Muhammad Tayyab Akhtar

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Key Qualifications:

- **PhD in Biosciences and Biotechnology**
- **15 years of research experience** in phytochemistry and plant-based natural products
- **7 years of teaching experience** at the university level
- **Author/co-author of over 50 peer-reviewed articles**
- **Supervised 18 PhD and M.Phil. students**, along with 30 B.Sc. (Hons.) students
- **Secured 6 competitive research grants**, including national and international funding
- **Facilitator of national and international conferences, seminars, and symposiums**
- **Developed metabolomics and zebrafish bioassay labs** at University Putra Malaysia (UPM)
- **Focal person for innovation and commercialization** initiatives
- **Designed advanced academic and research programs**, contributing to institutional growth
- **Member of the Board of Studies** at various universities
- **Reviewer of scientific journals** and **advisor for GCU Lahore Magazine**
- **Established national and international research collaborations** with top-tier academic and scientific institutions

Education:

PhD: Biosciences and Biotechnology (May 2013)
Leiden University, The Netherlands

MPhil: Biotechnology (April 2008)
Quaid-i-Azam University, Pakistan

BSc (Hons): Agriculture (August 2005)
University of Agriculture Faisalabad, Pakistan.

Work Experience

Assistant Professor: March, 2018 – Present.

Institute of Industrial Biotechnology, Government College University Lahore, Pakistan

- Collection, processing, extraction and isolation of cannabinoids from *Cannabis* plant samples collected from different regions of Pakistan.
- Applied NMR-based "Metabolomic" approach to differentiate and identify best *Cannabis* plant varieties from *Cannabis* cultivated regions of Pakistan.
- Used "Metabolomic" platform to detect food adulteration and to understand plant responses towards environmental and genetic changes.

- Qualitative and quantitative analysis of phytochemicals and their derivatives by using LC-MS, GC-MS and NMR.
- Prepared medicinal plants extracts and tested for different pharmacological activities.
- Supervised B.Sc. (Hons), M. Phil. and Ph.D. students in research work.
- Designed and taught various courses related to Chemistry and Biotechnology
- Participated in national/international seminars.
- Focal person to Innovation and Commercialization.
- Member Board of Studies of Department of Biotechnology, University of Okara, Pakistan.
- Member purchase committee.
- Undergraduate Lab‟s incharge.
- Developed research collaborations with local and international research groups.
- Advisor of Scientific Ravi (University Magazine)

Postdoc Researcher: April, 2014 – February, 2018.
Natural Products Laboratory, Institute of Bioscience, University Putra Malaysia.

- Extraction and isolation of bioactive chemical constituents from medicinally important plants.
- Metabolite profiling of various plant extracts and animal biofluids.
- Developed analytical methods and application of metabolomics platform to determine metabolites in clinical samples e.g. urine,blood and tissues.
- Performed biological activities of medicinal plants particularly of Southeast Asian origin e.g. anti-diabetic, anti-neurodegenerative and anti-cancer etc.
- Performed "Metabolomic" analyses to identify chemical markers in various plant species for quality control.
- Designed and built zebrafish bioassay lab.
- Developed zebrafish-based animal model for screening of medicinal plants for their therapeutic potential.
- Supervised and trained M. Phil. and Ph.D. students including number of junior scientists.
- Contributed in writing and winning 4 competitive research grants.
- Organized and attended several national and international conferences and seminars.

PhD Scholar: November, 2008 – May, 2013.
Laboratory of Natural Products, Institute of Biology, Leiden University, Netherlands.

- Processing of *Cannabis* plant samples received from Bedrocan BV.
- Extraction and isolation of cannabinoids by using column chromatography and centrifugal partition chromatography (CPC).
- Biotransformation of cannabinoids through microorganisms and plant cell cultures to have medicinally important new potent derivatives.
- Performed qualitative and quantitative analysis of cannabinoids and identified their transformed derivatives by using LC-MS and NMR.
- Developed zebrafish-based animal model to study behavioral effects of cannabinoids agonists and antagonists.

- Applied "Metabolomic" approach to study the metabolic effects of carrier solvents and cannabinoids on zebrafish embryo.
- Responsible for maintenance of analytical laboratory equipment"s e.g. HPLC and LC-MS
- Collaborated with fellow scientists to develop new methods for analyses of cannabinoids.
- Attended international conferences to share outcome of Ph.D. research work and new developments in the field of *Cannabis* industry.
- Documented research outcomes in the form of Ph.D. thesis and published scientific data in well reputed international journals.

Research Interests:

- Agricultural sustainability to ensure food security, environmental health, and economic viability.
- Plant responses to environmental and genetic changes.
- Role of plant-derived signals in shaping the rhizosphere microbiome.
- NMR- and LCMS-based metabolomics (from agriculture and health perspectives).
- Chemical modifications and biotransformation of natural products through microorganisms and plant cell cultures.
- Study of bioactive natural products and structure-activity-relationships (SAR).
- Isolation, structure elucidation, chemistry, and pharmacology of biologically active natural products from medicinally important plants.
- Standardization and quality control of plant-based products (e.g. herbs, herbal products, functional food, and phytomedicinal preparations).
- Comprehensive metabolite profiling, dereplication and molecular networks.
- Sustainability research on natural products and traditional medicines in global health care.
- Drug discovery and drug metabolism

Technical Skills:

- Compound extraction and isolation (Column chromatography, Centrifugal partition chromatography, Preparative HPLC)
- Qualitative and quantitative analyses of primary and secondary metabolites (HPLC, LC-MS, NMR)
- Structure elucidation (NMR, LC-MS)
- Metabolomics (NMR, LC-MS)
- In situ hybridization, qPCR
- Zebrafish husbandry and behavior analysis
- Microscopy and microinjections
- In vitro and in vivo bioassays

Computer Skills:

Well conversant with computer applications like Umetrics (Simca and Modde), MestReNova, Chenomx NMR, Topspin, Xcalibur, Microsoft Office, Internet Applications, Graph pad Prism, Corel draw, Chem office, etc.

Publications:

1. Rashidi H, **Akhtar MT**, Kooy FDR, Verpoorte R, Duetz. WA. Hydroxylation and further oxidation of Δ^9-tetrahydrocannabinol by alkane-degrading bacteria. **Applied Environmental Microbiology, 2009. 75: 7135–7141. IF = 3.9**

2. **Akhtar MT**, Ali S, Rashidi H, Van der Kooy F, Verpoorte R, Richardson MK. Developmental effects of cannabinoids on zebrafish larvae. **Journal of Zebrafish, 2013. 10: 283- 93. IF = 1.4**

3. **Muhammad T. Akhtar**, Khozirah Shaari, Robert Verpoorte. Biotransformation of Tetrahydrocannabinol. **Phytochemistry review, 2016. 15: 921-934. IF = 7.3**

4. **Muhammad T. Akhtar**, Mian Yahya Mushtaq, Robert Verpoorte, Michael K. Richardson and Young Hae Choi. Zebrafish as a model for systems medicine R&D: Rethinking the metabolic effects of carrier solvents and culture buffers determined by 1H NMR metabolomics. **OMICS: A Journal of Integrative Biology, 2016. 20: 42-52. IF = 2.2**

5. **Muhammad T. Akhtar**, Mian Yahya Mushtaq, Robert Verpoorte, Michael K. Richardsonand Young Hae Choi. Metabolic effects of cannabinoids in zebrafish (Danio rerio) embryo determined by 1H NMR metabolomics. **Journal of Metabolomics, 2016. 12: 1-11. IF = 3.5**

6. **Muhammad T. Akhtar**, Natali Rianika Mustafa, Robert Verpoorte. 2016. Hydroxylation and glycosylation of Δ9-tetrahydrocannabinol by Catharanthus roseus cell suspension culture. **Biocatalysis and Biotransformation, 2015. 33: 279-286. IF = 1.4**

7. Adegoke Damilola Samuel, Khozirah Shaari, Nur Kartinee Kassim, Yaya Rukayadi and **Muhammad Tayyab Akhtar.** Bioassay-guided isolation of anticandidal constituents from the stem and bark woods of Albizia myriophylla Benth. **Medicinal Plants – International journal of phytomedicines and related industries, 2015. 7: 284-291.**

8. Ramesh Kumar Santhanam, Syahida Ahmad, Faridah Abas, Intan Safinar Ismail1, Yaya Rukayadi1, **Muhammad Tayyab Akhtar** and Khozirah Shaari. 2016. Bioactive constituents of Zanthoxylum rhetsa bark and its cytotoxic potential against B16-F10 melanoma cancer and normal HDF (human dermal fibroblasts) cell lines. Journal of Functional Foods**. Molecules, 2016. 21: 652. IF = 4.2**

9. **Akhtar MT**, Ali S, Verpoorte R, Richardson MK. 2012. Behavioral effects of cannabinoids on zebrafish larvae. **Planta Medica 78 - PD123. IF = 2.1**

10. **Muhammad T. Akhtar,** Mohamad S. Bin Mohd Sarib, Intan S. Ismail, Faridah Abas, Khozirah Shaari. Anti-Diabetic Activity and Metabolic Changes Induced by *Andrographis paniculata* Plant Extract in Obese Diabetic Rats. **Molecules 2016. 2: 1026. IF= 4.2**

11. Ramesh Kumar Santhanam, **Muhammad Tayyab Akhtar** Syahida Ahmad, Faridah Abas, Intan Safinar Ismail1, Yaya Rukayadi1, and Khozirah Shaari. Utilization of ethyl acetate fraction of Zanthoxylum rhetsa bark extract as an active ingredient in natural sunscreen

formlations. **Industrial Crops and Products, 2017. 96: 165-172. IF = 5.6**

12. Muhammad Waseem Mumtaz, Azizah Abdul Hamid, Umer Rashid, **Muhammad TayyabAkhtar**, Zahoor Ahmad. An overview of recent developments in metabolomics and proteomic for phytotherapic research. **Frontiers in Life Science, 2017. 10: 137. IF = 2**

13. Muhammad Fraz Hussain, Hye Kyong Kim, Huub J.M. Linthorst, **Muhammad TayyabAkhtar**. Overexpression of ATWRKY50 correlated with enhanced production of sinapicderivatives in *Arabidopsis*. **Metabolomics 14 (3), 25** . **IF = 3.5**

14. Siti Nazirah, **Muhammad Tayyab Akhtar**, Maula Diani, Khozirah Shaari. Discriminative analysis of different grades of Gaharu (Aquilaria malaccensis Lmak.) H-NMR based metabolomics using PLS-DA and random forests classification models. **Molecules 2017 22(10), 1612**. **IF = 4.2**

15. Ramesh Kumar Santhanam, **Muhammad Tayyab Akhtar**, Faridah Abas, Intan Safinar Ismail1, and Khozirah Shaari. Inhibition of UVB-induced pro-inflammatory cytokines and MMP expresiion by Zanthoxylum rhetsa bark extract and its active constituent hesperidin. (**Phytotherapy research 2018, https://doi.org/10.1002/ptr.6092**). **IF = 6.1**

16. **Muhammad Tayyab Akhtar**, Siti Nazirah and Khozirah Shaari. **Rambutan (*Nephelium Lappaceum L.*).** Fruit and Vegetable Phytochemicals: Chemistry and Human Health, Second Edition. Edited by Elhadi M. Yahia. © 2017 John Wiley & Sons, Ltd. Published 2017 byJohn Wiley & Sons, Ltd.

17. Muhammad Waseem Mumtaz, Mizher Hezam AL-Zuaidy, **Muhammad Tayyab Akhtar**, Ahmed Adnan, Waseem Razaq, Azizah Abdul Hamid. Metabolite profilling and inhibitory properties of leaf extracts of *Ficus benjamina* towards α-glucosidase and α-amylase enzymes.**International Journal of Food properties, 2018 21(1), 1560-1574. IF = 3.9**

18. James William, Peter John, Muhammad Waseem Mumtaz, Ayoub Rashid Ch, Ahmad Adnan, Hamid Mukhtar, Shahzad Sharif, Syed Ali Raza, **Muhammad Tayyab Akhtar**, Azizah Abdul Hamid. Antioxidant activity, α-glucosidase inhibition and phytochemical profilling for *Hyophorbe lagenicaulis* leaf extracts. **Peer J, 2019, Vol 7, e7022. IF = 2.7**

19. Wan Nadilah-Ahmad, **Muhammad Tayyab Akhtar**, Khozirah Shaari, Alfi Khatib, Azizah Abdul Hamid, Muhajir Hamid. Variation in metabolites and α-glucosidase inhibitory activity of *Cosmos caudatus* at different growth stages. **BMC Complementary and Alternative Medicine, 2019, 19(1), 245. IF = 3.6**

20. Umer Farooq , Muhammad Waseem Mumtaz , Umer Rashid, **Muhammad Tayyab Akhtar**, Syed Ali Raza , Muhammad Nadeem, Hamid Mukhtar. UHPLC-QTOF-MS/MS based phytochemical characterization and anti-hyperglycemic prospective of hydro-ethanolic leaf extract of Butea monosperma. **Scientific Reports, 2020 10: 3530. IF = 3.8**

21. Zain Ul Aabideen, Muhammad Waseem Mumtaz, **Muhammad Tayyab Akhtar**, Hamid Mukhtar, Syed Ali Raza, Tooba Touqeer, Nazamid Saari. Anti-Obesity Attributes;

UHPLC-QTOF-MS/MS-Based Metabolite Profiling and Molecular Docking Insights of Taraxacum officinale. **Molecules**, 2020, 25: 4935. **IF = 4.2**

22. Syed Ali Raza, Ayoub Rashid Chaudhary, Muhammad Waseem Mumtaz, Ahmad Adnan, Hamid Mukhtar, Muhammad Tayyab Akhtar. 2020. Metabolite profiling and anti-diabetic attributes of ultrasonicated leaf extracts of Conocarpus lancifolius. **Asian Pacific Journal ofTropical Biomedicine**, 2020, 10(8), 353. **IF = 1.9**

23. Bisma Mudaser, Muhammad Waseem Mumtaz, **Muhammad Tayyab Akhtar**, Hamid Mukhtar, Syed Ali Raza, Anam Amin Shami, Tooba Touqeer**.** Response surface methodology-based extraction optimization to improve pharmacological properties and ^{1}H- NMR based metabolite profiling of *Azadirachta indica*. **Phytomedicine Plus**, 2021, 100025.

24. AA Behan, **MT Akhtar**, TC Loh, S Fakurazi, U Kaka. Meat Quality, Fatty Acid Content and NMR Metabolic Profile of Dorper Sheep Supplemented with Bypass Fats. **Foods, 2021,** 10: 1133. **IF = 4.7**

25. F Zakaria, **MT Akhtar**, WN Wan Ibrahim, N Abu Bakar. Perturbations in Amino Acid Metabolism in Reserpine-Treated Zebrafish Brain Detected by ^{1}H Nuclear Magnetic Resonance-Based Metabolomics. **Zebrafish,** 2021, 18: 42-54. IF = **1.4**

26. T Ahmad, A Ismail, SA Ahmad, K Abdul Khalil, EA Awad, **MT Akhtar**. Recovery of Gelatin from Bovine Skin with the Aid of Pepsin and Its Effects on the Characteristics of theExtracted Gelatin. **Polymers,** 2021, 13: 1554. **IF = 4.7**

27. Khaled Bashir Abdusalam, Lee Soo Yee,Ahmed Mediani, **Muhammad Tayyab Akhtar**, Nawal Buzgaia,Yaya Rukayadi,Intan Safinar Ismail and Khozirah Shaari. 1H-NMR based metabolomics profiling of Syzygium grande and Oenanthe javanica and relationship between their metabolites composition and antimicrobial activities. **Records of Natural Products, http://doi.org/10.25135/rnp.258.21.01.1927**. **IF = 1.7**

28. Zain -ul- Aabedin, Muhammad Waseem Mumtaz, **Muhamad Tayyab Akhtar**, Muhammad Asam Raza, Hamid Mukhtar, Ahmad Irfan, Syed Ali Raza, Tooba Touqeer.Cassia fistula leaves; UHPLC-QTOF-MS/MS based metabolite profiling and molecular docking insights to explore bioactives role towards inhibition of pancreatic lipase. ***Plants,*** 2021, *10*(7), 1334. **IF = 4.0**

29. **Muhammad Tayyab Akhtar ***, Muneeba Samar, Anam Amin Shami, Muhammad Waseem Mumtaz, Hamid Mukhtar, Amna Tahir, Syed Shahzad-ul- Hussan, Safee Ullah Chaudhary, Ubedullah Kaka. .1H-NMR-based metabolomics: an integrated approach for the detection of the adulteration in chicken, mutton, beef and donkey meat. ***Molecules,*** 2021, *26*(15), 4643. IF = **4.2**

30. Muhammad Afiq Ngadni, **Muhammad Tayyab Akhtar**, Intan Safinar Ismail, Anis Irfan Norazhar, Soo Yee Lee, Maulidiani Maulidiani, Khozirah Shaari *. Clitorienolactones and isoflavonoids of Clitorea ternatea roots alleviate stress-like symptoms in reserpine-induced zebrafish model. ***Molecules***, 2021, 26(14), 4137. **IF = 4.2**

31. Syed Ali Raza, Ayoub Rashid, Muhammad waseem Mumtaz, Sadia Bashir, Maqsood Ahmed, Tooba Tauqeer, Hamid Mukhtar, **Muhammad Tayyab Akhtar**, Ajed Ali and James William. Metabolites in Conocarpus erectus leaves attenuate α-amylase activity by modulating amino acid residues α-amylase: an in vitro and docking study. **Blacpma, 2021, 21(3): 352-364. IF = 0.87**

32. Zain Ul Aabideen, Muhammad Waseem Mumtaz, **Muhammad Tayyab Akhtar**, Muhammad Asam Raza, Hamid Mukhtar, Ahmad Irfan[3], Syed Ali Raza, Muhammad Nadeem, Yee Soon Ling. Anti-obesity effect and UHPLC-QTOF-MS/MS-based metabolites profiling of Solanum nigrum leaf extract. **Asian Pacific Journal of Tropical Biomedicine, 2022, 4(12): 164-174. IF = 1.9**

33. Zain -ul- Aabedin, Muhammad Waseem Mumtaz, **Muhamad Tayyab Akhtar.** In vitro antioxidant and lipoprotein lipase inhibitory properties of freeze drying assisted ultrasonicated extracts of Solanum nigrum. **Biologia (Lahore)**, 2021, 67 (1).

34. Qaiser Farid Khan, Sidra Anum, Hafiz Arbab Sakandar, Muhammad Farhan, **Muhammad Tayyab Akhtar**, Muhammad Afzal, Hamid Majeed. Occurrence of microplastic pollution in marine water. **Emerging contaminants and associated treatment technologies**. Pg Vol 1st. pp 257-274. Published by **Springer Cham**.

35. Khozirah Shaari, Muhammad Jahangir, Anam Amin Shami, Muhammad Tayyab Akhtar. Analytical platforms and methodologies in herbal metabolomics. **Evidence-Based Validation of Herbal Medicine. pp 587-602. Published by** Elsvier**.**

36. Anam Amin Shami, **Muhammad Tayyab Akhtar**, Muhammad Waseem Mumtaz, Hamid Mukhtar, Amna Tahir, Syed Shahzad-ul-Hussan, Safee Ullah Chaudhary. NMR based metabolomics: a new paradigm to unravel defense related metabolites in insect resistant cotton variety through different multivariate data analysis approaches. **Molecules, 2023. 28: 1763. IF = 4.2**

37. Fatima Akram, Hafiza Marium Waheed, Fatima Iftikhar Shah, Ikram ul Haq, Narmeen Nasir, **Muhammad Tayyab Akhtar**, Umar Farooq Gohar. Burgeoning therapeutic strategies to curb the contemporary surging viral infections. **Microbial Pathogenesis, 2023, 179, pp 106088. IF = 3.3**

38. Fauziahanim Zakaria, **Muhammad Tayyab Akhtar**, Wan Ibrahim Wan Norhamidah, Abu Bakar Noraini, Azira Muhamad, Shamarina Shohaimi, Hafandi Ahmad, Intan Safinar Ismail, Nor Hadiani Ismail, Khozirah Shaari. Centella asiatica (L.) Urb. Extract ameliorates branched-chain amino acid (BCAA) metabolism in acute reserpine-induced stress zebrafish model via 1H Nuclear Magnetic Resonance. **Comparative Biochemistry and Physiology Part C: Toxicology & Pharmacology, 2023. 264: 109501. IF = 3.9**

39. Anam Amin Shami, Tasbeeha Marjan, Syed Ali Raza, Hamid Mukhtar, Muhammad Waseem Mumtaz, Neelam Chaudhary, **Muhammad Tayyab Akhtar**. Evaluating the antimicrobial activity, antioxidant potential, and GC-MS based chemical characterization of cannabis sativa found in Pakistan. **Herba Polonica, 2023. 69: 1-11. IF = 0.78**

40. Hamid Mukhtar, Iram Hina, Bushra Muneer, Umar Farooq Gohar, **Muhammad Tayyab Akhtar**. Kinetics of the biosorptive removal of chromium from water using mycelial biomass of *Aspergillus oryzae*. **Bioremediation journal, 2024**. **28: 99-109. IF = 1.9**

41. Nadia Noreen Akhter, Muhammad Waseem Mumtaz, **Muhammad Tayyab Akhtar.** Dodonaea viscosa; Enzyme Inhibitory Potential Towards Obesity/Diabetes Management and UHPLC-QTOF-MS/MS Based Metabolite Profiling. **Iranian Journal of Chemistry and Chemical Engineering, 2024. 43: 2500-2517. IF = 1.0**

42. Fatima Akram, Amna Murrawat Ali, Muhammad Tayyab Akhtar, Taseer Fatima, Ifrah Shabbir, Ikram ul Haq. The journey of antibody-drug conjugates for revolutionizing cancer therapy: A review. **Bioorganic and Medicinal Chemistry, 2024. Online 21 November 2024, 118010. IF = 3.3**

43. Muhammad Akram, **Muhammad Tayyab Akhtar**, Fatima Akram, Umar Farooq Gohar. Mentha. Essentials of Medicinal and Aromatic Crops. **Springer International Publishing, 2023, pp 33-52**.

44. Qaiser Farid Khan, Mehvish Shabir, Gul Zareen Ghafoor, Faiza Sharif, Muhammad Khurshid, Rizwan Rasheed, Hafiz Arbab Sakandar, Naba Azhar, Umar Hayyat, **Muhammad Tayyab Akhtar,** Muhammad Afzaal, Mohsin Gulzar Barq. Biodegradation of POPs in Contaminated Land/Water. Contaminated Land and Water: Remediation and Management. **Springer International Publishing, 2024. pp 101-118.**

45. Haseeb Ashraf, Muhammad Waseem Mumtaz, Hamid Jamil, Hamid Mukhtar, Waheed Miran, **Muhammad Tayyab Akhtar**, Faisal Wali. A $CoFe_2O_4/Nb_2C$-MXene-Modified Anode Improved the Performance Characteristics of a Microbial Fuel Cell in Terms of Bioelectricity Generation and Water Treatment. **Catalysts, 2024. 14: 862. IF= 3.8**

46. Muhammad Tayyab Akhtar and Khozirah Shaari. A review on phytochemistry and pharmacology of Gynura procumbens. **(Submitted to journal of Herbal Medicine). manuscript number 5624149.**

Research grants:

Assisted in preparation and achieving research grants.

- **Title:** Elucidating the anti-depressive effects of *Centella asiatica* and *Nigella sativa* on reserpine-induce depression-like zebrafish model via multi-platform metabolomics approach. Malaysia Toray Science Foundation (MTSF).

- **Title:** Elucidating the anti-neuroinflammatory effect of *Clinacanthus nutans* on LPS induced neurotoxicity in BV2 cells and rat. Niche Research Grant Scheme (NRGS).

- **Title:** Evaluating the effect of Pegaga standardized extract (beca) on zebrafish and rat models of depression. Fundamental Research Grant Scheme (FRGS).

- **Title:** Transcriptomics, metabolomics, and mutagenesis of *Stevia rebaudiana* (Bertoni) PC1 variety: towards the development of new stevia varieties suitable for cultivation in

Malaysia. (Putra Grant)

- **Title:** Algal „OMICS" for sustainable aquaculture health. (FRGS)

- **Title:** Phytochemical analysis of *cannabis* varieties available in Pakistan (HEC/NRPU)

Conferences/seminars and training courses:

Presentation: titled "Acute and Chronic effects of Cannabinoids on the behaviour of zebrafish embryos" in September 2011 at Bonn, Germany.

Presentation: titled "Metabolic effects of cannabinoids in zebrafish (Danio rerio) embryos determined by ^{1}H NMR metabolomics" in July 2012 at New York, USA.

Participant in 3 days hands on workshop "creating values out of your data: Uncover multivariate data analysis and design of experiments". Wisma Research and Development, Universiti Malaya, 1-3 December, 2014.

Speaker cum Facilitator "Workshop on basic introduction to metabolomics" conducted by Laboratory of Natural Products, Institute of Bioscience, Universiti Putra Malaysia. 27th – 28th of May, 2015.

Panel examiner for the student seminar SPS 5903 & SPS 6903, Institute of Bioscience, Universiti Putra Malaysia on 10th of June, 2015.
Oral presentation in seminar "Global summit on herbals and natural remedies" organised by OMICS group, at Chicago, USA. 26th-27th of October, 2015.

Participant in 2 days hands on workshop "JAI Recycling Preparative HPLC training". LSS Lab Science Solution Malaya, 1st to 2nd of October, 2015.

Participant in 2 days workshop "Malaysia Zebrafish Disease Model" Sime Darby Medical Center, Subang, Malaysia. 11th to 12th of November, 2015.

Participant in 1 week hands on workshop "IBRO-APRC Associate school of Neuroscience 2016" Faculty of Pharmacy, University Technology MARA Selangor. 8th-14th August 2016.

Participant in 2 days "Regional Workshop On Zebrafish As Research Tool 2016" Human Molecular and Cellular Biology Research Cluster (iMOLEC) and Department of Biomedical Science, KAHS. 12th-13th October, 2016.

Participant in 3 days "Workshop on Metabolomics: GCMS 2016" Laboratory of Natural Products, Institute of Bioscience, University Putra Malaysia. 22-24 November, 2016.

Speaker cum Facilitator "Workshop on Metabolomics: Applying LC-MS and NMR based Metabolomics Approaches in Natural Products Research" conducted by Laboratory of Natural Products, Institute of Bioscience, Universiti Putra Malaysia. 7th – 11th of August, 2017.

Participant in 2 days seminar on "Metabolomics Approaches in Medicinal Plant Research" University Technology MARA Selangor. 14-15 August, 2017.

Participated in "Virtual organic and medicinal chemistry symposium 2020". 12th of September 2020.

Participated in "Natural Product Research: Trends and Technicalities". Virtual International Webinar. 29th of October 2020.

PSHS International Horticulture Conference. February 26-28, 2020

Natural Product Research: Trends and Technicalities. Virtual International Webinar 29th of October 2020.

Virtual organic and medicinal chemistry symposium 2020. September 12, 2020.

International Webinar "COVID-19: Biochemical Perspectives and Preventive Measures" held on Zoom. January 27 & 28, 2021.

International Webinar "Biocompatible Nanomaterials: Applications, Trends and Technicalities". February 25, 2021.

International Webinar "Call to action: comprehensive pesticide testing required to ensure safe cannabis and cannabinoids products". March 18, 2021

International Webinar on "Prospects and challenges of organic agriculture". July 13, 2021.

Innovative trends in science, technology, engineering, mathematics (STEM) and IT November 25, 2021.

Plantae Webinar: Plant cell focus issue on cell biology. January 25, 2022.

Conference on Sustainable Development Goals. March 29, 2022.

8th international and 17th national conference on "Advances in plant science in the era of climate change". October 26-28, 2022.

4th international conference on emerging trends in bioinformatics and bioscience 15-17 September 2022.

Training on Immuno-informatics. November 01, 2022.

Referees:

1. **Prof. Dr. Robert Verpoorte**
   Institute of Biology, Natural Products Laboratory, Leiden University, The Netherlands.
   Email: verpoort@chem.leidenuniv.nl.

2. **Dr. Young Hae Choi**
   Natural Products Laboratory, Leiden University, The Netherlands**.**
   Email: y.choi@chem.leidenuniv.nl.

3. **Prof. Dr. Michael K. Richardson**
   Integrative Zoology, Institute of Biology, Leiden University, The Netherlands.
   Email: m.k.richardson@biology.leidenuniv.nl

4. **Prof. Dr. Khozirah Shaari**
   Institute of Bioscience, Laboratory of Natural Products, University of Putra Malaysia.
   Email: khozirah@yahoo.com.my