CURRICULUM-VITAE

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Academic qualification:

S.N.	Degree	Year	Subject	University/Institution
1.	B.Sc.	2007	Applied Biotechnology	Sikkim Manipal University of Health, Medical and Technological Sciences, Gangtok (Sikkim)
2.	M.Sc. (Ag.)	2009	Genetics and Plant Breeding	Bundelkhand University, Jhansi (UP)
3.	Ph.D.	2014	Genetics and Plant Breeding	CCS Haryana Agriculture University, Hisar (HR)

Professional attainment:

S.N.	Positions held	Name of the Institute	From	To
1	Scientist	ICAR-Central Soil Salinity Research Institute, Karnal	01.04.2016	Till date
2	Scientist	ICAR-National Academy of Agricultural Research Management, Hyderabad	01/01/2016	31/03/2016

Current research area

Genetic improvement of pulses crops; soybean, mungbean and lentil, for salt affected area of the country using conventional and molecular breeding approaches.

Research projects

S.N.	Name of Project	PI/Co-PI	Duration of Project
1	Genetic improvement of Lentil (*Lens culinaris* Medikus) for salt tolerance using conventional and molecular breeding approaches	**PI**	July 2020-June 2025
2	Development of high-density linkage map and tagging salinity tolerance in lentil using genotyping-by-sequencing approach for improving salt tolerance **Funded by: Department of Biotechnology (DBT) Budget**	**CC-PI**	July 2019 – June 2022
3	Molecular genetic analysis of resistance/tolerance in rice, wheat, chickpea and mustard including sheath blight complex genomics. **Sub component 4: Mustard** **Funded by: ICAR**	**Co-PI**	July 2017 – March 2021
4	QTL mapping and identification of markers linked to salinity tolerance in chickpea (*Cicer arietinum* L.) **(Collaboration with JAU, Junagarh)**	**Co-PI**	Dec. 2018 – April 2021
5	Development of Soybean [*Glycine max* (l.) Merrillis] genotypes for higher yield under Salt Stress	**PI**	May 2017 – April 2020
6	Development of Salt Tolerant and High Yielding Indian Mustard (*Brassica juncea* L. Czern & Coss) Genotypes Using Classical and Modern Breeding Approaches	**Co-PI**	July 2017 – June 2020
7	Genetic improvement of chickpea for salt tolerance through conventional and molecular breeding approaches	**Co-PI**	Sept. 2018 –Aug. 2021
8	Enhancement of genetic potential of Moongbean and Lentil in multi season- and different cropping system adaptation **(Collaboration with ICAR-IARI, New Delhi)**	**CC-PI**	Feb. 2017 – April 2020
9	Development and validation of Multi-trait allele specific SNP panel for high through put genotyping of breeding populations in Soybean. **(Collaboration with ICAR- IISR, Indore)**	**Co-PI**	Aug. 2018 – Nov. 2019

Major Research Accomplishments

- **[Developed salt tolerant Indian Mustard Variety CS 62 (CS 15000-1-1-1-4-2):]** This variety CS 15000-1-1-1-4-2 (CS 62) has been released by the Uttar Pradesh State Sub-Committee on Seeds and Crop Varieties (UP-SVRC) during the year 2022 (office order: SF/296.T/SVN-08/2019-20/रा.बी.उ.स.2020-22/2022-23) and notified by Central Sub-Committee on Crop Standards, Notification & Release of Varieties (CVRC) vide Gazette notification S.O. 1056(E), dated on 6th March, 2023, for irrigated, sodic soils and timely sowing (by 25 October) of Uttar Pradesh. **Its yield is 20-22 q/ha in sodic soil (pH up to 9-9.4) and 25-27 q/ha in normal soil and water** and has about 39.5 percent oil content. This variety matures in about 136 days. The height of its plants is 168 cm. This variety is resistant to Alternaria blight, white rust, powdery and downy mildew, stag head and sclerotinia stem rot and also less infestation of aphid.

- **[Developed salt tolerant Indian Mustard Variety CS 61 (CS 13000-3-2-2-5-2):]** This variety CS 13000-3-2-2-5-2 (CS 61) has been released by the Uttar Pradesh State Sub-Committee on Seeds and Crop Varieties (UP-SVRC) during the year 2022 (office order: SF/296.T/SVN-08/2019-20/रा.बी.उ.स.2020-22/2022-23) and notified by Central Sub-Committee on Crop Standards, Notification & Release of Varieties (CVRC) vide Gazette notification S.O. 1056(E), dated on 6th March, 2023, for irrigated, sodic soils and timely sowing (by 25 October) of Uttar Pradesh. **Its yield is 21-22 q/ha in sodic soil (pH up to 9-9.3) and 25-28 q/ha in normal soil** and water and has about 39 percent oil content. This variety matures in about 132 days. The height of its plants is 181 cm. This variety is resistant to Alternaria blight, white rust, powdery and downy mildew, stag head and sclerotinia stem rot and also less infestation of aphid.

- **Developed salt tolerant Lentil variety PDL-1:** This lentil variety developed with collaboration of ICAR-Indian Agricultural Research Institute (ICAR-IARI), Pusa, New Delhi, and released and notified by Central Variety Release Committee (CVRC) with gazette notification number S.O. 3482 (E), dated 7th October 2020 for the medium salt prone soil and water of the NWP and NEP region (Punjab, Haryana, Delhi, Rajasthan, Uttar Pradesh, Bihar, Orissa, West Bengal and Assam). It has a plant height of 30–32 cm, flowering on 75–80 days, maturity of 103–118 days, 57 pods/plant, 1.9g weight of 100 seeds. This variety is also superior in quality traits like protein (22-24%), iron (95-100 mg/kg seed) and zinc (53-63 mg/kg seed) content. Its yield in salt affected soils (Saline ECe 6 dS/m and sodic pH 9.0) is 11–16 quintal/ha, while 25–30 quintal/ha in normal soil.

- **[Developed salt tolerant Lentil variety PSL-9:]** This lentil variety developed with collaboration of ICAR-Indian Agricultural Research Institute (ICAR-IARI), Pusa, New Delhi, and released and notified by Central Variety Release Committee (CVRC) with gazette notification number S.O. 3482 (E), dated 7th October 2020 for the medium salt prone soil and water of the NWP and NEP region (Punjab, Haryana, Delhi, Rajasthan, Uttar Pradesh, Bihar, Orissa, West Bengal and Assam). This variety attain a plant height of 31-33 cm, flowering on 69-77 days, maturity of 108-116 days, weight of 62 pods / plant, 2.6 g of 100 seeds. This variety is also good in quality traits like protein iron and zinc content as 24-26%, 68-82 mg/kg seed and 36-50 mg/kg seed, respectively. Its yield is 11–15 quintal/ha in saline (up to ECe 6 dS/m) and sodic (up to pH 9.0) soil, while 20–25 quintal/ha in normal soil.

- **Registration of Indian mustard germplasm/ national genetic stocks for salt tolerance under National Bureau of Plant Genetic Resources**

  - **RIL87 (IC640189 and INGR 22164):** A high-yielding strain of Indian mustard has been registered in 2022 as National Genetic Stock for unique traits *viz.* High tolerance to soil Sodicity stress (up to pH_2 9.4).

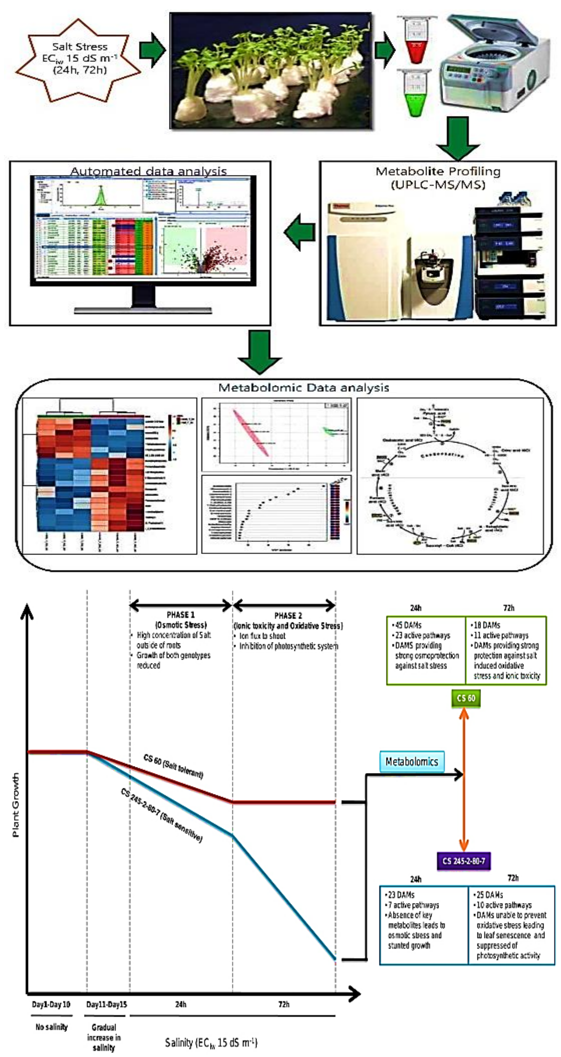
Performance of RIL87 under salt affected soil (pH_2 9.4)

  - **CS 52-SPS-1-2012 (IC0630607 & INGR 19082):** A spontaneous mutant of Indian Mustard has been registered in 2019 as National Genetic Stock for unique traits *viz.* salinity tolerant up to EC_e 15 dS/m, and alkalinity tolerant up to pH_2 9.5, high 1000- Seed weight (8.0-9.0 g) and high photosynthetic efficiency under salinity.

Performance of CS 52-SPS-1-2012 under salinity (EC 15 dS/m)

- ***Insights into Salt tolerance of Mustard (Brassica juncea): A metabolomics perspective:***

To unleash the relevant metabolic pathways involved in the salt tolerance mechanism in Indian mustard using salt tolerant CS 60 and sensitive CS 245-2-7-80-7 genotypes challenged with salt stress at different time points (24h and 72h), for better understanding of salt tolerance mechanism of mustard crop. For metabolomics study, whole plant sample (root and shoot) were subjected to Dionex UltiMate® 3000 Ultra High-Performance Liquid Chromatographic System combined with "Q Ex-active™ Plus Orbitrap™ Mass Spectrometer (UHPLC-MS/MS) analysis method coupled and data generated was analyzed using multi and univariate data analysis approach. Mainly 4124 compounds were detected, with 609 known and 3515 unknown metabolites in both the genotypes. These 609 known metabolites were further classified into 39 distinct groups.

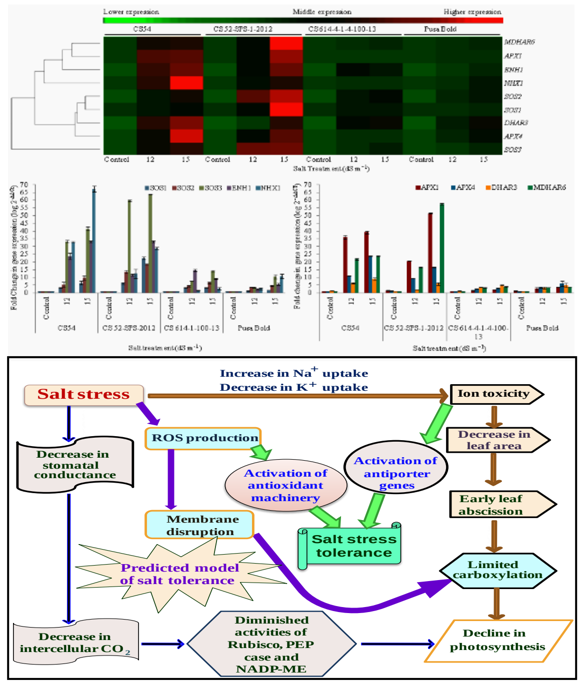


Mustard genotype CS 60 (tolerant) and CS 245-2-80-7 (sensitive) exhibited 63 and 48 differentially accumulated metabolites (DAMs), indicating metabolic alteration induced by salinity. The DAMs were majorly grouped in organic acids followed by nucleotide derivatives, amino acid derivatives and aldehydes. A total of 51 metabolic pathways with significant impact values in CS 60 were involved in the salt tolerance mechanism and majorly regulating the anti-oxidant defense system mutually supported by other relevant metabolic pathways associated with growth and development, gives tolerant genotype an edge against the sensitive genotype to withstand higher salt stress. Contrastingly, salt sensitive exhibited only arginine biosynthesis pathway consistent during the salt stress, accounting for its low response towards salt stress. Altering the DAMs through manipulation of the target gene expression (responsible for synthesis of metabolite that regulate the crucial cellular processes like cell membrane integrity, ionic homeostasis, antioxidant defense system), may help the plant breeder to transform any salt sensitive high yielding variety into a salt tolerant cultivar. It will be noteworthy if metabolomics generated data is integrated with other 'OMICS' based tools (genomics, transcriptomics), then it may provide better insight of the salt tolerance mechanism of Indian mustard. (**Singh et al. 2022. *Environmental and Experimental Botany*. 194: 104760)**

- ***Deciphering the salinity tolerance mechanism in Indian Mustard***

Till now the studies regarding the mechanism of salinity tolerance have been reported in model plants like *Arabidopsis* and very little work has been reported in agronomically important crop plants like mustard. The salt tolerance of Indian mustard might be the function of Na^{+}/H^{+} antiporters that enhanced sequestration of Na^{+} in roots and limiting Na^{+} influx into shoots and maintaining the higher net photosynthetic traits under stress compared to salt susceptible genotypes.

The existence of a more efficient salt scavenging system in salt tolerant genotypes is the evident of overexpression of **antiporters** (SOS1, SOS2, SOS3, ENH1 and NHX1; **if EC <10 dS/m**) and **antioxidant** (APX1, APX4, DHAR1 and MDHAR; **if EC >10 dS/m**) defense genes compared to salt susceptible genotypes. The pyramiding of these genes in Indian mustard might help to mitigate the ionic toxicity effects and cellular ionic homeostasis along with conditioning of photosynthetic attributes leading to a promising yield under salinity stress. ***Our findings will not only help researchers in determining relative importance of different components of salt tolerance mechanism but will also facilitate genes that can be used to screen germplasm and development of Mustard genotypes for salt tolerance***.



Model for salt tolerance in Indian Mustard based on our study

Publications

1. Singh J, **Singh V**, Dutt V, Walia N, Kumawat G, Jakhar M L, Yadava D K, and Sharma P C. 2022. Insights into salt tolerance of mustard (*Brassica juncea* L. Czern & Coss): A metabolomics perspectives. *Environmental and Experimental Botany* https://doi.org/10.1016/j.envexpbot.2021.104760
2. Singh D, Singh C K, Taunk J, Gaikwad K, **Singh V**, Sanwal S K, Karwa S, Singh D, Sharma P C, Yadav R K and Pal M. 2020. Linking genome wide RNA sequencing with physio-biochemical and cytological responses to catalogue key genes and metabolic pathways for alkalinity stress tolerance in lentil (*Lens culinaris* Medikus). *BMC Plant Biology* 22-29 https://doi.org/10.1186/s12870-022-03489-w
3. **Singh V**, Priyadarshni R, Singh AK, Jain Abhinav. 2021. Study of fertility restoration and genetic diversity of drought-tolerant breeding lines for hybrid rice (*Oryza sativa* L.) development. *Joural of Crop Science and Biotechnology* https://doi.org/10.1007/s12892-021-00112-6
4. Singh D, Singh CK, Taunk J, Sharma S, Gaikwad K, **Singh V**, Sanwal SK, Singh D, Sharma PC, Pal M. 2021. Transcriptome skimming of lentil (Lens culinaris Medikus) cultivars with contrast reaction to salt stress. *Functional Integrative Genomics* **21:** 139–156. https://doi.org/10.1007/s10142-020-00766-5
5. Singh D, Singh CK, Tomar R S S, Sharma S, Karwa S, Pal M, **Singh V**, Sanwal S K, Sharma PC. 2020. Genetics and molecular mapping for salinity stress tolerance at seedling stage in lentil (*Lens culinaris* Medik). *Crop Science*.1–13. https://doi.org/10.1002/csc2.20030
6. **Singh V**, Sanwal SK, Kumawat G, Kumar M S, Satpute GK, Gill BS, Panwar S, Singh J and Sharma PC. 2020. Assessing the Effect of Salt Stress on Soybean [Glycine max (L.) Merrillis] Genotypes Using AMMI and GGE Biplot Analysis. *Journal of Soil Salinity and Water Quality* 12(1): 95-100.
7. **Singh V**, Sanwal S K, Singh Z, Kumawat G, Shivakumar M, Satpute G K, Gupta S, Gill B S, Walia N, Mohan Jakhar M L, Sharma PC and Jogendra Singh J. 2020. Genome-wide In Silico Identification of Transcriptional Regulators Controlling the Response to Salt Stress in Soybean (Glycine max (L.) Merr.). *Journal of Soil Salinity and Water Quality* 12(2), 277-289.

8. Kumawat, G., Maranna, S., Gupta, S., Tripathi R., Agarwal N., **Singh V**., Rajesh V., Kamble V., Natraj V., Bharti A., Sharma M.P., Jadhav P.V., Ratnaparkhe M.B., Satpute G.K., and Bhatia V.S. 2020. Identification of novel genetic sources for agronomic and quality traits in soybean using multi-trait allele specific genic marker assays. *J. Plant Biochem. Biotechnol.* **30:** 160–171. https://doi.org/10.1007/s13562-020-00580-x
9. **Singh V**, Singh J, Kumar P, Banyal RK and Sharma PC. 2019. *Prosopis juliflora* and *Vachellia nilotica*: boon for salt-affected land and livelihood security-a review. *Journal of Soil Salinity and Water Quality*. **11**(1): 108–116.
10. Singh J, Sharma PC, **Singh V** and Kumar P. 2019. Predicted model to reveal the mechanism of salt tolerance in *Brassica juncea.* *Journal of Soil Salinity and Water Quality*. **11**(1): 18–30.
11. Singh J, **Singh V**, Vineeth TV, Kumar P, Neeraj and Sharma PC. 2019. Differential response of Indian Mustard *(Brassica juncea* L., Czern & Coss) under salinity: photosynthetic traits and gene expression. *Physiology and Molecular Biology of Plants*. **25**(1): 71–83.
12. Singh J, Sharma PC, **Singh V**, Sharma DK, Sharma SK, Singh YP and Singh RB. 2019. CS58: new high yielding, salt and alkaline tolerant cultivar of Indian mustard. *Crop Breeding and Applied Biotechnology*. **19**(4): 461-465
13. Singh J, **Singh V** and Sharma PC. 2018. Elucidating the role of osmotic, ionic and major salt responsive transcript components towards salinity tolerance in contrasting chickpea (*Cicer arietinum* L.) genotypes. *Physiology and Molecular Biology of Plants*. 24(3): 441–453.
14. Singh D, Singh CK, Singh YP, **Singh V**, Singh R, Tomar RSS. 2018. Evaluation of cultivated and wild genotypes of *Lens* species under alkalinity stress and their molecular collocation using microsatellite markers. *PLoS ONE*. **13**(8): e0199933.
15. Singh J, Sharma PC, Satyavan, Singh YP, Chauhan SK, **Singh V** and Neeraj. 2018. Notification of crop varieties and registration of germplasm: Indian Mustard Variety CS 60. *Indian J. Genet*., **78**(3): 398–399.
16. **Singh V**, Singh AP, Bhadoria J, Giri J, Singh J, Vineeth TV and Sharma PC. 2018. Differential expression of salt-responsive genes to salinity stress in salt-tolerant and salt-sensitive rice (*Oryza sativa* L.) at seedling stage. *Protoplasma*. 255 (6):1667–1681.
17. **Singh V**, Yadav NR and Singh J. 2017. Role of Genomic tools for Mungbean [*Vigna radiata* (L.) Wilczek] improvement. *Legume Research*. **40** (4): 601–608.
18. **Singh V**, Yadav RK, Yadav NR, Yadav Rajesh, Malik RS and Singh J. 2017. Identification of Genomic Regions/Genes for high Iron and Zinc Content and Cross Transferability of SSR Markers in Mungbean (*Vigna radiata* L.). *Legume Research*. **40**(6):1004–1011.
19. Singh J**,** Sastry EVD and **Singh V**. 2014. Effect of Salinity on Genetic Architecture of Fruit Yield and Its Contributing Traits in Tomato (*Lycopersicon esculentum* Mill.). *Journal of Soil Salinity and Water Quality.* **6**(1): 42–51.
20. **Singh V**, Panwar G S and Singh J. 2013. Validation of SSR markers for fertility restorer gene in drought tolerant advanced breeding lines of rice (*Oryza sativa* L.)]. *Crop Research*. **45**(3): 66–73.
21. **Singh V**, Yadav RK, Yadav R, Malik RS, Yadav NR, Singh J and Meena MD. 2013. Effect of different iron and zinc application on growth, yield and quality parameters of mungbean (*Vigna radiata* L.). *Annals of Agri Bio Research.***18**(2): 164–175.
22. **Singh V**, Yadav RK, Yadav R, Malik RS, Yadav NR and Singh J. 2012. Stability analysis in Mungbean [*Vigna radiata* (L.) Wilczek] for nutritional quality and seed yield. *Legume Research*. **35**(1): 43–48.
23. Singh J, Sastry EVD and **Singh V**. 2012. Effect of Salinity on Tomato (*Lycopersicon esculentum* Mill.) during Seed germination Stage. *Physiology and Molecular Biology of Plants*. **18**(1): 45–50.

Book/Book Chapter/compendium

1. Ratnaparkhe, M.B. and **Singh V**. (2022). Genomic Designing for Abiotic Stress Tolerant Soybean. In: Kole, C. (eds) Genomic Designing for Abiotic Stress Resistant Oilseed Crops. Springer, Cham. https://doi.org/10.1007/978-3-030-90044-1_1
2. Singh J, Sharma PC and **Singh V**. 2020. Breeding Mustard (*Brassica juncea*) for Salt Tolerance: Problems and Prospects. In: Brassica Breeding and Biotechnology, (Edi.). AKM Aminul Islam, MA Hossain and AKM Mominul Islam. IntechOpen Ltd., London, United Kingdom (*ISBN 978-1-83968-697-9*). Pp: 1-15. DOI: 10.5772/intechopen.9455. Available at *https://www.intechopen.com/chapters/74043*.

3. **Singh V**, Yadav RK, Singh J. 2016. Biofortification of mungbean using marker assisted selection. *LAP LAMBERT Academic Publishing*. OmniScriptum GmbH & Co., Germany. 120 pages. ISBN-10:3659946222; ISBN-13:978-3659946226).

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1. विजयता सिंह, रवि किरण के.टी.,जीतेन्द्र सिंह, **जोगेन्द्र सिंह** एवं प्रबोध चन्द्र शर्मा. 2021. लवणग्रस्त मृदा में मसूर की उन्नत खेती। आईसीएआर–सीएसएसआरआई / करनाल / फोल्डर / 2021 / 4
2. जोगेन्द्र सिंह, प्रबोध चन्द्र शर्मा एवं **विजयता सिंह.** 2018. "लवणग्रस्त भूमि में सरसों की खेती"। आई.सी.ए.आर.–सी.एस.एस.आर.आई. / करनाल / फोल्डर / 2018 / 08।
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Popular Articles

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2. जीतेन्द्र सिंह, **विजयता सिंह** एवं जोगेन्द्र सिंह॰ 2020॰ लवणग्रस्त भूमि में सरसों की अधिक पैदावार कैसे लें। सिद्धार्थः सरसों संदेश॰ 11: 53–56।

3. **विजयता सिंह,** जीतेन्द्र सिंह, जोगेन्द्र सिंह, जसवंत सिंह, धीरज कुमार, सतीश कुमार सनवाल एवं पी॰सी॰ शर्मा॰ 2020॰ सोयाबीन की उन्नत खेती। कृषि किरण॰ 12: 83–86।

4. जीतेन्द्र सिंह, **विजयता सिंह,** जोगेन्द्र सिंह, जसवंत सिंह, धीरज कुमार, सतीश कुमार सनवाल एवं पी॰सी॰ शर्मा॰ 2020॰ चने की उन्नत खेती। कृषि किरण॰ 12: 87–92।

5. Suthar MK, Meena RP, V Thondaiman and **Singh Vijayata**. 2019. miRNA and their putative targets in Andrographis paniculata. Biomolecule reports. BR/12/19/12, ISSN: 2456-8759.

6. **Singh Vijayata**, Singh Jogendra, Kakraliya SK, Barman Arijit, Singh Awtar and Suthar Manish. 2019. Agricultural Biodiversity: Indispensable for Sustainable Agriculture and Food Security. *Popular Kheti*. 7(2): 38–41.

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10. AK Mandal, A Datta, M Kumar, J Singh, **Vijayata Singh** and RK Singh. 2017. Basmati CSR-30: Doubling Farmers Income in Sodic soils. *ICAR News*. 23 (4): 10-11.

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13. **Vijayata Singh**, J Singh, A Singh, A Barman, S Vibhute and RS Tolia. 2017. "Genetic erosion: a threat to biodiversity depletion. *Innovative Farming*. 2(1): 63-65.

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E-publication

1. **Vijayata Singh**, Jogendra Singh, Zeetendra Singh, Sachin Kumar, Manish Suthar, Giriraj Kumawat, SK Sanwal and PC Sharma. 2020. Potential role of long noncodon RNA in soybean for salt tolerance.

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2. Jogendra Singh, **Vijayata Singh**, SK Sanwal, Awtar Singh and PC Sharma. 2019. Tolerance Mechanism of Salt and Drought Stresses in Plants: Genes and their roles.
(https://www.scribd.com/document/412912861/Tolerance-Mechanism-of-Salt-and-Drought-Stresses-in-Plants-Genes-and-their-roles).
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4. **Vijayata Singh** and Jogendra Singh. 2016. Brassica Breeding for Salt Stress Tolerance: Mendelian to Molecular Approaches. (https://www.scribd.com/document/333866854/Brassica-Breeding-for-Salt-Stress-Mendelian-to-Molecular-Approaches-Tolerance-Vijayata-Singh-and-Jogendra-Singh).
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6. Jogendra Singh, **Vijayata Singh** and Ashwani Kumar. 2013. Terminator Technology: Boon or Curse to Farmers.
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Awards and recognition

1. **Best Poster Award** In: DAE-BRNS Life Sciences Symposium (**LSS-2018**) on "Frontiers in Sustainable Agriculture" held at Bhabha Atomic Research Centre (BARC), Trombay, Mumbai on 26-28 April, 2018.
2. **Best Young Scientist Award-2020:** For overall achievements and accomplishment in the field of Science and Technology-under the category of "Genetics and Plant Breeding" by Novel Research Academy, Puducherry, India.
3. **Best Poster Award (First Prize):** Hindi poster competition conducted at ICAR-CSSRI, Karnal during 14-28 September, 2021.
4. **Best Poster Award (Second Prize):** In: Indian Society for Plant Physiology (ISPP) North Zonal Seminar-2022 on "Inter-disciplinary Research Strategies for Climate Resilient Agriculture" held at ICAR-SBI-RC, Karnal on 25th June, 2022.
5. **Best Poster Award (First Prize):** In: International Conference on Pulses Research (ICPR)-2022 organised by Society for Plant and Agricultural Science (SPAS)" held online on 10th Feb., 2022.

(Vijayata Singh)