



# R. J. COLLEGE of Arts, Science & Commerce (AUTONOMOUS)

(Hindi Vidya Prachar Samiti's RAMNIRANJAN JHUNJHUNWALA COLLEGE of Arts, Science & Commerce)

Opposite Ghatkopar Railway Station, Ghatkopar (West), Mumbai 400086, Maharashtra, INDIA.

Website: [www.rjcollege.edu.in](http://www.rjcollege.edu.in)

Email: [rjcollege@rjcollege.edu.in](mailto:rjcollege@rjcollege.edu.in)

Tel No: +91 22 25151763

Fax No: +91 22 25150957

College is recognized under Section 2(f) & 12(B) of the UGC Act, 1956

Affiliated to UNIVERSITY OF MUMBAI || NAAC Re-Accredited 'A' Grade (CGPA: 3.50)

## Guest lecture on 'Applications of ANOVA in Pharmaceutical Industry'

by

**Dr. C. P. Bapat**

Principal Advisor, Quality by Design

organised on

**Saturday, September 19, 2020**

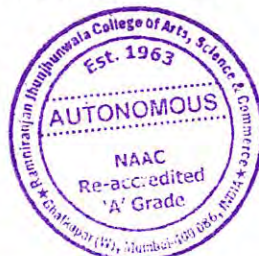
(DBT Star College Activity)

Hindi Vidya Prachar Samiti's  
**R. J. COLLEGE OF ARTS, SCIENCE & COMMERCE (AUTONOMOUS)**  
Opposite Ghatkopar Railway Station, Ghatkopar (W), Mumbai 400 086.  
**Department of Statistics**  
DBT Star College Activity

Lecture on  
**Applications of ANOVA in Pharmaceutical Industry**  
by  
**Dr. C. P. Bapat, Principal Advisor, Quality by Design**

19<sup>th</sup> Sept, 2020 (Saturday) 09.00 am Zoom Platform

The Department of Statistics organized a guest lecture on '**Application of ANOVA in Pharmaceutical industry**' on Saturday, September 19,



The PRINCIPAL  
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## CV of all Guest Speakers

**Dr. C. P. Bapat**

**(Topic: Applications of ANOVA in Pharmaceutical Industry)**

Email: [prdpbapat@gmail.com](mailto:prdpbapat@gmail.com)

Cell no. +91 9323199228

Dr. Chintamani Prabhakar Bapat

M.Sc., Ph.D. (Organic Chemistry) from University of Pune.

Post-Doctoral Research at University of Illinois, Urbana-Champaign, USA.

Has published 12 research papers in reputed journals & has filed 22 patents.

28 Years of industrial research experience working with pharmaceutical companies – Hoechst, Sandoz, Sun Pharmaceuticals & Calyx Chemicals & Pharmaceuticals.

Responsible for R&D Project Implementation & Management.

Presently associated with Sidvim Life Sciences & Institute of Pharmaceutical Management.



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## Report

The Department of Statistics organized a guest lecture on '**Application of ANOVA in Pharmaceutical industry**' on Saturday, September 19, 2020. **Dr. C.P. Bapat**, Principal Advisor, Quality by Design was invited as the resource person. He nicely explained the concept from data collection to analysis, and it's applications using ANOVA. This session was very interactive. In all 70 participants including teachers, students and teachers from other colleges were benefited by this session.

**Number of Beneficiaries : 70 attendees**

Link:

<https://youtu.be/gvLJn-qlq9Y>

*L. Vaze*  
HOD



*I/c*  
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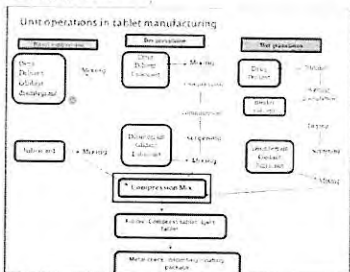
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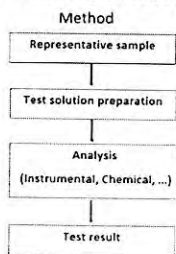
## One-Way ANOVA

- Tablet manufacturing process –



## Two-Way ANOVA

- Measurement method analysis –



Components of variability (Factors)

Sample

Analyst skill

Instrument

Active substance: Hydroxychloroquine

Assay by HPLC

## ANCOVA

- Stability study: Assignment of shelf life –
- Significance level  $\alpha = 0.25$  (higher level is used to get a conservative estimate)

Time k, months	01 Parity, %	Time k, months	02 Parity, %	Time k, months	03 Parity, %	Total X	Total Y
0	100	0	99	0	100		
1	100	1	100	1	100		
6	100	6	100	6	99		
9	100	9	99	9	99		
12	99	12	99	12	94		
18	98	18	97	18	92		
24	99	24	94	24	94	1747	
SUMS	504	504	504	504	504	20136	191368
SN	210	630	210	6	210	630	254310
SUMPRODUCT	4764	4764	4764	4764	4764	14292	14292
SSCOR	11	11	11	11	11	11	11

Between group variance is statistically significant  $\rightarrow$  significant difference between batches

Interaction term is not statistically significant  $\rightarrow$  slopes are not significantly different

Shelf life based on batch with lowest intercept and common slope

Shelf life, time =  $(Y - \text{Intercept}) / \text{Slope} = (95 - 100.03) / (-0.1635) = 30.76$  months

*Large*



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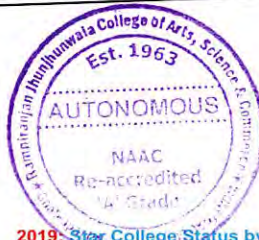
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## List of participants

Sr.No.	Name of Participants	Class
1	MRS. JAYSHREE VAZE	Teacher
2	MR. AJIT LIMAYE	Teacher
3	MRS. CHHAYA PINGE	Teacher
4	MR. RAHUL TIWARI	Teacher
5	MR. JAISHANKAR SINGH	Teacher
6	BAIG ABDUL AZIZ MOHD SAQUIB NAZIRA KHATOON	TYBSc
7	DUBEY SAHIL SANTOSH KUMAR POOJA	TYBSc
8	GAIKWAD DIPAK BABURAO K	TYBSc
9	GAUDA RASHMITA PRAKASH PRAVASINI	TYBSc
10	JAISAWAL BIKESH BIMLESH CHANDRA ANEETA DEVI	TYBSc
11	JAIWAR GYANPRAKASH ACHCHELAL SUMITRA SUMITRA	TYBSc
12	KANDARI DIKSHITA JAISINGH LATA	TYBSc
13	KANNAUJIYA AMARJEET TIKORI KANTI DEVI	TYBSc
14	KHAN FARHAT ANJUM NAYAB ALI TAHIRA KHATOON	TYBSc
15	KOKITKAR SAYALI PANDURANG VAIJAYANTA	TYBSc
16	KORI SHIVAM SINGH JAGAT BAHADUR SHAKUNTALA DEVI	TYBSc
17	LODHI ROHIT SHIVPRAKASH USHA DEVI	TYBSc
18	MHATRE PRANAY SATISH ANITA	TYBSc
19	MISHRA PINKA MAHENDRA KUMAR GUDIYA	TYBSc
20	MISHRA SHISU MITHLESH SUNITA	TYBSc
21	MISHRA SHIVANSHU ANIL KUMAR VIMALADEVI VIMALADEVI	TYBSc
22	NAR SIDDHI DILIP DIPALI	TYBSc
23	NISHAD AMITKUMAR KUNWARCHANDRA KESIYADEVI	TYBSc

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25	PAL RAHUL RAMASHANKAR MEELA	TYBSc
26	PAL RITESH RAMASHRAY USHA	TYBSc
27	PAL ROHIT RAMASHANKAR MEELA	TYBSc
24	PAL KOMAL RAMESH USHA	TYBSc
25	PAL RAHUL RAMASHANKAR MEELA	TYBSc
26	PAL RITESH RAMASHRAY USHA	TYBSc
27	PAL ROHIT RAMASHANKAR MEELA	TYBSc
32	PRAJAPATI AKASH SHIVSHANKAR BALDEI	TYBSc
33	PRASAD AJEET UMAKANT MANJU	TYBSc
34	QURESHI ELLIYAS YUNUS MEHZABEEN	TYBSc
35	RANA ASHISHKUMAR ARJUN SHANTIDEVI	TYBSc
36	SAHANI RAJESH RAVI PRAKASH MATI	TYBSc
37	SAWANT SHUBHAM VITHOBA KAMAL	TYBSc
38	SHARMA AMIT KUMAR CHOTELAL MANJUDEV	TYBSc
39	SHARMA ROSHAN RAMNARESH SHOBHA	TYBSc
40	SHETTY SUBHASH SUDARSHAN APSARA	TYBSc
41	SINGH MANOJKUMAR NANDLAL DURGAVATIDEVI	TYBSc
42	SINGH PANKAJ NANDKUMAR REKHA	TYBSc
43	SINGH SHAMLI MOHAN MANJU	TYBSc
44	SINGH SHIVANI MOHIT SEEMA	TYBSc
45	SONI AMAN RATAN AARTI	TYBSc
46	SURATRAN SHUBHAM SANDEEP RUPALI	TYBSc

*Signature*



*Signature*  
Principal  
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48	UPADHYAY NITIN HARINATH GEETA	TYBSc
49	UPADHYAY SHUBHAM MUKESHCHANDRA GUDDIDEVI	TYBSc
50	UPADHYAY YASHCHANDRA SHIVSHANKAR SUSHILADEVI	TYBSc
51	VAIDYA MEHUL RAMAKANT PRAJAKTA PRAJAKTA	TYBSc
52	VERMA ASHUTOSH ANIKUMAR PUSHPA PUSHPA	TYBSc
53	VERMA VIJAY KUMAR KRISHNANAND SANGEETA DEVI	TYBSc
54	VISHWAKARMA NIKHILKUMAR AVADHBIHARI ISHRAWATI	TYBSc
55	VISHWAKARMA SACHIN SURESH REKHADEVI	TYBSc
57	YADAV AJAY RAJESH ARTHI	TYBSc
58	YADAV AJIT DAYASHANKAR SHOBHA	TYBSc
59	YADAV AMITKUMAR DINESHCHANDRA GITADEVI	TYBSc
60	YADAV NEETU RADHESHYAM AJORADEVI	TYBSc
61	YADAV RINKU GULABCHAND MIRADEVI	TYBSc
62	TIWARI ADARSH RAJESH SHIVKUMARI	SYBSc
63	TRIPATHI ABHINAVKUMAR VISHNUDATT SANTARA	SYBSc
64	SALVI RAJ NAMDEV SNEHA	SYBSc
65	SHINDE PANKAJ VINAYAK ANITA	SYBSc
66	DUBEY DEWASHYA MAHENDRANATH LALITADEVI	SYBSc
67	YADAV NIKHIL ARVINDKUMAR KUSUMDEVI	SYBSc
68	BHAGAT LADLI SURENDRA SUNITA	SYBSc
69	TIWARI SHRIRAJ MATAPRASAD KRISHNADEVI	SYBSc
70	SINGH AMAN PRADEEP ANITA	SYBSc

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