

CURRICULUM VITAE



1. **Name** : **Shashi Pandey**
2. **Father's Name** : Shri G.N. Pandey
3. **Nationality** : Indian
4. **Age & Date of Birth** : 15th Nov, 1973
5. **Category** : General
6. **Special Category** : Female
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9. **Position held at BHU** : Assistant professor (Stage III)

10. Educational Qualification:

1. Ph. D. in Botany, Lucknow University, U. P. India (2002)
Thesis Title: Isolation and characterization of stress resistant mutants in *Catharanthus roseus* (periwinkle).
2. M. Sc. Botany, Lucknow University, U. P. India-Ist Div. 1995.
3. B. Sc. Biology, Lucknow University, U. P. India-Ist Div. 1993.
4. Intermediate, Biology, U. P. Board, India-Ist Div. 1990.
5. High School, Science, U. P. Board, India-Ist Div. 1988.

11: Awards & Recognition:

1. Awarded **Prof. Y S Murty Medal** 2012 from Botanical Society of India.
2. Awarded "**Birbal Sahni Memorial Gold Medal**" for obtaining Ist Div. and securing the highest percentage in M. Sc. (Botany), 1995.
3. Awarded "**Shri Rajeshwar Lal Sinha and Smt. Prema Sinha Gold Medal**" for obtaining highest percentage among the successful women candidates in M. Sc. Final Examination in Botany.
4. Awarded "**Kamayani Memorial Gold Medal**", candidates in M. Sc. (Botany), 1995.
5. **Best student award** in Botany from Akhil Bharti Vidyarthi Parishad, Lucknow University, Lucknow, 1995.
6. **Qualified Graduate Aptitude Test in Engineering (GATE), 1996** conducted by IIT.
7. Awarded, **C. S. I. R. Scientist Fellowship** (CIMAP), 1996, Lucknow, UP, India.
8. Awarded **C. S. I. R. Senior Research Fellowship** (CIMAP), 1998-2001, Lucknow, UP, India.
9. Awarded **C. S. I. R. extended Senior Research Fellowship** (CIMAP), 2001-2002, Lucknow, UP, India.
10. Awarded **C.S. I.R. Research Associate Fellowship** 2002-2005, NCPGR, New Delhi.
11. **Life Member** of the **National Academy of Sciences (NASI)**, India.

12. **Life Member** of Society of Conservation Biodiversity, India.
13. **Life Member** of the Biotech Research Society, India . LM 816
14. **Life Member** of the Indian Vegetable Science Society, India.
15. **Life Member** of the Indian Society of Plant Physiologist, India
16. **Fellow award** 2011of the Society of Applied Biotechnology, India
17. **Life Member** of The Indian Botanical Society, India.
18. **Life Member** of ISCA, India
19. **Member, Institutional Bio-safety Committee of BHU.** (2009- till date)
20. **Associate Editor Journal of Plant Genomics** (Bioinfo publication) ISSN: 0976-8823 & E-ISSN: 0976-8831 (2010-till date)
21. **Member in Editorial team of Indian Journal of Scientific Research** (ISSN - 0976-2876). (2010-till date)
22. **Member in Editorial team of Journal of Developmental Biology and Tissue Engineering** (Academic Journal- open access journals). (2010-till date)
23. **Hostel excellence award** 2011-12 for invaluable and sincere service as warden.
24. **Hostel excellence award** 2014-15 for invaluable and sincere service as Administrative warden

12. Brief write up for scientific/research contributions:

Dr Shashi Pandey Rai has made outstanding contribution in the area of genetics/ genomics of regulation of stress resistance /terpenoid indole alkaloid biosynthetic pathway expression in *Catharanthus roseus*. For the first time she has been able to demonstrate that drought and salt resistant loss-of-function mutants simultaneously harbour pleiotropic changes in seedling and adult plant morphology. Some of the mutants harbour gross changes in the shoot morphology and inflorescence architecture, implicating involvement of chromatin remodelling in the adaptation process against abiotic stresses. Implication of epigenetic repressors in the expression of alkaloid pathway and stress management gives an entirely new direction to the research on secondary metabolism in plants. She is involved in construction of a molecular map of *C. roseus* on which these marker will be placed. She also worked in the area of development of molecular markers associated with alkaloid yield in *Catharanthus roseus* and with high artemisinin content in *A. annua*. This work has entailed diversity analysis among genetic resources, QTL analysis for alkaloid/isoprenoids richness among recombinant inbred lines and identification of some new genes involved in alkaloid biosynthetic pathway of *C. roseus* and development of molecular markers for high artemisinin content in *A. annua*. Her pioneering efforts advanced the work aimed at construction of lines that hyper-express and accumulate pharmaceutical compounds in *C. roseus* and *A. annua*. She has used comparative genomics approaches to clone the developmental genes for leaf and inflorescence architectures in *C. roseus*, *A. annua* and *Pisum sativum*. The data generated by her efforts has opened new area of research work in India by providing novel genetic material in a plant in which secondary metabolism is of great commercial importance, developed protocols for enhancement of these secondary metabolites such as artemisinin, vinblastine and vincristine and also drug formulation for curing psoriasis using mice model . Besides she has discovered a new gene multifoliate pinna in pea *Pisum sativum* that represses ramification of the distal pinnae of the pea compound leaf. She has opened new area of research work in India by providing novel genetic material in a plant in which secondary metabolism is of great commercial importance.

13. Details of Work Experience:

- 1) 27th Sep-2017- till date, **Professor**, Botany Department , BHU, Varanasi, UP, India
- 2) 29th Oct 2005-2017 date, **Assistant Professor, Stage III**, Botany Department , BHU, Varanasi, UP, India.
- 3) 11th March 2002- 28th Oct 2005 , **Research Associate**, National Centre for Plant Genome Research (NCPGR) JNU campus, New Delhi ,India.
- 4) 3rd October 2001-11th March 2002, **Extended Senior Research Fellow**, National Centre for Plant Genome Research (NCPGR) JNU campus, New Delhi , India.
- 5) 15th September 1998-15th September 2001, **Senior Research Fellow**, Central Institute of Medicinal and Aromatic Plants, (CIMAP) Lucknow, (UP), India.
- 6) 1st January 1996 to 15th September 1998, **Scientist Fellow**, Central Institute of Medicinal and Aromatic Plants, (CIMAP) Lucknow, (UP), India.
- 7) **October, 1995 to January 1996, Graduate Trainee** Central Institute of Medicinal and Aromatic Plants, (CIMAP) Lucknow, (UP), India.

14. Technical skills:

1. *Basic molecular biology techniques*: Isolation, purification and estimation of genomic, nuclear and plasmid DNA and RNA, restriction digestion of genomic and plasmid DNA, construction of genomic DNA and microsatellite enriched libraries, PCR cloning, radioactive and non-radioactive labelling of probe DNA (random and end labelling), Southern and Northern blotting, Southern, Northern and in-gel hybridization, autoradiography, manual and automated DNA and EST sequencings, different PCR techniques (RAPD, RFLP, Microsatellite, AP-PCR, RT-PCR, AFLP,).
2. *Gene tagging and physical mapping*: Bulk segregant analysis (BSA) and selective genotyping, physical mapping using deletion lines.
3. *QTL mapping* : QTL mapping in *Catharanthus roseus* for different traits.
4. *Genetic diversity and cluster analyses*: Genetic diversity using different parameters such as expected heterozygosity and genetic distance using data on morphological traits as well as molecular markers .
5. *Association analysis*: The association between morphological traits and molecular markers using single marker regression and multiple regression analyses
6. *Statistical analyses*: ANOVA, Genetic similarity coefficients, cluster analysis, principal component analysis, simple regression and multiple regression analyses.
7. *Functional Genomics*: cDNA cloning, cDNA sequencing using sequencer, EST sequence analysis, phrap, sequence homology using different Blast engines (blastn, blastx, tblastx), multiple global alignment using ClustalW1.83, cluster analysis using phylip, repeatfinder & repeatmasker and ORF finder,
8. *Cell biology* : Isolation, quantitative and qualitative estimation of seed proteins by Lowery's method and polyacrylamide gel electrophoresis respectively. Isolation, quantitative and qualitative estimation of isozymes-acid phosphatase and esterase by Lowery's method and polyacrylamide gel electrophoresis respectively, Developed a protocol for sodium dodecyl gel electrophoresis for identification of new stress induced protein, different amino acids, osmolytes, sodium and potassium content determination in different stress conditions .
9. *Plant tissue culture* : Hairy root generation using Ri plasmid , Somatic and haploid culture, callus induction, micro-propagation, cell suspension culture.
10. *Construction of mutants, mapping population and multimarked strains using conventional methods*: Generation of stress tolerant mutants by physical and chemical mutagenesis, recombinant inbred lines construction for mapping and generation of multimarked strains with the help of breeding programme.
11. *Experience in cytological and anatomical studies*: Expertization in the area of anatomical and cytological studies, handling and photography with the help of optical and fluorescence microscopes .

15. Computer Experience:

Experience with MS word, MS Excel, Power point and Window 'xp'. Experience of primer designing, Handling of SPSS, Discovery Studio, NTSYS programme for diversity analysis and mapping, searching various data bases, etc.

16. Best Ten Publications:

1. Neha Pandey and **Shashi Pandey-Rai (2015)**. Deciphering UV-B-induced variation in DNA methylation pattern and its influence on regulation of DBR2 expression in *Artemisia annua* L. **Planta**. Doi: 10.1007/s00425-015-2323-3. (2013 Impact Factor: 3.376)
2. Neha Pandey and **Shashi Pandey-Rai (2014)**. Modulations of physiological responses and possible involvement of defense related secondary metabolites in acclimation of *Artemisia annua* L. against short-term UV-B radiation. **Planta**. 240:611-627. ISSN (print version): 0032-0935; ISSN (Electronic version): 1432-2048. (2013 Impact Factor: 3.376).

3. Neha Pandey and **Shashi Pandey-Rai** (2013). Short term UV-B radiation mediated transcriptional responses and altered secondary metabolism of in-vitro propagated plantlets of *Artemisia annua* L. **Plant Cell Tissue and Organ Culture: Journal of Plant Biotechnology**. ISSN: 1573-5044.
4. Rai, R. Meena, R.P. Smita, S.S. Shukla, A. Rai, S.K. **Pandey-Rai, S.** 2011. UV-B and UV-C pre-treatments induce physiological changes and artemisinin biosynthesis in *Artemisia annua* L, an antimalarial plant. **Photochemistry and Photobiology B** 105: 216-225.
5. Rai, R. Pandey, S. **Pandey-Rai, S.** 2011. Arsenic-induced changes in morphological, physiological, and biochemical attributes and artemisinin biosynthesis in *Artemisia annua*, an antimalarial plant. **Ecotoxicology** 20 (8):1900-1913.
6. Gupta, S. **Pandey-Rai, S.**, Srivastava, S. Naithani, S. C. Prasad, M. and Kumar, S. 2007. Construction of primary genetic linkage map of the medicinal plant *Catharanthus roseus* **J. Genet** 86:259-68.
7. Dutta, A. Batra, J. **Pandey-Rai, S.** Singh, D. Kumar, S. Sen, J. 2005. Expression of terpenoid indole alkaloid biosynthetic pathway genes corresponds to accumulation of related alkaloids in *Catharanthus roseus* (L.) G. Don. **Planta** 220: 376-383.
8. Kumar, S. Rai, S. K. **Pandey-Rai, S.** Srivastava, S. Singh D. 2004. Regulation of unipinnate character in the distal tendrilled domain of compound leaf blade by the gene MULTIFOLIATE PINNA (MFP) in pea *Pisum sativum*. **Plant sciences**.166: 929-940.
9. **Pandey-Rai, S.** Luthra, R. and Kumar S. 2003. Salt tolerant mutants in GLYCOPHYTIC SALINITY RESPONSE (GSR) genes in *Catharanthus roseus*. **Theoretical and Applied Genetics** 106:221-230.
10. **Pandey-Rai, S.** Luthra, R. Gupta M.M. and Kumar, S. 2001. Pleiotropic morphological abiotic stress resistance of the hyper abscisic acid producing Abo- mutant in periwinkle, *Catharanthus roseus*. **Jour. Of Biosciences** 26 (1): 57-70.

17. Patent:

“*Catharanthus roseus* mutant plant named Ili” Sushil Kumar, Shashi Pandey-Rai, S.K.Rai, Suchi Srivastava, Digvijay Singh and Raghvendra Kumar Mishra. (US patent) FPO 1826 , NF28/04 granted and published online in 2006.0

18. Technology Transfer:

Jeevanraksha cultivars and/or processing technologies have been transferred to following companies: ALMET Corporation Limited/ Mahasrastra Hybrid Seed Company Limited, Resham Bhawan, 4th floor, 78, Veer Nariman Road, Mumbai 400020.

19. Total List of Publications: (64 Paper published internationally and nationally, 9 Articles and 17 Book chapters)

1. Rai, K. K., Rai, N., Amir M., Tripathi D., and Rai, S. P (2020) Interactive role of salicylic acid and nitric oxide on transcriptional reprogramming for high temperature tolerance in *Lablab purpureus* L.: Structural and functional insights using computational approaches. *Journal of Biotechnology* Vol 309 113-130. Feb 10. doi: 10.1016/j.jbiotec.2020.01.001.
2. Rai, K. K., Rai, N., & Rai, S. P. (2019). Prediction and validation of DREB transcription factors for salt tolerance in *Solanum lycopersicum* L.: An integrated experimental and computational approach. *Environmental and Experimental Botany*. 165: 1-18.
3. Pandey, N., Tripathi, D., Rai, S.K., and Pandey-Rai, S., (2019) Transverse thin cell layer culture for high frequency shoot germination in *Boerhaavia diffusa* L., its conservation and assessment of genetic fidelity. *Plant Archives* vol 19 pp 1093-1101.
4. Rai K.K., Pandey N, Pandey Rai. S. (2019) Salicylic acid and nitric oxide signalling in plant heat stress *Physiologia Plantarum*, 2019. doi.org/10.1111/ppl.12958
5. Maurya B., Rai K. K., Pandey N, Sharma L., Goswami N.K., and Pandey-Rai, S., (2019) Influence of salicylic acid elicitation on secondary metabolites and biomass production in *in-vitro* cultured *withania coagulans* (L.) dunal *plant archives* vol. 19, supplement 1, 2019 pp. 1308-1045 e-issn:2581-6063 (online), ISSN:0972-5210.
6. Tripathi, D., Modi, A., Narayan, G., and Pandey-Rai, S., (2019) Green and cost effective synthesis of silver nanoparticles from endangered medicinal plant *Withania coagulans* and their potential biomedical properties *Materials Science and Engineering: C*, 100C: 152-164
7. Rai, K.K., Rai N. and Pandey Rai.S. (2018) Response of *Lablab purpureus* L. to high temperature stress and role of exogenous protectants in mitigating high temperature induced oxidative damages. *Molecular biology reports* 45 (5), 1375-1395.
8. Pandey, N., Goswami, N., Tripathi, D., Rai, K. K., Rai, S.K., Singh, S., and Pandey-Rai, S., (2018) Epigenetic control of UV-B-induced flavonoid accumulation in *Artemisia annua* L. *Planta*, 249: (2) 497-514.
9. Kumari A., and Pandey-Rai S. (2018) Enhanced arsenic tolerance and secondary metabolism by modulation of gene expression and proteome profile in *Artemisia annua* L. after application of exogenous salicylic acid. *Plant Physiology and Biochemistry* 132, 590-602.
10. Rai, K.K., Rai N. and Pandey Rai.S. (2018) Recent advancement in modern genomic tools for adaptation of *Lablab purpureus* L to biotic and abiotic stresses: present mechanisms and future adaptations. *Acta Physiologiae Plantarum* 40 (9), 164
11. Rai, K.K., Rai N. and Pandey Rai.S. (2018) Investigating the impact of high temperature on growth and yield of *Lablab purpureus* L. inbred lines using integrated phenotypical, physiological, biochemical and molecular approaches. *Ind J Plant Physiol* DOI .org/10.1007/s40502-018-0364-x
12. Rai, K. K., Rai, N. Pandey-Rai, S. (2018) Salicylic acid and nitric oxide alleviate high temperature induced oxidative damage in *Lablab purpureus* L plants by regulating bio-physical processes and DNA methylation. *Plant physiology and Biochemistry* (doi.org/10.1016/j.plaphy.2018.04.023).
13. Tripathi, D., Rai, K.K., Rai S.K., Pandey-Rai, S. (2018) An improved thin cell layer culture system for efficient *in vitro* clonal propagation and withanolide production in a medicinal plant *Withaniacoagulans* Dunal. *Industrial Crops and Products* 119(c), 172-182.
14. Rai, K.K., Pandey Rai.S. and Rai N. (2017) Down regulation of γ ECS gene affects antioxidant activity and free radical scavenging system during pod development and maturation in *Lablab purpureus* L. *Biocatalysis and Agricultural Biotechnology* 2017; 11: 192-200 DOI: 10.1016/j.bcab.2017.07.005.
15. Arora, N., Tripathi, D., Pandey, N., Rai, K.K., Rai, S. K., and Pandey-Rai, S. (2017) Study of Antioxidant, Anti-inflammatory, and DNA-Damage Protection Properties of Some Indian Medicinal Plants Reveal their Possible Role in Combating Psoriasis. *Int. J. Appl. Sci. Biotechnol.* 2017; 5(2): 141-149. DOI: 10.3126/ijasbt.v5i2.17618.
16. Kumari A., Pandey, N. and Pandey-Rai S. (2017) Exogenous salicylic acid-mediated modulation of arsenic stress tolerance with enhanced accumulation of secondary metabolites and improved size of

- glandular trichomes in *Artemisia annua* L. *Protoplasma* 255(1), 139-152. DOI 10.1007/s00709-017-1136-6.
17. Kumari A., Pandey, N. and Pandey-Rai S. (2017). Arsenic-mediated differential responses to oxidative stress and protection by selective accumulation of metabolites in roots and leaves of *Artemisia annua* L. *Biologia Plantarum* 61 (2): 367-377, 2017 DOI: 10.1007/s10535-016-0686-3.
 18. Pandey, N., Meena, R. P., Rai, S. K., & Pandey-Rai, S. (2016). In vitro generation of high artemisinin yielding salt tolerant somaclonal variant and development of SCAR marker in *Artemisia annua* L. *Plant Cell, Tissue and Organ Culture (PCTOC)*, 127(2), 301-314. DOI 10.1007/s11240-016-1050-1.
 19. Rai, S. K., Rai, K.K., Pandey, N., Kumari, A., Tripathi, D., Rai, N., & Pandey-Rai, S. (2016). Varietal performance of turmeric (*Curcuma longa* L.) with special reference to curcumin and essential oil content under climatic conditions of Indogangatic plains. *Indian Journal of Vegetable Science*, 43 (1):36-43 .
 20. Kumari, A., Pandey, N., Meena, R. P., Tripathi, D., & Pandey-Rai, S. (2016). In-vitro characterization of somaclonal variant against salt tolerance by analyzing antioxidative defense system and secondary metabolites in *Artemisia annua* L. *International Journal of Pharma and Bio Sciences*, 7(2): (B) 700 – 714.
 21. Arora, N., Shah, K., & Pandey-Rai, S. (2016). Inhibition of imiquimod-induced psoriasis-like dermatitis in mice by herbal extracts from some Indian medicinal plants. *Protoplasma*, 253(2), 503-515.
 22. Pandey, N., & Pandey-Rai, S. (2016). Updates on artemisinin: an insight to mode of actions and strategies for enhanced global production. *Protoplasma*, 253(1), 15-30.
 23. Pandey, N., & Pandey-Rai, S. (2015). Deciphering UV-B-induced variation in DNA methylation pattern and its influence on regulation of DBR2 expression in *Artemisia annua* L. *Planta*, 242(4), 869-879.
 24. Sarkar, A., Singh, A. A., Agrawal, S. B., Ahmad, A., & Rai, S. P. (2015). Cultivar specific variations in antioxidative defense system, genome and proteome of two tropical rice cultivars against ambient and elevated ozone. *Ecotoxicology and environmental safety*, 115, 101-111.
 25. Arora, N., & Pandey-Rai, S. (2014). GC–MS analysis of the essential oil of *Celastrus paniculatus* Willd. seeds and antioxidant, anti-inflammatory study of its various solvent extracts. *Industrial Crops and Products*, 61, 345-351.
 26. Pandey, N., & Pandey-Rai, S. (2014). Modulations of physiological responses and possible involvement of defense-related secondary metabolites in acclimation of *Artemisia annua* L. against short-term UV-B radiation. *Planta*, 240(3), 611-627.
 27. Rai, R., Pandey, S., Shrivastava, A. K., & Pandey Rai, S. (2014). Enhanced photosynthesis and carbon metabolism favor arsenic tolerance in *Artemisia annua*, a medicinal plant as revealed by homology-based proteomics. *International journal of proteomics*, 2014.
 28. Rai, K. K., Pandey, N., & Pandey Rai, S. (2014). Effect of 2,4-D on phenolics production and detection of in-vitro culture-induced variation through inter-simple sequence repeat and RAPD analysis in *Artemisia annua* L. *International Journal of Pharma and Bio Sciences*.
 29. Pandey, N., & Pandey-Rai, S. (2014). Short term UV-B radiation-mediated transcriptional responses and altered secondary metabolism of in vitro propagated plantlets of *Artemisia annua* L. *Plant Cell, Tissue and Organ Culture (PCTOC)*, 116(3), 371-385.
 30. Dixit, V., Pandey-Rai, S., & Chaudhary, B. R. (2013). *Allium sativum*: four-step approach to efficient micropropagation. *International Journal of Innovative Biological Research*, 2, 6-14.
 31. Arora, N., Singh, V. K., Shah, K., & Pandey-Rai, S. (2012). Qualitative and Quantitative analysis of 3D predicted arachidonate 15-lipoxygenase-B (15-LOX-2) from Homo sapiens. *Bioinformation*, 8(12), 555.
 32. Arora, N., & Rai, S. P. (2012). *Celastrus paniculatus*, an endangered Indian medicinal plant with miraculous cognitive and other therapeutic properties: an overview. *Int J Pharm Bio Sci*, 3(3), 290-303.
 33. Rai, S. K., Arora, N., Pandey, N., Meena, R. P., Shah, K., & Pandey-Rai, S. (2012). Nutraceutical enriched vegetables: Molecular approaches for crop improvement. *International Journal of Pharma and Bio Sciences*, 3, 363-379.
 34. Pandey, N., Meena, R. P., Rai, S.K., & Pandey-Rai, S. (2011). Medicinal plants derived nutraceuticals: a re-emerging health aid. *International Journal of Pharma and Bio Sciences*, 2, 419-441.
 35. Rai, R., Meena, R. P., Smita, S. S., Shukla, A., Rai, S. K., & Pandey-Rai, S. (2011). UV-B and UV-C pre-treatments induce physiological changes and artemisinin biosynthesis in *Artemisia annua* L.—an antimalarial plant. *Journal of Photochemistry and Photobiology B: Biology*, 105(3), 216-225.
 36. Rai, R., Pandey, S., & Rai, S. P. (2011). Arsenic-induced changes in morphological, physiological, and biochemical attributes and artemisinin biosynthesis in *Artemisia annua*, an antimalarial plant. *Ecotoxicology*, 20(8), 1900-1913.
 37. Tripathi, Y. B., Nagwani, S., Mishra, P., Jha, A., & Rai, S. P. (2012). Protective effect of *Pueraria tuberosa* DC. embedded biscuit on cisplatin-induced nephrotoxicity in mice. *Journal of natural medicines*, 66(1), 109-118.

38. Meena, R. P., Arora, N., Pandey, N., Rai, S.K., Sharan, R.A., & Pandey-Rai, S. (2011). *In vitro* callus induction, organogenesis and evaluation of arsenic tolerance capacity in *Artemisia annua* L. *Advances in Biology* 29: 51-63.
39. Pandey-Rai, S., Luthra, R., Kumar, S., & Rai, S.K. (2010). Pleiotropic salt tolerant monogenic recessive mutants in *Catharanthus roseus*. *Advances in Biology*, 28, 1-7.
40. Pandey-Rai, S., Saran, R. A., & Rai, S.K. (2010). Sustainable food production and Food security in India. *Advances in Biology*, 28, 87-90.
41. Smita, S.S., Pandey-Rai, S., Meena, R.P., Saran, R. A., & Rai, S.K. (2010). Hepatoprotective activity of hydro-methanolic extract of two species of *Artemisia* and *Lycopersicon esculentum* against carbon tetrachloride: an environmental contaminant. *Advances in Biology*, 28, 145-152.
42. Kumari, R., Chaudhary, S., Kumar Mishra, R., Pandey Rai, S., Kumar Rai, S., Sharma, V., & Kumar, S. (2010). Regulation of lifespan by the LLI and EGD genes in the perennial plant species *Catharanthus roseus*. *Proceedings of the Indian National Science Academy-Part A: Physical Sciences*, 76(1), 27.
43. Tripathi, R., Sarkar, A., Pandey Rai, S., & Agrawal, S. B. (2011). Supplemental ultraviolet-B and ozone: impact on antioxidants, proteome and genome of linseed (*Linum usitatissimum* L. cv. Padmini). *Plant Biology*, 13(1), 93-104.
44. Kanwar, M. S., Korla, B. N., Kumar, S., Rai, S. P., Smita, S. S., Meena, R. P., & Rai, S. K. (2009). Assessing Changes in Character Associations Among Biparental and F3 Progenies in Late Cauliflower (*Brassica Oleracea* Var. Botrytis L.). *Vegetable Science*, 36(3s), 304-308.
45. Singh, D. V., Rai, S. K., Pandey-Rai, S. H. A. S. H. I., Srivastava, S. U. C. H. I., Mishra, R. K., Chaudhary, S., ... & Kumar, S. (2008). Predominance of the serpentine route in monoterpenoid indole alkaloid pathway of *Catharanthus roseus*. In *Proc Ind Natl Sci Acad* (Vol. 74, pp. 97-109).
46. Srivastava, A. K., Ara, A., Bhargava, P., Mishra, Y., Rai, S. P., & Rai, L. C. (2007). A rapid and cost-effective method of genomic DNA isolation from cyanobacterial culture, mat and soil suitable for genomic fingerprinting and community analysis. *Journal of Applied Phycology*, 19(4), 373-382.
47. Gupta, S., Pandey-Rai, S., Srivastava, S., Naithani, S. C., Prasad, M., & Kumar, S. (2007). Construction of genetic linkage map of the medicinal and ornamental plant *Catharanthus roseus*. *Journal of Genetics*, 86(3), 259-268.
48. Pandey-Rai, S., Mallavarapu, G. R., Naqvi, A. A., Yadav, A., Rai, S. K., Srivastava, S., & Kumar, S. (2006). Volatile components of leaves and flowers of periwinkle *Catharanthus roseus* (L.) G. Don from New Delhi. *Flavour and fragrance journal*, 21(3), 427-430.
49. Rai, S. K., Mallavarapu, G. R., Pandey-Rai, S., Srivastava, S., Singh, D., Mishra, R., & Kumar, S. (2006). Constitution of the flower oil of *Carissa opaca* growing in Aravalli mountain range at New Delhi. *Flavour and Fragrance*, 21, 304-305.
50. Srivastava, S., Mallavarapu, G. R., Rai, S. K., Singh, D., Mishra, R., Pandey-Rai, S., & Kumar, S. (2006). Composition of the essential oils of the leaves and flowers of *Rhus mysorensis* Heyne ex Wight & Arn growing in the Aravalli mountain range at New Delhi. *Flavour and fragrance journal*, 21(2), 228-229.
51. Dutta, A., Batra, J., Pandey-Rai, S., Singh, D., Kumar, S., & Sen, J. (2005). Expression of terpenoid indole alkaloid biosynthetic pathway genes corresponds to accumulation of related alkaloids in *Catharanthus roseus* (L.) G. Don. *Planta*, 220(3), 376-383.
52. Digvijay, S., Shashi, P. R., Suchi, S., Kumar, R. S., Raghavendra, M., & Sushil, K. (2004). Simultaneous quantification of some pharmaceutical *Catharanthus roseus* leaf and root terpenoid indole alkaloids and their precursors in single runs by reversed-phase liquid chromatography. *Journal of AOAC International*, 87(6), 1287-1296.
53. Kumar, S., Rai, S. K., Pandey-Rai, S., Srivastava, S., & Singh, D. (2004). Regulation of unipinnate character in the distal tendril domain of compound leaf-blade by the gene MULTIFOLIATE PINNA (MFP) in pea *Pisum sativum*. *Plant science*, 166(4), 929-940.
54. Rai, S., Luthra, R., & Kumar, S. (2003). Salt-tolerant mutants in glycophytic salinity response (GSR) genes in *Catharanthus roseus*. *Theoretical and Applied Genetics*, 106(2), 221-230.
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2. Pandey, N., Rai, S. K., and Pandey Rai, S. (2018) Paan ki aadhunik sanrakshit kheti evam uske aushadiya gun. *Pragati (BHU)*, 5: 13-17.
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20. Book /Chapters:

1. Kumar, S., Pandey-Rai, S., & Rai, S. K (2006). Mint cultivation in India in *Mint: The Genus Mentha* edited by Brian M. Lawrence *Journal of Essential Oil Research*, Winston Salem, NC, USA Series: Medicinal and Aromatic Plants - Industrial Profiles Volume: 44 Print ISBN: 978-0-8493-0779-9 , eBook ISBN: 978-0-8493-0798-0
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10. Pandey N, Tiwari A. and Pandey-Rai S., (2019) Recent Advances in Epigenetic Research in Plants. *in the book*, Innovations in Life Science Research. Chapter 7: *ISBN: 978-1-53615-868-7*
11. Rai K.K, Rai N and Pandey-Rai S (2019) Enhancing Abiotic Stress Tolerance in Hyacinth Bean (*Lablab purpureus*. L) *in the book*, Innovations in Life Science Research Chapter 9: *ISBN: 978-1-53615-868-7*
12. Goswami N. K , Sharma L, Rai S. K., Apoorva and Pandey-Rai S (2019) *Paederia Foetida*: A Potent Medicinal Plant with Anti- Inflammatory and Anti-Oxidative Properties. *in the book*, Innovations in Life Science Research Chapter 12.*ISBN: 978-1-53615-868-7*
13. MauryaB., Sharma L., Apoorva and Pandey-Rai S. and Rai S. K. (2019) *Carica Papaya*: Pharmacological, Nutritional and Its Therapeutic Uses. *in the book*, Innovations in Life Science Research . *Chapter 13: ISBN: 978-1-53615-868-7*
14. Sharma L., Rai S.K., Apoorva and Pandey-Rai S . (2019) Significance of ploidy in genome evolution, speciation and crop improvement. *in the book*, Innovations in Life Science Research. Chapter 6: ISBN: 978-1-53615-868-7
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16. Deepika Tripathi and Shashi Pandey-Rai (2020) Impacts of green synthesized silver nanoparticles with natural bioactive compounds on plants developmental behavior Chapter 22 in book *Natural Bioactive Compounds –Technological advancements* Editor R.P. Sinha and D.P. Hader Elsevier.
17. Sanjay Kumar Rai, Apoorva, Krishna Kumar Rai and Shashi Pandey Rai (2020) New perspectives of the *Artemisia annua* bioactive compounds as an affordable cure in treatment of malaria and cancer Chapter 15 in book *Natural Bioactive Compounds –Technological advancements* Editors R.P. Sinha and D.P. Hader Elsevier.

21. Current Research Projects: running /completed:

- 1) Functional Genomic approach to prospect genes of sesquiterpene biosynthesis regulation in *Artemisia annua* metabolome” **Principal Investigator : Shashi Pandey**, under Fast Track scheme, DST Project No. R/Dev./ M-48-84 started on 9-3-07 to 9-3-10. (12.5 lakhs).
- 2) Isolation, purification, identification and molecular assessment of microbial diversity from selected districts of Indo-Gangetic Planes. PI Prof LC Rai, **Co. PI : Shashi Pandey**, under NBAIM- ICAR collaborative project . Started 2006-2012. (40 lakhs).
- 3) Role of dps protein in abiotic stress management in *Synacocystis* sp. PI : Prof LC Rai, **Co. PI : Shashi Pandey** , under INDO- JSPS Scheme DST 2007-2009. (3.74 lakhs)
- 4) Identification and development of a potential drug formulation/ new biological products from natural resources for treatment of Psoriasis . **PI Shashi Pandey** from Department of Biotechnology, Ministry of Science and Technology Govt. of India, New Delhi Under RGYI Scheme 1st May 2010-2013 (11.9 lakhs)
- 5) **CSIR sponsored** project entitled “ Mapping of arsenic induced proteome of *Artemisia annua* using 2D electrophoresis and Maldi-TOF –MS”, sanctioned up to three years starting for 1st April 2012-2016 (23 lakhs) **PI Shashi pandey (CSIR- Project) Code- 25/329**

- 6) Molecular characterization of stress responsive hypothetical proteins Alr8073, Alr5059, Alr3014 and Alr3199 of diazotrophic cyanobacterium *Anabaena* sp. PCC7120. **(PI: L.C. Rai and Co P.I.: Shashi Pandey)** SERB-DST , amount sanctioned 18,90,000/, 10 May 2018 , 3 years

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