

## **Dr. Sonam Kumari | Ph.D.**

Scientist 'B'

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### **Education and Academic Profile**

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#### **Ph.D.**

Ph.D.(Human health), International centre for genetic engineering and biotechnology (ICGEB), New Delhi, India (April 2021)

#### **Post-graduation**

M.Sc. Biotechnology, Faculty of Science, Banaras Hindu University, Varanasi, India (2013-2015)

#### **Graduation**

B.Sc. (Biotechnology), St. Columba's college, Vinoba Bhave University, Hazaribagh, India (2009-2012)

### **Awards and Achievements**

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CSIR-JRF June 2014, 61<sup>th</sup> rank

CSIR-LS June 2015 and June 2016

GATE 2015 (99<sup>th</sup> rank)

NCCS-DBT JRF, 2015 (Category B)

### **Post-Doc Work:**

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**Title:** Metabolic production of industrial metabolite Psilocybin in yeast *Saccharomyces cerevisiae*

#### **Research Summary:**

Psilocybin is an alkaloid produced by basidiomycete fungi *Psilocybe*, popularly known as "magic mushrooms". Active form of psilocybin is psilocin, formed in body by its dephosphorylation, and is structurally similar to human neurotransmitters serotonin. The content of psilocybin in psychedelic mushrooms is very low and extraction to a commercially viable level is costly. In order to produce this compound in high concentration and to reduce the cost of production, I have introduced the metabolic pathway of psilocybin production under an industrial project

### **Ph.D. Work:**

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**Title:** Role of ABC transporters in *Candida* species

#### **Research summary:**

I have inventoried ABC proteins in *C. glabrata*, predicted their localizations and performed their expression analysis in normal growth condition and with the transient exposure of antifungals. I have identified 25 putative ABC proteins in the genome of *C. glabrata*, out of

which only 18 proteins contained transmembrane domains in their topological structure and were considered membrane transporters. In the next phase I have created a mini-library of knockouts of all 18 membrane ABC transporters to study their potential role. The deletion of each of the genes in *C. glabrata* resulted in viable strains. Further, to study the ABC transporters in a homologous overexpression background, I have developed an endogenous expression system in *C. glabrata* without the masking effect of major transporter. The strain was constructed by disrupting seven ABC transporters from the *C. glabrata* genome and an integration based plasmid for the expression of gene of interest. In the next phase of my work, I have explored the role of an ABC transporter, CgYor1p. The transcript of CgYOR1 has been earlier reported to be upregulated in various azole-resistant clinical isolates of *C. glabrata*. However, its single deletion did not change susceptibility to any of the tested azoles. I have characterized this transporter in terms of azole resistance. It functions independently towards azole resistance during N2- starvation conditions involving TOR and calcineurin pathway. Overall my studies have opened a new window towards further characterization of lesser-explored ABC transporters.

#### Research Interest:

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- **To understand the Bacterial Pathology using Molecular biology tools.**
- **Prevalence and cost effective early detection of STD (Sexual transmitted infection biology).**
- **Physiology and prevalence of yeast infection using molecular biology and highthrough-put experiments.**
- **Antifungal resistance in fungi.**
- **Prevalent genotype and cellular metabolic pathways of fungal pathogen which promotes multi-drug resistance.**

#### Peer-review publications:

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1. **Kumari S**, Kumar M, Khandelwal NK, Kumari P, Varma M, Vishwakarma P, Shahi G, Sharma S, Lynn AM, Prasad R, Gaur NA. ABC transportome inventory of human pathogenic yeast *Candida glabrata*: Phylogenetic and expression analysis. **PLoS One.** 2018 Aug 28;13(8):e0202993. **Impact Factor: 3.20**
2. Pandey AK, Kumar M, **Kumari S**, Kumari P, Yusuf F, Jakeer S, Naz S, Chandna P, Bhatnagar I, Gaur NA. Evaluation of divergent yeast genera for fermentation-associated stresses and identification of a robust sugarcane distillery waste isolate *Saccharomyces cerevisiae* NGY10 for lignocellulosic ethanol production in SHF and SSF. **Biotechnology for biofuels.** 2019 Dec 1;12(1):40. **Impact Factor: 6.04**
3. **Kumari S**, Kumar M, Khandelwal NK, Pandey AK, Bhakt P, Kaur R, Prasad R, Gaur NA. A homologous overexpression system to study roles of drug transporters in *Candida glabrata*. **FEMS Yeast Research.** 2020 Jun 3. **Impact Factor: 2.79**
4. Shahi G, Kumar M, **Kumari S**, Rudramurthy SM, Chakrabarti A, Gaur NA, Singh A, Prasad R. A detailed lipidomic study of human pathogenic fungi *Candida auris*. **FEMS Yeast Research.** 2020 Aug 5. **Impact Factor: 2.79**
5. Kumar M, Pandey AK, **Kumari S**, Wani SA, Jakeer S, Tiwari R, Prasad R, Gaur NA. Secretome produced by a newly isolated *Aspergillus flavus* strain in engineered medium

shows synergy for biomass saccharification with a commercial cellulase. **Biomass Conversion and Biorefinery**. 2020 Aug 11:1-3. **Impact Factor: 4.9**

6. Galkina KV, Finkelberg JM, Markova OV, Azbarova AV, Banerjee A, **Kumari S**, Sokolov SS, Severin FF, Prasad R, Knorre DA. Protonophore FCCP provides fitness advantage to PDR-deficient yeast cells. **Journal of Bioenergetics and Biomembranes**. 2020 Aug 17:1-3. **Impact Factor: 2.74**

7. Kumar M, Singh A, **Kumari S**, Kumar P, Wasi M, Mondal AK, Rudramurthy SM, Chakrabarti A, Gaur NA, Gow NA. Sphingolipidomics of drug resistant *Candida auris* clinical isolates reveal distinct sphingolipid species signatures. **Biochimica et Biophysica Acta (BBA)-Molecular and Cell Biology of Lipids**. 2020 Sep 15:158815. **Impact Factor: 4.69**

8. **Kumari S**, Kumar M, Gaur NA and Prasad R, 2021. Multiple roles of ABC transporters in yeast. *Fungal Genetics and Biology*, 150, p.103550. **Impact Factor: 3.49**

9. Onchieku NM, **Kumari S**, Pandey R, Sharma V, Kumar M, Deshmukh A, Kaur I, Mohmmmed A, Gupta D, Kiboi D, Gaur N, Malhotra P. Artemisinin acts by inhibiting Plasmodium falciparum Ddi1, a retropepsin, resulting into the accumulation of ubiquitinated proteins. **bioRxiv**. 2021 Jan 1. (**Preprint**)

9. Onchieku NM, **Kumari S**, Pandey R, Sharma V, Kumar M, Deshmukh A, Kaur I, Mohmmmed A, Gupta D, Kiboi D, Gaur N. Artemisinin Binds and Inhibits the Activity of Plasmodium falciparum Ddi1, a Retroviral Aspartyl Protease. **Pathogens**. 2021 Nov;10(11):1465. **Impact Factor: 3.2**

10. Pandey AK, Kumar M, **Kumari S**, Gaur NA. Integration of acid pre-treated paddy straw hydrolysate to molasses as a diluent enhances ethanol production using a robust *Saccharomyces cerevisiae* NGY10 strain. **Renewable Energy**. 2022 Jan 18. **Impact Factor: 8.0**

11. **Kumari S**, Kumar M, Esquivel BD, Wasi M, Pandey AK, Kumar Khandelwal N, Mondal AK, White TC, Prasad R, Gaur NA. Unmasking of CgYor1-Dependent Azole Resistance Mediated by Target of Rapamycin (TOR) and Calcineurin Signaling in *Candida glabrata*. *mBio*. 2022 Jan 18;13(1):e03545-21. **Impact Factor: 7.8**

12. Shahi G, Kumar M, Khandelwal NK, Banerjee A, Sarkar P, **Kumari S**, Esquivel BD, Chauhan N, Chattopadhyay A, White TC, Gaur NA. Inositol Phosphoryl Transferase, Ipt1, Is a Critical Determinant of Azole Resistance and Virulence Phenotypes in *Candida glabrata*. **Journal of Fungi**. 2022 Jul;8(7):651. **Impact Factor: 5.7**

13. Guleria I, Kumari A, Lacaille-Dubois MA, Saini AK, Kumar V, Saini RV, Lal UR, Gaur NA, **Kumari S**, Seth A, Dhatwalia J. In-vitro antimicrobial, antioxidant, anti-inflammatory, and cytotoxic activities of *Populus ciliata* bark and leaves: A comparative study. **South African Journal of Botany**. 2022 Aug 1;148:238-50. **Impact Factor: 3.2**

#### **Patents:**

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1. **Kumari S**, Kumar M, Prasad R, Gaur NA. ABC transporters deficient pathogenic yeast strain, its overexpression system, for characterization of membrane transporters and a process for the same. Indian Patent. IPA No. 201911008033, LIPC ref. IPO294. 2020.

2. Guleria I, Kumari A, Saini AK, **Kumari S**, Gaur NA. An Antifungal composition comprising bark and leaves extract of Populus ciliate plant and method for preparing the same. Indian Patent. Patent filing No. 202011014386. 2020

**Poster Presented in Conferences:**

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1. ABC Transporter and sphingolipid's impact on bioethanol production in yeast (SYMTE 36th 2017)
2. Identification, inventory and phylogenetic analysis of ATP binding cassette (ABC) family in the human pathogen *Candida glabrata*. (Lipid meet 2016)
3. Impact of ABC Transporter and sphingolipids in inhibitor tolerant yeast for biofuel production (Yeast meeting 2018)
4. Tor signaling and calcineurin pathways contribute to Cgyor1 mediated azole resistance in *Candida glabrata* (Yeast meeting 2019)
5. CgYOR1 doesn't impart oligomycin susceptibility but mediates azole resistance via sphingolipid, calcineurin and TOR cascade in *Candida glabrata* (Lipid meet 2019)