

Dr. (Mrs) Pushpa Kharb

Professor

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Field of Specialization

Plant Biotechnology; Genomics

Genetic engineering & Molecular Biology

Academic record

Rockefeller Foundation Post doctoral Fellow, USA (1997-99)

Ph.D.Genetics, 3.93/4.00 (1st position). CSIR Junior and Senior Research Fellowships.

M.Sc. Genetics, 3.74/4.00 (1st position). HAU Merit Fellowship

B.Sc. Biology, Placed in Merit List

M.Sc. Thesis

Kharb, P. (January, 1984). Studies on genotoxic effect of some metal salts in the yeast *Saccharomyces cerevisiae*. M.Sc. Thesis submitted to Haryana Agricultural University in partial fulfillment for the degree of M. Sc. (Genetics).

Ph D. Thesis

Kharb, P. (May, 1994). *In vitro* regeneration and somaclonal variation in some species of Brassica. Ph D. Thesis submitted to Haryana Agricultural University in partial fulfillment for the degree of Doctor of Philosophy in Genetics.

Employment record

Professor, Biotechnology & Molecular Biology (Feb.2007 onwards)

Associate Professor (Genetics: 1999-23/12/2002; Biotech. & Mol. Biology: -2007)

Assistant Professor, Genetics (1990-1999)

Awards/ Fellowships:

- **ICAR sponsored Best Teacher Award of CCS Haryana Agricultural University, Hisar (2004-05)**
- **The Rockefeller Foundation Post-Doctoral Fellowship, Texas A & M University, U.S.A. (Nov.1997-Nov.99)**
- **CSIR Junior and Senior Research Fellowship during Ph.D.**
- **Awarded HAU merit fellowship during M.Sc.**
- **Placed in Merit List of Kurukshetra University during B.Sc. (Biology)**

Patents filed: Six

- **Pushpa Kharb**, K. Dahiya, V. Yadav, P. Batra, N. Narula, S. Dhillon and V. K. Chowdhury. **2005**. A modification of the process of preparation of tissue culture medium. **Application no. 127/DEL/2006**).
- **Pushpa Kharb**, P. Batra and N Narula. **2005**. A novel culture medium for plant tissue culture studies. **Application No. 356/DEL/2007**
- **Pushpa Kharb**, P Batra and V.K. Chowdhury. **2005**. A process for the storage of genetic material. **Application No. 76/DEL/2007**
- **Pushpa Kharb, P..Batra, Pavitra, Manjula Vasudeva and V.K.Chowdhury**. Ecofriendly way of surface sterilization of explants in plant tissue culture. Submitted to NRDC on 22nd September, 2008.
- **Pushpa Kharb and Charu Mitra**. SCAR marker based identification of sex in date palm. Submitted to NRDC, New Delhi on 17-5-2010. Registration no. IPR/4.16.19/10026
- **Pushpa Kharb, Surender and Charu Mitra**. Identification of sex in jojoba by SCAR marker. Submitted to NRDC, New Delhi on 17-6-2010.

Trainings

- Attended Summer Institute on “**Cell Technology and Genetic Engineering for Crop Improvement**” from **June 15 –July 5, 1994** at Centre for Plant Molecular Biology, Tamil Nadu Agricultural University, Coimbatore.
- Training on “**Computer Application**” organized by the Academy of Agricultural Research and Education Management, CCS HAU, Hisar; from **Dec.17 to Dec. 31, 1999**.
- Refresher course on “**Applications of Biotechnological techniques in Agriculture**” organized by the Department of Biotechnology and Molecular Biology and AAREM, from **Dec.4-24, 2003**.
- Training on “**Use of molecular markers for characterization of plant genetic resources**” held at **Huazhong Agricultural University, Wuhan, China**, from **Oct.11-23, 2004**.
- Training on “**DNA based diagnostics**” organized by Department of Animal Biotechnology, College of Veterinary Sciences, CCS HAU, Hisar, from **February 7-28, 2006**.
- Participated in ICAR Training-cum-Workshop on “**IP and Technology Management: Genetic Engineering**” held at Indian Agricultural Research Institute, New Delhi-110012 from **23-25 April 2008**
- Attended ten days training on “**Writing winning proposals in agricultural research**” organized by DHRM from **May 28-June 6, 2009**.

Conference/Symposium/Workshop/Summer School attended

- National symposium on Yeast Biology held in the Department of Microbiology, CCS, HAU, Hisar in Feb 1992.
- National symposium on Newer Perspectives in Environmental mutagenesis and Carcinogenesis held in the Department of Genetics, CCS,HAU, Hisar from Jan 19 to Jan 21, 1995.
- 4th Agricultural Science Congress on Sustainable Agricultural Export, held at Jaipur from Feb. 21-24, 1999.
- General Meeting of the International Programme on Rice Biotechnology; held at Phuket, Thailand from September 20-24, 2002.
- National Symposium on “New Opportunities and Challenges for Improving Crop Productivity through Biotechnology” held at CCS HAU, Hisar from Feb. 13-15, 2002.
- National Seminar on Emerging Trends in Research and Business Management of Medicinal and Aromatic Plants held at CCS, HAU, and Hisar from March, 11-13, 2003.
- National Seminar on “Research and Developments in Production , Protection, Quality, Processing and Marketing of Medicinal and Aromatic Plants Research and Development” held at CCS HAU, Hisar from Feb. 27-29, 2004.
- XXIX Annual conference and symposium on Environmental pollution organised by Environmental Mutagen Society of India and Dept. of Genetics, CCS HAU, Hisar, India. March 3-5, 2004.
- National seminar on “Role of Biochemistry in Modern Day Agriculture” Organized by Deptt. of Biochemistry, CCS HAU, Hisar and Society of Biological Chemists (1) Hisar Chapter on Jan. 24, 2004.
- National Seminar on “Transgenic Crops in Indian Agriculture: Status,Risks & Acceptance” held at Deptt. of Plant Breeding, CCS HAU, Hisar, on Jan.28-29, 2006.
- Participated in regional seminar on Patents and IP issues in agriculture organized by NRDC in collaboration with CCS HAU, held at CCS HAU, Hisar on Dec. 5, 2007.

Teaching

- Actively involved in teaching of under- and post-graduate courses in Genetics (1990 – 23/12/2002) and Biotechnology and Molecular Biology (24/12/2002 – to date) including General Genetics; Principles of Genetics; Introduction to Plant Biotechnology; Principles of Biotechnology; Molecular Biology; Techniques in Biotechnology; Genetic Engineering; Advances in Plant Genetic Engineering; Genomics; Plant Cell and Tissue Culture; Biotechnology, Environment & Society etc.
- Actively involved in developing course curricula for Molecular Biology and Biotechnology at ICAR level.
- Developed **six** practical manuals, chapters in books & manuals, e-book chapter etc.
- Guided/guiding **14 M.Sc.** and **2 Ph.D.** students.

Research profile

Projects completed:

- Identification of Gender-specific DNA markers in date-palm (*Phoenix dactylifera L.*) funded by CSIR (2003-06) **Principal Investigator.**
- Development of an efficient protocol for micro-propagation of date-palm (*Phoenix dactylifera L.*) funded by DST, Govt. of Haryana (2007-09) **CO- Investigator.**
- Identification of sex-specific DNA markers in jojoba (*Simmondsia chinenssa*) funded by DST, New Delhi (2005 - 08) **CO- Investigator.**
- Horticulture Mission Project on tissue culture funded by Govt. of Haryana. (2006) **CO- Investigator.**
- Use of Biotechnology in agriculture including Plant Tissue Culture funded by Ministry of Agriculture, Govt. of India. (2006) **CO-Investigator.**

On-going projects:

- Cloning and characterization of sex-specific DNA marker/s in date- palm (*Phoenix dactylifera L.*) **Principal Investigator**
- Identification of gender-specific DNA markers and genetic diversity in paradise tree [*Simarouba glauca*]. DST, GOI. **Co-Investigator**
- Business Planning and Development Unit. **Co-Investigator**

Peer Recognition

- Life member, Society of Plant Biochemistry & Biotechnology, India.
- Life Member, Association of Microbiologists of India.
- Member, Horticultural Society of Haryana
- Member, National Society of Plant Science
- International Association of Plant Tissue Culture
- Society of Biological Chemists
- Environmental Mutagen Society of India
- Member executive council of AMI (Hisar chapter).
- Expert member, paper setter and evaluation of post graduate theses and selection of SRF/RA etc. from various universities.

Important publications:

- Meenakshi Bhardwaj, Sanjogta Uppal, Sunita Jain, **Pushpa Kharb**, Ravinder Dhillon and Rajinder K Jain. **2010**. Comparative Assessment of ISSR and RAPD Marker Assays for Genetic Diversity Analysis in Jojoba [*Simmondsia chinensis* (Link) Schneider] J Plant Biochem and Biotech 19 (2). Online ISSN: 0974-1275.
- Priyanka Mehta, Praveen Batra, Sunita Khatak, **Pushpa Kharb**, Santosh Dhillon and V.K. Chowdhury (**2009**). Micropropagation in Ashwagandh (*Withania somnifera* (L.) Dunal) Genotype WS-1. IN: Sustainable Agriculture for Food, Bio-Energy and Livelihood Security. Eds.: R.K. Behl, D.P. Singh, V.S. Tomar, M.S. Bhale, D. Khare & S.D. Upadhyaya, Pp 155 – 158.
- Bharat Yadav, **Pushpa Kharb** and Sudhir Kumar. **2008**. Three dimensional structure prediction of tannase. In: EMBO World Lecture Course on Recent developments in Macromolecular Crystallography, held at NCL Pune from Nov. 9-14, 2008. pp 46.
- Gupta, A., Bhardwaj, M., Batra P., **Kharb P.**, Dhillon S. and Uppal S. (**2008**). *In vitro* regeneration studies in female date palm Cv. Hallawy selection-1. Haryana J. Hort. Sci. (Accepted for publication)
- Sapna Grewal, **Pushpa Kharb**, Rekha Malik and R.K. Jain **2007**. Assessment of genetic diversity among Indian wheat cultivars using random amplified polymorphic DNA (RAPD) markers.. **Ind. J. Biotech. 6:18-23**
- Rekha Rani, **Pushpa Kharb**, S.Uppal, S. Dhillon, Parveen Batra and V.K,Chowdhury. **2007**. Genetic divergence analysis in date palm (*Phoenix dactylifera* L.) genotypes using RAPD markers. **Haryana J. of Hort. Sci. 36(1-2): 101-103.**
- Puja Singh, **Pushpa Kharb**, Neelam Pandey, Parveen Batra, Sunita Khatak, S. Dhillon, S. Uppal & V. K. Chowdhury. **2006**. RAPD analysis for genetic diversity and identification of sex-specific marker in date palm (*Phoenix dactylifera* L.). **Haryana J. of Hort. Sci. 35(3-4): 232-234**
- **Pushpa Kharb**, Parveen Batra, Puja Singh, R.K. Yadava and V.K. Chowdhury. **2006**. *In vitro* shoot morphogenesis studies in a novel variant of *Cuminum cyminum* L. **Natnl. J. Pl. Improv. 8 (2):151-152**
- Santosh Dhillon, A.K. Chhabra and **P. Kharb**. Cloning strategies and screening of recombinant clones. Chapter submitted for e-book entitled 'Recombinant DNA Technology and Biotechnology' to Kamlesh Arora, Content Co-ordinator, NISCAIR, New Delhi.
- Puja Singh, Neelam, Parveen Batra, **Pushpa Kharb** and V. K. Chowdhury. **2006**. An efficient protocol for DNA isolation from date palm (*Phoenix dactylifera* l.) leaves. **Natnl. J. Pl. Improv. 8 (2):182-183**
- Manjula Vasudeva, **P.Kharb**, R.K.Vashishat, N.Narula and W.Merback.**2003**. Azide resistance in *Azotobacter chroococcum* and its relationship with respiratory activity,

ATP concentration, cytochrome C-oxidase and nitrogen fixation. **Ind. J. Microbiol.** **43(1):49-51**

- Manjula Vasudeva, R.K.Behl, **Pushpa Kharb**, R.K.Yadav, Neeru Narula, W.Merback and R.K.Vashishat. **2002**. Response of disomic chromosome substitution lines of wheat to *Azotobacter chroococcum* grown under different soil types. **Proc.** 2nd Intl. Conf. on Sustainable Agriculture for energy and industry. Sept. 8-13, held at **Beijing, China**. Pp 1736-1742.
- P.Sharma, M.Vasudeva, **P. Kharb**, K. Lakshminarayana and R.K.Vashishat.**2002**.Effect of azide resistant mutants of *Azotobacter chroococcum* on yield and nitrogen content in two cotton genotypes. **Arch. Acker-Pfl. Boden** **48 :1-7**
- **Pushpa Kharb**, Jinjiang Dong, M.N. Islam-Faridi, David M. Stelly and Timothy C. Hall. **2001**. Fluorescence *in situ* hybridization of single copy transgenes in rice chromosomes. **In Vitro Cell Dev. Biol. Plant** **37: 1-5**.
- Jinjiang Dong, **Pushpa Kharb**, Weimin Teng and Timothy C. Hall. **2001**. Characterization of rice transformed via an *Agrobacterium* mediated inflorescence approach. **Mol. Breeding** **7: 187-194**.
- Dong, J., **Kharb, P.**, Cervera, M., and Hall, T.C. **2001**. The use of FISH in chromosomal localization of transgenes in rice. **Methods in Cell Sci.** **23: 105-113**.
- Kusum, Tanwar, Manjula Vasudeva, **Pushpa Kharb** and R.K. Vashishat. **1998**. Screening of metal salts and non-azo dyes for induction of aneuploidy in *Saccharomces cerevisiae*. **Indian J. Microbiol** **38: 157-159**.
- Manjula Vasudeva, Subhadra, **Pushpa Kharb** and R.K. Vashishat. **1997**. Effect of colchicine and methylated purines on nitrous acid induced gene conversion in *Saccharomyces cerevisiae*. **Annals of Biology** **13 (1): 31-36**.
- Manjula Vasudeva, **Pushpa Kharb**, Neeru Narula and R.K. Vashishat. **1997**. Resistance of *Azotobacter* to different textile dyes. **Environ. Ecology** **15 (4): 940-42**.
- Kharb, R.P.S. and **Pushpa Kharb**. **1997**. Silver Jubilee Cumulative Index (1971-1995). **Seed Res.** **25 (2): 95-211**.
- Kharb, R.P.S. and **Pushpa Kharb** **1997**. Biochemical and cytogenetical changes during seed storage. In: **Seed Technology (B.S. Dahiya and K.N. Rai, Eds.)**, Kalyani Pub. Ludhiana, India.
- **Kharb, Pushpa** and J.B. Chowdhury. **1995**. General medium supporting shoot regeneration in *Brassica* species. **Crucifereae Newsletter No. 17: 28-29**.
- **Pushpa Kharb**, Subhadra, Manjula Vasudeva and R.K. Vashishat **1995**. Induction of aneuploidy in yeast by alkylating agents. **Annals of Biology** **11 (1): 141-144**.
- **Kharb, Pushpa**. **1993**. Regeneration studies on *Brassica juncea*. **Forage Res.** **19 (2): 151-155**.

- **Kharb, Pushpa** and R.K. Vashishat. **1992**. Induction of aneuploidy in *Saccharomyces cerevisiae* by diethyl sulfate. In : **Proceedings** of National Symposium on Yeast Biology held in the Department of Microbiology, CCS HAU, Hisar in Feb. 92 **pp. 91-94**.
- **Kharb, Pushpa** and Indira Singh. **1987**. Induction of respiratory deficiency in yeast by salts of chromium, arsenic, cobalt and lead. **Ind. J. Explt. Biol. 25 (2): 141-142**.
- Kundu, B.S., **P. Kharb**, I. Bala and K. Singh. **1987**. Response of cereals to plant hormones released by diazotrophs. **J. Curr. Biosci. 4: 8-11**.
- **Kharb, Pushpa** and B.S. Kundu. **1986**. Response of pearl millet to associative diazotrophs inoculation. **Environ. Eco. 4: 12-14**.
- Kundu, B.S., **Pushpa Kharb** and P. Tauro. **1985**. Dinitrogen fixation in pearl millet. **Curr. Sci. 54: 801-803**.
- Kundu, B.S., Renu Batra, **Pushpa Kharb** and P. Tauro. **1985**. Dinitrogen fixation in wheat and characterization of associative diazotrophs. **Proc. Ind. Acad. Sci. (Plant Sci.) 96: 9-15**.
- **Kharb, Pushpa** and Indira Singh. **1985**. Genotoxic effects of potassium dichromate, sodium arsenite, cobalt chloride and lead nitrate in diploid yeast. **Mut. Research 155: 117-120**.

Salient achievements of the research work:

a) Microbial genetics:

- Studied genotoxic effect of some metal salts, environmental chemicals, fiber and fabric dyes using strains of *Saccharomyces cerevisiae*.
- Worked on isolation, purification and characterization of *Azospirillum*, *Azotobacter* and *Rhizobia* and estimation of nitrogen fixation efficiency using gas liquid chromatography.
- Worked on a project on genetic and biochemical studies on rhizobia and *Azotobacter*. Analysis of plasmid patterns in chickpea rhizobia was done.
- Several azide resistant as well as azide sensitive mutants of *Azotobacter* were isolated and their incubation effect on cotton and wheat was studied.

b) Plant tissue culture and genetic transformation:

- Developed transgenic rice plants and characterized them for presence, copy number and expression of the transgene/s.
- Studied silencing of the transgenes in the transgenic rice plants.

- Physically located the transgenes (even a single copy) on rice chromosomes by using the technique of fluorescence *in situ* hybridization **(FISH)**.
- Developed protocols for micro-propagation of some important medicinal and horticultural plants such as *Catharanthus*, *Dioscoria*, *Capparis*, *Withania*, *Glycyrrhiza*, garlic, *Gerbera*, *Gladiolus*, banana etc.
- Studied the effectiveness of culture supernatant of phytohormone producing bacteria in tissue culture media.**(PATENT FILED)**.
- Developed a new medium for plant tissue culture. **(PATENT FILED)**.
- **Developed Bt chickpea plants without using tissue culture techniques. (PATENT FILED)**.
- Conducted experiments to transfer the *Amarantus* seed albumin gene, *AmAl*, driven by CaMV35S promoter in *indica* rice variety HKR46 and *japonica* rice variety TNG67 by *Agrobacterium*-mediated transformation.
- Developed an eco-friendly way of surface sterilization of explants. **(PATENT FILED)**.

c) Use of Molecular markers:

- Studied polymorphism in male and female genotypes of date-palm using RAPD and ISSR primers.
- Studied genetic diversity using RAPD primers in wheat, asparagus, ashwagandh etc.
- Identified sex-specific RAPD marker in date palm.
- **Developed SCAR marker for identification of sex in date palm. (PATENT FILED)**.
- **Developed SCAR marker for identification of sex in jojoba. (PATENT FILED)**.