yield Estimation,	*Bulletin of Environment, Pharmacology and Life Sciences* (ISSN 2277-1808)	Special Issue [1]	243-247	2022
3	Neetu Rani, Kiran Bamel, Abhinav Shukla and Nandini Singh	Analysis of Five Mathematical Models for Crop Yield Prediction	*South Asian Journal of Experimental Biology*(eISSN: 2230-9799)	12 (1)	46-54	2022

Fig: List of publications



शिवाजी कॉलेज
(दिल्ली विश्वविद्यालय)
Shivaji College
(University of Delhi)
NAAC ACCREDITED "A" GRADE COLLEGE

संदर्भ सं./Ref. No. SH/Acad./142/21 दिनांक/Dated 08/12/21

ORDER

Subject: Financial Sanction of the Minor Research Project MRP/2020/0001 entitled **"Yield Estimation of Baby Corn (Zea Mays L.) using Mathematical Modeling"** under the supervison of Dr Kiran Bamel, Department of Botany, Shivaji College, New Delhi 110027 and Dr Neetu Rani, Department of Mathematics, Shivaji College, New Delhi 110027.

1. Sanction of Shivaji College is hereby accorded to the grant for above mentioned project at a total cost of ₹ **30,000/-** (Rupees Thirty Thousand Only) for a duration of 12 months.

The items of expenditure for which the total allocation of ₹ **30,000/-** has been approved are given below:

Sl. No.	Budget Head	Amount (in ₹)
1.	Travel	10,000/-
2.	Plant Material / Seeds etc. purchase	2,000/-
3.	Labour Charges for the de-tasseling/Harvest	1,000/-
4.	Stationery/Printing	7,000/-
5.	Apparatus (Eureka Cans, Digital Vernier calliper/Micrometre)	5,000/-
6.	Contingency	5,000/-
	Total	**30,000/-**

2. The sanction has been issued to with the approval of the competent authority vide Diary No. P/194/ 21 dated 21.01.2021.

3. Sanction of grant is subject to the conditions as detailed in the Guidelines of Minor Research Project scheme of Shivaji College available at www.shivajicollege.ac.in

4. Proper stock register should be maintained by the Principal Investigators.

5. The file number MRP/2020/0001 should be mentioned in all communications arising from the above project.

6. Utilization Certificate (UC) and Statement of Expenditure (SE) dually verified by PI's, Administrative Office (Accounts) and Principal of the college must be submitted after 12 months from the date of start of the project.

Page 1 of 2

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Shivaji College
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NAAC ACCREDITED "A" GRADE COLLEGE

संदर्भ सं./Ref. No. दिनांक/Dated

7. Midterm report on the work done must be submitted by the Principal Investigators after the completion of six months from the date of start of the project.

8. The Principal Investigators must acknowledge the support provided to them in all publications, patents and any other output emanating out of the project funded by the Shivaji College.

9. General Finance Rules (GFR) to be followed for procurements.

Dr Shiv Kumar Sahdev
Principal

Copy forwarded for information and necessary action to:

1. Dr Kiran Bamel, Department of Botany, Shivaji College
2. Dr Neetu Rani, Department of Mathematics, Shivaji College
3. Convener, Research Cell, Shivaji College
4. Administrative Officer (Accounts)
5. Administrative Officer (Admin.)

Page 2 of 2

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Attested by the Principal,
Shivaji College (University of Delhi)
कार्यवाहक प्राचार्य / Officiating Principal
शिवाजी महाविद्यालय / Shivaji College
(दिल्ली विश्वविद्यालय) / (University of Delhi)
राजा गार्डन, नई दिल्ली-110027
Raja Garden, New Delhi-110027

Fig. Sanction Letter for the project

शिवाजी कॉलेज
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List of Ongoing Intramural Projects under CRIC

RESEARCH & INNOVATION CELL
Shivaji College
Intramural Research Scheme
Ongoing Minor Research Projects
Sanction Year: 2021-2022

S. No.	File No.	Principal Investigators	Title of the Project	Student Details	Sanction Order Details & Date of Start (DOS)
1	MRP/2022/0001	Dr Renu Baweja Dr Abhijeet Mishra	Disseminating Antimicrobial Resistance in Food Chain using Blended Learning Approach	1.SudhanshuShukla (20/06034), B. Sc. (H) Biochemistry 2. Aantra Rao (20/06012), B. Sc. (H) Biochemistry 3. Vanshika Bansal (20/06022) B. Sc. (H) Biochemistry 4. Karishma (20/06005) B. Sc. (H) Biochemistry 5. Gungun Saini (20/06038) B. Sc. (H) Biochemistry 6. Sparsh Aggarwal (21/06032) B. Sc. (H) Biochemistry	SH/Admn/142/22 Revised: SH/Admn/788/22 DOS: 16.03.2022
2	MRP/2022/0002	Dr Prabhavati Dr Vandana Katoch	Role of Medicinal Plant for Sustainability of Environment	1. Sumit Kumar Pathak (20/09024) B.Sc. (H) Botany 2. Sarthak (21/09008) B.Sc. (H) Botany 3. Palak Gupta (21/09048) B.Sc. (H) Botany 4. Saniya (21/10056) B.Sc. (H) Chemistry 5. Anurag (21/10052) B.Sc. (H) Chemistry	SH/Admn/142/22 DOS: 16.03.2022
3	MRP/2022/0003	Mr Sumit Singh Raheja Ms Shruti Goyal	Effectiveness of Nudges in Waste Management Policy Making	1. Akanksha Srivastava (20/28098) B. A. (H) Economics 2. Kinshuk Taneja (20/28111) B. A. (H) Economics 3.Aparna Rana (20/28109) B. A. (H) Economics 4. Shaily Sengar (20/28030) B. A. (H) Economics 5. Parth Jain (20/28090) B. A. (H) Economics	SH/Admn/142/22 DOS: 16.03.2022
4	MRP/2022/0004	Dr Sunita Singh	Interplay of Genetic and Lifestyle Risk Factors in Cardiovascular Disease	1. Tinilung Libang (20/06035) B.Sc. (H) Biochemistry 2. Sony Sharma (21/06050) B.Sc. (H) Biochemistry 3. Disha Chandeliya (21/06046) B.Sc. (H) Biochemistry 4. Himani Gautam (21/06045) B.Sc. (H) Biochemistry 5. Kajal Rawat (21/06018) B.Sc. (H) Biochemistry 6. Nitika Kumari (21/06042) B.Sc. (H) Biochemistry 7. Bhumika Choudhary(21/06043) B.Sc. (H) Biochemistry	SH/Admn/142/22 DOS: 16.03.2022
5	MRP/2022/0005	Ms Anshu Chopra Ms Nikita Gupta	Impact of online education on the schooling choices: A study of slums in Delhi	1. Khushi Bhatia (20/28025) B. A. (H) Economics 2. Abhishek Raj (20/28108) B. A. (H) Economics 3. Divyanshi Pathak (20/28097) B. A. (H) Economics 4. Devanshi Thakur (20/28107) B. A. (H) Economics 5. Saloni Agarwal (20/28061) B. A. (H) Economics	SH/Admn/142/22 DOS: 16.03.2022

No. of Students beneficiary : 28

No. of Teachers beneficiary : 09

Total beneficiary : 37

Kumari Priyanka 25/04/2022

Dr Kumari Priyanka
Convener, Research & Innovation Cell
Shivaji College (University of Delhi)
New Delhi 110027

Shiv K Sahdev
कार्यवाहक प्राचार्य / Officiating Principal
शिवाजी महाविद्यालय / Shivaji College
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राजा गार्डन, नई दिल्ली-110027
Raja Garden, New Delhi-110027

Kumari Priyanka 25/04/2022

Shiv K Sahdev
कार्यवाहक प्राचार्य / Officiating Principal
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(दिल्ली विश्वविद्यालय) / (University of Delhi)
राजा गार्डन, नई दिल्ली-110027
Raja Garden, New Delhi-110027

Attested by the Principal,
Shivaji College (University of Delhi)

Shiv K Sahdev
कार्यवाहक प्राचार्य / Officiating Principal
शिवाजी महाविद्यालय / Shivaji College
(दिल्ली विश्वविद्यालय) / (University of Delhi)
राजा गार्डन, नई दिल्ली-110027
Raja Garden, New Delhi-110027

Project M of ENACTUS Shivaji

Project M is a three-tier project whose aim is to find a single innovative solution to the 3 most common environmental hazards- air pollution due to stubble burning, excessive plastic usage and non-biodegradable waste generation. Students and teachers under Project M of ENACTUS Shivaji encourage farmers to curb pollution by cultivating oyster mushrooms on farm stubble. From these oyster mushrooms, three different products are then obtained- baked mushroom chips, mycelium packaging, and manure. The shoot part of the mushroom is used to create a healthy alternative to fried potato chips, i.e. baked oyster mushroom chips that is oil free, and potassium and vitamin D rich. Mycelium is made from the root part of these mushrooms. It is used as a biodegradable alternative to plastic packaging. To make Project M a zero-waste venture, the excess stubble is then converted into manure after the end of the process. The students and teachers working under Project M visited farms in Hapur and introduced the process of growing Oyster Mushroom on stubbles.

Attested by the Principal,
Shivaji College (University of Delhi)
कार्यवाहक प्राचार्य / Officiating Principal
शिवाजी महाविद्यालय / Shivaji College
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Raja Garden, New Delhi-110027

Fig: Students discussing the benefits of Oyster Mushroom cultivation on stubbles with farmers in Hapur.

Bio-Composting and Vermi-Composting Units

The college has a bio-composting unit with a capacity of 50 kg (input waste) which converts degradable components of solid waste such as horticultural waste and canteen waste into compost. A vermi-composting unit has also been installed in the college for the treatment of horticulture waste generated in the campus. It uses special red-worms that convert waste into high quality compost. The compost thus generated is then sold at nominal rates to the Garden Committee which uses it as manure for the college gardens. These two units not only ensure the proper management of solid waste generated in the college but are very beneficial to the students of Botany and Zoology who have to study about bio-composting and vermi-composting as they get a hands-on practical experience of the processes. Students of NSS and Eco Club are also trained in the processes so that they can spread environmental awareness.

Fig: Bio-Composting Unit

Fig: Vermi-Composting Unit

Attested by the Principal,
Shivaji College (University of Delhi)
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Paper Recycling Unit

The college has a paper recycling unit that recycles used paper to manufacture fresh paper sheets. The unit produces blotting sheets which are used in the various labs of the colleges, painting sheets which are used in painting competitions as well as to make posters and other decorative items for events, and files and folders. This not only brings down the college exchequer but imparts the value of environmental sustainability to students. Students of the AECC course Environmental Studies also get a hands-on experience of the paper recycling process, which is a part of their syllabus.

Fig: Students manufacturing paper sheets from used paper in the Paper Recycling Unit.

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Creation and Transfer of Knowledge

1. Report of Faculty Development Programme (FDP)

The Department of Commerce, Shivaji College, University of Delhi in collaboration with Mahatma Hansraj Faculty Development Centre organized a one-week National Faculty Development Program on "Multivariate Analysis & Structural Equation Modelling" from Nov 27 to Dec 3, 2021. The inaugural event of the FDP was graced by Prof. Alok Kumar Chakrawal, Vice-Chancellor of Guru Ghasidas Central University (GGCU), Bilaspur, as Chief Guest virtually. After the inaugural session, Dr. Ramesh Kumar Malik, Associate Professor, Shivaji College delivered a session on "Descriptive Analytics". On Day 3, in Session I, Dr. Satish Kumar Mittal, Assistant Professor, Gautam Buddha University elaborated on the topic "Data Structure" and in Session II, he explained about "Inferential Analytics". On Day 4, Professor Gyan Prakash Singh, Professor, Banaras Hindu University spoke on the topic 'Inferential Analytics' in Session I and 'Regression Modelling and Correlation' in Session II. On Day 5, Dr. Ashulekha Gupta, Associate Professor, Department of Management & Business Studies, Uttaranchal University, Dehradun, elaborated on the topic 'Factor Analysis' in session I. Session II was taken by Dr. Ajay Chauhan, Co-founder & Chief Consultant, Research Shiksha on the topic 'Structural Equation Modelling. On the sixth day, in session I, Dr. H K Dangi illuminated the audience on the topic 'Structural Equation Modeling. In Session II, Dr. Dangi explained 'Working with AMOS, where he explained how to use AMOS and Smart PLS software for analysis of data using Structural Equation Modelling. On the seventh i.e. the last day, Session I was taken by Resource Person, Prof. Madan Lal, Department of Commerce, Delhi School of Economics, University of Delhi on the Topic "Research Ethics".

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The FDP concluded with a valedictory session on the last day which was graced by Guest of the day, Prof. Tejinder Sharma, Chairman, Department of Commerce, Kurukshetra University. Dr. Kiran Chaudhary, Convenor of the FDP gave a welcome note at the beginning of the valedictory session. Feedback from participants was taken. The session ended with a Vote of Thanks by FDP Coordinator Dr. Ramesh Kumar Malik, Department of Commerce, Shivaji College.

Fig: Poster of the event and screenshots of online sessions

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2. International Conference

The Department of Commerce, Shivaji College, University of Delhi organized a Two-Day International Conference on "Data Analytics in Business and Marketing" on 21st and 22nd April 2022 in virtual mode. The inaugural ceremony of the conference was successfully completed in the presence of the Chief Guest, Professor Ajmer Singh Malik, Vice Chancellor, Chaudhary Devi Lal University, (Haryana), Guest of Honour, Professor Atul Parvatiyar, Rawls College of Business USA, Principal of Shivaji College- Prof. Shiv Kumar Sahdev, Conference Convener- Dr. Kiran Chaudhary, and Conference co-convener- Dr. Ramesh Kumar Malik. This conference was organized to bring together an impressive array of industry leaders and influencers to create a one-of-a-kind experience. All registered and accepted papers will be published in an edited book by Taylor and Francis [Indexing: SCOPUS and extended selected papers will be published in the [SCIE/SCOPUS] indexed Journals. Various international and national renowned Invited Speakers covered a wide range of topics such as various kinds of data, application of data analytics in human resource management, visualization and visual analysis for energy, application and growth of Big Data in corporate and daily life, evaluation of data science in the era of digital transformation, and application of Big Data to study human health. Prof. (Dr.) Shailendra Singh from IIM Lucknow, Dr. Xiufeng Liu from Department of Technology, Management and Economics Technical University of Denmark, Prof. Vijay Kumar Shrotiya from Delhi School Economics, University of Delhi, Prof. Arpan Kumar Kar from IIT Delhi, Prof. Purnima Kumar from Ohio State University, USA, Prof Alok Pandey Dean, School of Management GD Goenka University were the speakers in different technical sessions. Research Scholars from all over India presented their research papers according to their tracks. Session Chairs were renowned academicians from universities all over India.

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The conference came to end successfully with the valedictory session. The chief guest was Prof. Ganga Prasad Prasain, Vice Chancellor, Central University, Tripura. Concluding remarks were given by the convener Dr. Kiran Chaudhary and Dr. Ramesh Malik, co-convener of the conference, presented the formal vote of thanks.

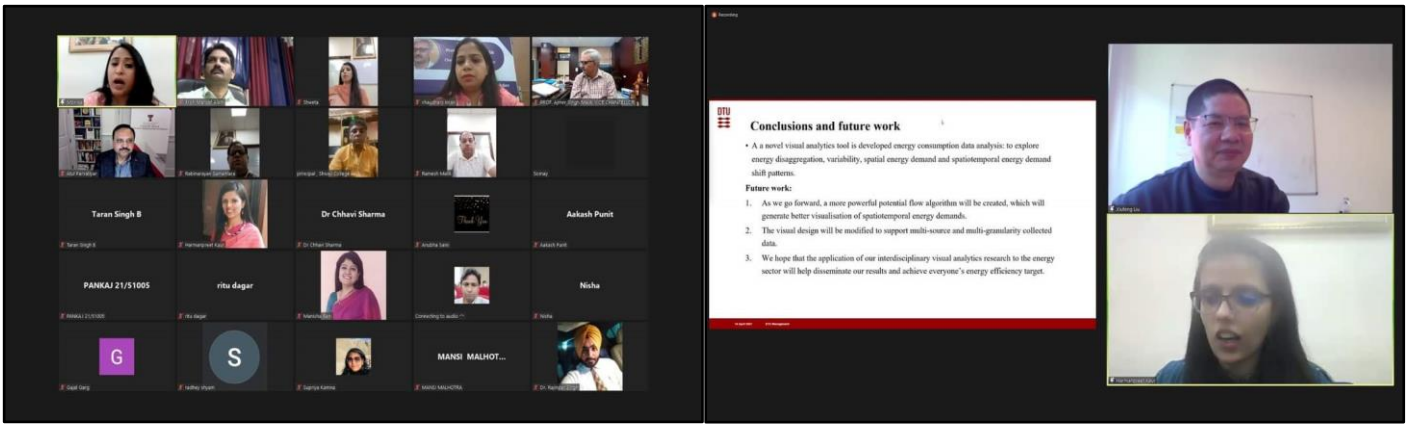

Fig. Event Poster and screenshots of online sessions with invited speakers

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3. Workshops

The Department of Biochemistry, Shivaji College, University of Delhi (under the aegis of DBT sponsored Star College Scheme) organized a First Hands-on Training Workshop on "Isolation of Bacterial Genomic DNA using Magnetic Nanoparticles" for faculty members on 8th April, 2022. The main objective of the workshop was to introduce participants regarding the methodologies of synthesis of Iron oxide nanoparticles and its use for the isolation of Genomic DNA of *E. coli* bacteria. Participants were acquainted with basic concepts of nanotechnology, different methods of DNA isolation and their advantages and disadvantages. Preparation of iron oxide nanoparticles by co-precipitation method and further its application as matrix for separation of genomic DNA of *E. coli* cells. It was attended by 10 participants from Shivaji College as well as other Delhi University colleges.

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Fig: Faculty members participating in the workshop

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4. Webinars

A webinar was organized by the Department of Zoology under the aegis of DBT Star College Scheme on 16th August 2021 at 9 a.m. on Zoom on the topic, "Genetically Engineered Vaccines: From Clone to Clinical Trials", by renowned academician and scientist Professor Rakesh Bhatnagar, V.C. Amity University, Rajasthan and Former V.C. BHU & Kumaun University, Uttarakhand. The webinar was attended by around 200 participants from all over India. Prof. Bhatnagar explained how genetically engineered vaccines are designed citing the example of potential bioterrorism weapon Anthrax. He elaborately discussed about various types of Anthrax such as cutaneous, gastrointestinal and inhalation, its causative agent *Bacillus anthracis*, toxin components, pathogenesis and immunogens which subsequently helps in designing a vaccine. He explained how the desired gene (Protective gene PA) is cloned and expressed and he also talked about post exposure therapeutics. The webinar ended with a vote of thanks by Dr. Parul Kulshreshtha.

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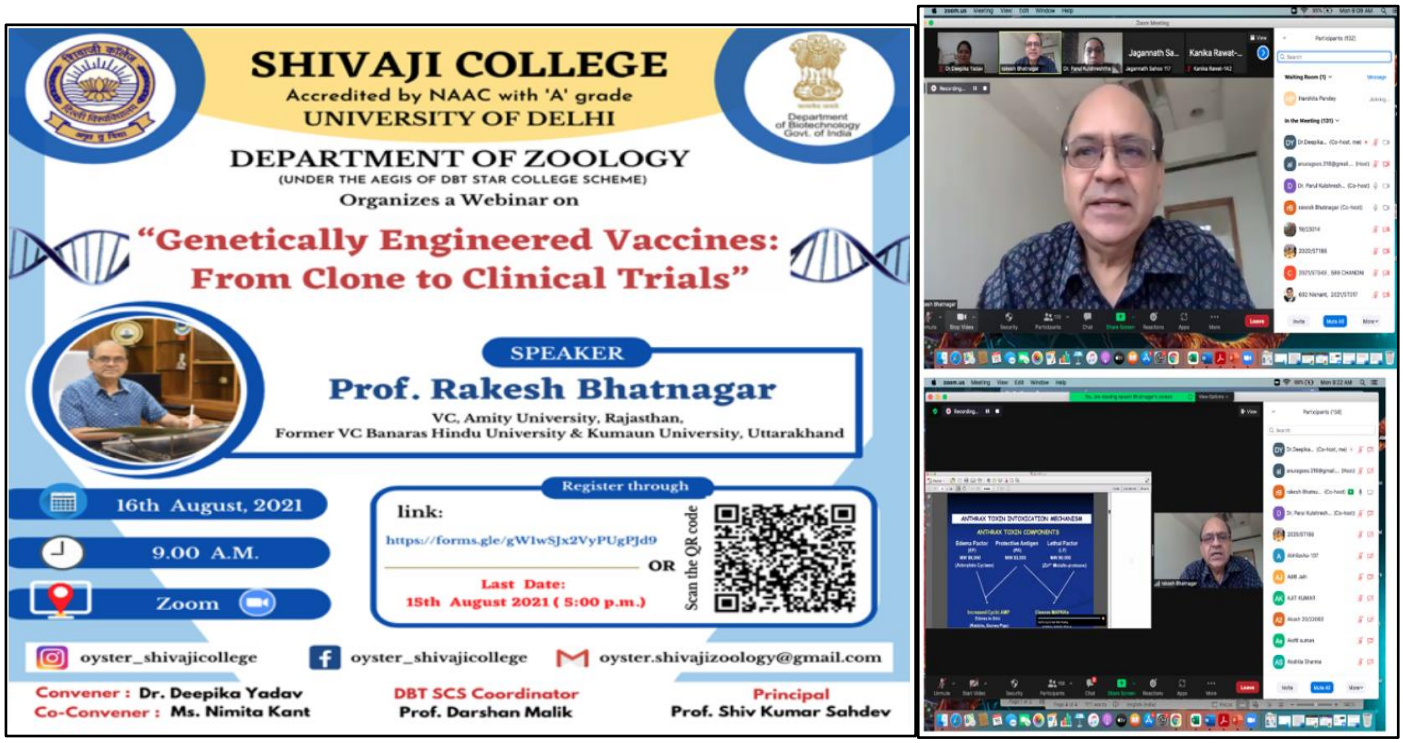

Fig: Poster and screenshots of the event

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5. Lab Skill Training Programme

An Inter-College Laboratory Skill Training Programme was organized for Assistants/Attendants in the Chemical and Life Science Laboratories from 14th September to 20th September, 2021 under DBT sponsored Star College Scheme involving Department of Biochemistry, Botany, Chemistry and Zoology. A total of 14 participants attended the workshop from different colleges.

Fig: Participants in the lab skill trainings

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