

## Science Setu Webinars by NIPGR

### Milestones in Plant Genomics

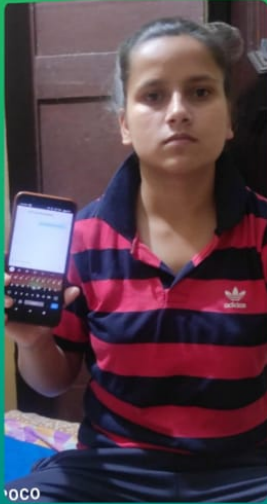
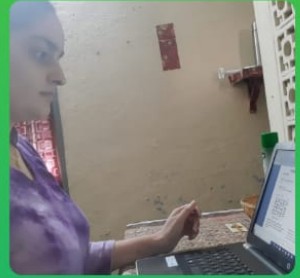
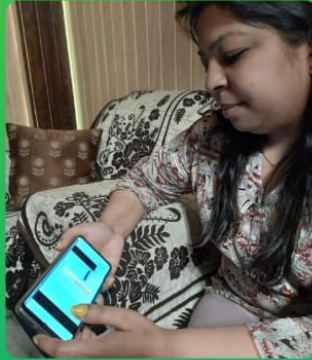
#### Press- Note

**Date: 28-04-2021, Friday**

**Resource person: Dr. Debasis Chattopadhyay, Scientist VII, NIPGR**

The Department of Biotechnology, Government of India, has planned “Science Setu” as a virtual platform to connect research Institutes with undergraduate students. Under this, our college has been assigned to National Institute of Plant Genome Research (NIPGR), New Delhi. NIPGR is an autonomous institution aided by the Department of Biotechnology. Research at NIPGR focuses on functional, structural, evolutionary and applied genomics of plants, including crop plants. Through the Science Setu program, our students and faculty virtually connect with NIPGR, New Delhi and got to know about the multifarious kinds of plant based research. It is a unique opportunity for science students at undergraduate and postgraduate level to get an exposure to high-level research.

Dr. Pinky Aggarwal, Scientist, NIPGR gave welcome note on this event. **Resource person: Dr. Debasis Chattopadhyay, Scientist VII, NIPGR** started his lecture by enlightening our knowledge on the concept of genomics. He discussed about the evolution of life and the process of DNA sequencing. He told about the chemistry of DNA sequencing. He stressed on the Sanger’s chain termination method for DNA sequencing. He focused on the genome sequencing of various plants. He discussed about the concept of separation of reaction products and detection of LASER. He also discussed about 2<sup>nd</sup> Generation DNA sequencing (Short Read Technology). He also talked about the evolution of plant species by genome duplication. He concluded his lecture by discussing about the genome sequencing of the various plant species such as, *Arabidopsis*, potato, grapevine, tomato and talked about the evolution of life by genome duplication. Faculty of Science and total 60 science students attended the event. Dr. Pinky Agarwal and Dr. Amarjeet Singh, Scientists, NIPGR attended the questions of the participants and gave vote of thanks. It was an intellectual and exciting experience for all the participants.



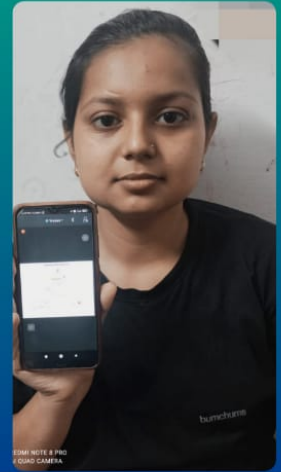
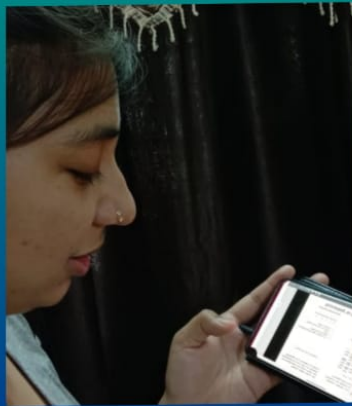
**Science Setu Webinars by NIPGR**

Milestones' webinar  
on 28<sup>th</sup> April, 2021, Wednesday  
at 3:00 p.m.

**"Milestones in Plant Genomics"**  
by  
**Dr. Debasis Chattopadhyay**  
Scientist VII, NIPGR



Moderated by  
**Dr. Pinky Agarwal & Dr. Amarjeet Singh**  
Scientists, NIPGR



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EDM NOTE 8 PRO  
6000 CAMERA



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Saruthi KMV college | Debasis Chattopadhyay | Piny Agnewal | A M A N 3 5 0 9 | Aashish Ranjan | Aayushi Chandra

Viewing Debasis Chattopadhyay

## What is the need of DNA sequencing?

1. DNA makes RNA makes Protein. Hence, change in DNA sequence may change protein sequence and may change protein's function. Protein sequencing is expensive.
2. Big changes in DNA sequences are associated with evolution of new species. Therefore, evolution can be studied by studying DNA sequences.
3. Changes in DNA sequences are associated with disease. Hence, DNA sequences are used as markers for disease and sometimes used to predict predisposition of disease/character.
4. DNA is transferred to the next generation. So, tracking a signature DNA sequence helps in tracking a character in the next generations. The dominant character can be detected from appearance but, existence of the DNA signature for the recessive character can be tracked by sequencing.
5. Small pathogens can be detected by DNA sequencing.

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Chat

Mahaveer Dhareppanavar  
Bsc agriculture  
Dharawad  
from Sakshi to all panelists: 3:08 PM

Karishma  
M.sc (I sem )  
Meerut college, Meerut  
from Sakshi to all panelists: 3:08 PM

Sakshi , Bsc.Bed (medical), Doaba college , Jalandhar  
from Divyanshi Parashar to all panelists: 3:09 PM

Divyanshi Parashar  
B.Sc (2 nd year)  
Meerut College , Meerut  
from ANTARIKSH LADMINARAYAN JOSHI to everyone: 3:10 PM

plant genomics, genome, gene, DNA,different types of DNA,genetics, genetic engineering,tools and techniques, ayurveda,homeopathy, bioinformatics, medicinal plants, crop plant, plant diseases

based vaccine

crop plants variety

Jigyasa Yadav  
Meerut College, Meerut  
from Jigyasa Yadav to all panelists: 3:10 PM

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Q & A

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## Fingerprinting vs. Sequencing

### Fingerprinting

I like the rainy season most

1 4 3 5 6 4

1. Number of words
2. Approx. Size of the words (letters)

DO WE HAVE A MATCH?

Word	Sakshi	Divya	Jide	Ramalingam
1	█	█	█	█
2	█	█	█	█
3	█	█	█	█
4	█	█	█	█
5	█	█	█	█
6	█	█	█	█

Cheap and quick

Useful for detecting large difference especially, for the species that undergoes sexual reproduction between unrelated varieties.

### Sequence-based genotyping

I like teh rnyal ssones mttt.

1 4 3 5 6 4

1. Number of words
2. Actual size of the words (letters)
3. Letters
4. Sequence of the letters
5. Any change in letters and/or sequence

Expensive and time-taking

Important for detecting minor differences especially for crops, which are self-fertilized and where hybrids are made between two very closely related varieties.

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Chat

Karishma  
M.sc (I sem )  
Meerut college, Meerut  
from Sakshi to all panelists: 3:08 PM

Sakshi , Bsc.Bed (medical), Doaba college , Jalandhar  
from Divyanshi Parashar to all panelists: 3:09 PM

Divyanshi Parashar  
B.Sc (2 nd year)  
Meerut College , Meerut  
from ANTARIKSH LADMINARAYAN JOSHI to everyone: 3:10 PM

plant genomics, genome, gene, DNA,different types of DNA,genetics, genetic engineering,tools and techniques, ayurveda,homeopathy, bioinformatics, medicinal plants, crop plant, plant diseases

based vaccine

crop plants variety

Jigyasa Yadav  
Meerut College, Meerut  
from Deepika Vashistha to all panelists: 3:13 PM

Deepika vashistha  
assistant professor  
Kmv Jalandhar

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### Chemistry of DNA Sequencing

Labels in diagram: Chromosome, Chromatin fiber, Nucleosome, Double helix, "Made on a string" DNA replication intermediate, base A, T, G, C, dNTP deoxyribonucleotide triphosphate, ddNTP

Chat:

from Divyanshi Parashar to all panelists: 3:09 PM  
 Divyanshi Parashar  
 B.Sc (2nd year)  
 Meerut College, Meerut  
 from ANTARIKH LAXMINARAYAN JOSHI to everyone: 3:10 PM  
 plant genomics, genome, gene, DNA, different types of DNA, genetics, genetic engineering, tools and techniques, ayurveda, homeopathy, bioinformatics, medicinal plants, crop plant, plant diseases  
 based vaccine  
 vaccine  
 crop plants variety  
 from Jyotsna Yadav to all panelists: 3:10 PM  
 Jyotsna Yadav  
 Meerut College, Meerut  
 from Deepika Vashistha to all panelists: 3:13 PM  
 Deepika vashistha  
 assistant professor  
 Kmv Jalandhar  
 from Meghna Rana to all panelists: 3:15 PM  
 bsc medical sem 6 207141  
 from Harleen Kaur to all panelists: 3:17 PM  
 Harleen Kaur, Botany Department, KMV College, Jalandhar.

To: Host

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> Q & A

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### Fluorescence-based Sanger's chain termination chemistry

Labels in diagram: DNA pol, Primer 5' ATGCTTAAACG (10 base) TACGAATTGC-OH (10 base), ddGTP, TACGAATTGCG-H (11 base)

Chat:

ayurveda, homeopathy, bioinformatics, medicinal plants, crop plant, plant diseases  
 based vaccine  
 vaccine  
 crop plants variety  
 from Jyotsna Yadav to all panelists: 3:10 PM  
 Jyotsna Yadav  
 Meerut College, Meerut  
 from Deepika Vashistha to all panelists: 3:13 PM  
 Deepika vashistha  
 assistant professor  
 Kmv Jalandhar  
 from Meghna Rana to all panelists: 3:15 PM  
 bsc medical sem 6 207141  
 from Harleen Kaur to all panelists: 3:17 PM  
 Harleen Kaur, Botany Department, KMV College, Jalandhar.  
 from palak chandel to all panelists: 3:20 PM  
 palak chandel  
 207004  
 bsc medical sem 4  
 from KUMAR, to all panelists: 3:20 PM  
 Komal Hothi (Doba College)  
 from Akanksha to all panelists: 3:20 PM  
 Akanksha Msc botany Kmv college jalandhar

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> Q & A

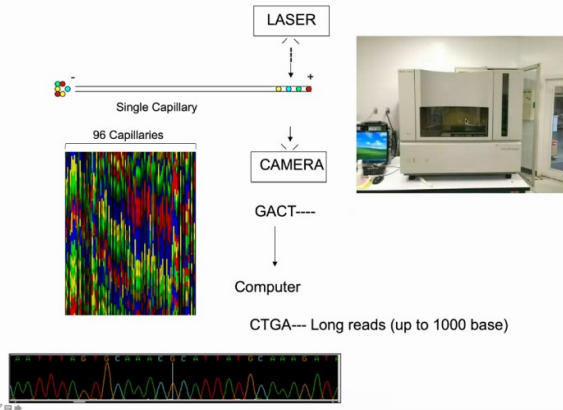
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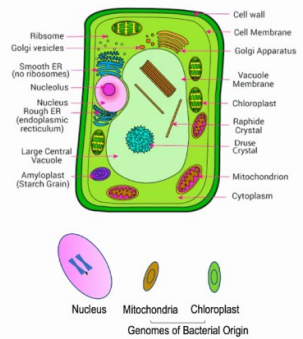
- Sarushi KMV college
- Debasis Chattopadhyay**
- Pinky Agarwal
- A.M.A.N.3.5.0.9
- Aayushi Chandra
- Amar Pal Singh

**Separation of reaction products and detection by LASER**



- Sarushi KMV college
- Debasis Chattopadhyay**
- Pinky Agarwal
- A.F.
- A.M.A.N.3.5.0.9

**Genomes of plant cell**



Three genomes in a plant cell

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### Features of chloroplast and mitochondria genomes

**Chloroplast**

156kb

**Mitochondria**

17kb

**Chloroplast genes**

1. 113 Chloroplast genes

- ❖ 30 genes required for making RNA and protein
- ❖ 40 genes for photosynthesis
- ❖ 33 genes for fatty acid synthesis and proteases
- ❖ 10 unknown genes

**Mitochondrial genes**

1. 72 Chloroplast genes

- ❖ 37 genes required for making RNA and protein
- ❖ 22 rRNA genes
- ❖ 13 genes for respiration

**Use of Mitochondrial genome sequence**

1. More stable than nuclear DNA
2. Exist in multiple copies in a cell
3. Highly conserved due to small size
4. Mitochondrial genes are used to track maternal lineage and identifying genera and species

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### Sequencing of first plant nuclear genome

**Arabidopsis: The model flowering plant**

Genome size: 125 Mb  
 Sequenced: 115 Mb  
 Chromosome no.: 5  
 Gene no.: 25,498

**articles**

**Analysis of the genome sequence of the flowering plant *Arabidopsis thaliana***

**The Arabidopsis Genome Initiative**

\*Authorship of this paper should be cited as "The Arabidopsis Genome Initiative". A full list of contributors appears at the end of this paper.

The flowering plant *Arabidopsis thaliana* has an important model system for identifying genes and determining their functions. Here we report the analysis of the genomic sequence of *Arabidopsis thaliana*. The sequenced genome size is 115 Mb. Arabidopsis has 120,000 genes and 1,200,000 exons. The analysis of the genome sequence of *Arabidopsis thaliana* has provided a comprehensive view of the genome organization of a higher eukaryote. Arabidopsis has many families of new proteins but also lacks some of common protein families, indicating that the sets of protein families have undergone differential expansion and contraction in the diverse eukaryotic eukaryotes. This is the first complete genome sequence of a plant and provides the first database for more comprehensive comparison of conserved proteins in all eukaryotes, identifying a wide range of plant-specific gene families and establishing tight systematic ways to identify genes for crop improvement.

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### 2<sup>nd</sup> Generation DNA Sequencing

#### Short Read Technology

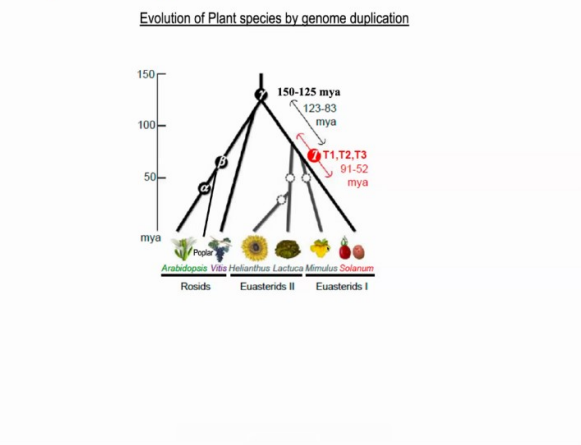
#### Illumina (Sequencing by synthesis using Reversible Terminator Nucleotide)

3'-O-azidomethyl 2'-deoxynucleoside triphosphate

DNA polymerase, template DNA  
Tris(2-carboxyethyl)phosphine

Incorporated Base

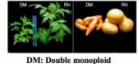
Read length = 100-200 base





### Sequencing of first vegetable plant nuclear genome

## Genome sequence and analysis of the tuber crop potato



DM: Double monophloid  
RIE: Diploid

The Potato Genome Sequencing Consortium\*  
Potato (*Solanum tuberosum* L.) is the world's second important non-grain food crop and is central to global food security. It is a clonally propagated, highly heterozygous, autotetraploid, and highly water-intensive crop. Here, we use a haploid genome derived from a single potato clone to sequence and assemble 81% of the 844-Mb genome. We predict 39,431 protein-coding genes and generate evidence for at least two genome duplications, a marker of a paleopolyploid origin. As the first genome sequence of an edible, the potato genome reveals 2,647 genes specific to...

Genome size: 844 Mb. Chromosome no. of DM: 12  
Sequenced: 725 Mb. Gene no.: 39,031

### Sequencing of model fruit nuclear genome

## The tomato genome sequence provides insights into fleshy fruit evolution



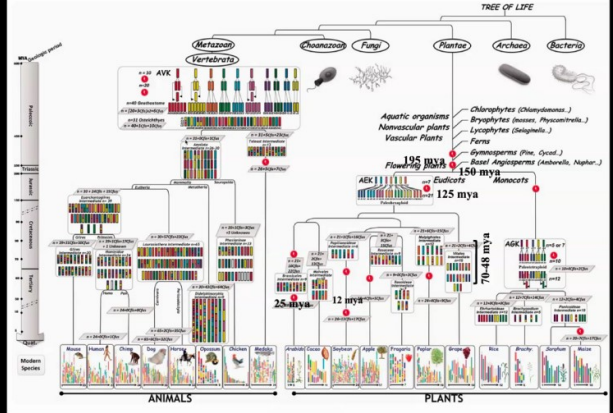
The Tomato Genome Consortium\*

Tomato (*Solanum esculentum* L.) is a model crop plant and a model system for fruit development. Solanum is one of the largest eudicot genera and includes several important plants. Here, we describe the 930-Mb genome of the tomato genome. The genome sequence of domesticated tomato, a draft sequence of its closest wild relative, *Solanum pennellii* Lamour., and sequence data for each other and to the potato genome (*Solanum tuberosum* L.). The two tomato genomes show only 0.4% nucleotide divergence and...

Genome size: 950 Mb. Chromosome no.: 12  
Sequenced: 739 Mb. Gene no.: 34,727

University of Delhi, South Campus  
National Institute of Plant Biotechnology, ICAR  
National Institute of Plant Genome Research

### Evolution Life by genome duplication

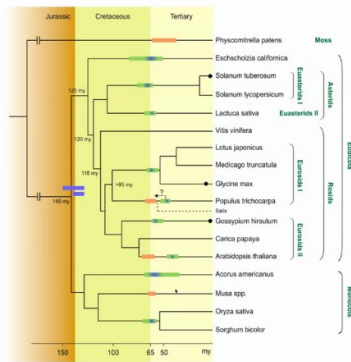


- Sarushi KMV college
- A F
- Debasis Chattopadhyay
- Pinky Agarwal
- A M A N 3 5 0 9
- Aayushi Chandra

### Evolution of Plant species with Geological era



Deep Impact and the Mass Extinction of Species 65 Million Years Ago



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Participants | Chat

< Participants (61)

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Panelists (56)



TEJINDER PREET

Me



NIPGR

Host



Debasis Chattopadhyay



A F



A M A N 3 5 0 9



Aayushi Chandra



Alok Sinha



Amar Pal Singh



Amar Pal Singh



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Me



NIPGR

Host



Debasis Chattopadhyay



A F



A M A N 3 5 0 9



Aayushi Chandra



Alok Sinha



Amar Pal Singh



Amar Pal Singh



Chat



## Chat with everyone

RS

RITIK SAINI ,Bsc 2nd year  
MEERUT COLLEGE ,MEERUT(UP)

DR

Divyanshi Rastogi 3:05 pm

Divyanshi Rastogi

DR

Divyanshi Rastogi 3:06 pm

Meerut College Meerut

AD

Anshika Dubey 3:06 pm

anshika dubey, kanya mahavidyalay,  
bsc medical

P

Prince 3:06 pm

Prince, 3503,bsc medical 2nd  
semester (doaba college)

RS

Ravinder Singh 3:07 pm

Ravinder Singh  
BSc Biotechnology, 4th Sem.  
Doaba College, Jalandhar

TM

Tanmoy Mondal 3:07 pm

Tanmoy Mondal  
Research Scholar, Horticulture (Fruit  
Science)  
Bidhan Chandra Krishi

Enter message here.



< Chat with everyone

B

Bhawna 2:57 pm

Bhawna ...(doaba College )

HK

Harleen Kaur 2:58 pm

Harleen Kaur, Botany department,  
KMV College, Jalandhar.

2:59 pm

Dr.Tejinder Preet (Dept of Botany, KMV  
College Jalandhar)

A

anushka 3:02 pm

anushka kamal  
doaba college bsc med sem 2

RS

Rajat Singh 3:03 pm

Rajat Singh  
MEERUT COLLEGE, MEERUT (U.P.)

IN

Isha Nagpal 3:03 pm

Isha Nagpal

kmv

PM

PAHELI MALAKAR 3:03 pm

Paheli Malakar from NIPGR

AC

Aayushi Chandra 3:03 pm

Aayushi Chandra (M.Sc Botany)

Enter message here.



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TM

Tanmoy Mondal 3:07 pm

Tanmoy Mondal  
Research Scholar, Horticulture (Fruit  
Science)  
Bidhan Chandra Krishi  
Viswavidyalaya, West Bengal

IN

Isha Nagpal 3:07 pm

Isha Nagpal from-Kanya Maha  
Vidhyala, Jalandhar.

MD

mahaveer dhareppanavar 3:07 pm

Mahaveer Dhareppanavar  
Bsc agriculture  
Dharawad

AJ

ANTARIKSH LAXMINARAYAN JOSHI 3:10 pm

plant genomics, genome, gene,  
DNA,different types of DNA,genetics,  
genetic engineering,tools and  
techniques, ayurveda,homeopathy,  
bioinformatics, medicinal plants, crop  
plant, plant diseases की जानकारी होने  
पर भी वैज्ञानिको द्वारा शोध होने पर भी plant  
based vaccine की जानकारी होने पर भी

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## < Chat with everyone

techniques, ayurveda, homeopathy, bioinformatics, medicinal plants, crop plant, plant diseases की जानकारी होने पर भी वैज्ञानिकों द्वारा शोध होने पर भी plant based vaccine की जानकारी होने पर भी प्लांट से टिका/vaccine बनाने में वैज्ञानिक सक्षम क्यों नहीं हो पाये और इन सब शोधों का ह्यूमन सिस्टम पर क्या प्रभाव हुआ? crop plants में variety होने पर भी ईकोनॉमी, देश और दुनिया को क्या लाभ हुआ?

AJ

ANTARIKSH LAXMINARAYAN JOSHI 3:34 pm

नये समय में पुराने plant aur animal cell के structure वही होंगे की उसमें भी वक्त के साथ परिवर्तन हुआ होगा? bands के बीच में difference का मतलब क्या है और ग्राफ में computer में तकनिक के इस्तेमाल के वक्त जो ग्राफ मिलता है जिसमें जरूरी चीज मिलने पर भी ग्राफ में बाकी सब क्या क्या है ये कैसे पता चलेगा जैसे की अप, डाउन, बीच में, phase में फिर इतने units से उतने units के मध्य में?

Enter message here.







## Chat with everyone

BIOINFORMATICS SUBCENTRE and  
my college is raisoni college nagpur  
and my educational qualification is  
msc biotechnology

in davv indor my job was contractual

PK

poonam k 3:46 pm

Dr Poonam Khullar  
BBK DAV College for Women  
Amritsar  
Punjab

AJ

ANTARIKSH LAXMINARAYAN JOSHI 3:49 pm

MSC biotechnology , year 2012 from  
ghraisoni college midc nagpur .

DC

Diksha Chauhan 3:50 pm

Diksha Chauhan  
MSc Botany  
KMV College jalandhar

DK

Dr. sandeep Kaur 3:57 pm

Dr. Sandeep Kaur, P.G. Department  
of Botany, Kanya Maha Vidyalya,  
Jalandhar

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## Chat with all panelists

[M.sc](#) ( ll sem )

Meerut college, Meerut

S

Sakshi 3:08 pm

Sakshi , Bsc.Bed (medical), Doaba college , Jalandhar

DP

Divyanshi Parashar 3:09 pm

Divyanshi Parashar

[B.Sc](#) (2 nd year)

Meerut College , Meerut

JY

Jigyasa Yadav 3:10 pm

Jigyasa Yadav

Meerut College, Meerut

DV

Deepika Vashistha 3:13 pm

Deepika vashistha  
assistant professor  
Kmv Jalandhar

MR

Meghna Rana 3:15 pm

bsc medical sem [6 207141](#)

HK

Harleen Kaur 3:17 pm

Harleen Kaur, Botany Department,  
KMV College, Jalandhar.

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## Chat with all panelists

MR

meghna kaur 3:15 pm

bsc medical sem [6 207141](#)

HK

Harleen Kaur 3:17 pm

Harleen Kaur, Botany Department,  
KMV College, Jalandhar.

PC

palak chandel 3:20 pm

palak chandel

[207004](#)

bsc medical sem 4

K

KOMAL 3:20 pm

Komal Hothi (Doaba College)

A

Akanksha 3:20 pm

Akanksha Msc botany Kmv college  
jalandhar

SJ

Shristi Jain 3:21 pm

Meerut College, Meerut

SK

simranjit Kaur 3:22 pm

simranjit Kaur [207022](#) bsc med sem4  
KMV jalandhar

KT

kritika thakur 3:23 pm

kritika thakur BSC medical  
KMV COLLEGE JALANDHAR

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