

Technologies at RCB

<u>Sl. No.</u>	<u>Patent Application No.</u>	<u>Patent Filed Date (DD/MM/YY)</u>	<u>Applicant's Name</u>	<u>Inventor/s Name</u>	<u>Title of the Patent</u>	<u>Status of Patent (Published / Granted)</u>
1	3120/DEL/2014	30/10/2014	Assigned to - RCB	Nidhi Adlakha, Neha Munjal	Microorganisms for enhanced production of 2,3 butanediol and uses thereof	Granted
2	201711023939	07-07-2017	1.RCB 2.IISER-BHOPAL	Avinash Bajaj, Aasheesh Srivastava, Prabhusrini vas Yavvari	Amphiphilic cationic polyelectrolytes and nanoformulations thereof	Granted
3	201811020894	04-06-2018	RCB	Eswaran Sambasiva n Venkat, Guchhait Prasenjit	Water soluble fullerene c60 adducts for nano-medicine & materials science	Granted
4	202111014735	31/03/2021	1.CIAB 2. RCB	Jayeeta Bhaumik, Sudhanshu Vrat, Yeddula Nikhileshwar Reddy, Sanjam Chandna, Shatabdi Paul, Ravneet Kaur, Shubhra Agarwal, S. Chandru	Lignin based polypyrrole nanoformulations as highly effective antiviral agents against sars-cov-2	Published
5	202111038068	23/08/2021	RCB	Ramu S Vemanna, PA Vanitha,	A pro-transpirants class combination	Published

				NV Preethi		
6	2022110063 52	02-07-2022	RCB	Ramu S Vemanna, Babitha K C, Veena H M	Pro- transpirants to increase crop productivity	Granted
7	2022110168 21	25/03/2022	RCB	Nidhi Adlakha , Kunal Meena	Method for the production of phenylalanine free diet through the reuse of phenylalanine ammonia lyase	Published
8	2022110498 22	31/08/2022	RCB	Nidhi Adlakha , Shivam Aggarwal, Sathish Dorairaj	Method for the production of biomass hydrolyzing enzymes in talaromyces cellulolyticus	Published
9	2023110152 85	03-07-2023	RCB	Dr. Ramu S. Vemanna, Dr. Avinash Bajaj, Dr. Saikat Bhattacharj ee, Garima Pal	RNP complex for crop protection against bacterial diseases	Granted
10	2024110627 81	20/08/2024	RCB	Garima Pal , Ramu S. Vemanna	Synthetic and natural molecules for crop protection against plant diseases caused by bacteria, nematode and virus and method thereof	Granted

11	2023110585 28	31/08/2023	RCB	Dr. Ambadas Bhagwanrao Rode, Krushna Anandrao Shinde, Divya Ojha, Dr. Ramu S Vemanna	Novel small molecule modulators of crispr-cas9 activity and method thereof	Granted
12	2025110069 44	28/01/2025	RCB	Shankar Mavinamar, Sneha Singla Pareek, Avinash Bajaj, Ramu S. Vemanna	Transgene-free, in planta-mediated delivery of rnp to edit genes in plants	Published
13	2025110120 51	02-12-2025	RCB	Sudhanshu Vrat, Anshula Sharma, S. Chandru, Shouri KA	Formulation of an Emetine dihydrochloride based drug for treatment of Chikungunya virus and its related symptoms and method thereof	Filed
14	2025110129 49		RCB	S. K. Jha and Avinash Bajaj.	An oral formulation for treatment of gastrointestinal cancers	Filed
15	2020110055 13	08-07-2020	THSTI and RCB	Guchhait Prasenjit and Asthana Shailendra et al	1,2-Disubstituted benzimidazolyl amino acids as selective sirtuin-1 lysine deacetylase inhibitors	Published

16	2016110214 86	22/06/2016	RCB	Bajaj Avinash, Sengupta Sagar, Sreekanth Vedagopur am	Conjugated Anti- proliferative Drug Nano- particles and Process for Preparation thereof	Published
17	2018110161 54	29/04/2018	RCB	Bajaj Avinash, Gupta Siddhi, Mishra Deepak, Kumar Sandeep	Molecular Probes for detection of mycobacteria	Published
18	2020110071 17	February, 2020	RCB	Asthana S, Suri C, Kalia M, Awasthi A, Chande A, Rode A B, Prajapat S, Shadhu S, Bhardwaj V and Ojha D	m-Tor independent autophagy inducing small peptide and therapeutic uses thereof	Filed

Details of Patents filed and granted

Patent 1. Conjugated Anti-proliferative Drug Nano-particles and Process for Preparation thereof

Sreekanth Vedagopuram, Sandeep Kumar, Sagar Sengupta, and **Avinash Bajaj**

Indian Patent Application No. 201611021486.

21 June 2017

This invention is related to the development of nanomaterials for drug delivery based on modified steroidal lipids conjugated to drugs/diagnostic agents that can improve the bioavailability, solubility and therapeutic efficacy of existing chemotherapeutics. This invention includes methods of production of bile acid derivatives modified with suitable head groups (Phosphocholine, Polyethylene glycol/oligopeptides) based nanomicelles by nanoprecipitation/emulsion/solvent evaporation/dialysis etc., consisting of single/multiple therapeutics or imaging agents for the treatment of cancer microbial infection, and inflammatory disease using parental routes (intravenous, subcutaneous).

Patent 2. An oral formulation for treatment of gastrointestinal cancers.

S. K. Jha and A. Bajaj.

Indian Provisional Patent Application No. 202511012949. 14 February 2025

The present disclosure pertains to the engineering of a gemcitabine conjugate for treatment of gastrointestinal cancers on oral delivery.

Patent 3. Molecular Probes for detection of mycobacteria

Avinash Bajaj, Siddhi Gupta, Sandeep Kumar and Deep Kumar Mishra

Indian Patent Application No. 201811016154. 22 April 2019

The patent describes the design and synthesis of a molecular probe that can be used to diagnose cases of extrapulmonary tuberculosis and differentiate them from non-tuberculosis infection cases affecting the same region. The simple chemical synthesis, easy derivatization, and small size make this probe novel and different. The uniqueness of this probe is its ability to selectively target mycobacteria even in a mixture of other bacterial species, thus helping in the accurate diagnosis of extrapulmonary tuberculosis, which is otherwise very challenging. We have shown the potential of this probe in detecting mycobacteria in clinical gastrointestinal tuberculosis samples and also in differentiating the cases of gastrointestinal tuberculosis with those of Crohn's disease. The probe holds a strong potential to be used for clinical diagnosis owing to easy synthesis and maintenance, versatile ways of application, quick results as well as cost effectiveness.

Patent 4. m-Tor independent autophagy inducing small peptide and therapeutic uses thereof

Asthana S, Suri C, **Kalia M**, Awasthi A, Chande A, **Rode A B**, Prajapat S, Shadhu S, Bhardwaj V and Ojha D

Indian Patent Application No. 202011007117

February, 2020

The present invention is related to the use of autophagy-inducing peptides. Autophagy is a cellular pathway that is upregulated during stress and disease conditions. Small peptides have

been designed that upregulate autophagy. These peptides can have therapeutic implications in various disease states or conditions where autophagy upregulation is likely to be beneficial.

Patent 5. A Pro-Transpirants Class Combination

Ramu S Vemanna, PA, Vanitha, NV, Preethi (23 August 2021)

Indian Patent Application No. 202111038068

The invention relates to the field of agrochemical composition, improving plant productivity. The objective of the invention is to develop a combination of agrochemicals that enhances transpiration and increases the yield in plants under drought conditions. Under drought conditions, the productivity of crops reduces due to the accumulation of Absciscic acid (ABA). The present invention discloses a pro-transpirants class combination for downregulating the transcription factor, which reduces the accumulation of ABA in rice, enhances transpiration and increases the yield of plants.

Patent 6: Method for the production of phenylalanine free diet through the reuse of phenylalanine ammonia lyase

Dr. Nidhi Adlakha

Provisional Patent Application no. 202211016821 (Date: 29 March 2022)

The invention deals with developing a platform for generating low-phenylalanine diet for Phenylketonuria patients. The main highlights of the invention includes immobilization of phenylalanine ammonia lyase enzyme on MwCNT, which is employed to treat any proteinaceous substrate and deplete levels of Phenylalanine in a sustainable manner.

Patent 7. Method for the production of Biomass hydrolyzing enzymes in *Talaromyces cellulolyticus*

Nidhi Adlakha and Shivam Aggarwal, Sathish Dorairaj (31 August 2022)

Indian Patent Application No. 202211049822

This invention deals with identification of novel inducers for increasing the secretion of cellulolytic enzymes. The rationale of the inducers was derived from detailed omics analysis and, further the inducers were scrutinized using Design of Experiment strategy. Using in vitro induction tests and response surface methodology, it was identified that *Talaromyces* sp. produces cell wall-breaking enzymes in response to cellobiose and gentiobiose as a stimulant. Precisely, a 2.5:1 stoichiometric ratio of cellobiose to gentiobiose led to a 2.4-fold increase in cellulase synthesis. The application of the optimized inducers in cre knockout strain significantly increased the enzyme output.

Patent 8. Lignin based polypyrrole nanoformulations as highly effective antiviral agents against SARS-COV-2

Sudhanshu Vрати and Jayeeta Bhaumik (2021)

Indian Patent Application No. 202111014735 (31 March 2021)

Patent 9. 1,2-Disubstituted benzimidazolyl amino acids as selective Sirtuin-1 lysine deacetylase inhibitors.

Guchhait Prasenjit and Asthana Shailendra (May' 2022)

Reference number IP0424. From the Regional Centre for Biotechnology, Faridabad, India, and Translational Health Science Technology Institute, Faridabad, India.

Patents Granted

Patent 10. A Formulation of an Emetine dihydrochloride based drug for treatment of Chikungunya virus and its related symptoms and method thereof

Sudhanshu Vrat

Indian Provisional Patent Application No. 202511012051 dated 12 February 2025

Patent 11. Transgene-free, inplanta-mediated delivery of RNPS to edit genes in plants

Shankar Mavinamar, Dr Sneh Lata Singla Pareek, Dr. Avinash Bajaj, Dr. Ramu S. Vemanna

Indian Patent Application No. 202511006944 dated 28 January 2025

Patent Granted

1. Microorganisms for enhanced production of 2,3 butanediol and uses thereof

Nidhi Adlakha, Munjal N

Indian patent application number 337873. June 2020. The present innovation is related to the modification of metabolic pathways for the fermentative production of 2, 3-butanediol, in order to enhance the yield and productivity. 2,3-Butanediol is a versatile bulk chemical with a huge market of ~320 billion USD, owing to its wide application in the manufacture of printing inks, perfumes, fumigants, moistening and softening agents, explosives, plasticizers, foods, pharmaceuticals, etc. Currently, it is derived from crude oil fractionation, but due to limited reserves and increasing prices of crude oil, the price hike for 2,3-butanediol (2,3-BDO) is indispensable. For this, we have engineered non-pathogenic *Paenibacillus polymyxa* using synthetic biology approach. Two enzymes butanediol dehydrogenase and acetolactate synthase were overexpressed whereas alcohol dehydrogenase was knocked out to achieve 60% increase in butanediol yield.

2. Novel Small Molecule Modulators of CRISPR-Cas9 Activity and method thereof

A. Rode, K. Shinde, D. Ojha, R. Vemanna

Patent Number :539344 (27 May 2024)

3. Pro-transpirants to increase crop productivity.

Babitha KC, Veena HM and **Ramu S Vemanna** (7 February 2022)

Patent Granted: no. 550300 (13/09/2024)

The present invention's emphasis is to develop a combination that increases transpiration and increases the yield in plants, even in the stressful conditions that induces stress in plants. We developed a formulation/combination that keeps the stomata open and enhances transpiration. The formulations inhibit the function of transporter, and was found effective on rice, wheat, cowpea and mungbean (Greengram) to enhance yield.

4. RNP complex for crop protection against bacterial diseases

Pal G, Bajaj A, Bhattacharjee S, Vemanna RS (7 March 2023)

Indian patent application number – 202311015285, Patent No. 560014, granted date 12.02.2025

The present invention provides a nanopolymer-RNP complex to deliver RNP complex. Particularly, the invention provides a nanopolymer-RNP complex targeting *Xanthomonas oryzae pv oryzae* (Xoo) bacterial *hrpX* and *hrpG* genes that protects from bacterial blight disease on rice and *Rolstonia solanacearum* (RS) *hrpX* and *hrpG* in potato that protects from bacterial wilt, and *Pseudomonas syringae* pv tomato (DC3000) (PSt) HopP1 protecting from bacterial speck on Arabidopsis.

Patent 5. Amphiphilic Cationic Polyelectrolytes and Nanoformulations Thereof

Prabhu S. Yavvari, **Avinash Bajaj**, and Aasheesh Srivastava

Indian Patent Application No. 201711023939

9 July 2018

The present embodiment relates to polymeric nanogel formulations, and, more particularly to nanogel formulations for delivery of therapeutic, diagnostic and theranostic cargos/loads such as siRNA, miRNA, plasmid DNA (pDNA), proteins, peptides, drugs and inorganic nanomaterials (Au, Ag, SiO₂), or any combination/conjugates thereof.

Patent 6. Water Soluble Fullerene C60 Adducts for Nano-Medicine & Materials Science **Prasenjit Guchhait** and SV Eswaran

Indian Patent Application No. 202011007117

June 2018

This patent application proposes the use of Water Soluble Fullerene C60 adducts and metal complexes as anti-neoplastic or anti-cancer agents.

Patent 7. Synthetic and natural molecules for crop protection against plant diseases caused by bacteria, and nematode and virus. Garima Pal, Ramu S Vemanna, 202411062781, TEMP/E-1/72958/2024-DEL, (Provisional patent filed – filed for complete filing).

The invention, in general, relates to the field of plant protection against broad spectrum of diseases. More particularly, the present invention relates to Synthetic and natural molecules for crop protection against plant diseases caused by bacteria, nematode and virus and method thereof.

Industry-Sponsored Projects

1. Pre-clinical validation of antitumor activity of novel chimeric antigen receptor (CAR) T cells in mice xenograft model

PI: Avinash Bajaj

Funding Industry: Cellogen Therapeutics

November 2022-May 2024

Cost of Project: 82.88 Lakh

2. An agrochemical inhibiting ABA biosynthesis proteins or anion channels that regulate stomatal opening inspite of ABA accumulation

PI: Dr. Ramu S. Vemanna

Post Doctoral Researcher: Dr. Babitha

BRIC-BIRAC Post Doc Entrepreneur-in-Residence (EIR) program

Funding Agency: BIRAC Rs. 19.70 lakhs + Navam Capital Private Limited (Venture Capital firm) - Rs. 19.70 lakhs

Duration: March 2026-September 2027

Cost of Project: 39.4 Lakhs

3. Rational Engineering of Talaromyces sp. to augment cellulase secretion

PI: Dr. Nidhi Adlakha

Funding Agency: ANRF and BPCL

Duration: 2024-27

Cost of Project: ANRF (55 Lakh) and BPCL (12 Lakh)