



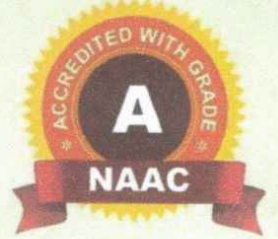
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Key Indicator

6.5.1 - Internal Quality Assurance Cell (IQAC) has contributed significantly for institutionalizing the quality assurance strategies and processes Academic Contribution

INDEX

Sr. No.	Particular	Page No.
1.	Awards And Recognitions Of The Institute	02
2.	Seminar, Workshop, FDP & Conference	04
3.	PhD Scholars	11
4.	List of MoU's	13
5.	Research Publication Data	14
6.	Patents	32




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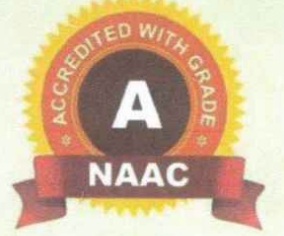
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AWARDS AND RECOGNITIONS OF THE INSTITUTE

- The institute is accredited by National Assessment and Accreditation Council (NAAC) with A Grade (CGPA 3.06) in First Cycle.




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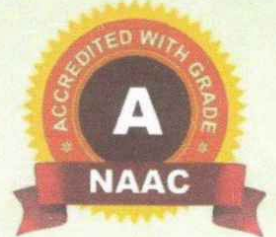
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राष्ट्रीय मूल्यांकन एवं प्रत्यायन परिषद

विश्वविद्यालय अनुदान आयोग का स्वायत्त संस्थान

NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL

An Autonomous Institution of the University Grants Commission

Quality Profile

Name of the Institution : Shrishakti Shaikshanik Sanstha's
Divine College of Pharmacy

Place : Satana, Tal. Baglan, Dist. Nashik, Maharashtra

Criteria	Weightage (W _i)	Criterion-wise Weighted Grade Point (Cr WGP)	Criterion-wise Grade Point Averages (Cr WGP/W)
I. Curricular Aspects	100	340	3.40
II. Teaching-Learning and Evaluation	350	1248	3.57
III. Research, Innovations and Extension	110	220	2.00
IV. Infrastructure and Learning Resources	100	320	3.20
V. Student Support and Progression	140	335	2.39
VI. Governance, Leadership & Management	100	243	2.43
VII. Institutional Values and Best Practices	100	350	3.50
Total	$\sum_{i=1}^7 W_i = 1000$	$\sum_{i=1}^7 (CrWGP) = 3056$	

$$\text{Institutional CGPA} = \frac{\sum_{i=1}^7 (CrWGP)}{\sum_{i=1}^7 W_i} = \frac{3056}{1000} = \boxed{3.06}$$

Grade = **A**

Date : October 27, 2023

Muni
Director

- This certification is valid for a period of Five years with effect from October 27, 2023
- An institutional CGPA on four point scale in the range of 3.51 - 4.00 denotes A⁺⁺ grade, 3.26-3.50 denotes A⁺ grade, 3.01-3.25 denotes A grade, 2.76-3.00 denotes B⁺⁺ grade, 2.51-2.75 denotes B⁺ grade, 2.01-2.50 denotes B grade, 1.51-2.00 denotes C grade
- Scores rounded off to the nearest integer

EC(SC)/17/1st Cycle/MHCOGNI12812



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3 | Page



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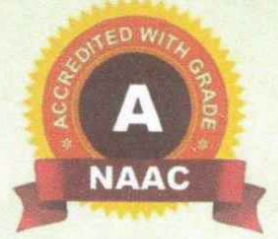
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Faculty Participation in Seminar / Webinar

Sr. No	Name of the Faculty	No.	Title of Conferences/Workshops/Seminars
1.	Mr. Shivraj Popat Jadhav	1	National Level 01 day Webinar on SOLID SHALL BE ALTERNATE SOURCE TO REPLACE HARMFUL ORGANIC SOLVENT IN FUTURE (MIXED SOLVENCY CONCEPT) at Society of Pharmaceutical Sciences and Research (SPSR), 8-Jun-2023.
		2	National Level 01 day Webinar on Futuristic Innovations in Pharmaceutical Arena at Dr. Sir M S Gosavi College of Pharmaceutical Education and Research Nasik 26-Jun-2023.
		3	National Level 01 day Webinar on Quality Cosmetics Role of evolving technologies and regulations at Society of Pharmaceutical Science and Research 27-Jun-2023.
2.	Mr. Khemchand R. Surana	1	National Level 01 day Webinar on SPSR Webinar on Solid shall be alternative source to replace harmful organic solvent in future (Mixed Solvency Concept) at Society of Pharmaceutical Science and Research. 06-Aug-2023.
		2	National Level 01 day Webinar on SPSR Webinar on Quality Cosmetics: Role of Evolving Technologies and Regulations at Society of Pharmaceutical Science and Research 27-Aug-2023.
		3	National Level 01 day Webinar On "TRENDS IN DRUG DESIGN AND DISCOVERY" at Society of Pharmaceutical Science and Research 26-Aug-2023.
		4	One Day National Webinar on Futuristic Innovations in Pharmaceutical Arena GES Sir Dr. M. S. Gosavi College of Pharmaceutical Education and Research, Nashik, 26-Aug-2023.
		5	National Level 01 day Webinar on IPR IN THE ERA OF DIGITAL TRANSFORMATION at Society of Pharmaceutical Sciences and Research 08-Oct-2023.
		6	One Day National Webinar on Strategic approach to Research Mistry: Drug Discovery from herbal source with advanced instrumentation at



4 | Page

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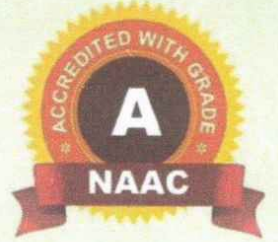
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		<p>7 Society of Pharmaceutical science and Research 17-Dec-2023.</p> <p>One Day National Webinar on Cancer Drug Discovery : A Molecular Journey to targeted treatment at Society of Pharmaceutical science and Research 09-Nov-2023.</p> <p>8 Pharmacist Proactive Positive player in rational therapeutic at Society of Pharmaceutical science and Research 24-Sep-2023</p> <p>9 One Day National Webinar on Elementary principles of Pharmaceutical Research and Technology for Budding Pharmacist at GES Dr. MD Gosavi College of Pharmaceutical Research and Education, Nashik 25-Nov-2023.</p> <p>10 One Day National Webinar on Emerging Trends in Co- Processed excipients and architecting dosage form at GES Dr. MD Gosavi College of Pharmaceutical Research and Education, Nashik 28-Oct-2023.</p> <p>11 National Level 01 day Webinar On Attaining intelligence to move towards artificial intelligence: Pharma Prospective at Society of Pharmaceutical Sciences and Research 29-Oct-2023.</p> <p>12 National Level 01 day Webinar On Emerging Trends in Pharmacovigilance and clinical Trials at Aman Pharmacy College in association with APTI J & K Branch 12-Dec-2023.</p> <p>13 National Level 01 day Webinar On Fundamentals of Pharmaceutical Technology and Research for aspiring Pharmacist Dr. MS Gosavi Institute of Pharmacy and Pharmaceutical Research, Nashik. 27-April-2024.</p>
3.	Mr, Yashwant Shantaram Chaudhari	<p>1 International 03 days' Workshop On Research Methodology for faculties and Research Scholar at Bharti Vidhyapith (Deemed To be University, New Law College, Pune (Maharashtra), India, and Social Science and Management Welfare Association. Bengaluru, Karnataka. 28-30 Aug 2023.</p> <p>2 State Level Webinar on "World Population Day" at organized by IQAC, Department of Economics & Department of Geography Loknete Vyankatrao Hiray Arts, Science & Commerce College, Panchavati, Nashik. 11-July-2023.</p> <p>3 One Day National level Webinar on "Different Dimensions of Personality Development" at Govt. Girls College Jhabua (M.P.) 31 Aug</p>



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			2023.
4	Mr. Sushant Mothabhau Ahire	1	National level Webinar on "Emerging trends in Pharmacovigilance and Clinical Trails" at Aman Pharmacy College 24 Dec-2023.
		2	One Day National level Webinar on "Importance of intellectual property rights in education sector" at Dr. D. Y. Patil Institute of MCA and Management, Akurdi, Pune. 29 Dec-2023.
		3	1-Day National level Webinar on "Integrated Microfluidic Bio Chips, Polymer Design for Drug Delivery & Organic Synthesis" at Taiwan Educare 15 Sep-2023.
		4	"Emerging Trends in Instrumentation and Application of HPTLC in Drug National level Webinar on Discovery" at Anchrom Enterprises (I) Pvt. Ltd., Mumbai & Kamalprakash Pharmacy College and Research Centre, Kherda, Karanja (Lad) Dist. Washim, Maharashtra. 29 Sep-2023
		5	National level 1 day Webinar on Emerging trends in pharmacovigilance and clinical trials at Aman Pharmacy college & APTI 24 Dec-2023.
		6	Integrated Microfluidic Bio Chips, Polymer Design for Drug Delivery & Organic Synthesis" at Educare Taiwan.15 Sep-2023.
		7	Synergizing Excellence: Integrating research methodology with Advanced drug delivery systems at IQAC MSGCOPER. 27 Jan-2024."IC Design for Different Applications & Environmental & Biomedical Technologies" at Taiwan 02 Feb-2024.
		8	Fundamentals of pharmaceutical technology and research for aspiring pharmacists at MSGCOPER 27April 2023.
		9	1-Day National level Webinar on "The Future of Clinical Trials: Integrating AI and Machine Learning" at M.S. College of pharmacy & ClinoSol Research Private Ltd, 5 Jun 2024.
5	Dr. Chandrashekhar Dinkar Patil	1	National level 1 day Webinar on NieCer 103: Scientific Writing in Health Research at ICMR-National Institute of Epidemiology 04 March 2024.
6	Mr. Vijayraj Narendra Sonawane	1	One day International Level webinar on "Intellectual Property Rights: Challenges, Risks, and Solutions "at PUNE DISTRICT EDUCATION ASSOCIATION'S SETH GOVIND RAGHUNATH SABLE COLLEGE OF PHARMACY & POLY, SASWAD 22 Dec-2023
		2	National Level 01 day Webinar On Elementary Principle of Pharmaceutical Research and technology for Budding Pharmacists at MSGCOPER Nashik. 15 July 2023




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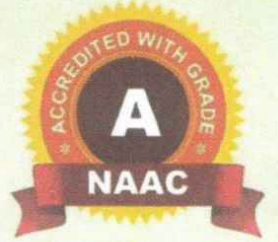
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		3	National Level 01 day Webinar On Futuristic Innovations in Pharmaceutical Arena at MSGCOPER Nashik. 25 Nov-2023
		4	One day International Level webinar on Fundamentals of Pharmaceutical Technology and Research for Aspiring Pharmacists at MSGCOPER, NASHIK, 18 April 2023.

Faculty Participation in FDP Programme

Sr. No.	Name of the Faculty	No.	Title of FDP
1.	Dr. Chandrashekhar Dinkar Patil	1	National Level-FDP on National Education Policy 2020 at Indira Gandhi National open University 01-July-2023.
2.	Mr. Khemchand R. Surana	1	National Level-FDP on "Trends in Medical Technology Innovation and Pharmaceuticals " on 8-12 Jan 2024 at Shri Vishnu College of Pharmacy, Bhimavaram, Vishakapatnam 08-12 Jan 2024
3.	Mr. Sushant Mothabhau Ahire	1.	"Emerging Trends in Instrumentation and Application of HPTLC in Drug Discovery" at KRPC and Anchrom 29-Sep-2023
		2	National Level 6 days FDP programme on Recent trends in medical technology innovation and pharmaceuticals at Shri vishnu college of pharmacy. 12-Jan-2024.
		3	National Level 6 days FDP programme on Empowering Academia: Crafting Research, Review Articles and Funded Project at UGC-Malaviya Mission Teacher Training Centre (UGC-MMTTC/GAD-MMTTC), SGTB Khalsa College, University of Delhi in collaboration with Bajiraoji Karanjekar College of Pharmacy (BKCP), Sakoli. 29-Jan-2024.
		4	International Level 6 days FDP programme on "Recent Advancements in Pharmaceuticals: Academic, Research, Ethics, and Social Perspective" at Internal Quality Assurance Cell, Gokhale Education Society's Sir Dr. M. S. Gosavi College of Pharmaceutical Education & Research, Nashik 11-16 March 2024.
4.	Mr. Abdul Kalam	1	National Level 8 days FDP programme on Initiatives for Forcasting Quality Higher Education in India the 21th Century at KR Mangalam University, Sohna Road Gurugram 01-07 Aug 2023.
5.	Ms. Madhuri Daulat Davange	1	National Level 2 days FDP programme on Implementing ER 2020: Challenges and Opportunities at MET's Institute of Pharmacy, Nashik. 7 to 8 July 2023.




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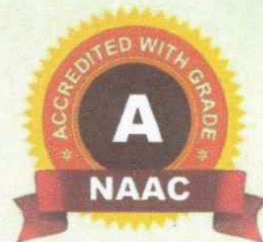
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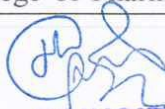
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		2	National Level 5 days FDP programme on Recent Trends in Medical Technology Innovation and Pharmaceuticals at Shri Vishnu College of Pharmacy, Bhimavaram.8 to 12 Jan 2024
6.	Ms, Mayuri Papalal Pole	1	National Level 7 days FDP programme on Initiatives for Fostering Quality Higher Education in India in the 21th Century at K.R Mangalam University, Sohna Road, Gurugram. 01-07 Aug 2023.
7.	Ms. Davange Madhuri Daulat	1	National Level 2 days FDP programme on Implementing ER 2020: Challenges and Opportunities at MET's Institute of Pharmacy, Nashik.07 July 2023.
		2	National Level 5 days FDP programme on Recent Trends in Medical Technology Innovation and Pharmaceuticals at Shri Vishnu College of Pharmacy, Bhimavaram.01 Aug 2023.

Faculty Participation in Conferences

Sr. No.	Name of the Faculty	No.	Title of Conference
1.	Mr, Yashwant Shantaram Chaudhari	1	The National Conference On Multidisciplinary Research in Library and Information Science at Social Science and Management Welfare Association (Cell-Library Science), Radiant Group of Institutions Jabalpur (MP), SRF Research Foundation 13 Aug 2023.
		2	One day Online Conference on "National Conference on Multidisciplinary Research In Library and Information Science" Organised by Social Science and Management Welfare Association, Radiant Group of Institutions Jabalpur(MP), SRF Research Foundation. The Global Publisher, Bengluru, Karnataka 07 May 2023.
2.	Mr, Shivraj Popat Jadhav	1	3 days National conference on Regulation of E pharmacy In India at Pravara Rural College of Pharmacy, Loni, AICTE. 28-30 Aug 2023.
3.	Mr. Abdul Kalam	1	National Conference on "Intelligent Automation in Pharmaceutical Industry" at Kamla Nehru College of Pharmacy, Butibori, Nagpur 15 Aug 2023.
4.	Mr. Khemchand R. Surana	1	1 day National Conference on Intelligent Automation in Pharmaceutical Industry at IQAC, Kamla Nehru College of Pharmacy, Butibori, Nagpur & APTI (M.S. Branch) 15 July 2023.
5.	Ms. Davange	1	1 day National Conference on Intelligent Automation in Pharmaceutical Industry at IQAC, Kamla Nehru College of Pharmacy, Butibori, Nagpur. 15




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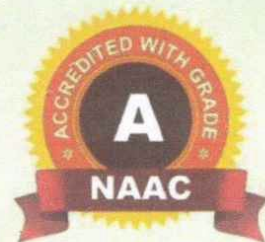
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	Madhuri Daulat		July 2023.
6.	Mr. Sushant Mothabhau Ahire	1	“Global Career Opportunities for Pharmacy Students”at Training & Placement Cell, Loknete Dr. J. D. Pawar College of Pharmacy, Manur Tal. Kalwan Dist. Nashik, Maharashtra, India 423 501. 17 Feb 2024.
7.	Mr. Vijayraj Narendra Sonawane	1	National conference on Pharmacovigilance Department of Pharmaceutical Medicine, Maharashtra University of Health Sciences, Nashik 22 April 2023.

Faculty Participation in Workshop

Sr. No.	Name of the Faculty	No.	Title of Workshop
1.	Mr. Yashwant Shantaram Chaudhari	1	3 days International Workshop On Research Methodology for faculties and Research Scholar at Bharti Vidhyapith (Deemed To be University , New Law College, Pune (Maharashtra), India, and Social Science and Management Welfare Association. Bengaluru, Karnataka 28-30Aug 2023.
		2	Online "Three Days International Workshop On Research Methodology For Faculties and Research Scholar"at Organized By Bharati Vidhyapith (Deemed To Be University, New Law College Pune), and Social Science and Maharashtra Welfare Association, Bengaluru, Karnataka 28-30 July 2023.
2.	Mr. Khemchand R. Surana	1	One Day Online National Level Workshop Cum FDP on “Emerging Trends in Instrumentation and Application of HPTLC in Drug Discovery”Jointly organized by Anchrom Enterprises (I) Pvt. Ltd., Mumbai & Kamalprakash Pharmacy College and Research Centre, Kherda, Karanja (Lad) Dist. Washim, Maharashtra. 29 Sep 2023.
		2	One Day Online National Level Workshop National Level Article Writing Competition Y.B. CHAVAN COLLEGE OF PHARMACY, AURANGABAD 11 Mar 2023.
3.	Mr. Sushant Mothabhau Ahire	1	One Day Online National Level Workshop Cum FDP on “Emerging Trends in Instrumentation and Application of HPTLC in Drug Discovery” Anchrom Enterprises (I) Pvt. Ltd., Mumbai & Kamalprakash Pharmacy College and Research Centre, Kherda, Karanja (Lad) Dist. Washim, Maharashtra. 29 Sep 2023.



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		2	2- Days Online National Level Workshop Cum FDP on "PHARMACEUTICAL RESEARCH METHODOLOGY IN THE MODERN ERA" Smt. Taisaheb Kadam Sevabhavi Foundation and Research Centre Sonai's YASH INSTITUTE OF PHARMACY, CHHATRAPATI SAMBHAJINAGAR 29-30 May 2023.
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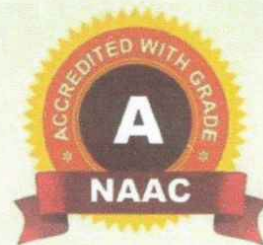
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PhD Scholars

Sr. No.	Name of the Candidate	Subject	Year of Admission	Date of Registration	Guide	Title of the Thesis	Year of the Award
1.	Mr. Khemachand Rajendra Surana	Pharmaceutical Chemistry	Feb. 2020	15/02/2020	Dr. S. K. Mahajan	Design Synthesis and Characterization of Coumarin Based Molecules and their Invitro and Invivo Evaluation	15 May 2024




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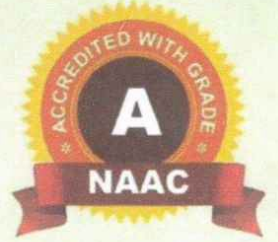
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Savitribai Phule Pune University

(formerly University of Pune)

Declaration of Result of the Doctor of Philosophy (Ph.D.)

Candidate's Name : Surana Khemchand Rajendra
(सुराणा खेमचंद राजेंद्र)

Mother's Name : Chhaya (छाया)



University has accepted the thesis submitted by the above candidate for award of Ph.D. Degree, as per reports of referees and examiners of open defense of the thesis. Accordingly, it is hereby notified that, the above candidate is declared to have passed the examination of Ph.D. and has become eligible for the award of Ph.D. Degree.

Relevant details are as under :

1. Faculty : Science and Technology
2. Subject Name : Pharmaceutical Chemistry
3. Title of Thesis : "Design, Synthesis and Characterization of Coumarin Based Molecules and their Invitro and Invivo Evaluation."
4. Research Center : Mahatma Gandhi Vidyamandir Pharmacy College, Nashik - 422003
5. Name and Address of the Guide : Dr. Mahajan Sunil Kashinath
Mahatma Gandhi Vidyamandir Pharmacy College, Nashik - 422003
6. Date of Registration : 15/02/2020
7. Date of Declaration of Result : 15/05/2024




Ganeshkhind, Pune - 411007.
Ref. No. PGS/Ph.D./24/S&T/0683
Date : 16/05/2024



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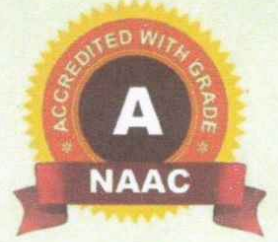
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MOUS WITH PHARMACEUTICAL INDUSTRIES, HOSPITALS & ORGANIZATIONS

Sr. No.	Organization with Which MoU is signed	Year of Signing MoU	List of Actual Activities under each MoU
1.	Apex Hospital, Satana	10/08/2023	Collaborative Research Work, Hospital Visit
2.	MGV's KBH Arts Science and Commerce College, Nimgaon Tel-Malegaon, Nashik	08/01/2024	Collaborative Research Work, Analytical Lab Visit.
3.	Clinisights Health Pvt. Ltd. Nashik	05/04/2024	Career Guidance, Skill Developments, Consultancy & Services.



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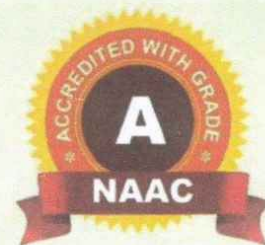
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RESEARCH/REVIEW PUBLICATIONS

Following review/research papers published by faculty in indexed journals

(Academic Year 2023-24).

LIST OF RESEARCH/ REVIEW PUBLICATIONS IN INDEXED JOURNALS

Sr. No	Title of paper	Name of the author/s	Department of the teacher	Name of Journal	Year of publication	ISSN number	Indexing UGC
1	<u>Survey Based Assessment of Adverse Effect in Covid-19 Vaccination Breakthrough Infections</u>	Jubershaha Fakir, Khemchand R. Surana, Dhananjay M Patil, Deepak D Sonawane	Pharmacology	Asian Journal of Research in Pharmaceutical Sciences	2023-24	2231-5659 2231-5640	Peer Reviewed
2	Development and Validation of Simple UV-Spectrophotometric Method for Estimation of Diclofenac Sodium	Chaitali A. Yeola, Vaishali N. Sonawane, Vijayraj N. Sonawane, Khemchand R. Surana, Dhananjay M. Patil, Deepak D. Sonawane	Pharmaceutical Chemistry	Asian Journal of Pharmaceutical Analysis	2023-24	2231-5675 (Online) 2231-5667 (Print)	Peer Reviewed
3	Estimation of Paracetamol in various brands of Paracetamol Tablets and their Comparative Study	Vaishali N. Sonawane, Chaitali A. Yeola, Vijayraj N. Sonawane, Khemchand R. Surana, Dhananjay M. Patil, Deepak D. Sonawane	Pharmaceutical Chemistry	Asian Journal of Pharmaceutical Analysis	2023-24	2231-5675 (Online) 2231-5667 (Print)	Peer Reviewed
4	Possible Reactions on Coumarin Molecule	Suvarna S Bahiram, Santosh R. Tambe, Swati Hatagale, SK Mahajan.	Pharmaceutical Chemistry	Journal of Advanced Scientific Research	2023-24	0976-9595	UGC



14 | Page

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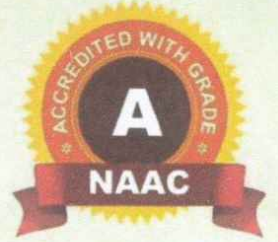
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		Khemchand R Surana					
5	In vitro Antimicrobial and Antifungal Activity of Mentha piperita Active Phytoconstituents	SHITAL J. PATIL, KHEMCHAND R. SURANA and SUNIL K. MAHAJAN	Pharmaceutical Chemistry	Research Journal of Agricultural Sciences	2023-24	0976-1675	UGC
6	A Review On Computer-Aided Drug Design And Discovery	Sushant M. Ahire, Shivraj P. Jadhav, Vijay V. Shewale, Prerana S. Pawar, Aditi M. Kokande, Dhanashree P. Sonawane, Dhananjay M Patil	Pharmaceutical Chemistry	Journal for Research and Development in Diversities	2023-24	2589-7799	Scopus
7	Quantification of Active Phytoconstituents in Ethanolic Extract of Mentha piperita by Modern Analytical Tools	Shital J. Patil, Khemchand R. Surana and Sunil K. Mahajan	Pharmaceutical Chemistry	Research Journal of Agricultural Sciences	2023-24	0976-1675	UGC
8	Exploring The Therapeutic Potential of Rubia cordifolia: Extraction, Phytochemical Evaluation and Microbiological Perspectives	Vijayraj N. Sonawane, Amjadkhan Pathan, Deepak D. Sonawane	Pharmaceutical Chemistry	Advances in Bioresearch	2023-24	E-ISSN : 2277-1573 P-ISSN : 0976-4585	Web of Science



15 | Page

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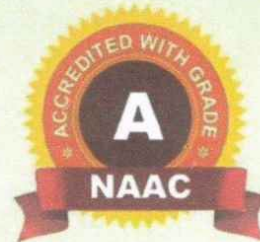
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9	A Comprehensive Study on Zinc Oxide Nanoparticles: Synthesis, Characterization, Evaluation and Microbiological Insights	Vijayraj N. Sonawane, Amjadkhan Pathan, Deepak D. Sonawane	Pharmaceutical Chemistry	International Journal of Zoological Investigations	2023-24	2454-3055	Web of Science
10	A Systematic Review on Remdesivir for Preventing Covid 19	Indrakumar K. Sonawane, Khemchand R. Surana, Deepak D. Sonawane, Yogesh P. Sharma, Dhananjay M. Patil	Pharmaceutical Chemistry	Advances in Bioresearch	2023-24	2277-1573 0976-4585	January 2024 Web of Science



16 | Page

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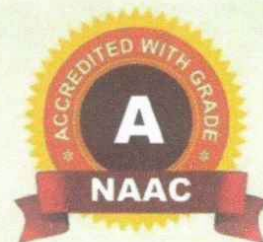
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Sample Paper published by faculty



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ISSN: 2454-3055

A Comprehensive Study on Zinc Oxide Nanoparticles: Synthesis, Characterization, Evaluation and Microbiological Insights

Sonawane Vijayraj Narendra^{1*}, Pathan Amjadkhan² and Sonawane Deepak Devidas³

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Abstract: Over the past ten years, nanoscale science and technology have become revolutionary areas of study. Due to their ability to withstand challenging processing circumstances, inorganic materials like metal oxides and metals have received an attention in the past 10 years. Metal oxides like zinc oxide, calcium oxide, titanium dioxide, and magnesium oxide are important inorganic materials that are generally considered safe for use by humans and animals. Due to their antibacterial qualities, zinc oxide and silver nanoparticles have been used as an effective approach for preventing infectious infections. Shape, crystallinity, composition, and morphology are the primary determinants of the intrinsic properties of metal nanoparticles. In this research, sodium hydroxide, zinc nitrate and soluble starch were used as precursors and stabilising agents in the chemical creation of zinc oxide nanoparticles. Then zinc oxide nanoparticles were characterized for evaluation of their properties. The ZnO nanoparticle assay, TEM, UV-visible spectroscopy, SEM, EDX, antimicrobial test, and Malvern size distribution report were used to characterize the zinc oxide nanoparticles. The average particle size of zinc oxide nanoparticles was found to be 10-40 nm. The antibacterial activity of the zinc oxide nanoparticles was demonstrated against *Candida albicans* (CA), *Escherichia coli* (EC), *Staphylococcus aureus* (SA), and *Pseudomonas aeruginosa* (PA). During comparison of zone of inhibition it was observed that the zinc oxide nanoparticles show strong antimicrobial activity than zinc oxide powder.

Keywords: Metal Nanoparticles, Characterization, Skin diseases, Antibacterial activity, Nanosize, *Candida albicans*, *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*

Citation: Sonawane Vijayraj Narendra, Pathan Amjadkhan and Sonawane Deepak Devidas: A comprehensive study on zinc oxide nanoparticles: synthesis, characterization, evaluation and microbiological insights. Intern. J. Zool. Invest. 10(1): 647-655, 2024.

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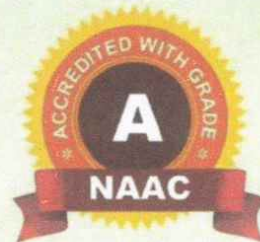
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Quantification of Active Phytoconstituents in Ethanolic Extract of *Mentha piperita* by Modern Analytical Tools

Shital J. Patil^{*1}, Khemchand R. Surana² and Sunil K. Mahajan³

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Abstract

The present study investigates the qualitative and quantitative analysis of the bioactive constituents mostly preservative of medicinally important selected plant. The quantitative method for ethanolic extract of *Mentha Piperita* (Extract 3A) was developed using spectroscopic methods such as UV spectroscopy, IR spectroscopy, GCMS, also chromatographic methods such as TLC, HPTLC. The present active phytoconstituents in *Mentha piperita* that possess antimicrobial and antifungal activity are *Menthol* and *Pulegone*. The modern tools like gas chromatography and mass spectroscopy are excellently work to analyses phytoconstituents from natural herb extract. Using this technique, it is very easy to achieve separation of both active constituent with full m/z range. In GC method the experiment was done on thermofischer instrument using chromeleon software. The column DB-1 (25m×0.32mm×1.0µm) was used as stationary phase and mobile phase was helium is used with optimized flow rate. In GCMS method Stationary phase was Rxi-5ms, Restek (30 m x 0.25 mm x 0.25 µm) and mobile phase was helium with 1.4ml/minute flow rate. The validation key parameters were also performed. After quantification by modern analytical tool the Extract 3A shows presence of active phytochemical in ratio of 1:10 equivalency with that of standard drug.

Key words: Quantitative analysis, Chromatography, Spectroscopy, Analysis of phytoconstituents, Hyphenated techniques, Herbal formulation

Natural active ingredients or phytoconstituents are extracted nowadays using modern sophisticated extraction methods. These active phytoconstituents possess medicinal importance and need to be incorporated in formulation in food and pharmaceutical industry. The potential and acceptance of these formulation are gaining importance over chemically synthesized drug formulation [1]. The active chemical constituent which are having antimicrobial and antioxidant properties are utilized in herbal formulation as preservatives. Thus, utilization most of commonly used natural spices like clove (*Syzygium aromaticum*), cinnamon (*Cinnamomum zeylanicum* Nees), black pepper (*Piper nigrum* L.), garlic (*Allium sativum* L.), have been added in formulation as preservatives [2]. Preliminary examination of extract often furnishes important information, which simplifies further course of analysis. Although these tests are not conclusive but sometimes, they give quite important clues for the presence of phytoconstituents meant for formulation [3]. Gas chromatography technique is cost effective while GCMS is the hyphenated technique with chromatographic and spectroscopic application gives accurate quantification of present active chemical constituents [4]. To attain separation with all other impurities can be done with gas chromatography, thus this

technique also has application of qualitative analysis in herbal formulation industry [5-10].

Several commonly used natural spices like clove, cinnamon, black pepper, and garlic, known for their antimicrobial and antioxidant properties, are being added to formulations as preservatives. These natural additives offer potential benefits and are preferred over synthetic preservatives [11]. Preliminary examination of extracts provides valuable information for further analysis. While these tests may not be conclusive, they often offer important clues regarding the presence of phytoconstituents suitable for formulation [12]. Gas chromatography (GC) is a cost-effective technique used for separation, while gas chromatography-mass spectrometry (GC-MS) is a hyphenated technique combining chromatographic and spectroscopic applications, providing accurate quantification of active chemical constituents [13-15]. GC also finds application in qualitative analysis within the herbal formulation industry, aiding in separating active constituents from impurities [16-20]. Overall, these modern analytical techniques contribute to the development and quality assurance of natural formulations in the food and pharmaceutical sectors.

MATERIALS AND METHODS

*Correspondence to: Shital J. Patil, E-mail: sjpmgvp@gmail.com; Tel: +91 9011052003

Citation: Patil SJ, Surana KR, Mahajan SK. 2024. Quantification of active phytoconstituents in ethanolic extract of *Mentha piperita* by modern analytical tools. Res. J. Agril. Sci. 15(3): 615-621.



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18 | Page



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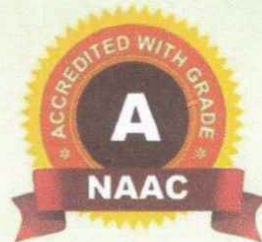
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BOOKS PUBLISHED BY THE FACULTY

Following books are published by faculty in reputed publications

Sr. No.	Name of the teacher	Title of the book	National / International	Year of publication	ISBN number of the proceeding	Name of the publisher
1	Editors: Khemchand R. Surana , Eknath D. Ahire, Raj K. Keservani Rajesh K. Kesharwani	Preventive and Therapeutic Role of Nutraceutical Vitamins	International	April 2024	978-1-774-91444-1	Apple Academic Press (CRC Press), Taylor and Francis)
2	Dr. Deepika Raina, Dr. Abhijeet Ojha, Dr. Vishakha Jaiswal, Dr. Raj K. Keservani, Dr. Khemchand R. Surana	A Textbook of Novel Drug Delivery System	National	May 2024	978-81-954223-9-5	Piyush Book Publication
3	Khushali R. Pagar, Kiran B. Patil, Sachin S. Gunjal, Khemchand R. Surana	A Textbook of Pharmaceutical Jurisprudence	National	Upcoming 2024		Brilliant Publication




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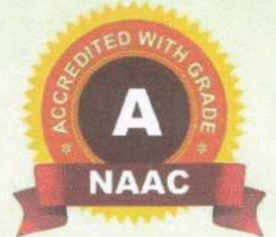
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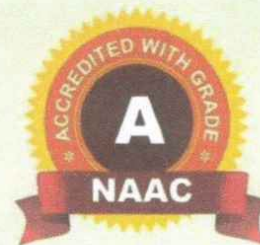


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BOOK CHAPTERS

3. BOOK CHAPTERS PUBLISHED BY THE FACULTY

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Sr. No.	Name of the teacher	Title of the book published	Name of editor	Title of the book chapter	National / International	Year of publication	ISBN number of the proceeding	Name of the publisher
1	Eknath D Ahire, Khemchand R Surana, Vijayraj N Sonawane, Swati G Talele, Sanjay J Kshirsagar, Umesh D Laddha, Gokul S Talele	COVID-19 and Immunomodulation with Special Emphasis on Nutraceutical and Herbal Formulation	Rajesh K. Kesharwani, Raj K. Keservani	Role of Synthetic Medicines as Immunomodulators for the Cure of COVID-19	International	2023	Hard ISBN: 9781774913178 E-Book ISBN: 9781003347804	Apple Academic Press (CRC Press), Taylor and Francis
2	Tushar N. Lokhande, Komal S. Valve, Subhash S. Shinde, Khemchand R. Surana, and Ganesh U. Chaturbhuj	Vitamins as Nutraceuticals in Cancer	Editors: Khemchand R. Surana, Eknath D. Ahire, Raj K. Keservani, Rajesh K. Kesharwani	Preventive and Therapeutic Role of Nutraceutical Vitamins	International	Sept 2023	ISBN 9781774914441 (hardcover) ISBN 9781774914458 (softcover)	Apple Academic Press (CRC Press), Taylor and Francis
3	Vaishali N. Pardeshi, Tushar N. Lokhande, Khemchand R. Surana, Ashwini Shelke, and Yogita B. Thombare	Vitamins as Nutraceuticals for Tuberculosis	Editors: Khemchand R. Surana, Eknath D. Ahire, Raj K. Keservani, Rajesh K. Kesharwani	Preventive and Therapeutic Role of Nutraceutical Vitamins	International	Sept 2023	ISBN 9781774914441 (hardcover) ISBN 9781774914458 (softcover)	Apple Academic Press (CRC Press), Taylor and Francis



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4	Abhijeet G. Parkhe, Khemchand R. Surana, Eknath D. Ahire, Raj K. Keservani, and Sunil K. Mahajan	Vitamins as Nutraceuticals for HIV and AIDS	Editors: Khemchand R. Surana, Eknath D. Ahire, Raj K. Keservani Rajesh K. Kesharwani	Preventive and Therapeutic Role of Nutraceutical Vitamins	International	Sept 2023	ISBN 9781774914 441 (hardcover) ISBN 9781774914 458 (softcover)	Apple Academic Press (CRC Press), Taylor and Francis
5	Snehal D. Pawar, Snehal S. Kolpe, Tushar N. Lokhande, Khemchand R. Surana, Santosh R. Tambe, and Chandrakant G. Bonde	Vitamins as Nutraceuticals for Viral Infection	Editors: Khemchand R. Surana, Eknath D. Ahire, Raj K. Keservani Rajesh K. Kesharwani	Preventive and Therapeutic Role of Nutraceutical Vitamins	International	Sept 2023	ISBN 9781774914 441 (hardcover) ISBN 9781774914 458 (softcover)	Apple Academic Press (CRC Press), Taylor and Francis
6	Ashwini V. Shelke, Khemchand R. Surana, Vaishali N. Pardeshi, Tushar N. Lokhande, and Sunil K. Mahajan	Vitamins as Nutraceuticals for Microbial Infections	Editors: Khemchand R. Surana, Eknath D. Ahire, Raj K. Keservani Rajesh K. Kesharwani	Preventive and Therapeutic Role of Nutraceutical Vitamins	International	Sept 2023	ISBN 9781774914 441 (hardcover) ISBN 9781774914 458 (softcover)	Apple Academic Press (CRC Press), Taylor and Francis
7	Pankaj R. Aher, Khemchand R. Surana, Eknath D. Ahire, Sunil K. Mahajan, and Sanjay J. Kshirsaga	Vitamins as Nutraceuticals for Covid-19	Editors: Khemchand R. Surana, Eknath D. Ahire, Raj K. Keservani Rajesh K. Kesharwani	Preventive and Therapeutic Role of Nutraceutical Vitamins	International	Sept 2023	ISBN 9781774914 441 (hardcover) ISBN 9781774914 458 (softcover)	Apple Academic Press (CRC Press), Taylor and Francis
8	Kshitij S. Varma, Tushar N. Lokhande, Ramesh A. Herole, Khemchand R. Surana, and Sunil K. Mahajan	Vitamins as Nutraceuticals for Hypertension	Editors: Khemchand R. Surana, Eknath D. Ahire, Raj K. Keservani Rajesh K. Kesharwani	Preventive and Therapeutic Role of Nutraceutical Vitamins	International	Sept 2023	ISBN 9781774914 441 (hardcover) ISBN 9781774914 458 (softcover)	Apple Academic Press (CRC Press), Taylor and Francis
9	Abhijeet G. Parkhe, Khemchand R. Surana, Eknath D. Ahire, Sunil K.	Vitamins as Nutraceuticals for Neurodegenerative	Editors: Khemchand R. Surana, Eknath D. Ahire, Raj	Preventive and Therapeutic Role of Nutraceutical Vitamins	International	Sept 2023	ISBN 9781774914 441 (hardcover)	Apple Academic Press (CRC Press), Taylor and



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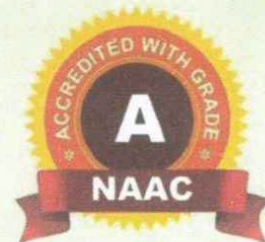
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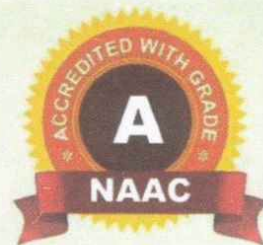
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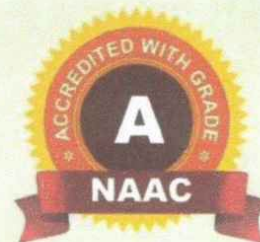
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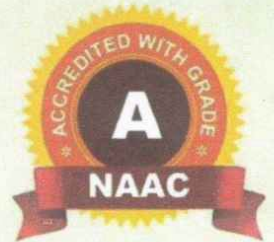
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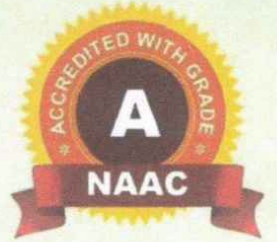
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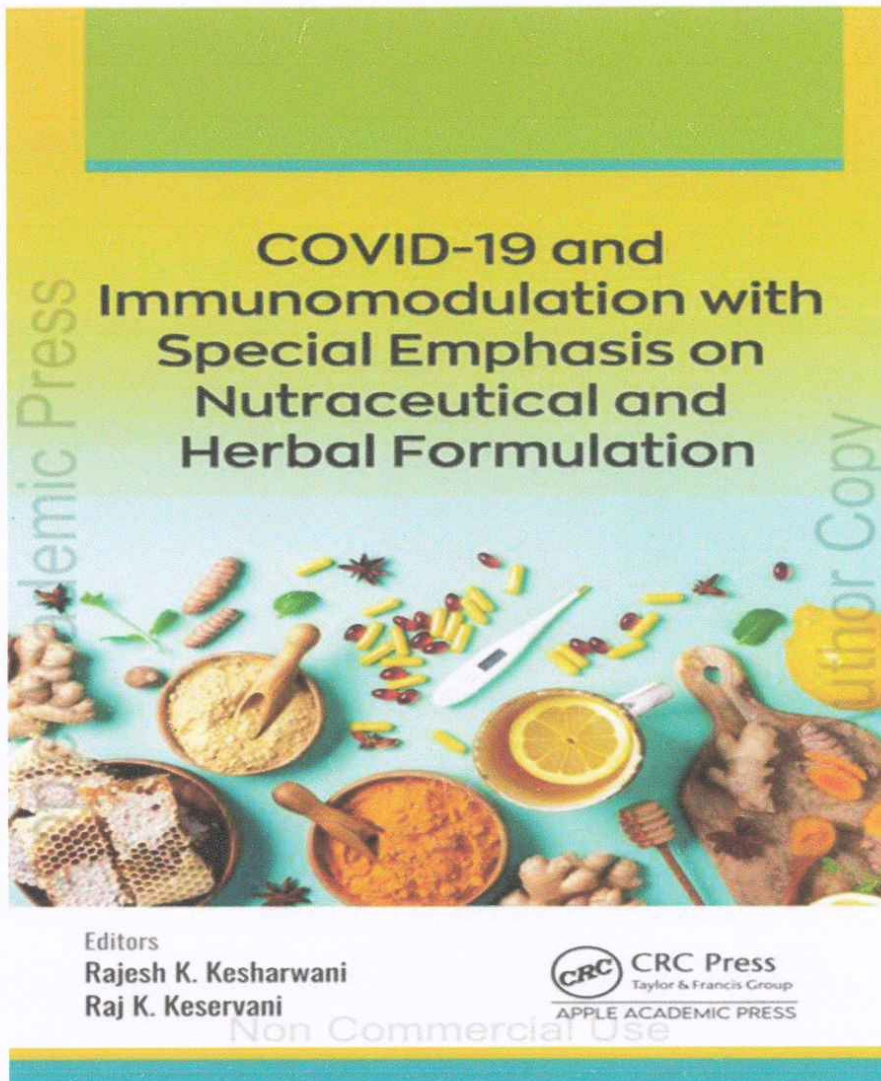
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29 | Page

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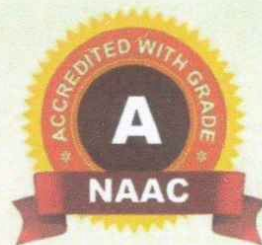
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CHAPTER 7

Role of Synthetic Medicines as Immunomodulators for the Cure of COVID-19

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ABSTRACT

Immunomodulation is a therapeutic approach in which we attempt to intervene in the defense system's autoregulating processes, and immunomodulators modulate immune system activity, which reduces the inflammatory response. Immunomodulators are most commonly used in organ transplantation to prevent organ rejection and in autoimmune diseases such as rheumatoid arthritis. To speed up the response during active flares

COVID-19 and Immunomodulation with Special Emphasis on Nutraceutical and Herbal Formulation.
Rajesh Kumar Kesharwani & Raj Kumar Keservani (Eds)
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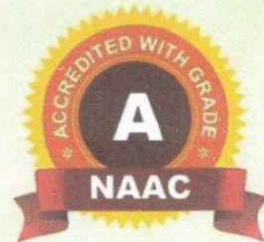
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CHAPTER 1

Vitamins as Nutraceuticals in Cancer

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ABSTRACT

Cancer is a disease characterized by the development of abnormal cells that divide uncontrollably and have the ability to infiltrate and destroy normal body tissue. Cancer has a high proclivity for spreading throughout the body. Cancer is the world's second biggest cause of death, but advances in cancer screening, therapy, and prevention are increasing survival rates for many types of cancer. There are four main types of cancer: Carcinomas, Sarcomas, Leukemia, and Lymphomas. Vitamins are the compounds that the body requires for appropriate growth and development. Several clinical trials have been carried out in recent years to establish the role of vitamins in the treatment or prevention of cancer. Because of their contentious role in cancer, taking vitamins for treatment or the prevalence of cancer is still prescribed. Vitamins have been shown in epidemiological research to have anticancer

Preventive and Therapeutic Role of Vitamins as Nutraceuticals. Khemchand R. Surana, Eknath D. Ahire, Raj K. Keservani, & Rajesh K. Kesharwani (Eds.)

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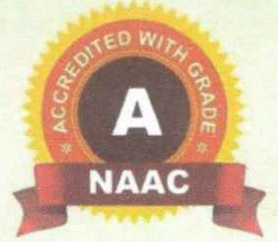
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PATENTS:

Sr. No	Name of the faculty	Date of Patent Granted/ Publication/ Submission	Application Number	Type of Patent	Title of Invention	Status
1.	Mr. Mustkim Sha Sabir Shaikh. Mr. Musab Mhommedali Saiyyed. Mr. Taufik Faruk Sayyed. Dr. Deepak Devidas Sonawane. Dr. Dhananjay Machhindra Patil. Mr. Vijayraj Narendra Sonawane	21/10/2022	372931-001	Indian Patent	Blood Group Detection Kit	Granted 30/01/2024
2.	Mr. Khemchand Rajendra Surana Mr. Vijayraj Narendra Sonawane	30/11/2022	374872-001	Indian Patent	Wearable personal health, Activity and lifestyle tracking device	Granted 18/04/2024
3.	Mr. Ganesh Bhaskar Sonawane	06/01/2024	202221073528	Indian Patent	The neural network method for the diabetic retinopathy detection	Published 06/01/2023
4.	Dr. Khemchand Rajendra Surana, Miss Leena Vijay Savale, Mr. Jayesh Sanjay Aher, Dr. Dhananjay Machhindra Patil, Dr. Deepak Devidas Sonawane, Mr. Shivraj Popat Jadhav	13/02/2024	407321-001	Indian Patent	Portable Melting Point Apparatus	Granted 31/05/2024
6.	Prof. Mr. Shivraj Popat Jadhav, Dr. Dhananjay Machhindra Patil, Dr. Deepak Devidas Sonawane, Prof. Khemchand Rajendra Surana	13/02/2024	407320-001	Indian Patent	Portable tissue carrier	Granted 18/04/2024
7.	Dr. Chandrashekhhar Dinkar Patil	10/01/2024	404158-001	Indian Patent	Derivatizing reagent dispenser for Thin layer chromatography	Granted 07/03/2024



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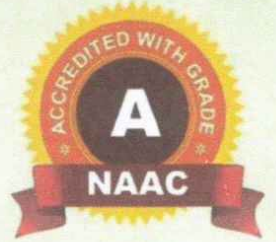
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प्रमाणित किया जाता है कि संलग्न प्रति में दर्जित डिजाइन जो BLOOD GROUP DETECTION KIT से संबंधित है, का पंजीकरण, श्रेणी 24-01 में 1.Mr. Mustkim Sha Sabir Shaikh 2. Mr. Musab Mhommedali Saiyyed 3.Mr. Taufik Faruk Sayyed 4.Dr. Deepak Devidas Sonawane 5.Dr. Dhananjay Machhindra Patil 6.Mr. Vijayraj Narendra Sonawane के नाम में उपयुक्त संख्या और तारीख में कर लिया गया है।

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डिजाइन अधिनियम, 2000 तथा डिजाइन नियम, 2001 के अध्याधीन प्रावधानों के अनुसरण में।
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जारी करने की तिथि : 30/01/2024
Date of Issue : 30/01/2024

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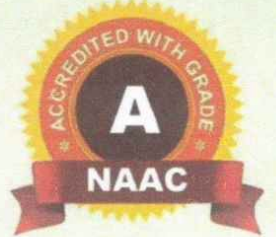
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डिजाइन के पंजीकरण का प्रमाण पत्र | Certificate of Registration of Design

डिजाइन सं. / Design No.	374872-001
तारीख / Date	30/11/2022
पारस्परिकता तारीख / Reciprocity Date*	
देश / Country	


प्रमाणित किया जाता है कि संलग्न प्रति में वर्णित डिजाइन जो **WEARABLE PERSONAL HEALTH, ACTIVITY AND LIFESTYLE TRACKING DEVICE** से संबंधित है, का पंजीकरण, श्रेणी 10-04 में 1.Dr. Raj Kumar Keservani 2. Mr. Eknath Damu Ahire 3.Mr. Abhishek Sharma 4.Dr. Bhushan Rajendra Rane 5.Dr. Amit Kishor Srivastava 6.Dr. Pratibha Pal 7.Mr. Khemchand Rajendra Surana 8.Mr. Vijayraj Narendra Sonawane 9.Dr. Garima Kapoor के नाम में उपर्युक्त संख्या और तारीख में कर लिया गया है।

Certified that the design of which a copy is annexed hereto has been registered as of the number and date given above in class 10-04 in respect of the application of such design to **WEARABLE PERSONAL HEALTH, ACTIVITY AND LIFESTYLE TRACKING DEVICE** in the name of 1.Dr. Raj Kumar Keservani 2. Mr. Eknath Damu Ahire 3.Mr. Abhishek Sharma 4.Dr. Bhushan Rajendra Rane 5.Dr. Amit Kishor Srivastava 6.Dr. Pratibha Pal 7.Mr. Khemchand Rajendra Surana 8.Mr. Vijayraj Narendra Sonawane 9.Dr. Garima Kapoor.

डिजाइन अधिनियम, 2000 तथा डिजाइन नियम, 2001 के अध्वधीन प्रावधानों के अनुसरण में।
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जारी करने की तिथि: 18/04/2024

Date of Issue



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34 | Page

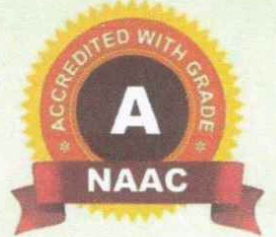

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डिजाइन के पंजीकरण का प्रमाण पत्र | Certificate of Registration of Design

डिजाइन सं. / Design No. : 407321-001
 तारीख / Date : 13/02/2024
 पारस्परिकता तारीख / Reciprocity Date :
 देश / Country :

प्रमाणित किया जाता है कि संलग्न प्रति में वर्णित डिजाइन जो **PORTABLE MELTING POINT APPARATUS** से संबंधित है, का पंजीकरण, श्रेणी 10-04 में 1.Prof. Khemchand Rajendra Surana 2. Miss Leena Vijay Savale 3.Mr. Jayesh Sanjay Aher 4.Dr. Dhananjay Machhindra Patil 5.Dr. Deepak Devidas Sonawane 6.Mr. Shivraj Popat Jadhav के नाम में उपर्युक्त संख्या और तारीख में कर लिया गया है।

Certified that the design of which a copy is annexed hereto has been registered as of the number and date given above in class 10-04 in respect of the application of such design to **PORTABLE MELTING POINT APPARATUS** in the name of 1.Prof. Khemchand Rajendra Surana 2. Miss Leena Vijay Savale 3.Mr. Jayesh Sanjay Aher 4.Dr. Dhananjay Machhindra Patil 5.Dr. Deepak Devidas Sonawane 6.Mr. Shivraj Popat Jadhav.

डिजाइन अधिनियम, 2000 तथा डिजाइन नियम, 2001 के अध्याधीन प्रावधानों के अनुसरण में।
 In pursuance of and subject to the provisions of the Designs Act, 2000 and the Designs Rules, 2001.

जारी करने की तिथि : 30/05/2024
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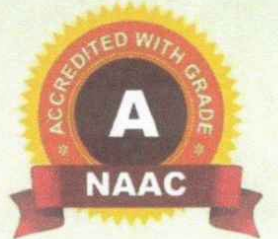
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डिजाइन के पंजीकरण का प्रमाण पत्र | **Certificate of Registration of Design**

डिजाइन सं. / Design No. : 407320-001
 तारीख / Date : 13/02/2024
 पारस्परिकता तारीख / Reciprocity Date* :
 देश / Country :

प्रमाणित किया जाता है कि संलग्न प्रति में वर्णित डिजाइन जो **PORTABLE TISSUE CARRIER** से संबंधित है, का पंजीकरण, श्रेणी 24-01 में 1.Prof. Mr. Shivraj Popat Jadhav 2. Prof.Dr. Dhananjay Machhindra Patil 3.Prof.Dr. Deepak Devidas Sonawane 4.Prof.Mr. Khemchand Rajendra Surana के नाम में उपर्युक्त संख्या और तारीख में कर लिया गया है।

Certified that the design of which a copy is annexed hereto has been registered as of the number and date given above in class 24-01 in respect of the application of such design to **PORTABLE TISSUE CARRIER** in the name of 1.Prof. Mr. Shivraj Popat Jadhav 2. Prof.Dr. Dhananjay Machhindra Patil 3.Prof.Dr. Deepak Devidas Sonawane 4.Prof.Mr. Khemchand Rajendra Surana.

डिजाइन अधिनियम, 2000 तथा डिजाइन नियम, 2001 के अध्यायीन प्रावधानों के अनुसरण में।
 In pursuance of and subject to the provisions of the Designs Act, 2000 and the Designs Rules, 2001.

जारी करने की तिथि : 18/04/2024
 Date of Issue

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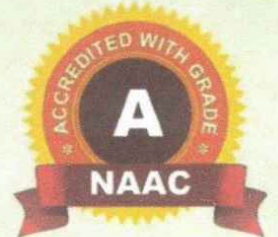
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डिजाइन सं. / Design No. : 404158-001

तारीख / Date : 10/01/2024

पारस्परिकता तारीख / Reciprocity Date* :

देश / Country :

प्रमाणित किया जाता है कि संलग्न प्रति में वर्णित डिजाइन जो **DERIVATIZING REAGENT DISPENSER FOR THIN LAYER CHROMATOGRAPHY** से संबंधित है, का पंजीकरण, श्रेणी 24-02 में 1.Dr. Sandeep B Mundhe 2. Dr. Chandrashekhar Dinkar Patil 3.Dimple Sukhadev Shinde 4.Dr. Madhuri Murlidhar Deshmukh 5.Mr. Manoj Ravsaheb Kadam 6.Syeda Saher Naaz 7.Vishal Gokul Beldar के नाम में उपर्युक्त संख्या और तारीख में कर लिया गया है।

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डिजाइन अधिनियम, 2000 तथा डिजाइन नियम, 2001 के अन्वयेन प्रावधानों के अनुसरण में।
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जारी करने की तिथि : 07/03/2024

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