BUSHRA RASHID (PhD)

PERSONAL INFORMATION

Present Position: Professor (BPS-21)
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ACADEMIC QUALIFICATIONS

2012 PostDoc: University of Edinburgh Scotland UK, sponsored by CommonWealth Academic Fellowship

2008 PhD (Molecular Biology): Centre of Excellence in Molecular Biology University of the Punjab, Lahore Pakistan. Thesis Title: "*Transformation of cotton with Bt genes to develop sustainable resistance*".

1994 MSc Hons. Agriculture (Horticulture): University of Agriculture, Faisalabad, Pakistan.

1991 BSc Hons. Agriculture (Horticulture): University of Agriculture, Faisalabad, Pakistan.

PROFESSIONAL CAREER

Professor: March 2021-**date**
Associate Professor (BPS): June 2018-Feb 2021
Assistant Professor (TTS): August 2009-June 2018 (CEMB Lahore)
Senior Research Officer: 2007-2009 (CAMB Lahore)
Research Officer: 1996-2007 (CEMB Lahore)
Research Fellow: 1994-1996 (CAMB Lahore)

GRANTS/FUNDINGS

1. **PI of the project,** "Creation and Application of New Drought Tolerant Cotton Germplasm" under The eighteenth session of China-Pakistan committee on science and technology cooperation by Pakistan Science Foundation in collaboration with Ministry of science and technology of the People's Republic of China (PI from China Dr Meng Zhigang from Institute of Biotechnology, Chinese Academy of Agricultural Sciences, Haidian, Beijing China). 2021-(Continue)
2. **CoPI of Project**, Establishing phenological and genetic responses to seasonal shifts in Guava (Psidium guava L.) germplasm, in collaboration with University of Agriculture Faisalabad; funded by Pakistan Science Foundation, 2.58Million PKR (continued)
3. **PI of project**, "Identification & isolation of wax genes from local cultivars of *G arboreum* to Breed CLCuV tolerance/resistance in *G. hirsutum*" by HEC 6.67 Million PKRs 2015 (Final report submitted)
4. **PI of project**, "Transformation of Bt Cotton with Transcription Factor Gene of *Gossypium arboretum* to Enhance Drought Tolerance" HEC 3.037 Million PKRs. (complete).
5. **Co-PI of the project**, "The development of cotton arrays and their use in the analysis of abiotic stress" HEC, Pakistan Rs. 6.445Million PKRs (complete).
6. **Grant of Rs. 200000/-**Received from PSF to organize, "4th International Symposium on Advances in Molecular Biology of Plant and Health Sciences" Dec. 21-23, 2021 as Focal person
7. **Grant of Rs. 653,000/-**Received from HEC to organize, "3rd International Symposium on Advances in Molecular Biology of Plant and Health Sciences" Dec. 19- 21, 2018 as Focal person
8. **Grant of Rs. 575,000/-**Received from HEC to organize, "2nd International Symposium on Advances in Molecular Biology of Plant and Health Sciences" Nov. 21- 23, 2017 as Focal person.

9. **Grant of Rs 169500 from HEC for** Short consultancy visit of Dr Motoaki Seki, Team Leader, RIKEN Centre for sustainable resource Kanagawa, Japan to Centre of excellence in molecular biology university of the Punjab Lahore Pakistan under HEC Program: Pakistan Program for collaborative Research (PPCR) to prepare a joint research proposal between RIKEN Japan and CEMB March 23, 2018

FOREIGN FELLOWSHIPS/TRAININGS

- **Attended one week** "Workshop on the formulation and study of spatial development, climate change and the environment for agricultural transformation" organized by Asian Productivity Organization Japan and The Development Academy of Philippines held in Manila, Philippines, 18-22 November, 2019.
- **Visiting Faculty** to Omer Halisdemir University, Nigde Turkey under Mevlana Faculty Exchange Programe funded by Omer Halisdemir University, Nigde Turkey April 12-26, 2018
- **Invited Scientist** to Harran University, Sanliurfa, Turkey, 17-24 March 2013.
- **Commonwealth Visiting Fellow**, The University of Edinburgh, School of Biological Sciences, Scotland, UK, Sep-Dec. 2012.
- **Training Course,** "Safety Induction Training", organized by and held at School of Biological Sciences, University of Edinburgh, Scotland UK, October 05, 2012.
- **Endeavour Fellow** as Endeavour Executive Award to Commonwealth Scientific and Industrial Research Organization (CSIRO) Canberra, Australia by Austraining International July-Nov. 2010.
- **Attended one week,** "Biochip Training Course" organized by "Genomic Solutions", held at Varsity Drive, Ann Arbor, Michigan, USA, Aug. 11-17, 2006.
- **Visiting Scientist**, for "Development of Genomic Laboratory for Gene Discovery and Plant Pathogen Interaction," to Department of Plant Biology, University of Illinois, Urbana-Champaign USA, June-Dec. 2005.

RESEARCH AND TEACHING EXPERIENCE

Research:

2006-Date: Currently working and heading Plant Genomics Group and main focus of our research is identification, isolation and characterization of biotic and abiotic stress tolerant genes in cotton (*Gossypium arboreum*) and other plant species by using the applications of plant genomics such as microarray, differential display and gene homology.. Brief overview of research is:

Identification of abiotic stress tolerant genes: Heat shock protein gene, universal stress protein genes, Zinc finger transcription factor gene, proton gradient regulator gene, proteinase inhibitor gene, Myb related transcriptipon factor gene etc have been isolated from local cotton varieties of *Gossypium arboreum* and Roselle plant species under drought and salt stress conditions. Transgenic plants of local *G hirsutum* have been developed by using these genes. Integration and expression of transgene has been studied in transgenic plants of *Gossypium hirsutum* and Morphological, biochemical, physiological and molecular characteristics of transgenic plants have been evaluated under the stress conditions. PCR, realtime PCR, RACE, cloning, sequencing, Blotting techniques, Genomic and Plasmid Nucleic acid extraction, plant tissue culture, bioinformatics tools and other routine applications of molecular biology are in practice to achieve the objectives of this study.

High-throughput gene identification under abiotic stress by using Microarray: Oligonucleotide microarray has been developed for the ESTs identified from G arboreum and G hirsutum showing Homology with *Arabidopsis thaliana*. After hybridization with the target and scanning the images, data showed the homologous genes with the abundant transcripts expressing under different abiotic stress conditions. The data file is submitted to GEO DATABASE. cDNA microarray library has been developed for the root and leaf of Gossypium arboreum and Agave sisalana under drought stress conditions. The transcripts/ESTs have been identified expressing in biological, cellular, metabolic and molecular process of the plants. Data has been validated through real time PCR analyses. (Bioinformatics tools, microarray printing, hybridization, scanning, realtime PCR, conventional PCR, sequencing, microbiology techniques dealing with plasmid/cultures etc are used in this study).

Gene Identification responsive for CLCuV infection: Cotton leaf curl viral (CLCuV) infection responsive gene and wax related gene have been identified in local variety of *G arboreum* and development of transgenic plants by using agrobacterium mediated transformation system is in process. Role of wax will be studied against pathogen infection in cotton.(Routine practices of molecular biology such PCR, real time PCR cloning, sequencing, genetic transformation as well as field evaluation of plants under virus infection are used in this study)

High-throughput studies of Agave sisalana under drought stress: A de-novo assembly of *Agave sisalana* has been developed under drought stress and transcripts have been identified through RNA Seq. Validation studies are in progress for the identification and confirmation of the transcripts.

These are the major research experiments in my lab and other small studies related to the gene identification under

differential expression, transformation experiments and transgene expression related to the major experimental data are also in progress to achieve the targets. My Group includes two faculty members, PhD and MPhil students and I have collaborative and leading abilities in academics, research as well as academic administration.

2001-2006: Plasmid *pK_2Ac* was transformed by Sonication Assisted *Agrobacterium* to local cotton variety CIM-482. Amplification of insecticidal genes was detected in the DNA of the transgenic plants through PCR in the form of 0.5 kb fragment of c*ry1Ac* and 0.6 fragment of *cry2A* gene. In Southern blot 3kb fragment of *cry1Ac* full length cassette was detected. The expression of these foreign genes was also studied through ELISA and in Western blot 68 kDa protein of Cry1Ac was also detected. The entomocidal activity of the *Heliothis armigera* 2nd instar observed on the leaves of transgenic plants and high mortality (75-100%) of the insects confirmed the expression of Bt genes in transgenic plants. This is the first GM crop in Pakistan and has been approved as variety Bt Cotton CEMB-II by National Biosafety Committee, Ministry of Environment, Pakistan (http://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=5081), and by Punjab Seed Council http://www.pakissan.com/english/advisory/biotechnology/first.bt.cotton.grown.in.pakistan.shtml

1995-2000: Established tissue culture conditions in cotton. Callus, meristem and cell suspension culture was established in different local cotton varieties.

1991-1994: M.Sc Hons Research thesis title “Callogenesis, Embryogenesis and Organogenesis in Orchid".

STUDENT SUPERVISION: 08 students have completed the PhD degree in Molecular Biology, 45 students have completed MPhil degree in Molecular Biology under my supervision.

TEACHING (MPhil/PhD Students):
CAMB506- Plant Molecular Biology
CAMB501- Molecular Biology
CAMB568- Practical Approach to DNA Microarray
CAMB508- Tutorial/Presentation Skill Enhancement

NATIONAL TRAININGS/WORKSHOPS/SEMINAR ATTENDED/PARTICIPATED

1. Participation in “National dialogue on Ag-Biotech for Food Security and Capacity Building of Food Safety Regulators”, organized by Pakistan Biotechnology Information Centre (PABIC) Lahore Chapter and Forman Christian College University Lahore, held at COMSTECH Islamabad December 11-12, 2019.
2. Participated in Symposium, “Brain, neurogenetics and regenerative medicine”, held at CEMB, Oct. 03, 2019
3. Attended One day Workshop on “Moving towards success: Strategic Time Management”, held at CEMB October 18, 2019.
4. Workshop, “Countering Violent Extremism Orientation” at University of the Punjab Lahore in collaboration with Centre for Health and Gender Equality (CHANGE) Sep 13, 2017
5. Attended half day workshop on “how to create quality culture in higher education” organized by Leadership and Management Development Associates, Lahore, June 06, 2017.
6. Participated in ELTR-HEC-TELS workshop on “English as a medium of instruction (EMI)”,organized by Department of English, Virtual University of Pakistan Feb 06-10, 2017
7. Training workshop “Modern techniques in research on abiotic stress tolerance in plants”, 21-24 Feb 2012 organized by Nuclear Institute for Agriculture and Biology (NIAB), Faisalabad
8. One day research workshop, “Citation and Referencing in Research using EndNote X4” organized by The University of Lahore and Institute of Research Promotion, held at The University of Lahore, 26th April, 2011.
9. Workshop “Writing project proposals for Competitive Grant System (CGS)”, organized by and held at Punjab Agricultural Research Board, Lahore, Pakistan, November, 09-11, 2009.
10. International Thematic Workshop “Nanomedicine: The use of nano particles in medical diagnostics” jointly organized by OIC Ministerial Standing Committee on Scientific and Technological Cooperation (COMSTECH) and Higher Education Commission (HEC), held at COMSTECH Secretariat Islamabad, Pakistan, March,13-20, 2008.
11. Training course “Modern Techniques in Biotechnology”, organized by National Institute in Biotechnology and Genetic Engineering (NIBGE), Faisalabad, Pakistan, April 03-08, 2005.
12. Training workshop “Latest developments in Molecular Biology and Biotechnology” organized by UGC in collaboration with CEMB Lahore, Oct. 08-13, 2001.
13. Training course "Kitchen Gardening", held at National Agricultural Research Council (NARC) Islamabad, Pakistan, March, 26-31, 1994.

HONOURS

1. **Certificate of participation** in webinar, "Biotechnological innovations for improving resource use efficiency in food and nutrition" Organized by International Association of Scientists (IAS) held at Istanbul Turkey, January 30, 2022.
2. **Recognition of services** for Peer Review process in HEC
3. **Awarded performance** based increment and Performance based Honorarium from 2015-2018.
4. **Awarded performance** research incentive award and research publication incentive awards 2018-2020
5. **Focal Person, 4th** International symposium on Advances of Molecular Biology in Plants and Health Sciences, at CEMB Lahore, Dec 23-24, 2021
6. **Member Board of Studies** Department of Molecular Biology, Virtual University, Lahore 2020-date
7. **Member Board of Studies** Department of Biotechnology, Qarshi University Lahore, 2020-todate
8. **Member Organizing Committee** of the International Symposium on "Development of CKC Technology", Organized by and held at CEMB December 15, 2020.
9. **Member Organizing Committee**, "Two-Day Workshop on CRISPR/Cas Genome Editing Technology", held at CEMB, April 29-30, 2019.
10. **Member Organizing Committee**, 8th Invention to Innovation Summit Buy and Sell Technology, Organized by University of the Punjab Lahore, April 02-03, 2019.
11. **Member Organizing Committee**, "Web of Science Conference" held at CEMB, March 11, 2019.
12. **Focal Person** 3rd International symposium on Advances of Molecular Biology in Plant and Health Sciences, held at CEMB Lahore, Dec 19-21, 2018
13. **Member of the Organizing team of the** one day workshop, "Drought stress challenges and mitigation strategies", organized by and held at CEMB, March 17, 2018.
14. **Participation in Stall Management in**, "7th Invention to innovation" organized by and held at University of the Punjab Lahore, March 7-8, 2018.
15. **Member of the organizing committee** of the Training workshop, "Behavioral Based Biosafety Culture " organized by and held at CEMB in collaboration with American Society for Microbiology, Congress of Molecular Biology, Health Security partners and Gull's Association , Aug 23, 2017
16. **Focal Person** 2nd International symposium on Advances of Molecular Biology in Plant and Health Sciences, held at CEMB Lahore, 21-23 November, 2017
17. **Letter of appreciation**, One day workshop "Communication and Negotiation Interlock", at CEMB Lahore, April 25, 2107
18. **Focal Person** in, "International training workshop on Microarray for gene expression", held at CEMB, Feb. 14-17, 2017
19. **Certificate of appreciation as resource person** in the training course on "Planning of cotton production, land preparation, weed control, pest and disease control and harvesting", held at CEMB Lahore, December 12-16, 2106
20. **Certificate of appreciation for being resource person** in the workshop, "A day with Biosafety" held at CEMB in association with Congress of Molecular Biology (CMB) and Gull's Association, October 25, 2016
21. Guest of Honour at, "Breast Cancer awareness seminar", held at CEMB, Oct. 03, 2016
22. **Member of the organizing committee** "Nays-CEMB-CMB-National workshop on CRISPR/Cas9 Genome Editing Technology" held in CEMB, June 02, 2016
23. **Member of the organizing team** in, "ICGEB course on Basic Biotechnology Techniques" jointly organized by National Academy of Young Scientists Pakistan and CEMB, March 07-09, 2016
24. **Letter of appreciation for winning 2nd position** in poster presentation at International symposium on Advances in Molecular Biology of Plants and Health Sciences, at CEMB Lahore, 29-31 Dec 2015.
25. **Focal Person** in, "International symposium on advances of molecular biology in agriculture and health sciences", held at CEMB, Dec. 29-31, 2015
26. **Member of the team f**or curriculum development of "Molecular biology" in higher education commission (HEC) 28-30Oct. 2015
27. **Member of the organizing committee**, "Hands on training workshop on next generation data analysis", held at CEMB, October, 14-16 2015.
28. Member of the **management committee** for A Training Workshop on "New Trends in Molecular Diagnosis of Genetic Diseases" held at CEMB, Lahore, May, 25-29, 2015

29. **Course secretary and resource person** in "International Training Workshop on Microarray for Gene Expression" held at, CEMB Lahore, April, 22-25-2014.
30. **Member Board of Studies** Department of Botany, Government College Women University Madina Town Faisalabad 2014-17
31. **Workshop Coordinator**, "The development and Testing of Transgenics for Cotton leaf curl virus (CLCuV) disease resistance" at CEMB Lahore in collaboration with Pak-US Cotton Productivity Enhancement Programme of ICCARDA and USDA, March, 18-19-2014
32. Act as **Resource Person and Course Coordinator** in Training Course on "Advances in Applications of Molecular Biology" organized by & held at CEMB Lahore 19-23 December 2011.
33. **Resource Person and Workshop Coordinator** "2nd International Training Workshop on DNA Microarray for Gene Expression" & "Training Workshop on Biosafety in Biomedical Research" held at CEMB Lahore in Collaboration with Biosafety Association of Pakistan 7-11 March 2011
34. **HEC Approved supervisor** for student supervision by Higher Education Commission (HEC), Pakistan 2010-todate
35. **Resource Person** "International training course on Microarray Technology for gene discovery and expression", jointly organized by Islamic Educational, Scientific and Cultural Organization (ISESCO) and Asia Pacific International Molecular Biology Network (A-IMBN) in collaboration with and held at CEMB Lahore, Oct. 05-09, 2009.
36. **Invited reviewer** of journals, Plant Cell Reports, BMC Genomics, BMC Genomics, Pakistan journal of Agricultural Sciences, Journal of Agricultural Sciences, Plant Cell and Physiology, Plant Molecular Biology Reports.

ADMINISTRATIVE SKILLS:

1. Member organizing Committee, "CEMB cotton Seminar Success, challenges future directions", organized by & held at CEMB Lahore March 22, 2022
2. Principal Organizer "Hands-on training workshop on structural bioinformatics tools", organized by & held at CEMB Lahore Feb 23-25, 2022
3. Member Departmental Tenure Track Review Committee (DTRC) 2019-todate
4. Female Sports Coordinator in Annual Sports week at CEMB March 18-22, 2019.
5. Focal person, "National Enrolment Drive Program in the Country", at CEMB 2016.
6. Departmental focal person for PM laptop scheme (2015-17)
7. Chairperson, "Departmental Women's Rights Committee", 2015-Date
8. Incharge MPhil/PhD programme, CEMB Lahore (Sep 2013-Date)
9. Chairperson Procurement and Evaluation Committee at the CEMB Lahore (2011-Sep 2013)
10. Member departmental academic committee, CEMB Lahore (2011-date)
11. Member of the departmental promotion committee at the CEMB Lahore (2010-date)
12. Member of the organizing committee of the Symposium, "Future Trends in Molecular Biological Research and its Applications in Agriculture and Health" in CEMB Lahore, March 25-27, 2009.
13. Member of the organizing committee of "National Bioforum, 2008" CEMB Lahore (March, 2008).
14. Co-Chairperson of the Procurement and Evaluation Committee at the CEMB Lahore (2007-2010).
15. MPhil/PhD Student Coordinator in CEMB Lahore 2006-07.
16. Chairperson of the Centre's Journal Club to make arrangements for functions, seminars, symposia, tours and other extra-curricular activities, 1997-1998.
17. Member of the Landscape Committee of Centre's premises from 1994-1997

Invited Talks

1. Bushra Rashid (2022), Invited speaker at 1st International Conference (Online) Recent Approaches in Plant Sciences (RAPS-2022) and delivered talk ""Plant Genomics: A sustainable approach to meet the climatic challenges" held at Department of Botany University of Education, Lahore, Pakistan March 30-31, 2022.
1. Bushra Rashid (2021). **Invited guest speaker** at "International webinar on Plant Biotechnology in Horticulture, Held in University of Agriculture Faisalabad, Dec 02, 2021.
2. Bushra Rashid (2021). Heat Shock Protein Genes Circumvent Climatic Changes for Sustainable Crop Production. **KeyNote speaker at** Online International Conference on "Food, Nutrition, Environmental and Agricultural Sciences (ICFNEAS-21)" organized by GREEN (Global Research, Education and Event Network) and with the scientific support of Akdeniz University (Antalya, Turkey) held in Turkey Aug 19-20, 2021
3. Presentation delivered at International Symposium on "Development of CKC Technology", Organized by and held at CEMB December 15, 2020.
4. **Rashid B**, Hassan S, Sarwar MB, Sher Z, Ahmad Z, Husnain T (2018) Identification, Isolation and Characterization of Drought Stress Responsive Genes in Different Plant Species. Invited talk at Plant Biotechnology for Food Security, held at Forman Christian College Lahore- A Chartered University,

November 27-28, 2018.

5. **Bushra Rashid** (2018). "Learning Excitements beyond the boundaries", Invited speaker at 6th International Conference on Education (ICE) Science Beyond Class Room held at University of education, Lahore, 15-17 March 2018.
6. **Invited speaker** at "International Training Course on Poultry Viral Diagnostics" and delivered a talk on "DNA Microarray in the study of molecular diagnosis" at University of Veterinary and Animal Sciences, Lahore, March 5-12, 2018.
7. **Invited speaker** at 4th Conference on Computational Biology and Genomics, held at Hazara University Mansehra, September 27-29, 2017

PUBLICATIONS:

Book Chapters

1. Ramzan A, Sandhu ZY, Altaf S, Tarar A, Arshad I, Rashid S, Shakoor H, Abbas R, **Rashid B** (2021). Plant Molecular Farming: The Ultimate Health Solution-Advances and Future Prospects, In: Frontiers in Molecular Pharming, Book series "**Frontiers in Protein and Peptide Sciences" Vol 2** Chapter 10, Editor Khan S. Bentham Science Publishers; ISBN online 978-981-5036-66-3; pp 267-297.
2. Hussain SS, Ahsan MA, **Rashid B**, Shi B-J (2016). Plant aquaporin biotechnology: Challenges and prospects for abiotic stress tolerance under a changing global environment. In: Water Stress and Crop Plants: A Sustainable Approach, 1st Edn. Edited by Ahmad P. John Wiley UK. ISBN: 978-1-119-05436-8. DOI: https://doi.org/10.1002/9781119054450.ch11
3. Rao AQ, Din SU, Akhtar S, Sarwar MB, Ahmad M, **Rashid B**, Khan MAU Qaisar U, Shahid AA, Nasir IA, Husnain T (2016) Genomics of salinity tolerance in plants", In Plant Genomics, edited by Abdurakhmonov, I. Y., InTech Publisher,ISBN 978-953-51-2455-9 http://dx.doi.org/10.5772/63361
4. Jan S, **Rashid B,** Azooz MM, Hossain MA, Ahmad P (2016). Genetic Strategies for Advancing Phytoremediation Potential in Plants: A Recent Update, In: Plant Metal Interaction Emerging Remediation Techniques, Edited by Parvaiz Ahmad, 1st Edition; Chapter 17 pp 431-454; Elsevier, ISBN: 978-0-12-803158-2; https://doi.org/10.1016/B978-0-12-803158-2.00017-5
5. Latef AAHA., Jan S, Abd-Allah AF, **Rashid B,** John R, Ahmad P. (2016). Soybean under abiotic stress: Proteomic approach. In: Plant-Environment Interaction: Responses and Approaches to Mitigate Stress, 1st Edn. by Azooz MM. and Ahmad P. John Wiley & Sons, Ltd. Chichester, UK; Print ISBN: 9781119080992; https://doi.org/10.1002/9781119081005.ch2
6. **Rashid B,** Husnain T, Riazuddin S (2014). Genomic Approaches and Abiotic Stress Tolerance in Plants. In: Emerging Technologies and Management of Crop Stress Tolerance, Vol1, P. Ahmad (Ed): pp1-26. Elsevier, ISBN: 978-0-12-800876-8 DOI: http://dx.doi.org/10.1016/B978-0-12-800876-8.00001-1
7. **Rashid B,** Husnain T, Riazuddin S (2012). Plant Genetic Engineering: Problems and Applications. In Crop Production for Agricultural Improvement. Ashraf, M.; Öztürk, M.; Ahmad, M.S.A.; Aksoy, A. (Eds.2012). ISBN 978-94-007-4115-7. http://www.springer.com/life+sciences/agriculture/book/978-94-007-4115-7
8. **Rashid B,** Husnain T, Riazuddin S (2010). Plant Adaptation and Phytoremediation, Chapter 19 Herbicides and pesticides as potential pollutants – A global problem. Ashraf, M.; Ozturk, M.; Ahmad, M. S. A. (Eds.) 1st Ed., 482 p., Springer Netherlands - Dordrecht, Hardcover ISBN: 978-90-481-9369-1. https://dx.doi.org/10.1007/978-90-481-9370-7

Thesis as a Book

1. Muhammad Bilal Sarwar, **Bushra Rashid** (2014). Transgene study under Drought Stress (A Comparative study between Transgenic and non-transgenic Plants with Complete Protocols). Lambert Academic Publishing; ISBN: 978-3-659-61834-5
2. **Rashid, B.,** Husnain, T., Riazuddin, S. (2010). Gene Pyramiding: An Approach Towards Sustainable Insect Resistance; by Publishers VDM Verlag Dr. Müllar Aktiengesellschaft & Co. Kg Dudweiler Landstr. 99,66123 Saarbrücken, Germany. ISBN 978-3-639-25629-1.

Research Articles

1. Usman M, Bokhari SAM, Fatima B, **Rashid B**, Nadeem F, Sarwar MB, Nawaz-ul-Rehman MS, Shahid M, Ayub CM (2022) Comparative drought stress mitigating morphological, physiological, biochemical and molecular responses of Guava (Psidium guajava L.) cultivars. Frontiers in Plant Science, DOI: 10.3389/fpls.2022.878616.
2. Batcho AA, Sarwar, MB, Jabbar B, **Rashid B,** Hassan S, Husnain T. (2022). Transient expression analysis of Agave sisalana heat shock protein gene (AsHSP70) in model species (*Nicotiana benthamiana*) under Heat Stress. Biology Bulletin 49(3): 160-168. DOI: 10.1134/S1062359022030037
3. Hafeez MN, Khan MA, Sarwar B, Hassan S, Ali Q, Husnain T, **Rashid B** (2021). Mutant Gossypium universal stress protein-2 (GUSP-2) gene confers resistance to various abiotic stresses in *E. coli BL-*

21 and CIM-496-*Gossypium hirsutum*. Scientific Reports 11, 20466 (2021). https://doi.org/10.1038/s41598-021-99900-x

4. Hassan S, Ahmad A, Batool F, **Rashid B**, Husnain T. (2021) Genetic modification of *Gossypium arboreum* Universal Stress Protein (GUSP1) improves drought tolerance in transgenic cotton (*Gossypium hirsutum*). Physiology and Molecular Biology of Plants. 27(8):1779-1794 https://doi.org/10.1007/s12298-021-01048-5
5. Ahmad Z, Bashir K, Matsui A, Tanaka M, · Sasaki R,· Oikawa A, Hirai MY, Chaomurilege, Zu Y, Kawai-Yamada K, **Rashid B**, Husnain T, Seki M (2021)**.** Overexpression of *nicotinamidase 3* (*NIC3*) gene and the exogenous application of nicotinic acid (NA) enhance drought tolerance and increase biomass in *Arabidopsis*. Plant Molecular Biology 107: 63-84. https://doi.org/10.1007/s11103-021-01179-z.
6. Batcho AA, Sarwar MB, **Rashid B**, Hassan S, Husnain T. (2021) Heat shock protein gene identified from *Agave sisalana* (*As*HSP70) confers heat stress tolerance in transgenic cotton (*Gossypium hirsutum*). Theoretical and Experimental Plant Physiology 33: 141-156. https://doi.org/10.1007/s40626-021-00200-6.
7. Qamar Z, Nasir IA, Abouhaidar MG, Hefferon KL, Rao AQ, Latif A, Ali Q, Anwar S, Rashid B, Shahid AA. (2021). Novel approaches to circumvent the devastating effects of pests on sugarcane. Scientific Reports 11**,** 12428 (2021). https://doi.org/10.1038/s41598-021-91985-8
8. Sher Z, Majid MU, Hassan S, Batool F, Aftab B, **Rashid B.** (2021). Identification, isolation and characterization of GaCyPI gene in Gossypium arboreum under cotton leaf curl virus disease stress. Phyton-International Journal of Experimental Botany. 90(6): 1613-1632. https://doi.org/10.32604/phyton.2021.016154.
9. Jabbar B, Batcho AA, Sarwar MB, **Rashid B**, Hassan S, Husnain T. (2021*).* RNA-Seq Data Analysis Unveils Potential Conserved micro-RNAs in *Agave deserti.* Current Proteomics 18(2): 248-263 https://doi.org/10.2174/1570164617999200529122637
10. Majid MU, Sher Z, Rashid B, Ali Q, Sarwar MB, Hassan S, Husnain T. (2020). Role of leaf epicuticular wax load and composition against whitefly population and cotton leaf curl virus in different cotton varieties. Cytology and Genetics 54 (5): 472-486. https://doi.org/10.3103/S009545272005014X.
11. Mizna, Sajid M, Hassan S, **Rashid B**, Husnain T (2020). Embryogenic capabilities of cotton through tissue culture and expression analysis of SERK3 for regeneration potential. Indian Journal of Agricultural Research, 54(3): 361-366. https://doi.org/10.18805/IJARe.A-515.
12. Jamal A, Shahid MN, Aftab B, Johargy AK, Alshmemri MS, **Rashid B**, Husnain T. (2020). Isolation, characterization and expression analysis of putative drought responsive expressed sequenced tags from Gossypium arboreum roots. The Journal of Animal and Plant Sciences, 30(3): 749-765. https://doi.org/10.36899/JAPS.2020.3.0088
13. Sarwar MB, Ahmad Z, Anicet BA , Sajid M, **Rashid B**, Hassan S, Ahmed M, Husnain T. (2020). Identification and Validation of Superior Housekeeping Gene(s) for qRT-PCR Data Normalization in *Agave sisalana* (a CAM-plant) under Abiotic Stresses. Physiology and Molecular Biology of Plants. 26(3): 567-584. https://doi.org/10.1007/s12298-020-00760-y
14. Hassan S, Qadir I, Aslam A, **Rashid B,** Sarwar MB, Husnain T. (2020). Cloning, genetic transformation and cellular localization of abiotic stress responsive universal stress protein gene (GUSP1) in *Gossypium hirsutum.* Iranian Journal of Biotechnology;18(2): e2312. https://doi.org/10.30498/IJB.2020.138051.2312
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Full Length Gene

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Proceedings (Participation in Conferences with Presentations)

1. Azhar M, Batool F, Hassan S, **Rashid B**. (2022) The consequences of Covid-19 on global food supply and agriculture sector" 3rd International Conference on Food, Nutrition, Environmental, and Agricultural Sciences (ICFNEAS-22) held at Istanbul, Turkey on Feb 19-20, 2022
2. Batcho AA, Hassan S, Batool F, Sarwar MB, **Rashid B.** (2021) Heat shock protein gene induces heat stress tolerance in transgenic cotton (*Gossypium hirsutum*)**.** International scientific conference "Science, technology and development of innovative technologies", dedicated to the 30th anniversary of independence of Turkmenistan held in Ashgabat Turkmenistan, June 12-13, 2021.
3. Bushra Rashid (2021). Heat Shock Protein Genes Circumvent Climatic Changes for Sustainable Crop Production.Online International Conference on "Food, Nutrition, Environmental and Agricultural Sciences (ICFNEAS-21)" organized by GREEN (Global Research, Education and Event Network) and with the scientific support of Akdeniz University (Antalya, Turkey) held in Turkey Aug 19-20, 2021.
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