Vivek Dogra, PhD

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Google Scholar: http://scholar.google.com/citations?user=3Zfem6QAAAJ&hl=en

Professional experience:

Duration	Designation	Institution
04/2020 - Present	Senior scientist	CSIR-Institute of Himalayan Bioresource Technology, Palampur-176061, India
01/2019 - 03/2020	PIFI Postdoctoral Fellow	Shanghai Center for Plant Stress Biology, Chinese Academy of Sciences (CAS), Shanghai- 201602, China
11/2014 - 02/2019	Postdoctoral Fellow	Shanghai Center for Plant Stress Biology, Chinese Academy of Sciences (CAS), Shanghai- 201602, China
04/2012 - 10/2014	Junior Research Fellow	CSIR-Institute of Himalayan Bioresource Technology, Palampur-176061, India
10/2007 - 03/2012	Senior Research Fellow	CSIR-Institute of Himalayan Bioresource Technology, Palampur-176061, India
07/2006 - 10/2007	Research Biologist	Panacea Biotech Limited, Mohali -145001, India

Education:

Degree	Duration	Subject/specialization	Institution
PhD	01/2009 - 03/2015	Plant Biotechnology	CSIR-Institute of Himalayan Bioresource Technology, Palampur-176061, India
MSc	06/2004 - 05/2006	Molecular Biology and Biochemistry	Guru Nanak Dev University, Amritsar, India
BSc	06/2001 - 05/2004	Medical	Himachal Pradesh University, Shimla, India

Research Interests and contributions

Area of Interest: Plant Molecular Biology, Plant stress signaling (Abiotic and Biotic), Chloroplast-to-nucleus retrograde signaling, Post-translational modifications

Research Contributions:

My research interest focusses on to deciphering the role of the chloroplast as an environmental sensor (sensing both abiotic and biotic factors) and in initiating retrograde signaling cascades activating cognate responses. In particular, I have elucidated the singlet oxygen ($^1O_2$) triggered chloroplast-to-nucleus RS pathways. The chlorophyll in LHC-Photosystem II (PSII) complex absorbs photo-energy to drive electron transport; however, it transfers excess energy to O_2, generating highly reactive $^1O_2$ as a byproduct. Stress (both abiotic and biotic)-induced increased levels of $^1O_2$, impose damage to photosynthetic

apparatus by oxidizing proteins, lipids, and carotenoids. We discovered that the oxidation of a nuclear-encoded and chloroplast localized protein EXECUTER1 at its singlet oxygen sensor domain is essential for initiating signaling leading to acclimation and programmed cell death (**PNAS 2016; FiPS 2017; Nat. Commun. 2019**). We recently revealed that EXECUTER2, a protein similar to EX1, acts like a paralog that modulates EX1-mediated signaling by attenuating EX1 oxidation (**Mol. Plant 2022**). In addition, we discovered a distinct signaling pathway instigated by the oxidation of prokaryotic fatty acids (C16), generating reactive electrophile species in the chloroplast, leading to autoimmune mimicking programmed cell death and growth inhibition (**Plant Cell, 2020**). Using forward genetics in chloroplast division mutant *crl*, we recently unveiled the link between plastid division and plastid protein import (**PNAS, 2022**). We also revealed the operation of chloroplast-specific unfolded protein response triggering increased expression of protein quality control machinery for reinstating chloroplast homeostasis (**JXB 2019**). Besides, we, for the first time, identified the specific amino acid residues undergoing oxidation leading to PSII damage, an inevitable physiological process known for decades (**JXB 2019; Plant Physiology 2019**).

The chloroplast also provides the site for the synthesis of several essential metabolites, phytochemicals, and phytohormones, including salicylic- (SA) and jasmonic acid (JA). We have also revealed a cross-talk between ROS and defense hormones, where SA was found to act as a genuine retrograde signaling molecule upon impaired chloroplast homeostasis, dealing with plant immune responses (**Plant Physiology, 2019**). We recently showed that many pathogens, including viruses, target chloroplast to inhibit photosynthesis or SA-mediated defense. We found that the coat (C4) protein of TYLCV normally targets to the plasma membrane (PM) where it interacts with RNAi transmission machinery inhibiting RNAi movement. Upon activation of host defense, PM localized C4 protein disintegrates and translocates into the chloroplast and inhibits SA-mediated defense by interacting with chloroplast-localized calcium-sensing protein (**Cell, 2020**). Besides, bacterial effectors were also found to follow the same translocation mechanisms. This translocation mechanism was found to mimic host proteins, mainly involved in defense. However, the relevance of the translocation of those host proteins from PM to chloroplast still remains to be investigated.

Ongoing projects:

We are now delineating other retrograde signaling cascades operating and priming plant responses in Himalayan plants (**Trends in Plant Sci 2023**). In addition, we are interested in identifying and characterizing various phytoelicitors, including reactive electrophile species, metabolites, and phytohormones released as retrograde signals that prime stress responses in high-altitude crop and medicinal plants (**Physiol Plantarum 2023**). Some of the ongoing projects include:

1. Understanding how chloroplast senses environmental (abiotic and biotic) signals and triggers retrograde signaling cascades priming plant responses
2. Deciphering the mechanisms and relevance of translocation of pathogen effector and host proteins to the chloroplast upon elicitation
3. Understanding adaptive mechanisms attributing to stress-resilience in plants, especially in high-altitude extremophiles

Research Publications:

(Number of Articles: **34**; Book chapters: **01**, Total impact factor: **322.805**; Citations: 829, *h*-index: **15**)

S. No.	Detail of Articles	Journal /Volume/Page	Year	IF (2021)
1.	Ghosh D, Mohapatra S, **Dogra V*** . Improving photosynthetic efficiency by modulating non-photochemical quenching.	***Trends in Plant Science*** doi.org/10.1016/j.tplants.2022.12.016	2022	22.081
2.	Neha, Twinkle, Mohapatra S, Sirhindi G, **Dogra V*** Seed priming with brassinolides improves growth and reinforces anti-oxidative defenses under normal and heat stress conditions in seedlings of *Brassica juncea*	***Physiologia Plantarum*** doi.org/10.1111/ppl.13814	2022	5.083
3.	Fang J, Li B, Chek LJ, **Dogra V**, Luo S, Wang P, Hwang I, Li H, Kim C. TIC236 gain-of-function mutations unveil the link between plastid division and plastid protein import	***PNAS USA*** 119 (11) e2123353119	2022	12.779
4.	Kumari A, **Dogra V**. Joshi R and Kumar S Stress-responsive *cis*-regulatory elements underline podophyllotoxin biosynthesis and better performance of *Sinopodophyllum hexandrum* under water deficit conditions	***Frontiers in Plant Science*** 12:751846	2022	6.627
5.	**Dogra V**, Singh RM, Li M, Li M, Singh S, and Kim C EXECUTER2 modulates the EXECUTER1 signalosome through its singlet oxygen-dependent oxidation	***Molecular Plant*** 15(3): 438-453	2022	21.949
6.	Li M, Lee KP, Liu T, **Dogra V**, Duan J, Li M, Xing W, Kim C Antagonistic modules regulate photosynthesis-associated nuclear genes via GOLDEN2-LIKE transcription factors	***Plant Physiology*** 188(4): 2308-2324	2021	8.005
7.	Sharma M, Anand P, Padwad YS, **Dogra V*** and Acharya V* DNA damage response proteins synergistically affect the cancer prognosis and resistance	***Free Radical Biology and Medicine*** 178, 174-188	2021	8.101
8.	Medina-Puche L, Kim C, Lozano-Duran R, **Dogra V** Protocol for evaluating protein relocalization from the plasma membrane to chloroplasts	***STAR protocols*** 2 (4), 100816	2021	NA
9.	Sawrnkar MK, Kumar P, Dogra V, Kumar S. Prickle morphogenesis in Rose is coupled with secondary metabolite accumulation and governed by canonical MBW transcriptional complex	***Plant Direct*** doi.org/10.1002/pld3.325	2021	3.369
10.	Kumar A, Guleria S, Ghosh D, **Dogra V***, Kumar S Managing reactive oxygen species-Some learnings from high altitude extremophytes	***Environmental Experimental Botany*** 10.1016/j.envexpbot.2021.104525	2021	6.028
11.	Medina-Puche L, Tan H, **Dogra V**, Wu M, Rosas-Diaz T, Wang L, Ding X, Zhang D, Fu X, Kim C and Lozano-Duran R. A Defense Pathway Linking Plasma Membrane and Chloroplasts and Co-opted by Pathogens.	***Cell*** 182(5):1109-1124.e25	2020	66.850

12.	Li B, Fang J, Singh RM, Lv S, Zi H, Liu R, **Dogra V*** and Kim C. FATTY ACID DESATURASE 5 is Required to Induce Autoimmune Response in Gigantic Chloroplast Mutants of Arabidopsis. **[*Co-corresponding author]**	***The Plant Cell*** 32(10): 3240-3255	2020	12.085
13.	Wang F, Fang J, Guan K, Luo, S, **Dogra V**, Li B, Ma D, Zhao X, Lee KP, Sun P, Xin J, Liu T, Xing W and Kim C. The Arabidopsis CRUMPLED LEAF protein, a homolog of the cyanobacterial billin lyase, retains the phycocyanobilin binding pocket for a yet unknown function.	***Plant Journal*** *104: 964-978*	2020	7.091
14.	Lee KP, Liu K, Kim EY, Medina-Puche L, Dong H, Duan J, Li M, **Dogra V**, Li Y, Lv R, Li Z, Lozano-Duran R and Kim C. Intercellular signaling mediated by PNP-A and its cognate receptor protein PNP-R2 counteracts SA-mediated signaling and the SA-primed cell death pathway.	***The Plant Cell*** 32 (7) 2237-2250	2020	12.085
15	Li Z#, **Dogra V#**, Lee KP, Li R, Li M, Li M and Kim C. N-terminal acetylation stabilizes SIB1 involved in salicylic acid-primed cell death.	***Plant Physiology*** 183(1):358-370	2020	8.005
16	**Dogra V** and Kim, C. Singlet Oxygen Metabolism: from Genesis to Signaling.	***Frontiers in Plant Science*** 10:1640	2020	6.627
17.	**Dogra V** and Kim, C. Chloroplast protein homeostasis is coupled with retrograde signaling.	***Plant Signaling & Behavior*** 14:11	2019	2.734
18.	**Dogra V#**, Li M#, Singh S#, Li M and Kim C. Oxidative post-translational modification of EXECUTER1 is required for singlet oxygen sensing in plastids.	***Nature Communications*** 10:2834	2019	17.694
19.	Duan J#, Lee KP#, **Dogra V#**, Zhang S, Liu K, Caceres-Moreno C, Lv S, Xing W, Kato Y, Sakamoto W, Liu R, Macho AP and Kim C. Impaired PSII proteostasis promotes retrograde signaling via salicylic acid.	***Plant Physiology*** 180(4):2182-2197.	2019	8.005
20	**Dogra V#**, Duan J#, Lee KP, and Kim C. Impaired PSII proteostasis triggers an UPR-like response in the var2 mutant of *Arabidopsis thaliana*.	***Journal of Experimental Botany*** 70(12):3075-3088	2019	7.298
21.	Lv R, Li Z, Li M, **Dogra V**, Lv S, Liu R, Lee KP* and Kim C Uncoupled expression of photosynthesis-associated genes contributes to cell death in lesion-mimicking mutant.	***The Plant Cell*** 31 (1): 210-230	2019	12.085
22.	**Dogra V,** Rochaix, J-D, and Kim C. Singlet oxygen-triggered chloroplast-to-nucleus retrograde signaling pathways: an emerging perspective.	***Plant Cell and Environment*** 41(8):1727-1738	2018	7.947

23.	**Dogra V**, Duan J, Lee KP, Lv S, Liu R and Kim C. Proteolysis of EXECUTER1 is essential in mediating singlet oxygen-triggered retrograde signaling in *Arabidopsis thaliana*.	***Frontiers in Plant Science*** 8:1145	2017	6.627
24.	Wang L, Kim C, Xu X, Piskurewicz U, **Dogra V**, Singh S, Mahler H and Apel K. Singlet oxygen- and EXECUTER1-mediated signaling is initiated in grana margins and depends on the protease FtsH2.	***PNAS USA*** 113(26): E3792-800	2016	12.779
25.	**Dogra V,** Sharma R and Sreenivasulu Y. Xyloglucan endo-transglycosylases/hydrolase (XET/H) gene is expressed during the seed germination in *Podophyllum hexandrum*: a high altitude Himalayan plant.	***Planta*** 244:505-515	2016	5.393
26.	Kaushal R, Sharma N and **Dogra V**. Molecular characterization of Glycosyl hydrolases of *Trichoderma harzianum* WF5 - a potential strain isolated from decaying wood and their application in bioconversion of poplar wood to ethanol under separate hydrolysis and fermentation.	***Biomass and Bioenergy*** 85: 243-251	2016	5.774
27.	**Dogra V,** Bagler G and Sreenivasulu Y. Re-analysis of protein data reveals the germination pathway and up accumulation mechanism of cell wall hydrolases during the radical protrusion step of seed germination in *Podophyllum hexandrum* - a high altitude plant.	***Frontiers in Plant Science*** 6:874	2015	6.627
28.	Kaushal R, Sharma N and **Dogra V**. Optimization of the production and molecular characterization of cellulase-free xylanase from an alkalophillic *Bacillus subtilis* SD8 isolated from paper mill effluent.	***Applied Biochemistry and Microbiology*** 51(5): 551-559	2015	1.065
29.	Kaur D[#], **Dogra V[#],** Thapa P, Sood A, Bhattacharya A and Sreenivasulu Y. *In vitro* flowering associated protein changes in *Dendrocalamus hamiltonii*.	***Proteomics*** 15:1291-1306	2015	3.913
30.	**Dogra V** and Sreenivasulu Y. Cloning and functional characterization of β-1, 3-glucanase gene from *Podophyllum hexandrum* - A high altitude Himalayan plant.	***Gene*** 554(1):25-31	2015	3.855
31.	Shafi A, **Dogra V**, Gill T, Ahuja PS and Sreenivasulu Y. Simultaneous Over-Expression of *Pa*SOD and *Ra*APX in Transgenic Arabidopsis thaliana Confers Cold Stress Tolerance through Increase in Vascular Lignifications	***PLOS One*** 9(10): e110302	2014	3.752
32.	Deswal R, Gupta R, **Dogra V**, Singh R, *et al*. Plant Proteomics in India and Nepal: Current Status and Challenges Ahead.	***Physiology and Molecular Biology of the Plants*** 19(4): 461-477	2014	3.023
33.	**Dogra V**, Ahuja PS and Sreenivasulu Y. Change in protein content during seed germination of a high altitude plant *Podophyllum hexandrum* Royle.	***Journal of Proteomics*** 78: 26-38	2013	4.540

34.	Gill T, **Dogra V**, Sreenivasulu Y, Kumar S and Ahuja PS. Protein dynamics in Arabidopsis seeds over-expressing Potentilla superoxide dismutase during germination under copper stress.	***Journal of Plant Research*** 125(1):165-172	2012	3.000

Research Grants/Fundings:

S. No	Title of the project	Project Type/Category	Budget sanctioned	Sponsoring agency	PI/Co-PI
1.	Deciphering Chloroplast Oxi-Proteome for Engineering Oxidative Stress Resilient Chloroplasts in Plants	Research grant for Ramalingaswami Fellowship	42.5 Lakhs for 5 years (2020-2025)	DBT	PI
2.	Deciphering the mechanism of epidermal cell differentiation leading to prickle formation in *Rosa hybrida*	National project (GAP0289)	27 Lakhs for 2 years (2022-2024)	DST	PI
3.	Revealing the Chloroplast Oxi-proteome and Engineering ROS-insensitive Photosynthetic Apparatus	National project (MLP0179)	95 Lakhs for 2 years (2022-2024)	CSIR	PI
4.	Captive cultivation, development of location-specific-agrotechnology, downstream processing and value-addition of Mentha piperita: A sustainable option for livelihood improvement and security in the western Himalayan Region	National project (DBT Himalayan Mission) (GAP0295)	118 Lakhs for 3 years (84 lakhs for CSIR-IHBT) (2022-2025)	DBT	Co-PI
5.	Role of viral and host factors in circulative transmission of tomato begomoviruses by the whitefly Bemisia tabaci	Indo-French International Project	175 lakhs for 3 years (83 lakhs for CSIR-IHBT) (2022-2025)	IFCPRA /DST	Co-PI
6.	Linking the chloroplast-triggered programmed cell death with the coordination between chloroplast division and cell cycle in Arabidopsis thaliana	International (Regional) Cooperation and Exchange Project category	400,000 RMB for 2 years (2019 - 2020)	National Natural Science Foundation of China	PI

Mentorship/Supervision

- Currently guiding 4 PhD students
- Mentored 1 Post-doc, 4 PhD and 2 Master students at Shanghai Center for Plant Stress Biology, Shanghai, PR China (during 2014-2020)
- Supervised several undergraduate research trainees at CSIR-Institute of Himalayan Bioresource Technology, Palampur, India (during 2007-2014)

Memberships of Professional Societies:

1. Member of International Plant Proteomics Organization (**INPPO**) *www.inppo.com*
2. Member of Asia-Pacific Chemical, Biological& Environmental Engineering Society (**APCBEES**) (member no **200340)** *www.cbees.org*
3. Nominated member of the **German Society of Proteome Research (DGPF)** (2013-14).
4. Member of **Indian Society of Plant Physiology** (**ISPP**).

Reviewing/editorial responsibilities:

Editorial: Frontiers in Plant Science (Review Editor- Plant Abiotic Stress section), Frontiers in Genetics (Review Editor- Genomics), PlosOne (Academic editor)

Reviewing: Nature Plants, Nature Communications, The Plant Cell, Molecular Plant, Plant Physiology, Physiologia Plantarum, Food Chemistry, Protoplasma, Plant Signaling and Behavior, Gene, PLoS ONE, Molecular Biology Reports, Plant Physiology and Biochemistry, Industrial crops and Products, Scientific Reports Plant Gene

Honors and accomplishments

1. Selected as a **Member of the Indian National Young Academy of Sciences (INYAS), INSA, in 2023.**
2. **ISPP-ASPB Young Scientist Award of Indian Society of Plant Physiology** at the 5th International Plant Physiology Congress (iFANS-2023).
3. **Ramalingaswami Re-entry fellowship 2019-20** by the Department of Biotechnology, GOI, in March 2020.
4. **President's International Fellowship Initiative (PIFI) Postdoctoral fellowship** by the Chinese Academy of Sciences (CAS) in Dec 2018 for two years; 2019-2020).
5. Received a **research grant as an International Young Scientist** from the National Natural Science Foundation of China (NSFC) in August 2018 for two years; 2019-2020.
6. **Dr. D.S. Kothari Postdoctoral Fellowship** by University Grants Commission (UGC), GOI in June 2015.
7. Received **International Travel Grant** from SERB, DST, under the Young Scientist category to attend the international conference Proteomic Forum 2013 in Germany in March 2013.
8. **Senior Research Fellowship** by CSIR, GOI, in Jan 2012.
9. Qualified **CSIR/UGC NET LS in Life sciences** twice in June 2006 and Dec 2008.
10. Qualified **Radiological Safety Officer (level 1)** exam at AERB, BARC, INDIA in April 2007.
11. University **Gold Medalist** in Post-graduation (in 2006).

Professional Referees

1. **Dr. Sanjay Kumar**, PhD (FNAAS, FNASI)
   Director, CSIR-Institute of Himalayan Bioresource Technology,
   Palampur 176061, INDIA, Phone:(91) 1894-230433, Email: director@ihbt.res.in

2. **Prof. Chanhong Kim**, PhD (Postdoctoral Supervisor)
   Professor, Center for Excellence in Molecular Plant Sciences (CEMPS),
   Shanghai Center for Plant Stress Biology (PSC), Shanghai, PR China, Phone:(86) 21- 57078272
   Email: chanhongkim@sibs.ac.cn

3. **Prof. Y Sreenivasulu**, PhD (PhD Supervisor)
   Professor, Hyderabad Central University,
   Hyderabad 500007, AP, INDIA, Phone: +91 9418037339, Email: sree_yelam@yahoo.com

4. **Prof. Sudhir Kumar Sopory**, PhD (FNAAS, FNASI, FINSA, FIAS, FTWAS)
   Emeritus Senior Scientist
   International Centre for Genetic Engineering and Biotechnology
   Aruna Asaf Ali Marg, 110067 New Delhi, India, E-mail: sopory@icgeb.res.in

5. **Prof. Kailash C. Bansal,** PhD (FNAAS, FNASI)
   Secretary, National Academy of Agricultural Sciences, India
   Senior Advisor, Alliance Bioversity International CIAT (CGIAR), Asia-India
   New Delhi, Delhi, India, Email: kcbansal27@gmail.com