

## **Dr. SUMBAL SABA**

**Assistant Professor of Organic Chemistry (Permanent)**

Federal University of Goiás (UFG)

Câmpus Samambaia - Goiânia, Brazil

**Secretary of OWSD National Chapter, Brazil**



**Current Address:** Instituto de Química – IQ, Universidade Federal de Goiás - UFG  
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### **Objective:**

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I am enthusiastic organic chemist, working in the field of sustainable organic synthesis. Besides, I advocate science, female education, and protection of environment.

### **Education:**

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**1. Associate Researcher (Post-Doc)**

**Session =** October 2017- September 2019, *Federal University of Santa Catarina (Brazil)*

**Field of specialization =** Synthetic Organic Chemistry (Photochemistry/ Green Chemistry/ Organochalcogen Chemistry)

**2. Associate Researcher (Post-Doc)**

**Session =** April 2016 - August 2016, *Federal University of Santa Maria (Brazil)*

**Field of specialization =** Synthetic Organic Chemistry (Organoselenium Chemistry)

**3. Post-Graduation (PhD)**

**Session=** 2012-2016, *Federal University of Santa Catarina (Brazil)*

**Field of specialization =** Organic Chemistry (Synthetic Chemistry/ Green Chemistry)

**Scholarship =** TWAS-CNPq PhD Fellowship

**Thesis Title:** Synthesis of unsymmetrical diorganyl chalcogenides by using arylboronic acids or C(sp<sup>2</sup>)-H bond functionalization of arenes under greener conditions

**4. Post-Graduation (M.Phil.) Course Work**

**3.9 / 4.0 (CGPA), Session =** 2009-2011, *H.E.J., Karachi University (Pakistan)*

**Subject =** Chemistry

**Field of specialization =** Organic Chemistry (course work)

**5. Professional Qualification(B.Ed.)**

**71.27 %,** **Session=** 2008-2009, *University of Peshawar (Pakistan)*

= Bachelor of Education and Teaching Practice

6. **Post-Graduation (M.Sc.)**

Session = 2006-2008, University of Peshawar (Pakistan)  
Subject = Chemistry  
Field of specialization = Organic Chemistry + Research  
Thesis Title: Synthesis of 2-aminobenzohydrazide based aza heterocyclic compounds

7. **Graduation (B.Sc.)**

Session= 2004-2006, University of Peshawar (Pakistan)  
Course = Biological Sciences (Chemistry, Botany, Zoology)

8. **Pre Graduation (HSSC / F.Sc.)**

Session= 2001-2003, B.I.S.E. Peshawar (Pakistan)  
Subject= Pre-medical (Chemistry, Biology, Physics)

9. **SSC**

Session= 1999-2001, B.I.S.E. Peshawar (Pakistan)  
Subject = Science (Chemistry, Biology, Physics, Mathematics)

***Field of Specialization:***

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Chemistry; Organic Chemistry; Synthetic Organic Chemistry; Catalysis;  
Homogeneous and Heterogeneous; Green Chemistry; Photochemistry;  
Electrochemistry; Medicinal Chemistry

***Employment:***

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- **Assistant professor of Organic Chemistry**, Institute of Chemistry – IQ, Federal University of Goiás (UFG), Câmpus Samambaia - Goiânia, Brazil. December 2020 to Present.
- **Assistant professor of Organic Chemistry (visiting)**, Center for Natural and Human Sciences – CCNH, Federal University of ABC (UFABC), Sao Paulo, Brazil. September 2019 to December 2020.
- **Lecturer of Chemistry**, Experimental Organic Chemistry I, QMC5232 (2018-1) at Federal University of Santa Catarina (UFSC), Florianópolis, Brazil, March 2018, to July 2018.
- **Assistant Professor of Organic Chemistry**, Department of Chemistry, Shaheed Benazir Bhutto Women University, Larama, Peshawar, Pakistan, June 2016, to September 2017.
- **Lecturer of Chemistry**, Experimental Organic Chemistry I, QMC 5230 at Federal University of Santa Catarina (UFSC), Florianópolis, Brazil, August 2015, to December 2015.

- **Lecturer of Chemistry**, Experimental Organic Chemistry I, QMC 5230 at Federal University of Santa Catarina (UFSC), Florianópolis, Brazil, March 2014, to July 2014.
- **Lecturer of Chemistry**, Theoretical Organic Chemistry, QMC 5222 at Federal University of Santa Catarina (UFSC), Florianópolis, Brazil, August 2013, to December 2013.
- **Research Fellow**, (National internship Program) at Hussain Ebrahim Jamal Research Institute of Chemistry (HEJ) Research Institute of Chemistry, ICCBS, University of Karachi, Karachi, Pakistan, Feb 2010 to Feb 2011.
- **Junior Research Fellow** at HEJ Research Institute of Chemistry, ICCBS, University of Karachi, Karachi, Pakistan, 2009 to 2011.
- **Lecturer of Chemistry**, National College of Science and Business Management, Peshawar, December 2008, to March 2009.

### ***Mini-Courses Delivered:***

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- Delivered Mini-course on the topic entitled “**Introduction to Photochemistry applied in Organic Synthesis**” in the 7<sup>th</sup> Week of Post-graduation, Department of Chemistry, Federal University of Santa Catarina, UFSC, Brazil, 29-31 October 2018.

### ***Administrative Duties:***

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#### **Empowerment of Women in Science**

- Secretary of OWSD National Chapter Brazil, 2020 – present.

### ***Awards and Scholarships:***

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- **AAAS-TWAS Course** on Science Diplomacy, the World Academy of Sciences (TWAS), (2020). virtual
- Secretary (Executive Committee) of **Organization for Women in Science for the Developing World** (OWSD), Chapter-Brazil.
- One of the two selected candidates from Brazil for attending fully funded “**ACS Summer School on Green Chemistry & Sustainable Energy**”, Colorado School of Mines Golden, Colorado, (2019).
- **Research Productivity Award 2017-2018**, Pakistan Council for Science and Technology (PCST), (2018).
- **Pakistan Productive Scientists Award**, Pakistan Council for Science and Technology (PCST), (2018).
- **Postdoctoral Researcher**, PNPD-CAPES, Brazil (October 2017-September 2019).

- Selected as “**HEC Approved PhD Supervisor**”, by Higher Education Commission Pakistan, (12, January 2017).
- **Technology Award** in Invention to Innovation Summit 2016, UET, Peshawar University, (16-17, November 2016).
- **SRC Awards for Innovative Chemistry Research (20,000 PKR)**, in Invention to Innovation Summit 2016, UET, Peshawar University, (16-17, November 2016).
- **Postdoctoral Researcher**, PDJ-CNPq, Brazil (March 2016-March 2017).
- Awarded to attend the **TWAS/BioVisionAlexandria.NXT 2016** conference, Alexandria, Egypt (10-11, April 2016) and the **BioVisionAlexandria 2016** conference (12-14, April 2016).
- **TWAS-CNPq PhD Research Fellowship**, Brazil (2012-2016).
- Awarded to attend the **BIOVISION.Next Fellowship** Programme at BIOVISION 2014 - the World Life Sciences Forum, Lyon, France (June 5-6, 2014).
- Awardee of **National Internship Programme (NIP)** as a Research Fellow in HEJ, Research institute of Chemistry, Karachi (2009-2010).
- **Among the distinguishing students** (Got 1<sup>st</sup> position during B.Ed. in Bakhtawar College of Education, University of Peshawar (2008-2009).

### ***Research Grants:***

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1. Awardee of Universal Project Grant (MCTIC/CNPq n.º 28/2018) as a co Principle Investigator (*co P.I.*) funded by Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Brazil, **2019-22**.  
  
**Project Title:** Synthesis and biological activity of heterocyclic compounds (chalcogen-heterocyclic) by more sustainable processes
2. Awardee of Institutional Program for Scientific and Technological Initiation (PIBIC/CNPq) Grant (201703139) as a Principle Investigator (*P.I.*) funded by CNPq, Brazil, **2018-19**.  
  
**Project Title:** Synthesis of Chiral organochalcogenides with potential biological activities
3. Awardee of Start-up Research Grant (SRGP) as Principle Investigator (*P.I.*) funded by Higher Education Commission (HEC), Pakistan, **2016**.  
  
**Project Title:** Synthesis and Biological Evaluation of diselenides derivatives of esters: Potential multi-targeted therapeutics against Alzheimer’s disease

**Research ID:** <http://www.researcherid.com/rid/G-1094-2017>

**ORCID:** <http://orcid.org/0000-0002-6134-7249>

**Google Scholar:**

<https://scholar.google.com.br/citations?user=qJutRbUAAAAJ&hl=en>

1. I. C. Veloso, E. Delanogare, A. E. Machado, S. P. Braga, G. K. Rosa, A. F. D. Bem, J. Rafique, **S. Saba**, R. N. d. Trindade, F. Z. Galetto, E. L. G. Moreira, A selanylimidazopyridine (3-SePh-IP) reverses the prodepressant- and anxiogenic-like effects of a high-fat/high-fructose diet in mice. *Journal of Pharmacy and Pharmacology*, Accepted 2021. ([doi.org/10.1093/jpp/rgaa070](https://doi.org/10.1093/jpp/rgaa070))
2. D. C. d. Santos, J. R. **S. Saba**, G. M. Almeida, T. Siminski, C. Pádua, D. W. Filho, A. Zamoner, A. L. Braga, R. C. Pedrosa, F. Ourique. Apoptosis oxidative damage-mediated and antiproliferative effect of selenylated imidazo[1,2-a]pyridines on hepatocellular carcinoma HepG2 cells and in vivo. *J Biochem Mol Toxicol*, Accepted 2020. ([doi.org/10.1002/jbt.22663](https://doi.org/10.1002/jbt.22663))
3. L. S. Galant, J. Rafique, A. L. Braga, F. C. Braga, **S. Saba**, R. Radi, J. B.T. da Rocha, C. Santi, M. Monsalve, M. Farina, A. F. de Bem. The Thiol-Modifier Effects of Organoselenium Compounds and Their Cytoprotective Actions in Neuronal Cells. *Neurochem Res.* v. 46, p. 120-130, 2021.
4. **S. Saba**, C. R. Dos Santos, B. R. Zavarise, A. A. S. Naujorks, M. S. Franco, A. R. Schneider, M. R. Scheide, R. F. Affeldt, J. Rafique, A. L. Braga. Eosin Y-catalyzed photo-induced direct C(sp<sup>2</sup>)-H bond azo coupling of imidazo-heteroarenes and anilines with aryl diazonium salts. *Chemistry - A European Journal*, v.26, p. 4461-4466, 2020. (*Hot Topic in sustainable Chemistry*)
5. J. S. S. Neto, R. A. Balaguez, M. S. Franco, Victor C. de Sá Machado, **S. Saba**, J. Rafique, F. Z. Galetto and A. L. Brag. Trihaloisocyanuric Acids in Ethanol: An Eco-Friendly System for the Regioselective Halogenation of Imidazo-heteroarenes. *Green Chemistry*, v. 22, p. 3410-3415, 2020.
6. T. E. A. Frizon, J. H. Cararo, **S. Saba\***, G. C. Dal-Pont, M. Michels, H. C. Braga, T. Pimentel, F. Dal-Pizzol, S. S. Valvassori, J. Rafique. Synthesis of Novel Selenocyanates and Evaluation of Their Effect in Cultured Mouse Neurons Submitted to Oxidative Stress. *Oxidative Medicine and Cellular Longevity*, v. 2020, p. 1-10, 2020. (corresponding author)
7. J. Rafique, G. Farias, **S. Saba\***, E. Zapp, I. C. Bellettini, C. A. M. Salla, I. H. Bechtold, M. R. Scheide, J. S. S. Neto, D. M. d. S. Junior, H. d. C. Braga, L. F. B. Ribeiro, F. Gastaldon, C. T. Pich, T. E. A. Frizon. Selenylated-oxadiazoles as

promising DNA intercalators: Synthesis, electronic structure, DNA interaction and cleavage. *Dyes and Pigments*, v. 180, p. 108519, 2020. (corresponding author)

8. M. R., Scheide, A. R. Schneider, G. A. M. Jardim, G. M. Martins, D. C. Durigon, **S. Saba**, Jamal Rafique, A. L. Braga. Electrochemical synthesis of selenyl-dihydrofurans via anodic selenofunctionalization of allyl-naphthol/phenol derivatives and their anti-Alzheimer activity. *Org. Biomol. Chem.*, v. 18, p. 4916-4921, 2020.
9. T. E. A. Frizon, A. A. Vieira, F. N. da Silva, **S. Saba\***, G. Farias, B. de Souza, E. Zapp, M. N. Lôpo, H. de C. Braga, F. Grillo, S. F. Curcio, T. Cazati, J. Rafique. Synthesis of 2,1,3-Benzoxadiazole Derivatives as New Fluorophores—Combined Experimental, Optical, Electro, and Theoretical Study. *Frontiers in Chemistry*, v. 8, p. 360, 2020. (corresponding author)
10. A. G. Meirinho, V. F. Pereira, G. M. Martins, **S. Saba**, J. Rafique, A. L. Braga, S. R. Mendes. Electrochemical Oxidative C(sp<sup>2</sup>)-H Bond Selenylation of Activated Arenes. *European Journal of Organic Chemistry*, v. 2019, p. 6465-6469, 2019.
11. Y. Fakhria, J. Rahmanib, C. A. F. Oliveira, L. T. Franco, C. H. Corassin, **S. Saba**, J. Rafiquee, A. M. Khaneghahf. Aflatoxin M1 in human breast milk: A global systematic review, meta-analysis, and risk assessment study (Monte Carlo simulation). *Trends in Food Science & Technology*, v. 88, p. 333-342, 2019.
12. J. Rafique, **S. Saba**, M. S. Franco, L. Bettanin, A. R. Schneider, L. T. Silva, A. L. Braga. Direct, metal-free C(sp<sup>2</sup>)-H chalcogenation of indoles and imidazopyridines with dichalcogenides, catalyzed by KIO<sub>3</sub>. *Chemistry - A European Journal*, v. 24, p. 4173-4180, 2018.
13. G. M. Almeida, J. Rafique, **S. Saba**, T. Siminski, N. S. R.S. Mota, D. W. Filho, A. L. Braga, R. C. Pedrosa, F. Ourique. Novel selenylated imidazo[1,2- a ]pyridines for breast cancer chemotherapy: Inhibition of cell proliferation by Akt-mediated regulation, DNA cleavage and apoptosis. *Biochemical and Biophysical Research Communications*, v. 503, p. 1291-1297, 2018.
14. J. Rodrigues, **S. Saba**, A. C Joussef, J. Rafique, A. L. Braga. KIO<sub>3</sub>-catalyzed C(sp<sup>2</sup>)-H bond selenylation/sulfenylation of (hetero)arenes: synthesis of chalcogenated (hetero)arenes and their evaluation for anti-Alzheimer activity.. *Asian Journal of Organic Chemistry*, v. 7, p. 1819-1824, 2018, 2018.
15. **S. Saba**, J. Rafique, M. S. Franco, A. R. Schneider, L. Espindola, D. Silva, A. L. Braga. Rose Bengal Catalyzed Photo-Induced Selenylation of Indoles, Imidazoles and Arenes: A Metal Free Approach. *Organic & Biomolecular Chemistry*, v. 16, p. 880-885, 2018.
16. Y. H. Matzkeit, B. L. Tornquist, F. Manarin, G. V. Botteselle, J. Rafique, **S. Saba**, A. L. Braga, J. F. Felix, Ricardo Schneider. Borophosphate glasses: Synthesis, characterization and application as catalyst for bis(indolyl)methanes

- synthesis under greener conditions. *Journal of Non-Crystalline Solids*, v. 498, p. 153-159, 2018.
17. L. Bettanin, S. Saba, C. V. Doerner, M. S. Franco, M. Godoi, J. Rafique, A. L. Braga. NH<sub>4</sub>I-catalyzed chalcogen(S/Se)-functionalization of 5-membered N-heteroaryls under metal-free conditions, *Tetrahedron*, v. 47, p. 3971–3980, 2018.
  18. A. G. Dal-Bó, R. C. Duarte, R. Cercená, M. Peterson, J. Rafique, **S. Saba**, E. Zapp, E. S. Gil, P. F. B. Gonçalves, F. S. Rodembusch, T. E. A. Frizon. New long-chain donor-acceptor-donor pyromellitic diimide (PMDI) derivatives. A combined theoretical and experimental study. *Dyes and Pigments*, v. 157, p. 143-150, 2018.
  19. B. L. Tornquist, G. de P. Bueno, J. C. M. Willig, I. M. de Oliveira, H. A. Stefani, J. Rafique, **S. Saba**, B. A. Iglesias, G. V. Botteselle, F. Manarin. Ytterbium (III) triflate/Sodium Dodecyl Sulfate: A Versatile Recyclable and Water-Tolerant Catalyst for the Synthesis of Bis(indolyl)methanes (BIMs). *ChemistrySelect*, v. 3, p. 6358-6363, 2018.
  20. M. M. Peterle, M. R. Scheide, L. T. Silva, **S. Saba**, J. Rafique, Antonio L. Braga. Copper-Catalyzed Three-Component Reaction of Oxadiazoles, Elemental Se/S and Aryl Iodides: Synthesis of Chalcogenyl (Se/S)-Oxadiazoles. *ChemistrySelect*, v. 3, p. 13191-13196, 2018.
  21. J. C. M. Willig, A. A. Amaral, J. Rafique, **S. Saba**, S. Valiati, I. M. Oliveira, H. A. Stefani, F. Manarin, F. G. V. Botteselle. Synthesis of Bis(indolyl)methanes Using Fe<sub>3</sub>O<sub>4</sub> Nanoparticle as a Robust, Efficient and Magnetically Recoverable Catalyst Under Solvent-Free Conditions. *Revista Virtual de Química*, v. 10, p. 1591-1606, 2018.
  22. J. Rafique, **S. Saba**, T. E. A. Frizon, A. L. Braga. Fe O Nanoparticles: A Robust and Magnetically Recoverable Catalyst for Direct C-H Bond Selenylation and Sulfenylation of Benzothiazoles. *ChemistrySelect*, v. 3, p. 328-334, 2018.
  23. **S. Saba**, G. Botteselle, M. Godoi, T. E. A. Frizon, F. Galetto, J. Rafique, A. L. Braga. Copper-Catalyzed Synthesis of Unsymmetrical Diorganyl Chalcogenides (Te/Se/S) from Boronic Acids under Solvent-Free Conditions. *Molecules*, v. 22, p. 1367, 2017.
  24. L. Bettanin, **S. Saba**, F. Z. Galetto, G. A. Mike, J. Rafique A. L. Braga. Solvent- and metal-free selective oxidation of thiols to disulfides using I<sub>2</sub> /DMSO catalytic system. *Tetrahedron Letters*, v. 58, p. 4713-4716, 2017.
  25. L. T. Silva, J. B. Azeredo, **S. Saba**, J. Rafique, A. J. Bortoluzzi, and A. L. Braga, Solvent- and metal-free chalcogenation of bicyclic arenes using I<sub>2</sub>/DMSO as non-metallic catalytic system, *European Journal of Organic Chemistry*, v. 2017, p. 4740–4748, 2017.
  26. J. Rafique, **S. Saba**, A. R. Schneider, M. S. Franco, S. M. Silva, and A. L. Braga, Metal- and Solvent-Free Approach to Access 3-Se/S-Chromones from the

Cyclization of Enaminones in the Presence of Dichalcogenid Catalyzed by KIO<sub>3</sub>, *ACS Omega*, v. 2, p. 2280–2290, 2017.

27. M. S. T. Rocha, J. Rafique, **S. Saba**, J. B. Azeredo, D. Back, M. Godoi, A. L. Braga, Stereoselective Hydrothiolation of Terminal Acetylene catalyzed by Magnetite (Fe<sub>3</sub>O<sub>4</sub>) Nanoparticles, *Synthetic Communications*, v.47, p. 291-298, 2017.
28. F. A. R. Barbosa, R. F. S. Canto, **S. Saba**, J. Rafique, A. L. Braga, Synthesis and evaluation of dihydropyrimidinone-derived selenoesters as multitargeted directed compounds against Alzheimer's disease, *Bioorganic and Medicinal Chemistry*, v. 24, p. 5762–5770, 2016.
29. J. Rafique, **S. Saba**, and A. R. Rosário, and A. L. Braga, Regioselective, solvent- and metal-free chalcogenation of imidazo[1,2-a]pyridines employing I<sub>2</sub>/DMSO as an eco-friendly catalytic oxidation system, *Chemistry - A European Journal*, v. 22, p. 1-10, 2016. **Hot Paper**
30. **S. Saba**, J. Rafique and A. L. Braga, DMSO/Iodine-Catalyzed Oxidative C–Se/C–S Bond Formation: A Regioselective Synthesis of Unsymmetrical Chalcogenides with Nitrogen- or Oxygen-containing Arenes, *Catalysis Science & Technology*, v. 6, p. 3087-3098, 2016.
31. H. Khan, H. Amin, A. Ullah, **S. Saba**, J. Rafique, K. Khan, N. Ahmad and S. L. Badshah, Antioxidant and antiplasmodial activities of bergenin and 11-O-galloylbergenin isolated from *Mallotus philippinensis*, *Oxidative Medicine and Cellular Longevity*, v. 2016, p. 1-6, 2016.
32. A. G. D. Bó, Y. M. S. Micheletto, F. C. Giacomelli, G. Lopez, M. J. R. Sartor, J. Rafique, **S. Saba**, L. D. M. D. Silveira, J. Mendes and T. E. A. Frizon, Synthesis of new monodendrons, gallic acid derivatives, selfassembled in a columnar phase. *Liquid Crystals*, v. 43, p. 292-304, 2016. **Selected for the Cover page of Journal Liquid Crystals**
33. J. Rafique, R. F. S. Canto, **S. Saba**, F. A. R. Barbosa and A. L. Braga, Recent advances in the synthesis of biologically relevant selenium containing 5-member heterocycles, *Current Organic Chemistry*, v. 20, p. 166-188, 2016.
34. M. Arfan, R. Khan, A. Tavman and **S. Saba**, Spectral characterization and crystal structure of 2-amino-N'-[(1Z)-1-(4-chlorophenyl)ethylidene]-benzohydrazide. *Journal of Saudi Chemical Society*, v. 20, p. 40-44, 2016.
35. J. Rafique, **S. Saba**, R. F. S. Canto, T. E. A. Frizon, W. Hassan, E. P. Waczuk, M. Jan, D. F. Back, J. B. T. D. Rocha and A. L. Braga, Synthesis and Biological Evaluation of 2-Picolylamide-Based Diselenides with Non-Bonded Interactions. *Molecules*, v. 20, p. 10095-10109, 2015.
36. **S. Saba**, J. Rafique and A. L. Braga, Synthesis of Unsymmetrical Diorganyl Chalcogenides under Greener Conditions: Use of a Catalytic Iodine/DMSO



Oxidant System, Solvent- and Metal-Free Approach. *Advanced Synthesis & Catalysis*, v. 357, p. 1446-1452, 2015.

37. T. E. Frizon, J. Rafique, **S. Saba**, I. H. Bechtold, H. Gallardo and A. L. Braga, Synthesis of new functionalized organoselenium materials: selenides and diselenides containing cholesterol. *European Journal of Organic Chemistry*, v. 2015, p. 3470-3476, 2015.
38. G. Abbas, M. Shahzad, Z. Saddiqe, M. J. Hassan, **S. Saba**, J. Rafique, R. Malik and H. Hussain, Various fractions of *Hypericum x moserianum* and *Hypericum ericoides* possess antiglycation, anti-lipid peroxidation, antioxidative activities and non-toxic effects in vitro. *Pakistan journal of pharmaceutical sciences*, v. 28, p. 933-98, 2015.
39. J. Rafique, **S. Saba**, A. R. Rosário, G. Zeni and A. L. Braga, K<sub>2</sub>CO<sub>3</sub>-mediated, direct C–H bond selenation and thiolation of 1,3,4-oxadiazoles in the absence of metal catalyst: an eco-friendly approach. *RSC Advances*, v. 4, p. 51648-51652, 2014.
40. M. Arfan, M. N. Tahir, R. Khan, **S. Saba** and M. S. Iqbal, (2-Aminophenyl)[(5S)-5-hydroxy-3,5-dimethyl-4,5-dihydro-1H-pyrazol-1-yl]methanone. *Acta Crystallographica Section E*, E65, o1834-o1835, 2009. [ doi:10.1107/S1600536809026294 ].

### **Patents:**

1. **S. Saba**, Diselenide derivatives of 2-picolyamine and process of their obtaining, *BR-10-2013-010963-0 A2*, Publication date: 26/05/2015.
2. **S. Saba**, Process of production of diselenide derivatives of esters: compounds obtained, and the use of compounds (synthesis and application) as antioxidants and Glutathione Peroxidase Enzyme (GPX) mimetics, *BR-10-2014-021458-5 A2*, Publication date: 26/04/2016.
3. **S. Saba**, Process for the preparation of selenoesters derivatives of Dihydropyrimidinone and its application as antioxidants and as inhibitors of acetylcholinesterase in the treatment of Alzheimer disease, *BR 10 2017 007303 3*, 2017.

### **Conference Presentations/Papers:**

#### **Poster and Oral Presentations:**

1. New Approaches to access biologically relevant organochalcogenides. WEmpower Pakistan, Pakistan, 6<sup>th</sup> August 2020. (Online Oral Talk)
2. Greener Synthetic Protocols to Access Biologically Relevant Chalcogen-Containing Molecules. “*World Forum for Women in Science-2020*”, Brazilian academy of Sciences, Rio de Janeiro, 10-14 February 2020. (Oral Talk)

3. Eosin Y-Catalyzed visible light mediated direct C (sp<sup>2</sup>)-H Bond azo coupling of imidazo-heteroarenes with aryl diazonium salts. “*ACS Summer School on Green Chemistry & Sustainable Energy*”, Colorado School of Mines Golden, Colorado, United States of America, 16-23 July 2019.
4. Visible-light-promoted, regioselective C(sp<sup>2</sup>)-H bond selenylation of indoles, imidazoles, and arenes: A Metal-Free Approach. “*257th ACS National Meeting & Exposition*”, Orlando, United States of America, 31 March-04 April 2019.
5. Photo-induced direct C(sp<sup>2</sup>)-H bond azo coupling of imidazo-heteroarenes with aryl diazonium salts. “*257th ACS National Meeting & Exposition*”, Orlando, United States of America, 31 March-04 April 2019.
6. Rose Bengal catalyzed photo-induced selenylation of indoles, imidazole and arenes; A metal free approach. “*14th International Conference on the Chemistry of Selenium and Tellurium (ICCST-14)*”, Sardinia, Italy, 03-07 June 2019. (Oral Talk)
7. Fe<sub>3</sub>O<sub>4</sub> Nanoparticles: A Robust and Magnetically Recoverable Catalyst for Direct CH Bond Selenylation and Sulfenylation of Benzothiazole. “*8th annual Workshop of the multidisciplinary network SeS Redox and Catalysis, WSeS-8*”, Perugia, Italy, 30-31 May and 1st June.
8. Synthesis and characterization of new 2,1,3-benzoxadiazole derivative. “*42ª Reunião Anual da Sociedade Brasileira de Química*”, Joinville, Brazil, 27-30 May, 2019.
9. Synthesis and Characterization of Cu/CNT Heterogeneous Catalyst for Application in Click Chemistry. “*42ª Reunião Anual da Sociedade Brasileira de Química*”, Joinville, Brazil, 27-30 May, 2019.
10. Synthesis of novel aromatic selenocyanates and evaluation of their effect in cultured mouse neurons submitted to oxidative stress. “*42ª Reunião Anual da Sociedade Brasileira de Química*”, Joinville, Brazil, 27-30 May, 2019.
11. Synthesis and Characterization of new PMDI derivative. “*42ª Reunião Anual da Sociedade Brasileira de Química*”, Joinville, Brazil, 27-30 May, 2019.
12. Regioselective, solvent- and metal free approach to access 3-Se/S-chromones from the cyclization of enaminones employing I<sub>2</sub>/DMSO as an eco-friendly catalytic oxidation system. “*255th ACS National Meeting & Exposition*”, New Orleans, United States of America, 18-22 March 2018.
13. Catalytic Chalcogenylation under greener conditions: A regioselective, metal- and solvent-free, synthesis of 3-Se/S-indole/imidazo [1, 2-1] pyridines catalyzed by

- KIO<sub>3</sub>. “*255th ACS National Meeting & Exposition*”, New Orleans, United States of America, 18-22 March 2018.
14. Direct, metal-free C(sp<sup>2</sup>)-H chalcogenation of indoles and imidazopyridines with dichalcogenides, catalysed by KIO<sub>3</sub>. “*17th BMOS - Brazilian Meeting on Organic Synthesis*”, Salvador, Brazil, 21-24 October 2018.
  15. CuO@CeO<sub>2</sub> nanoparticles catalyzed synthesis of unsymmetrical diorganyl chalcogenides (Te/Se/S) from boronic acids: An efficient heterogeneous and recyclable catalyst for the C-S/Se/Te bond formation. “*VII ESSeTe & 7th WSeS*”, Santa Maria, Brazil, RS, 3-6 September 2018.
  16. Regioselective, Solvent- and Metal-Free C(sp<sup>2</sup>)-H Chalcogenation (S/Se) of Chromones by Employing I<sub>2</sub>/DMSO as Catalytic Oxidation System, “*VI Meeting on Selenium and Tellurium, VII ESSeTe & 7th WSeS*”, Santa Maria, Brazil, RS, 3-6 September 2018.
  17. Direct, metal-free C(sp<sup>2</sup>)-H bond chalcogenation of indoles and imidazopyridines with dichalcogenides, catalyzed by KIO<sub>3</sub>, “*VI Meeting on Selenium and Tellurium, VII ESSeTe & 7th WSeS*”, Santa Maria, Brazil, RS, 3-6 September 2018.
  18. KIO<sub>3</sub>-catalyzed C(sp<sup>2</sup>)-H bond chalcogenation (S/Se) of (hetero)arenes: synthesis of selenylated/sulfonylated (hetero)arenes, “*VI Meeting on Selenium and Tellurium, VII ESSeTe & 7th WSeS*”, Santa Maria, Brazil, RS, 3-6 September 2018.
  19. Copper Catalyzed Synthesis of Chalcogenyl (Se/S)-Oxadiazoles via Three-Component Reaction, “*VI Meeting on Selenium and Tellurium, VII ESSeTe & 7th WSeS*”, Santa Maria, Brazil, RS, 3-6 September 2018.
  20. Metal and solvent free approach to the synthesis of 3-Se/S chromones from the cyclization of enamines in the presence of dichalcogenides catalyzed by KIO<sub>3</sub>. “*25th International Symposium: Synthesis in Organic Chemistry*”, University of Oxford, United Kingdom, 17 - 20 July 2017.
  21. KIO<sub>3</sub>/glycerol: an efficient and eco-friendly catalytic system for regioselective, solvent- and metal-free synthesis of 3-Se/S-indoles. “*Workshop CERSusChem*”, São Pedro/SP, Brazil, 6-7<sup>th</sup> October 2017.
  22. Preparação de disselenetos amínicos quirais derivados de Aminoácidos a partir de aminoálcoois N-Boc-O-mesilados. “*XXIV Encontro de Química da Região Sul, SBQ-SUL A Química na Interface*”, Florianópolis, Brazil, 29 Nov – 1 Dec 2017.

23. NCS-Promoted, Solvent Free Seleno-Functionalization of Olefins at Room Temperature, 5th BSWOC. "***5th Brazil-Spain Workshop on Organic Chemistry***", Florianópolis, Brazil, 24-26 October 2016.
24. NCS-Promoted a Solvent Free Seleno-Functionalization of Olefins at Room Temperature. "***VI Meeting on Selenium and Tellurium, VI ESeTe***", Bento Gonçalves, RS, Brazil, 12-15 September 2016.
25. Regioselective, solvent- and metal-free chalcogenation of imidazo[1,2a]pyridines employing KIO<sub>3</sub> as an eco-friendly catalyst. "***VI Meeting on Selenium and Tellurium, VI ESeTe***", Bento Gonçalves, RS, Brazil, 12-15 September 2016.
26. DMSO/Iodine-Catalyzed Oxidative C–Se/C–S Bond Formation: A Regioselective Synthesis of Unsymmetrical Chalcogenides with Nitrogen- or Oxygen-containing Arenes. "***VI Meeting on Selenium and Tellurium, VI ESeTe***", Bento Gonçalves, RS, Brazil, 12-15 September 2016.
27. Synthesis and evaluation of potential antioxidant coumarin functionalized with selenium. "***VI Meeting on Selenium and Tellurium, VI ESeTe***", Bento Gonçalves, RS, Brazil, 12-15 September 2016.
28. Synthesis and antioxidant evaluation of selenoesters derived from diidropirimidinonas. "***VI Meeting on Selenium and Tellurium, VI ESeTe***", Bento Gonçalves, RS, Brazil, 12-15 September 2016.
29. Regioselective, Solvent- and Metal-free Chalcogenation of imidazo[1,2-a]pyridines Employing I<sub>2</sub>/DMSO as an Eco-friendly Catalytic Oxidation System. "***13th International Conference on the Chemistry of Selenium and Tellurium (ICCST-13)***", Gifu, Japan, 23-27 May 2016.
30. Synthesis of Unsymmetrical Diorganyl Chalcogenides under Greener Conditions: Use of a Catalytic Iodine/DMSO Oxidant System, Solvent- and Metal-Free Approach. "***16th BMOS - Brazilian Meeting on Organic Synthesis***", Buzios-RJ, Brazil, 15-18 Nov 2015.
31. Regioselective Chalcogenation of imidazoheterocycles under Greener Conditions: Use of an Iodine/DMSO System, Solvent- and Metal-Free Approach. "***16th BMOS - Brazilian Meeting on Organic Synthesis***", Buzios-RJ, Brazil, 15-18 Nov 2015.
32. Design and synthesis of Probucol organochalcogen analogues. "***16th BMOS - Brazilian Meeting on Organic Synthesis***", Buzios-RJ, Brazil, 15-18 Nov 2015.
33. Synthesis of Dihydropyrimidinone-derived chalcogenoesters with potential biological activity. "***16th BMOS - Brazilian Meeting on Organic Synthesis***", Buzios-RJ, Brazil, 15-18 Nov 2015.

34. Synthesis of 3-selenocyanate indoles under mild conditions. “*16th BMOS - Brazilian Meeting on Organic Synthesis*”, Buzios-RJ, Brazil, 15-18 Nov 2015.
35. Synthesis of new functionalized organoselenium materials. “*16th BMOS - Brazilian Meeting on Organic Synthesis*”, Buzios-RJ, Brazil, 15-18 Nov 2015.
36. Process of production of diselenide derivatives of esters: compounds obtained, and the use of compounds (synthesis and application) as antioxidants and Glutathione Peroxidase Enzyme (GPX) mimetics (INPI: BR 10 2014 021458 5). **Sumbal Saba** and Antonio L. Braga. “*3ª Feira do Inventor UFSC*”, Florianopolis, Brazil, 21-22 Oct 2015.
37. Diselenide derivatives of 2-picolyamine and process of their obtaining (INPI: BR 10 2013 010963 0). **Sumbal Saba** and Antonio L. Braga. “*3ª Feira do Inventor UFSC*”, Florianopolis, Brazil, 21-22 Oct 2015.
38. Transition Metal-Free Direct CH Bond Selenation of 1,3,4-oxadiazoles. “*248th ACS National Meeting*” - San Francisco, USA, 10-14 August 2014.
39. Synthesis of Diselenide Based Novel Amide Derivatives: A potential Anti-Alzheimer Compounds. “*37-SBQ, Natal Brazil*”, 26-29 May 2014.
40. Transition Metal-Free Direct C–H Bond Selenation of 1,3,4-Oxadiazoles. “*37-SBQ, Natal – Brazil*”, 26-29 May 2014.
41. Synthesis of Diselenide Containing Esters: Biologically Potential Compounds. “*15-BMOS, Campos do Jordao –Brazil*”, 10-13 Nov 2013.
42. Synthesis of Diselenide Based Picolylamide Derivatives: Biologically Potential Compounds. “*15-BMOS, Campos do Jordao –Brazil*”, 10-13 Nov 2013.
43. Convergent synthesis of 4-amido substituted dihydropyrimidinone diselenides: Biologically Potential Compound. “*IV Meeting on Selenium and Tellurium, ESeTe IV, Torres- Brazil*”, 3-6 Dec 2012.
44. Microwave-Assisted Solvent-Free Fmoc Protection of Amines. “*4th International IUPAC Conference on Green Chemistry, Foz do Iguacu –Brazil*”, 25-29 Aug 2012.

### *Supervision and Co-supervision Completed:*

#### *Masters (M.Sc.) Thesis:*

- Sundus Ali. Synthesis of new chalcone derivatives and study of their antioxidant and anti-Alzheimer activities. **2016**. Dissertation (Chemistry) - Sarhad University of Science and Information Technology, Peshawar, Pakistan. (**Supervision**)

- Alex Ricardo Schneider. An Eco-friendly approach for Sulfur- and Seleno-functionalization of Olefins at room temperature. 2018. Dissertation (Organic Chemistry) - Federal University of Santa Catarina, UFSC, Brazil. (**Co-Supervision**)

### **Graduation Thesis:**

- Evelyn Terhaag. Synthesis of chiral organocalcogenides with potential biological activity (PIBIC/CNPq). Beginning: **2019**. Scientific initiation (Graduation in Chemistry), Federal University of Santa Catarina, CNPQ, UFSC, Brazil. (**Supervision**)
- Caio Rodrigo dos Santos. Supported copper catalyst in cross coupling reactions. **2019**. Scientific initiation (Graduation in Chemistry), CNPQ, Federal University of Santa Catarina, UFSC, Brazil. (**Co-Supervision**)
- Bruno Rostirolla Zavarise. Synthesis of biologically relevant organoselenides. **2019**. Scientific initiation (Graduation in Chemistry), CNPQ, Federal University of Santa Catarina, UFSC, Brazil. (**Co-Supervision**)
- Letícia da Silva Nascimento. **Synthesis of imidazoheterocycle containing chalcogenides**. 2018. Scientific initiation (Graduation in Chemistry), CNPQ, Federal University of Santa Catarina, UFSC, Brazil. (**Co-Supervision**)
- Thiago Lehmkuhl Luciano. **Imidazopyridine containing selenides: A green route of synthesis**. 2018 Scientific initiation (Graduation in Chemistry), CNPQ, Federal University of Santa Catarina, UFSC, Brazil. (**Co-Supervision**)
- Alex Ricardo Schneider. **Metal-free synthesis of chalcogeno-chromones**. 2017. Scientific initiation (Graduation in Chemistry), CNPQ, Federal University of Santa Catarina, UFSC, Brazil. (**Co-Supervision**)
- João Eduardo de Lucena Linhares. **CuI catalysed synthesis of unsymmetrical diorganylchalcogenides**. 2015. Scientific initiation (Graduation in Chemistry), CNPQ, Federal University of Santa Catarina, UFSC, Brazil. (**Co-Supervision**)

### **Supervision and Co-supervision in Progress:**

**Doctorate (PHD) Thesis:** 01 Supervision is in Process.

**Master's Thesis:** 02 Supervisions in Process.

**Graduation Thesis:** 03 Supervisions in Process.

### **Editorial Board Member and Reviewer of Journals:**

- Current Catalysis

### ***Editorial Board Member and Reviewer of Journals:***

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- Molecules
- Journal of Chemistry
- Orbital: The Electronic Journal of Chemistry
- Molbank
- Toxin Review
- Food Chemistry
- Journal of Food Process Engineering;

### ***PARTICIPATION IN THESIS DEFENCES:***

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#### ***PhD Thesis:***

- Tairine Pimentel. Regioselective Synthesis of 5- calcogenyl-Imidazo- Thiazoles using I<sub>2</sub> / DMSO catalytic system. A greener process. Federal University of Mato Grosso de Sul (UFMS), Brazil, **2020**.
- Marcos Maragno Peterle. Synthesis of Organochalcogen compounds with potencial biological applications or as a ligands for the complexes of Fe(III) and Mn(I) as a liberators of CO. Federal University of Santa Catarina (UFSC), Brazil, **2019**.

#### ***MPhil Thesis:***

- Irum Zaman. Chemical and biological investigation of Cyphostemma Digitatum. Institute of Chemical Sciences, University of Peshawar, Pakistan, **2017**.
- Faiza Shah. Synthesis, Functionalization, Docking Studies and Biological Screening of 3-Alkyl-4,6-Diaryl-4,5-Dihydrindazoles. Institute of Chemical Sciences, University of Peshawar, Pakistan, **2017**.

#### ***Master's Thesis:***

- Naira Vieira Machado. Enantioselective reduction of pro-chiral ketones catalyzed by carrot. Federal University of ABC (UFABC), Brazil, **2020**.
- Marcos Roberto Scheide Neto. Chalcogenation one-pot of 1,3,4-Oxadiazoles with iodoarenes and elementar selenium catalyzed by CuO supported in solid matrix. Federal University of Santa Catarina (UFSC), Brazil, **2019**.
- Gabriela Mattevi Almeida, In vitro study of the anti-tumor potential of new derivatives of imidazo[1,2-a]pyridine selenylated. Federal University of Santa Catarina (UFSC), Brazil, **2018**.

- Maria Maqsood. Synthesis and transformation of Chalcone into Ethyl-2-Oxo-4,6-Diaryl Cyclohex-3-ene-Carboxylate. Institute of Chemical Sciences, University of Peshawar, Pakistan, **2016**.
- Marhaba Samiullah. Synthesis and functionality of 1,2,4-Triazole. Institute of Chemical Sciences, University of Peshawar, Pakistan, **2016**.
- Muhammad Usman Shakir. Synthesis of Isoesteviol derivatives and their characterization. Islamia College Peshawar, Pakistan, **2016**.
- Adil Habib. New analog docking study against the Leishmania Disease (Leishmanolysin) Causing Protein. Islamia College Peshawar, Pakistan, **2016**.
- Asif Ahmad. Synthesis of Steviol Derivatives and their Biological Activities. Islamia College Peshawar, Pakistan, **2016**.

### **Graduation Thesis:**

- Mateus Henrique, Biodiesel production using magnetic nanoparticles functionalized with metformin. Federal University of Santa Catarina (UFSC) Brazil, **2018**.
- Kamilla Kretzer. Solvatochromic behavior of dyes containing electron-donor dialkylamino groups in pure solvents. Federal University of Santa Catarina (UFSC) Brazil, **2018**.
- Jéssica Toigo. Síntese e caracterização de N-acil hidrazonas bifenílicas com potencial atividade inibitória de proteína tirosina fosfatase (PtpA) de Mycobacterium tuberculosis. Federal University of Santa Catarina (UFSC), Brazil, **2017**.

### **Participation in RoundTable Meetings:**

- Invited as a guest speaker in the roundtable of “Women in Science” organized by the Federal University of Santa Catarina (UFSC), Week of Post-graduation, Brazil, 31 October **2018**.

### **Membership:**

- Secretary of **OWSD National Chapter of Brazil** since 2020.
- Full Member of **Organization for Women in Science for the Developing World (OWSD)** since 2016.
- Full Member of **WEmpower (WEP2020-01)** Pakistan since 2020.
- Full Member of **National Academy of Young Scientists (NAYS)**, Pakistan since 2016.
- **American Chemical Society (ACS)** since 2014.
- **Brazilian Chemical Society (SBQ)** since 2013.



### Conferences/Trainings/Workshops/Seminars Attended:

- Participation in the virtual “**ACS Reviewer Lab**”, USA, August 21, 2020.
- Completion of “**2020 Virtual Postdoc to Faculty (P2F)**”, USA, August 2, 2020.
- Participation in the virtual “**The 24th Annual Green Chemistry & Engineering (GC&E) Conference**”, Seattle, WA on June 16-18, 2020.
- Poster Presentation in “**ACS Summer School on Green Chemistry & Sustainable Energy**, Colorado School of Mines Golden, Colorado, 16-23 July, 2019.
- Poster Presentation in “**257th ACS National Meeting & Exposition**”, Orlando, United States of America, 31 March-04 April 2019.
- Poster and oral Presentations in “**8th annual Workshop of the multidisciplinary network SeS Redox and Catalysis, WSeS-8**”, Perugia, Italy, 30-31 May and 1st June.
- Poster Presentation in “**VI Meeting on Selenium and Tellurium, VII ESSeTe & 7th WSeS**”, Santa Maria, RS, 3-6 September 2018.
- Attended Five-Days training workshop on “**Inferential and Descriptive Research Analysis through SPSS**” Shaheed Benazir Bhutto Women University, Peshawar, Pakistan, 17-21 April 2017.
- Attended Two-Day Seminar on “**Faculty Skills Development**”, Sarhad University of Science and Information Technology, Peshawar, Pakistan, 16-17 January 2017.
- Patents presentation in “**Invention to Innovation Summit 2016**”, UET, Peshawar University, 16-17, November 2016.
- Poster Presentation in “**5th Brazil-Spain Workshop on Organic Chemistry**”, Florianópolis, Brazil, 24-26 October 2016.
- Poster presentation in “**13th International Conference on the Chemistry of Selenium and Tellurium (ICCST-13)**”, Gifu, Japan, 23-27 May 2016.
- Attended “**Minicourse on the Introduction to Strategies for the Synthesis of Complex Molecules**”, organized by UFSC, SC, Brazil, 2<sup>nd</sup> Semester 2015.
- Attended course “**Advance Techniques of Nuclear Magnetic Resonance (NMR)**”, organized by UFSC, SC, Brazil, July-December 2015.
- Training in “**Operation and basic maintenance on HPLC system composed of: 2Bomba LC-20AD; Degasser DGU-20A3; SIL-20ACHT gun; Oven CTO-20th; Detector SPD-M20A; CBM-20A Controller Lite; API-quadrupole LCMS - 2020; Software Lab Solutions LCMS; - Shimadzu Brand,**” 16 July, 2015.

- Attended “**Minicourse on Element Analysis for Specification, Bioanalysis and Metallomics**”, organized by UFSC, SC, Brazil, 06-10 October 2015.
- Posters presentation in “**248th ACS National Meeting - San Francisco, CA**”, - San Francisco, USA, 10-14 August, 2014.
- Participated in “**BIOVISION.Nxt Fellowship Program at BIOVISION 2014 - the World Life Sciences Forum**”, Lyon, France, 5-6 June 2014.
- Poster presentation in “**37th SBQ – Brazilian Chemical Society**”, Natal, Brazil, 26-29 May 2014.
- Attended “**Mini-course on the Mass Spectrometry- Basic Concepts of EI / CI and the Revolution of Technic through ESI / MALDI: Modern Applications in Chemistry, Medicine and Nanotechnology**”, organized by UFSC, SC, Brazil, 6-10 October 2014.
- Attended “**2<sup>nd</sup> week of Post-Graduate in Chemistry at UFSC**”, organized by UFSC, SC, Brazil, 17-21 June 2013.
- Attended “**Second International Workshop PPGEQ/UFSCar: Advances in Industrial Biotechnology**”, UFSCar São Carlos - SP, Brazil. 28-29 July 2013.
- Attended “**Mini-course on Analytical Instrumentation**”, organized by UFSC, SC, Brazil, 17-21 June 2013.
- Attended “**Mini-course on NMR in Solutions - Aspects, Theories and Practice**”, organized by UFSC, SC, Brazil, 17-21 June 2013.
- Attended “**1<sup>st</sup> week of Post-Graduate in Chemistry at UFSC**”, organized by UFSC, SC, Brazil, 18-22 June 2012.
- Participated in “**9<sup>th</sup> International and 21<sup>st</sup> National Chemistry Conference 2011**”, organized by International Center for Chemical and Biological Sciences (ICCBS) and Department of Chemistry, University of Karachi, 14-16 March 2011.
- Participated in “**3<sup>rd</sup> International Symposium-cum-Training Course on Molecular Medicine and Drug Research (MMDR-3)**” organized by Dr. Panjwani Center for Molecular Medicine and Drug Research, International Center for Chemical & Biological Sciences (ICCBS), University of Karachi, 3-6 January, 2011.
- Participated in “**12<sup>th</sup> International Symposium on Natural Product Chemistry**” organized by HEJ Research Institute of Chemistry, International Center for Chemical and Biological Sciences, University of Karachi, Karachi-75270, 22-25 November 2010.
- Annual training on the “**Use of Nuclear and other Techniques in Food and Agricultural Research**” organized by Nuclear Institute for Food and Agriculture (NIFA) Tarnab, Peshawar, 03-14 November 2008.

- Participated in **Mega Science exhibition** 2006-07, University of Peshawar.

### ***PROFICIENCIES / SKILLS:***

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- Can operate Bruker Ac-200 & Ac-400 NMR, Cary 60 UV, Bruker Benchtop IR Spectrophotometer, CD, Gas Chromatography and Mass spectrometry, Recycling Preparative HPLC machines.
- Structure elucidation with modern NMR techniques including acquisition of 1D and 2D NMR techniques. Use of current analytical and predictive tools including HPLC, GCMS, LCMS chromatography.
- Can operate HPLC system consisted of: 2Bomba LC-20AD; Degasser DGU-20A3; SIL-20ACHT gun; Oven CTO-20th; Detector SPD-M20A; CBM-20A Controller Lite; API-quadrupole LCMS - 2020; Software Lab Solutions LCMS; - Shimadzu Brand.

### ***Languages:***

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English; Portuguese (Brazil); Urdu; Pushto; Panjabi; Hindi

### ***References:***

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- ***Prof. Dr. Antonio Luiz Braga*** (Ph.D – Brazil)  
LabSelen - Lab. de Síntese de Pequenas Moléculas Quirais de Selênio e Telúrio  
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- ***Prof. Dr. Claudio Santi*** (Ph.D – Italy)  
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