

Proteomics and Functional Genomics

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During my time as a research officer at the Centre for Applied Molecular Biology (CAMB), I spent four years in the Biopharmaceutical lab, where I participated in the expression, purification, and yield improvement of human recombinant insulin at lab-scale level, as well as the development of purification methods and quality control assays of human recombinant Interferon. During my doctoral research at the Centre of Excellence in Molecular Biology (CEMB), University of the Punjab, I worked on the expression studies of herbal proteins to suppress PVY in potato.

Human ailments are treated by bioactive plant compounds, primarily secondary metabolites. Due to secondary metabolites' high cytotoxicity, restricted bioavailability, poor absorption, low quantity, and improper metabolism, researchers have turned to alternate biologically active molecules. Plant proteins are antibacterial, antioxidative, antiviral, anticancer, ribosome-inactivating, and neuromodulatory. Bowman-Birk protease inhibitor and Mistletoe Lectin-I are being studied for prostate and oral carcinoma, as well as malignant melanoma.

My research entails isolating and purifying native plant proteins and assessing their medicinal potential. Cloning and expression of proteins originating from plants and other organisms, as well as evaluation of their medicinal capability. Construct design and cloning of fusion recombinant protein. Fusion proteins have boosted drug development. Homogeneous recombinant fusion proteins make it easier to control receptor orientation and accessibility. Therefore, they can improve disease treatment. Drug synergy for therapeutic potential and evaluation of the medicinal potential of metal complexes and their interaction with DNA and protein are essential in pharmacology because they help to determine drug action mechanisms and designing of more efficient and specifically targeted drugs with lesser side effects.

M. Phil Students Supervised

1. Kashaf Saeed, *In silico* approach to identify Estrogen Receptor α antagonists from Natural products, 2018-2020
2. Shazia Rasheed, *In silico* Structure Prediction of MATH/TRAF Protein from *Brassica rapa*, 2018-2020
3. Huma Imtiaz, Combinational Studies of Erlotinib and Ascorbic Acid Against Hepatocellular Carcinoma, 2018-2020
4. Rubab Ameen, Comparative studies of the cytotoxic potential of plant lectins isolated from *Celosia cristata* and *Digera muricata*, 2017-2019

5. Zilwa Mumtaz, Periplasmic expression studies of MATH/TRAF gene from *Brassica rapa*, 2017-2019
6. Maham Khalid, Isolation and partial characterization of lectin from *Iberis umbellata*, 2017-2019
7. Hira Zahid, Evaluation of anti-viral potential of lectin from *Iberis umbellata*, 2017-2019
8. Sadia Nadeem Ch. Periplasmic expression of Jaclin-like lectin isolated from *Convovulus arvensis*, 2017-2019
9. Anam Ashraf Butt, Cytotoxic potential of RIP-like protein from *Momordica dioica*, 2017-2019
10. Zainab Akram, Isolation, purification and partial characterization of Lectin from *Atriplex hortensis*. 2016-2018
11. Saman Shahid, Cloning and expression studies of Thionin gene from *Brassica rapa*, 2016-2018
12. Fizza Hassan Kazmi, Cloning and expression of Traf like protein gene from *Brassica rapa*, 2016-2018
13. Aneeqa Sadaf, Cloning and expression studies of Thionin gene from *Brassica Oleraceae*, 2016-2018

Research Projects:

- ✓ **Principal Investigator, University of the Punjab, Lahore**

Assessment of the Cytotoxicity Potential of the Plant-derived Recombinant Therapeutic Protein.

- ✓ **Co-Principal Investigator, NRPU (HEC)**

Isolation and Biological Characterization of RIP (Ribosome Inactivating Protein)/-like protein from plant/s with multiple enzymatic activities. A future drug (June 2020-Present).

- ✓ **Principal Investigator, University of the Punjab, Lahore**

Improvement of Alpha Amylase Producing Strain/Strains Through Random Mutation.

Publications:

1. Ateeq, M., Adeel, M.M., Kanwal, A., Tahir ul Qamar, M., Saeed, A., Khaliq, B., Saeed, Q., Atiq, M.N., **Bilal, M.**, Alharbi, M. and Alshammari, A & Akrem, A. (2022). In Silico Analysis and Functional Characterization of Antimicrobial and Insecticidal Vicilin from Moth Bean (*Vigna aconitifolia* (Jacq.) Marechal) Seeds. *Molecules*, 27(10), 3251.
2. Javed, M., **Bilal, M.**, Tabassum, B., Malik, A., Adeyinka, O. S., Tariq, M., & Nasir, I. A. (2022). Purification and functional characterization of lectin from *Chenopodium album*. *Journal of Proteins and Proteomics*, 13(1), 55-62.

3. **Bilal, M.**, Bashir, H., Ameen, R., Sumrin, A., Hussain, M., & Manzoor, S. (2022). Anti HCV activity and expression inhibition of HCC markers by protein extract from *Iberis gibraltarica*. *Brazilian Journal of Biology*, 84.
4. Saleem, T., Sumrin, A., **Bilal, M.**, Bashir, H., & Khawar, M. B. (2022). Tumor-derived extracellular vesicles: Potential tool for cancer prognosis, diagnosis, and therapy. *Saudi Journal of Biological Sciences*.
5. Khaliq, B., Falke, S., Saeed, Q., **Bilal, M.**, Munawar, A., Ali, A., ... & Akrem, A. (2021). *Eruca sativa* seed napin structural insights and thorough functional characterization. *Scientific reports*, 11(1), 1-13.
6. **Bilal, M.**, Tabassum, B., Ali, Q., & Nasir, I. A. (2021). Down regulation of Potato Virus Y (PVY) Coat Protein (CP) expression by *Iberis gibraltarica* protein extract. *Cytology and Genetics*, 55(1), 80-86.
7. Yasin, U., **Bilal, M.**, Bashir, H., Amirzada, M. I., Sumrin, A., & Asad, M. H. B. (2020). Preparation and Nanoencapsulation of Lectin from *Lepidium sativum* on Chitosan-Tripolyphosphate Nanoparticle and Their Cytotoxicity against Hepatocellular Carcinoma Cells (HepG2). *BioMed Research International*, 2020.
8. **Bilal, M.**, Nasir, I. A., Tabassum, B., Akrem, A., Ahmad, A., & Ali, Q. (2020). Cytotoxicity and in-vitro antiviral activity of lectin from *crocus vernus* L. Against potato virus Y. *APPLIED ECOLOGY AND ENVIRONMENTAL RESEARCH*, 18(1), 1301-1315.
9. Ramzan, I., Chaudhry, A., Bashir, H., **Bilal, M.**, & Sumrin, A. (2019). Comparative study of alpha amylase producing mutated and unmutated bacillus strains by taking cost effective measures. *Pure and Applied Biology (PAB)*, 8 (2), 1789-1800.
10. **Bilal, M.**, Tabassum, B., Farooq, A. M., Tariq, M., Nasir, I. A., & Hussain, T. (2019). In-vitro Analysis of *Chenopodium murale* extract for resistance against potato virus Y. *Pure and Applied Biology (PAB)*, 8(2), 1172-1181.
11. Usman, Sana, Zara Naz, Komal Saleem, Hamid Bashir, **Muhammad Bilal**, and Aleena Sumrin. "The countermeasure for Zika virus: a hard nut to be cracked." *Future Virology* 13, no. 5 (2018): 361-369.
12. Naz, Zara, Sana Usman, Komal Saleem, Sara Ahmed, Hamid Bashir, **Muhammad Bilal**, and Aleena Sumrin. "Alpha-fetoprotein: A fabulous biomarker in hepatocellular, gastric and rectal cancer diagnosis." *Biomedical Research* 29, no. 12 (2018): 2478-2483.
13. Sumrin, A., Moazzam, S., Khan, A. A., Ramzan, I., Batool, Z., Kaleem, S., ... & **Bilal, M.** (2018). Exosomes as Biomarker of Cancer. *Brazilian Archives of Biology and Technology*, 61.
14. Shahzadi Javeed, Maha Almas, Muhammad Shahid, Aleena Sumrin, Hamid Bashir, **Muhammad Bilal**, Zafar Saleem, Ghulam Zahra Jahangir, Samia Afzal, Muhammad Idrees, Iram Amin: *Review Nrf2: A MASTER REGULATOR OF CELLULAR DEFENSE MECHANISM AND A NOVEL THERAPEUTIC FACTOR*. *Pakistan Journal of Biotechnology* 01/2017; 14(1):121-126
15. Khan, Khushbukhat, Muhammad Adeel Aslam, Fatima Tuz Zahra, Hamid Bashir, **Muhammad Bilal**, and Aleena Sumrin. "Potential biomarkers for the diagnosis of respiratory tract infection and lungs cancer." *Cell Mol Biol (Noisy le Grand)* 63, no. 11 (2017).
16. Wahid, Braira, Hamid Bashir, **Muhammad Bilal**, Khansa Wahid, and Aleena Sumrin. "Developing a deeper insight into reproductive biomarkers." *Clinical and experimental reproductive medicine* 44, no. 4 (2017): 159-170.

17. Javed Z, Ullah M, Ashfaq MA, Shah AH, Shahzad **M, Bilal** M, Sumrin A, Bashir H, Siddiqi MH, Sadia H (2016). Role of MicroRNA in Endometrial Carcinoma. *Adv. Life Sci.* 4(1): 08-13.
18. Kausar Malik*, Hamid Bashir, **Muhammad Bilal**, Husnain Qamar, Zaid Mehmood , In vitro evaluation of synergistic antimicrobial activity of *Trachyspermum ammi* and *Syzygium aromaticum*. *International Journal of Biosciences*, (2016) Vol. 9, No. 4, p. 221-228.
19. Wardah Safdar, Maria Aftab, Beenish Saddique, Irsa Akhtar, Hamid Bashir, **Muhammad Bilal**, Aleena Sumrin*, Methodological development of cytokine as a biomarker. *International Journal of Biosciences*, (2016) Vol. 9, No. 6, p. 55-65.
20. Khan, A., Tabassum, B., Nasir, I. A., **Bilal, M.**, Tariq, M., & Husnain, T. (2015). POTATO VIRUS X FROM PAKISTAN: COAT PROTEIN SEQUENCE ANALYSIS. *JAPS, Journal of Animal and Plant Sciences*, 25(4), 1016-1021.
21. **Bilal, M.**, Saeed, M., Nasir, I. A., Tabassum, B., Zameer, M., Khan, A., Tariq, M., Javed, M. A., & Husnain, T. (2015). Association mapping of cane weight and tillers per plant in sugarcane. *Biotechnology & Biotechnological Equipment*, 29(4), 1-7.
22. Tabassum, B., Sher, Z., Tariq, M., Khan, A., Shahid, N., **Bilal, M.**, Ramzan, M., Iqbal, M. S., Nasir, I. A., & Husnain, T. (2013). Overview of Acquired Virus Resistance in Transgenic Plants. *Experimental Agriculture & Horticulture*. 2(2), 12-28.
23. Khan, S., Attaullah, S., Ayaz, S., Khan, S. N., Shams, S., Ali, I., **Bilal, M.**, & Siraj, S. (2011). Molecular Epidemiology of HCV among the health care workers of Khyber Pakhtunkhwa. *Virology J*, 8(1), 105.
24. Iqbal, M. S., Shad, M. A., Ashraf, M. W., **Bilal, M.**, & Saeed, M. (2006). Development and validation of an HPLC method for the determination of dexamethasone, dexamethasone sodium phosphate and chloramphenicol in presence of each other in pharmaceutical preparations. *Chromatographia*, 64(3-4), 219-222.