# Biodata of Dr. H. S. Dhaliwal

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## Date of birth: March 1, 1946.

**Academic Qualifications**:

Ph.D. 1972-75. Genetics, University of California, Riverside, California, USA. OGPA 3.78/4.00.

M.Sc. (Hons.) 1967-1969 Plant Breeding; Punjab Agricultural University, Ludhiana, India. OGPA 3.91/4.00.

B.Sc. 1963-1967 (Agric.), Panjab University, Chandigarh, India. Second position in the University.

Matriculation 1962, Panjab University, Chandigarh, India (Obtained 71.18% marks).

**POSITIONS HELD AND RESEARCH EXPERIENCE**

**Professor of Biotechnology, Department of Biotechnology, Indian Institute of Technology Roorkee, Roorkee, Uttarakhand. November 20, 2003 onwards.** Introgression of genes of economic importance from wild relatives of crop plants, molecular cytogenetics and genomics of crop and medicinal plants. Genetic engineering crop plants for improvement of resistance against biotic and abiotic stresses and quality.

**Professor of Biotechnology and leader of Introgression and molecular breeding unit of Department of Genetics and Biotechnology. February, 2000 to September 30, 2003.** Introgression of useful variability from related wild species of wheat and rice, molecular characterisation of useful derivatives, molecular mapping, gene tagging and pyramiding, map and insertional mutagenesis based gene cloning, genetic transformation and characterisation of transgenic plants.

**Founder Director/Head, Biotechnology Centre, PAU, Ludhiana. February 1992 to February 2000.** Strengthened Biotechnology Centre. Formulated and got funded a number of research projects from national and international agencies including Rockefeller Foundation, US-Indo-Fund, DBT, NABARD, ICAR, DST, Asian Rice Biotechnology Network. Formulated 12 new courses for offering Biotechnology as a field of specialization to 13 different departments. Established laboratories and green house facilities for large-scale micropropagation of plants, genetic transformation, wide hybridization and molecular mapping.

**Visiting Scientist, Applied Biotechnology Centre, CIMMYT, Mexico. August to October 1999**. Molecular tagging of Karnal Bunt resistance genes of wheat using AFLPs and microsatellite markers.

**Rockefeller Foundation Career Fellow, Institute of Molecular and Cellular Biosciences, University of Tokyo, Japan, three months each year from 1996 to 1998.** Genetic transformation of Basmati rice with maize Ac, Ds transposons for gene cloning using *Agrobacterium tumefaciens* system. Molecular gene characterization of transgenic plants

**Visiting Professor, Weizmann Institute of Science, Rehovot, Israel, April-May, 1997.** Genetic transformation of wheat for Dalapon resistance using particle bombardment gun and *Agrobacterium tumefaciens.*

**Visiting Professor, Kihara Institute for Biological Research, Yokohama, Japan, September, 1996, 1997.** Cytological and molecular characterization of interspecific derivatives of wheat with disease resistance from *Ae. triuncialis* and *Ae . ovata*.

**Visiting Scientist, Division of Plant Industry, CSIRO, Canberra, Australia, August-Sept. 1994**. Genetic transformation of rice and wheat using particle bombardment. Production of haploids using wheat x maize crosses

**Professor of Biotechnology, Department of Plant Breeding, PAU, Ludhiana. Sept.1990 to Feb. 1992.** Established Biotechnology Centre at the PAU and formulated research programme in plant biotechnology.

**Associate Director Research Zone II, PAU, RRS, Gurdaspur. February 1990 - September 1990 (Full time) and September 1990 - November 1991 (Additional charge)**. Successfully implemented the World Bank aided National Agricultural Research Project for Zone II of the State.

**Senior Scientist-cum-Director (Professor) PAU Regional Research Station, Gurdaspur. April 1985 to Feb. 1990.** Guided agricultural research and extension activities of multidisciplinary teams for developing high yielding and disease resistant varieties of field, fruit and vegetable crops and development of package of practices for agroclimatic zone II of Punjab

**Visiting Professor, Department of Plant Pathology, Kansas State University, Manhattan, Kansas, USA. Feb.1989 to June 1989.** Developed a series of D genome addition lines in *T.durum* using C-banding; Characterized *Agropyron elongatum* and *Agropyron intermedium* chromosome segments carrying resistance to wheat streak mosaic virus.

**Senior Research Fellow, CIMMYT, Mexico. Feb. to June 1987.** Discovered a number of missing links in epidemiology and completed the life/disease cycle of Karnal bunt disease of wheat.

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**Research Fellow, Friedrich Miescher Institute, Basel, Switzerland. Jan.1977 to May 1979.** Developed biochemical system for selection of immature haploid embryos of maize and embryogenic haploid calli for *in vitro* mutagenesis and genetics studies, investigated *in vivo* and *in vitro* maize x sorghum intergeneric hybrids, histological investigations of organogenesis of embryogenic cultures of sorghum.

.**D.F. Jones Postdoctoral Fellow, Department of Plant Sciences, University of California, Riverside. July 1975 to Dec.1976.** Synthesized numerous amphiploids in Triticeae, established *T.urartu* as one of the parents of tetraploid wheat; analyzed seed storage protein diversity in Triticeae and its genetic control.

**Research Assistant (Part-time), Department of Plant Sciences, University of California, Riverside.**

**Sept.1972 to June 1975.** Classified wild wheat collection of Dr. B.L Johnson using seed protein electrophoresis, cytology, interspecific hybridization and anther morphology. Discovered *Triticum urartu*, a new species of diploid wheat.
**Research Assistant, Punjab Agricultural University, Ludhiana. Aug. 1969 to Sept. 1972.** Developed disease resistant and high yielding varieties of pulses including *Cicer arietinum, Vigna mugna, Vigna radiata, Lens esculentum and Pisum sativum.*

**Awards and Fellowships**:

Received Merit-cum-Means scholarship from ICAR from 1963-1967.

Awarded Junior Fellowship ICAR from 1967-1969.

Research Assistantship of University of California from 1972- 1975.

D.F.Jones Post-doctoral Fellow, University of California from 1975-1976.

Senior Research Fellow, CIMMYT, Mexico, 1987.

Visiting Professorship, Department of Plant Pathology, Kansas State University, Kansas, USA, 1989.

Selected National Fellow by ICAR in 1983 but did not join.

Cash award from Federation of Indian Chambers of Commerce and Industry in 1985.

Pesticide India Award from Mycology and Plant Pathology Society of India 1988.

Fellow, National Academy of Agricultural Sciences, India, 1992.

Member, International Advisory Board, Wheat Information Service, Yokohama, Japan

Rockefeller Foundation Career Fellowship, University of Tokyo, Japan, 1996-1998.

Visiting Professor, CIMMYT, Mexico, 1999.

Cochran Fellowship by United States Department of Agriculture, September, 2001 and October, 2003 to review the US work on GMOs and their public acceptance and biosafety.

**Membership of Scientific Societies, Task Forces and Committees**:

- Indian Society of Genetics and Plant Breeding.
- Society for Plant Biochemistry and Biotechnology.
- Crop Improvement Society of India.
- Member, Editorial Board, Indian Journal of Agricultural Sciences, ICAR, 1997-2000.
- Member, Task Force, Biotechnology, Department of Biotechnology, Ministry of Science and Technology, Govt. of India, New Delhi. 1997-2000.
- **Member, Agricultural Biotechnology Task force, Department of Biotechnology, Ministry of Science & Technology, Govt. India, New Delhi. 2006-09.**
- Member, Expert Group, Monitoring and Mentoring and Expert Teams of Department of Biotechnology, Ministry of Science & Technology, Govt. of India for strengthening biotechnology

research capabilities in State Agricultural Universities, . 2006 onwards.

- Member Editorial Board as Executive Editor of The Indian Journal of Crop Science of The Royal Society of Crop Science, Meerut, India, 2006 onwards
- Chairman, Project Monitoring committee for Wheat Quality Breeding, Department of Biotechnology, Ministry of Science & Technology, Government of India, December 2007 onwards
- Member , Expert Committee on Biotechnology and Biosafety, National Biodiversity Authority, Chennai, January, 2008
- Member , faculty of Inter-disciplinary and Applied Sciences, University of Delhi, South Campus, New Delhi, February 4, 2008 onwards.
- Member Expert Committee of DBT for July 7, 2008.
- Member Expert Team DBT to visit Anand Agriculture University, Anand, Gujrat for "Programme Support for R&D in Agricultural Biotechnology" June 20, 2008.
- Member of An Expert Committee of DBT on "Application of molecular markers for improvement of crop plants under Grand Challenge Programme"September 15-16, 2008.
- Member "Project Monitoring Committee in Agri-Biotechnology" of DBT of projects sanctioned under the scheme "Centre of Excellence/ Programme Support in Biotechnology" July 1, 2008. Met from November 7-8, 2008 at UAS, Bangalore.
- **Member of the Research Advisory Committee of Indian Agricultural Research Institute, New Delhi constituted by ICAR for a period three years from 25.6.2008 to 24.6.2011. Met from November 19-21, 2008 at IARI, New Delhi.**
- Chairman Project Monitoring Committee of DBT for "Wheat Quality Network Projects" October 18, 2008 at Pune.
- Member Expert Committee of Department of Biotechnology, New Delhi under Grand Challenge Programme from 2008 onwards. Met at Directorate of Oilseeds Research at Hyderabad from December 16-17, 2008.

**Participation in Conferences/Seminars/Workshops/Symposia**:

International Congress of Genetics, University of California, Berkeley, DAVIS, 1973.

Annual Meeting, American Society of Genetics, University of Utah, Salt Lake City, 1975.

Conversazione on Wheat, University of Missouri, Columbia, USA, 1976.

Round Table Discussion on Plant Tissue Culture, Friedrich Miescher Institute, Basel, Switzerland, 1977.

International Congress of Genetics, Moscow, USSR, 1978.

Allerton House Meeting of Corn Geneticists, University of Illinois, Urbana-Champaign, USA, 1979.

Plant Breeding Symposium II, Ames, Iowa, USA, 1979.

Invitation from a Plant Tissue Group, University of Southern Paris, Orsay, France, 1979.

Attended International Congress of Genetics, New Delhi, India, 1983.

Visited Tissue Culture Centre for Crop Projects, Fort Collins, Colorado, July 1987.

Visited Plant Breeding Institute, Cambridge, England and delivered a seminar on Karnal bunt disease of wheat, July 1987.

Attended nine different Annual All India Wheat Research Workers' Workshops held at various places in India since 1979.

Attended Stadler Genetics Symposium, University of Missouri, Columbia, March 13-15, 1989.

Attended International workshop on Evaluation and Utilization of Biodiversity in wild relatives and Primitive forms for wheat Improvement. ICARDA, Aleppo, Syria, October 12-15, 1992.

Attended Sixth Annual Meeting of the International Rockefeller Foundation Program on Rice Biotechnology, Chiang Mai, Thailand, February 1-5, 1993.

Attended a Study Meeting on Biotechnology Application in Agriculture from 18-28 January 1994 in Tokyo which was sponsored by National Productivity Council, India, Asian Productivity Organization, Tokyo and Ministry of Agriculture, Fishery and Forestry, Japan.

Attended 7th Annual Meeting of International program on Rice Biotechnology, Bali, Indonesia, May 1994.

Attended Third International Rice Genetic Symposium, Manila, Philippines, October 1995.

Attended 5th Annual meeting, National Rice Biotechnology Network, Nov.13-16, 1996. ICGEB, New Delhi.

Attended 2nd International Crop Science Congress. 17-24 November, 1996, New Delhi.

Convenor, Biotechnology Session, Third Agricultural Science Congress by National Academy of Agricultural Sciences, March 12-15, 1997, PAU, Ludhiana.

Delivered invited lecture Breeding for resistance to bunts and smuts diseases of wheat: Indian Scenario at the Bunts and Smuts of Wheat: International Symposium organized by USDA, North Carolina, August 16-21, 1997.

Attended International meeting on Rice Biotechnology at Malacca, Malaysia organized by Rockefeller Foundation and MARDI, September 15-20, 1997.

Attended the 12th Toyota Conference "Challenge of Plant and Agricultural Sciences to the crisis of Biosphere on the Earth in the 21st Century", Mikkabi, Shizuoka, Japan, Nov.25-28, 1998 and Chaired a Session on Improvement of Plant functions with Conventional Methods and Biotechnology.

Attended Inaugural Symposium of Indo-Swiss Collaboration in Biotechnology organized by DBT and SDC at Indian Habitat Centre, New Delhi February 12-13, 2001 and delivered the invited lecture.

Reviewed the Chinese UNDP funded project on inactivation of Karnal bunt teliospores using electron bombardment at the Tsinghua University as an international expert in May, 2001.

Attended Annual meetings of Indo -Swiss Collaboration in Biotechnology in February 2001, February, 2002 and March, 2003 at Delhi, Pune and Delhi, respectively.

Attended Indo-US Agricultural Biotechnology Conference on Nutritional enhancement and Abiotic stress tolerance at Delhi from May 15-17, 2003.

Attended Indo-US Workshop on Research & Development in Genomics covering Health, Agriculture and Industry at Bangalore, September 7-10, 2003.

Attended Interactive Workshop on **Crop Biofortification for Alleviating Micronutrient Malnutrition** held at M. S. Swaminathan Research Foundation, Chennai from August 23-24, 2004 and chaired a session on Micronutrient deficiency-problems and solutions.

Visited Okayama University, Research Institute for Bioresources at Kurashiki, Tottori University, University of Tokyo and Kihara Institute for Biological Research, Yokohama in Japan from November 23-30, 2004 and delivered an invited lecture on **Wild germplasm of wheat: A mine of useful variability for food and nutritional security** at the Wheat and Barley Symposium at Tottori University.

Attended workshop on "**Food and Feed –Nutrition, safety and improved use of raw materials**" under Indo-Danish Bilateral Programme at University of Hyderabad, Andhra Pradesh, India from January 29-31, 2007 and presented a paper entitled " **Biofortification of wheat for micronutrients and protein content and bioprospecting of plants and microbes"**.

Attended an international symposium "**Molecular Basis of Plant Breeding**" at CCS University, Meerut, India from February 26-28, 2007 as its **Chief Guest** and delivered a Keynote address on **Molecular Plant Breeding : An overview**.

Attended International **Annual Meeting of Crop Biofortification Programme of India and HarvestPlus** at the Indian Agricultural Research Institute, NASC complex , New Delhi, March 19-20, 2007 and **Chaired the session on Wheat Biofortification.**

Visited Kansas State University, Manhattan, Kansas, USA from June 26-29, 2007 and delivered a seminar on "**Biofortification of wheat for high iron and zinc micronutrient content using conventional and molecular breeding techniques"** in the Department of Plant Pathology.

Attended Third Annual Interactive Meeting on **Crop Biofortification for Alleviating Micronutrient Deficiency** at M. S. Swaminathan Research foundation, Chennai, India, February 22-23, 2008 and presented the progress report of IIT Roorkee Centre.

Organized and attended National Symposium on **Advances in Biotechnology research for Crop Improvement and food Security**, SVBP University of Agriculture & Technology, Meerut, March 6-7, 2008, chaired a session and delivered a Plenary Lecure "Application of Biotechnology for Plant Improvement. Souvenir and Abstracts: 1-9.

Visited the Wheat Genomics work at Washington State University, Pullman, Washington, USA from July 21-22, 2008 and discussed various issues of wheat genomics and biofortification with the faculty.

Visited Agriculture and Agri-Food, Canada Research Station at Lethbridge, Alberta and gave a talk on " **Progress and Prospects of Germplasm Enhancement of wheat for ensuring Food and Nutritional Security**. July 23-24, 2008.

Attended Workshop on **Biosafety issues related to practicing Agricultural Biotechnology** at GBP University of Agriculture & Technology, Pantnagar, November 3-4, 2008. Delivered an invited lecture **"Challenges faced by farmers in northern India and their mitigation through biotechnological interventions"**

Attended **National Symposium on Biotechnology**: **Vision 2020** at SVBP University of Agric. & Technology, Meerut December 8-9, 2008. Chaired a session and delivered an invited lecture "Genomics and Plant Molecular Breeding"and participated in panel discussion.

**Salient Teaching/Research/Extension contributions**:

Identified a new species of wild diploid what *Triticum urartu* and gathered evidence to implicate *T. urartu* as one of the parents of polyploid wheats.

Developed a biochemical system for the selection of immature haploid embryos and haploid morphogenetic culture of *Zea mays*.

Developed systems for the classification of wild wheats and some *Aegilops* species using anther morphology.

Transferred yellow mosaic virus resistance from *Vigna mungo* and *V.sublobata* to *V.radiata* through interspecific crosses.

Discovered the mode of further development of Karnal bunt of wheat after primary infection.

Developed seven wheat varieties viz., PBS 54, PBW 120, PBW 138, PBW 175, PBW 222, PBW 226 and PBW 299 approved for cultivation in Punjab and North Western Plain Zone of India.

Collected and evaluated more than 14,000 accessions of wild and cultivated wheats and *Aegilops* species for resistance to rusts, powdery mildew, Karnal bunt and abiotic stresses.

Synthesized *T. durum – T. monococcum* amphiploids with high yield potential of *T. durum* and resistance to rusts and Karnal bunt of *T. monococcum*.

Transferred resistance to herbicide (Isoproturon) from *Triticum monococcum* to *T. durum*.

Developed a complete monosomic series in a high yielding spring wheat variety WL711.

Discovered that Karnal bunt infected spikes and inoculated leaves and soil produce secondary sporidia in abundance for further infection.

Discovered that hybrid necrosis in wheat was a low temperature phenomenon and could be controlled by growing the hybrids above 28C degree centigrade.

Developed maize x teosinte hybrids for fodder and transferred BSDM resistance of teosinte to maize.

Discovered a weedy race of *Sesamum indicum* which is resistant to several diseases of sesamum.

Developed all the seven D-genome addition lines in *Triticum durum* using Giemsa C-banding.

Analyzed alien chromosomes carrying resistance to wheat streak mosaic virus and green bug among wheat-*Agropyron* derivatives using C-banding and *in-situ* hybridization.

Induced and screened several morphological, male sterile and endosperm mutants in diploid wheat *T. monococcum*.

Developed facilities for long-term storage of wheat germplasm under natural conditions at Keylong (HP)

Made numerous interspecific and intergeneric crosses and amphiploids involving wheat and *Aegilops* species for transfer of useful variability for biotic and abiotic stresses.

Developed substitution lines of *Aegilops ovata* and *Aegilops triuncialis* in *T. aestivum* carrying resistance to stripe and leaf rusts, powdery mildew and cereal cyst nematodes.

Identified novel HMW-glutenin subunits in the progenitors of wheat, which are being transferred to durum and bread wheats.

Established high degree of polymorphism at the molecular level in diploids wheats through RAPDs and developed RAPD linkage maps in diploid wheats.

Established that the pollen-tube channel cannot be used as for delivery of exogenous DNA to wheat ovules for transformation.

Prepared Status Report of Agroclimatic Zone-II of Punjab and compiled completion report of NARP-Phase-I for Zone II and III of the State.

Guided or in the Advisory Committees of 15 M.Sc. and 20 Ph.D. students.

Taught Advances in Cytogenetics of crop plants and Advances in Plant Biotechnology" since 1992. Teaching Genetic Engineering, Plant Cell and Tissue Culture and Genomics and Proteomics at IIT Roorkee

Organized more than 16 Regional Kisan Melas, three ZRAC meetings and coordinated Lab-to-Land Programme at RRS, Gurdaspur.

Organized training courses on Micropropagation of ornamental and other plants through tissue culture at the Biotechnology Centre.

Formulated course curricula for postgraduate programme in Biotechnology at M.Sc. and Ph.D. levels in the PAU.

Associated with the development of protocols for micropropagation of ornamental, fruit and field crops, anther, isolated pollen and protoplast culture in rice, genetic transformation using particle bombardment gun and *Agrobacterium tumefaciens.*

Established molecular cytogenetic and genetic transformation units in the Biotechnology Centre.

Standardized protocol for routine production of haploids using wheat x maize crosses.

Transformed Basmati 370 with Ds transposon using *Agrobacterium tumefaciens* system isolated six Ds insertional mutants of Basmati 370.

Tagged resistance to Karnal bunt of wheat with RAPD, AFLP and microsatellite markers.

Tagged gene(s) for high protein content, seed size and pre-harvest sprouting tolerance in wheat using STMS marker.

**Pyramided three genes *xa5, xa13* and *Xa21* for bacterial leaf blight resistance** into commercial rice variety PR 106 using MAS.

Developed near isogenic lines of wheat variety PBW343 for leaf rust resistance genes *Lr24* and *Lr28* and pyramided them in PBW343 using marker-assisted selection.

Collected landraces of wheat and barley from higher hills of Uttarakhand and found them to be distinct from the pre- and post-green revolution wheat varieties developed and released in India in the 20th century. The land races possess useful variability for micrunutrient content, protein profile, grain hardness and resistance against biotic and abiotic stress.
Identified a number S genome containing *Aegilops* species for high iron and zinc content and made several biofortified wheat-*Aegilops* amphiploids.

Identified and mapped several EMS induced brittle culm and dwarf mutants in diploid wheat being used for functional genomics through reverse genetics.

Identified, introgressed and catalogued three novel wheat rust resistance genes, *Lr57* and *Yr40* from *Aegilops geniculata* and *Lr58* from *Aegilops triuncialis* which could save losses due to leaf and stripe rusts of wheat worth billion of US dollars across the globe.

Another set of 10 novel genes from other related wild species, introgressed into wheat, are being catalogued which on deployment among wheat cultivars will stabilize world's wheat production.

Transferred novel genes for extreme type of grain hardness and softness from *Aegilops* species into bread wheat highly desirable for bread and biscuit making, respectively.

Cloned and characterized four important genes in Basmati 370 controlling **Polyembryony, gibberellic acid insensitive dwarf, oligoculm, pectin methyl esterase and seedling lethal** using T-DNA insertions.

Molecular marker assisited pyramiding of bacterial bligh resistance genes *Xa 21* and *xa13* and the green revolution semidwarfing gene *sd1* in **Dehraduni** basmati variety Type 3.

Wheat-*Ae. kotschyi* introgressive derivatives with more than double the grain iron and zinc content recovered.

Identified three low phytic acid EMS induced mutants in *T. monococcum* having enhanced bioavailability of micronutrients iron and zinc proportionate to their phytic acid reduction.

**Research projects implemented successfully.**

1. Plant Biotechnology and tissue culture centre, Pb.Govt. 1986-91 to date

2. Cataloguing and pre-breeding of wheat genetic resources, USDA. 1989-90 to 1994-95.

3. Somatic cell, protoplast and anther culture of *Indica* rices, Rockefeller Foundation. 1992-93 to 1996-97.

4. Development of cytoplasmic substitution lines in *Brassica* through protoplast fusion, Department of Biotechnology (GOI), New Delhi, 1989-93.

5. Utilization of alien wheat addition lines resistant against Karnal bunt, powdery mildew and loose smut, ICAR, 4 years.

6. Micropropagation and induction of somaclonal variation in sugarcane, ICAR, 3 years. 1993-96.

7. Construction of RFLP linkage map in *Triticum* monococcum and its utilization in the transfer of disease resistance from related species, DBT. 1994-99.

8. Micropropagation in Citrus and Litchi (*L .chinensis*), NABARD, 1994-95 to 1998-99.

9. *In vitro* techniques for selection of radiation induced mutants adopted to adverse environment conditions, IAEA/FAO. 1994-95 to 1998-99 and 1999-2000.

10. Cataloguing and Molecular tagging of quality traits in bread wheat and related species, DBT. 1995-96 to 1999-2000.

11. Identification and transfer of Novel HMW glutenin subunits from wild *Triticum* and *Aegilops* species for improvement of bread making quality of cultivated wheat ICAR-117, ICAR. 1995-96 to 1997-98.

12. Micropropagation and production of ornamental and other plants, PSCST.

13. Micropropagation of sugarcane. Punjab Govt.

14. Genetic transformation of basmati rice. Rockefeller Foundation. 1996-97 to date.

15. Genetic Engineering of novel herbicide resistance into wheat to provide a less resistance prone replacement to isoproturon CSS-10, DST. 1996-97 to 1998-99 and 1999-2000,

16. Molecular tagging of precise transfer of rust and Karnal bunt resistance from non-progenitor *Aegilops* species into cultivated wheats. USDA. 1998-99 to 2002-04.

17. Karnal Bunt screening of US winter wheats under Indian conditions. USDA 2000-2005

18. Fine mapping and map based cloning of genes of economic importance in diploid wheat, *Triticum monococcum* jointly funded by Indo-Swiss Collaboration in Biotechnology and Department of Biotechnology, India, 2000-2006

19. Pyramiding of leaf rust resistance genes in wheat. NATP-ICAR, 1999-2004.

20. Genetic transformation of sugarcane for insect-pests and disease resistance. DBT, 2000-03.

21. Bioinformatics Center of the PAU. DBT, 1997 to continue.

22. Development of diploid wheat ( *Triticum monococcum*) deletion lines for reverse genetics. National Science Foundation, USA, 2005-07.

23. Biofortification of wheat for micronutrients through conventional and molecular breeding approaches. DBT. Govt. India. 2006-2011.

24. Functional Genomics for Validation of Important Candidate Genes for Improvement of Rice. DBT, Govt. India. 2008-2011.

**Current Research Activities**:

Transfer of useful variability from related species of various crop plants through wide hybridization, molecular cytogenetics, molecular mapping, gene tagging, gene cloning and transformation. Characterization and testing of interspecific derivatives and transgenic plants. Functional genomics of wheat and rice using reverse genetic approaches for cloning of genes of economic importance. Biofortification of wheat for

enhanced micronutrient content and bioavailability.

**Publications**

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| Research papers | - 190 |
| Articles published in Symposia, Seminars and Conferences | - 17 |
| Reviews | - 3 |
| Chapters contributed to books | - 7 |
| Papers presented in meetings, Conferences and abstracted | - 100 |
| Popular articles | - 15 |
| Books/Bulletins/Manuals | - 2 |

**Referees:**

- Dr. B.S. Gill, Distinguished Professor, Department of Plant Pathology, KSU, Manhattan KS 66506-502. Phone: 1-785-776-5962, email: bsgill@ksu.edu
- Dr. D.S. Brar, Head, Plant Breeding, Genetics and Biochemistry Division, International Rice Research Institute (IRRI), PO Box No.933, 1099 Manila, Philippines, Ph: 63-2-845-0563, 844-3351, Fax: 63 2 891 1174 e-mail: d.brar@cgiar.org.
- Dr. Deepak Pental, Vice Chancellor, University of Delhi, New Delhi-110021Ph: 91-11-27667190, Fax: 91-11-27667049, Email: vcdu@vsnl.com
- Dr. Gurdev Singh Khush, Adjunct Professor, Department of Plant sciences, University of California, Davis, CA 95616, USA. Ph: 1-530-754-5111, Email: gurdev@khush.org
- Dr. Jai Rup Singh, Vice Chancellor, Guru Nanak Dev University, Amritsar-143 005. Ph: 0183-2258811, Fax: 0183-2258820, E-mail: vcgndu@yahoo.co.in

**List of Publications of Dr. H.S.Dhaliwal**

Dhaliwal, H.S. and K.B. Singh. 1970. Combining ability and inheritance of pod and cluster number in *Phaseolus mungo* L. Theor. Appl. Genet., **40**: 117-120.

Singh, K.B.and H.S.Dhaliwal. 1970. Combining ability and genetics of seed yield in black gram. Indian J.Genet., **32**: 99-102.

Singh, K.B. and H.S.Dhaliwal. 1971. Combining ability and genetics of days to 50 per cent flowering in blackgram (*Phaseolus mungo Roxb*.). Indian J.agric.Sci. **41**: 719-723.

Singh, K.B. and H.S.Dhaliwal. 1971. Combining ability and graphical analysis for yield and its components studies in F2 generation in wheat. Indian J. Agric. Sci., **41**: 1039-1046.

Malhotra, R.S., K.B. Singh and H.S.Dhaliwal. 1972. Correlation and path analysis in soybean (*Glycine max* L.). Indian J. agric.Sci., **42**: 26-29.

Malhotra, R.S., H.S. Dhaliwal, G.S.Bhullar and K.B. Singh. 1973. Combining ability and inheritance of different characters in lentil. Plant Science V: 24-29.

Singh, K.B., R.S.Malhotra and H.S.Dhaliwal. 1975. Genetic divergence for yield and its components in green gram. Mysore J. Agric., **10**: 535-544.

Dhaliwal, H.S. and A.S.Gill. 1973. Studies of heterosis, combining ability and inheritance of yield and yield components in a diallel cross of Bengal gram (*Cicer arietinum*), Theor. Appl. Genet., **431**: 381-386.

Bhullar, G.S., R.S.Malhotra, K.B. Singh and H.S. Dhaliwal, 1976. Adaptability in black gram (*Phaseolus mungo* L.). Genet. Agrar., **30**: 27-34.

Bhullar, G.S., K.B. Singh, H.S.Dhaliwal and R.S.Malhotra. 1976. Heterosis and combining ability in peas. Genet. Agrar., **30**: 35-46.

Dhaliwal, H.S. and B.L. Johnson. 1976. Anther morphology and the origin of the tetraploid wheat. Am. J. Bot., **63**: 362-368.

Dhaliwal, H.S. 1976. Fertility and morphology of the synthetic amphiploids and the origin of tetraploid wheats. Cereal Res. Commun., **4**: 411-418.

Johnson, B.L., and H.S. Dhaliwal. 1976. Reproductive isolation of *Triticum boeoticum* and *Triticum urartu* and the origin of the tetraploid wheats. Am. J. Bot., **63**: 1088-1094.

Dhaliwal, H.S. and B.L. Johnson. 1976. Origin of *Triticum zhukovskyi*. Wheat. Inf. Serv., **42**: 33-35.

Dhaliwal, H.S.1976. Cytoplasmic relationship between *Triticum boeoticum* and *Triticum urartu*. Wheat Inf. Serv., **42**: 1-2.

Dhaliwal, H.S. 1977. Genetic variability and improvement of seed proteins in wheat. Theor. Appl. Genet., **51**: 71-79.

Dhaliwal, H.S. and P.J.King. 1978. Ploidy analysis of haploid derived tissue cultures of *Zea mays* by chromocentre counting. Maydica, **24**: 103-112.

Dhaliwal, H.S. 1977. Genetic control of seed protein in wheat. Theor. Appl. Genet., **50**: 235-239.

Dhaliwal, H.S.1977. Basis of difference between reciprocal crosses involving *Triticum boeoticum* and *Triticum urartu*. Theor. Appl. Genet., **49**: 283-286.

Dhaliwal, H.S. 1977. The *Ph* gene and the origin of tetraploid wheats. Genetica, **47**: 117-182.

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