Name: Dr. NIRANJAN RAJ S

Designation: Assistant Professor & Chairman

Email: niruraj@gmail.com, niranjanraj.ksou@ka.gov.in

Date of Birth: 14th June 1973.

Mobile: 9886859350

Office: 0821 – 2519947

Field of Research: Molecular Plant Pathology, Induction of Resistance, Microbial Biotechnology, Plant Disease Management

Teaching Experience: 14 years

Professional Experience: 20 Years

Professional Recognition & Research Recognition: see detailed CV.

Academic/Membership in Professional bodies:

1. Association of Microbiologist of India.
2. Indian Mycology and Plant Pathology Society.
3. Indian Science Congress Association-Life Member.
4. Indian Phytopathological Society-Life Member
5. National Environmental Science Academy-Life Member/Fellow
6. Society of Biotechnology, DOS in Biotechnology
7. Society of Applied Biotechnologists.
8. Society of Biological Chemists.

Areas of Interest: Molecular Microbiology and Plant Pathology Research; Science Education in ODL and Online mode; Virtual learning.

Research Interest: Molecular Plant Pathology, Induction of Resistance, Microbial Biotechnology, Plant Disease Management

CURRICULUM VITAE OF DR. NIRANJAN RAJ S.

1.	**Name**	**NIRANJAN RAJ S**
2.	**Date of Birth**	June 14, 1973
3.	**Full Address Office**	Department of Studies in Microbiology, Karnataka State Open University, Mukthagangotri, Mysuru-570006, Karnataka, India
4.	**Residence**	# 2266/4, 5th Main, 6th Cross, Rama Mandir Road, Vinayakanagar, Mysore-570 012, Karnataka, India.
5.	**Telephone**	(Off.): 0821-2500873; (Res.): 0821-2513262, Mobile: 9886859350
6.	**Fax**	0821 – 2519947
7.	**E-mail**	niruraj@gmail.com, niranjanraj.ksou@ka.gov.in
8..	**Present position**	**Assistant Professor & Chairman,** Department of Studies in Microbiology, Karnataka State Open University (KSOU), Mukthagangotri, Mysuru-570006.

WORK EXPERIENCE

Dec. 2012-Tilldate: Working as an Assistant Professor in Department of Studies in Microbiology, Karnataka State Open University (KSOU), Mukthagangotri, Mysore-570006.

2005 –Nov.2012: Worked as an Assistant Professor in the Indian Council of Agricultural Research - All India Coordinated Pearl Millet Improvement Project at the Department of Applied Botany and Biotechnology, University of Mysore, Mysore, Karnataka, India.

2001-2005 Worked as a Senior Research Fellow in the project entitled "Systemic acquired resistance – an eco-friendly strategy for management of diseases in pearl millet and rice" sponsored by Danish International Development Agency – Enhancement of Research Capabilities (DANIDA-ENRECA) Denmark, at the Department of Applied Botany and Biotechnology, University of Mysore, Mysore, Karnataka, India.

2000-2001 Worked as a Research Assistant in the Indian Council of Agricultural Research (ICAR) sponsored All India Coordinated Pearl Millet Improvement Project-National Agricultural Technology Project project on pearl millet downy mildew disease management, at the Department of Applied Botany and Biotechnology, University of Mysore, Mysore, Karnataka, India.

1999-2000 One year Pre Ph.D programme in M.Phil Seed Technology and Seed Pathology with specialization in seed bacteriology. Dissertation title: Epidemiology and Transmission of *Clavibacter michiganensis* causing bacterial canker of tomato and

its management, at the Ddepartment of Applied Botany and Biotechnology, University of Mysore, Mysore, Karnataka, India.

LANGUAGES KNOWN

Kannada: fluent (mother tongue) **Hindi:** fluent
English: fluent

Educational Qualification:

Examination Passed	Subject studied	Year of Passing	% of marks obtained	Name of the Institute
S. S. L. C.	-	1989	72.16	St. Joseph's High School, Jayalakshmipuram, Mysore
B.Sc.	Botany, Biochemistry, Zoology	1995	71.7	Yuvaraja's College, Mysore
M.Sc.	Botany	1998	74.5	DOS in Botany, Manasagangotri, Mysore
M.Phil.	Seed Technology	1999	74.5	DOS in Biotechnology, Manasagangotri, Mysore
Ph.D.	Biotechnology	2006	-	DOS in Biotechnology, University of Mysore
SLET	Life Sciences	2006	-	Kuvempu University, Shimoga.

Additional Qualification:

1. Diploma in Computer Basics (66 %) – Diana Tholoor School of Computers, Fraser Town, Bangalore -5. – 1987.
2. Diploma in Computer Graphics (85 %) - Diana Tholoor School of Computers, Fraser Town, Bangalore -5. – 1987.

Academic Achievements:

- Prof. Paul Neergaard Gold medal in M.Phil., University of Mysore, Mysore
- First Rank in M. Phil., in Seed Technology, University of Mysore, Mysore
- Silver Medal in Computer Programming, DTSC, Bangalore

Awards and Recognitions

1. Best poster prize for the poster entitled "Lipopolysaccharides of *Pseudomonas fluorescens* induce systemic resistance in pearl millet downy mildew disease" in the 2001-National Seminar on Seed Science and Technology in the New Millennium held at DOS in Applied Botany, University of Mysore.
2. Best poster Award for the poster entitled " PGPR mediated growth promotion and resistance induction in pearl millet downy mildew system" in 2002-Indian Science Congress held at Lucknow.
3. NCSTC/RVPSP YSA 2004 best research paper award at the 91st Session of Indian Science Congress Association held in Chandigarh during January 3 – 7, 2004.
4. Certificate of excellence awarded during the 'VI International Workshop on Plant Growth Promoting Rhizobacteria" held at Calicut, Kerala, India, during October 5-10, 2003.
5. Invited to present a paper for the young scientist award competition during the 91st Indian Science Congress Association session at Chandigarh, India during 3-7 January, 2004.
6. Best paper presentation prize for the paper entitled "Lipopolysaccharides modulated defesne responses during pearl millet-*Sclerospora graminicola* interaction and plausible mechanisms involved" entitled in the 2004-National Seminar on Emerging trends in applied botany, seed

science and technology held during November 4-6, 2004 at the DOS in Applied Botany and Biotechnology, University of Mysore, India.

7. Awarded the P.P. Singhal Memorial Pesticide India Award for the paper entitled "Tebuconazole and thiabendazole –novel fungicides to control toxigenic *Fusarium verticilloides* and fumonisins in maize growth in India" during the 2nd Asian Congress of Mycology and Plant Pathology held at Osmania University, Hyderabad during 19-22 December 2007.
8. Prof. M. J. Narasimhan Academic Merit Award for the paper entitled "Nitric Oxide mediates defesne mechanisms in response to *Sclerospora graminicola*, an incitant of downy mildew disease in pearl millet" by the Indian Phytopathological Society, 2007.
9. Appreciation Certificate awarded by the Hungarian Academy of Sciences, Budapest, Hungary-2008.
10. Certificate of Merit awarded by the Society of Millet Research and ICAR-All India Coordinated Pearl Millet Improvement project – 2008.
11. Team Award for Chaudhary Devi Lal Best co-ordinated research project award by ICAR, 2003.
12. Commendation Certificate for the poster entitled "Elicitation of resistance and associated defense responses against pearl millet downy mildew by an endophytic *Trichoderma hamatum*" Poster Presentation in the International Conference on "Plant, pathogens and people" organized by the Indian Phytopathologial Society, during 23-27, 2016 at NASC Complex, Indian Agricultural Research Institute, New Delhi.

Foreign Visits:

1. Attended the III workshop of Systemic Acquired Resistance Project in Copenhagen, Denmark and presented a paper entitled "Newer approaches for downy mildew disease management" during May, 2001.

Symposia and Workshops Attended:

1. Participated in the First Regional workshop on plant growth promoting rhizobacteria held at University of Mysore and presented a paper entitled "Efficiency of *Pseudomonas fluorescens* isolates in managing pearl millet downy mildew disease" held during March 28-29, 2000.

2. Attended the national seminar on "New Trends in Plant Disease Management" in Kuvempu University, Shimoga and presented a paper entitled "Comparative efficiency of *Pseudomonas fluorescens* isolates to manage downy mildew disease" during March, 2001.

3. Attended the Third Workshop of DANIDA-ENRECA Project on Systemic Acquired Resistance, held at Department of Plant Biology, The Royal Veterinary and Agricultural University, Copenhagen , Denmark and presented a paper entitled "Newer approaches for downy mildew disease management" during May 11-15, 2001.

4. Participated and presented poster entitled "Lipopolysaccharides of *Pseudomonas fluorescens* induce systemic resistance in pearl millet downy mildew disease" in the 2001-National Seminar on Seed Science and Technology in the New Millennium: Vistas and Vision held at DOS in Applied Botany, University of Mysore, during 5-7, August 2001.

5. Participated and presented a poster entitled " Plant growth promoting rhizobacteria-the green alternative in the downy mildew system" during the 3-7, January 2002 in the Botany Section at 89th -Indian Science Congress Assocaiation held at Lucknow University, Lucknow, India.

6. Participated and presented a paper in the Asian Congress of Mycology and Plant Pathology, held at DOS in Applied Botany, University of Mysore during October 1-4, 2002.

7. Participated in the "Intensive workshop on Bioinformatics" held during 3-7, February 2003 at the Central Sericultural Research and Training Institute, Mysore, sponsored by Department of Biotechnology, Government of India.

8. Participated in the 38th Annual Group Meeting of Pearl Millet Scientists AICPMIP ICAR and presented a paper held at Department of Applied Botany and Biotechnology, University of Mysore, Manasagangotri, Mysore during 25-27 April 2003.

9. Participated and presented a poster in the 'VI International Plant Growth Promoting Rhizobacteria Workshop" held at Calicut, Kerala, India, during October 5-10, 2003.

10. Participated in the Symposium on computational challenges in bioinformatics at the Centre for Development of Advanced Computing (C-DAC), C-DAC Knowledge Park, Bangalore – 560 038 during November 5, 2003.

11. Invited to present a paper for the young scientist award competition during the 91st Indian Science Congress Association session at Punjab University, Chandigarh, India during 3-7 January, 2004.

12. Participated and presented a paper entitled "Biochemical and Molecular Analysis of Rhizobacteria Mediated Induced Resistance Against Pearl Millet Downy Mildew Disease" under the 'P. R. Verma Young Scientist Award" competition at the National Symposium on Mycology and Plant Pathology held at Goa University, Goa during 7-9, October 2004.

13. Participated and presented a paper entitled "Lipopolysaccharides modulated defense responses during pearl millet – *Sclerospora graminicola* interaction and plausible mechanisms involved" in the 2004-National Seminar on Emerging trends in applied botany, seed science and technology, held during November 4-6, 2004 at the DOS in Applied Botany and Biotechnology, University of Mysore, Mysore, India.

14. Presented an invited lecture entitled "Tissue printing analysis of defense enzymes during rhizobacteria mediated resistance against pearl millet downy mildew disease" at the Annual Meeting of Indian Phytopathological Society and National Conference on Emerging trends in mycology, plant pathology and microbial biotechnology held at the Department of Botany, Osmania University, Hyderabad during December 29-31, 2004.

15. Participated in the Indian Council of Agricultural Research –All India Coordianted Pearl Millet Improvement Programme 40th Annual Pearl Millet Research Workers Group Meeting held at the Agricultural Research Station, Rajashtan Agricultural University, Bikaner, Rajasthan during 1-3, May, 2005.

16. Participated in the Indian Council of Agricultural Research –All India Coordianted Pearl Millet Improvement Programme 41st Annual Pearl Millet Research Workers Group Meeting held at the Junagadh Agricultural University, Junagadh, Gujarat, during April 11-13, 2006.

17. Attended the hands-on training in microarray at the "National Workshop on Microarray Techniques" sponsored by the DBT at the Center of Potential in Genomic Sciences, Mudarai Kamaraj University, Madurai during December 5-16, 2006.

18. Participated in the Indian Council of Agricultural Research –All India Coordianted Pearl Millet Improvement Programme 42nd Annual Pearl Millet Research Workers Group Meeting held at the International Crop Research Institute for Semi-Arid Tropics (ICRISAT), Patancheru, Hyderabad during 14-16, April 2007.

19. Participated and presented a paper entitled "Novel approaches for management of pearl millet downy mildew disease" in the 2007-National seminar on Molecular Plant Pathology and Biotechnology for Sustainable Crop Production, jointly organized by University of Mysore and Indian Phytopathological Society, held at Department of Studies in Applied Botany and Biotechnology, University of Mysore, during 28-29, November 2007.

20. Participated in the Indian Council of Agricultural Research –All India Coordianted Pearl Millet Improvement Programme 43rd Annual Pearl Millet Research Workers Group Meeting held at the Department of Biotechnology, University of Mysore, Manasagangotri, Mysore-570 006, Karnataka during 25-27, April 2008.

21. Participated and presented a paper entitled "Value addition for seeds for sustainable agriculture in the II International Symposium on" Seed Health in Agricultural Development (SHAD)" jointly organized by the University of Mysore and Danish Seed Health Centre (DSHC), Denmark held at Department of Studies in Applied Botany and Biotechnology, University of Mysore during 9-12, June 2008.

22. Participated and presented a paper entitled "Rhizobacteria mediated induced resistance against pearl millet downy mildew" in the 30th Annual Conference & Symposium On Advances In Biotechnology For Plant Protection held at Department of Studies in Applied Botany and Biotechnology, University of Mysore during 17-19, November 2008.

23. Participated and presented a paper entitled "Thionins (PR protein-13) mediates pearl millet downy mildew disease resistance" in the First International Biotechnology Conference held at Sikkim Manipal Institute of Technology, Majitar, Gangtok, Sikkim, India during 28-30 December 2008.

24. Participated and presented a paper entitled "Exploiting of diversity of crop wild relatives for mining resistance sources" in the Dr. E. Norman Borlaug commemoration National conference on Plant diversity and plant health, held at Department of Studies in Botany, University of Mysore, Manasagangotri, Mysore during 11-12, March 2009.

25. Participated in the Indian Council of Agricultural Research –All India Coordianted Pearl Millet Improvement Programme 44th Annual Pearl Millet Research Workers Group Meeting held at the Mahathma Phule Krishi Vidyapeeth, Rahuri, Maharashtry during 28-30 April 2009.

26. Participated in the 14th Southern regional conference on Microbial Inoculants held at Institute of Oceanography organized by Goa University during February 11-12, 2010.

27. Participated in the Indian Council of Agricultural Research –All India Coordianted Pearl Millet Improvement Programme 45th Annual Pearl Millet Research Workers Group Meeting held at the Agricultural Research Station, Mandore, Jodhpur 342-304, Rajasthan during March 19-21, 2010.

28. Participated in the Indian Council of Agricultural Research –All India Coordianted Pearl Millet Improvement Programme 46th Annual Pearl Millet Research Workers Group Meeting held at CCS Haryana Agricultural University, Hisar, 12-14, March 2011.

29. Participated in the one day workshop on "Intellectual Property Rights" jointly organized by KSCST, Bangalore and Centre for Information Science and Technology (CIST), University of Mysore held on 25 March 2011 at CIST, University of Mysore, Mysore, India.

30. Participated and presented a paper entitled "Pearl millet blast caused by *Pyricularia gresea* a new emerging disease" at the ISMPP South Zone Conference on Fungal Diversity and Emerging Crop Diseases organized by University of Mysore and Indian Society of Mycology and Plant Pathology, held during 12-13 May 2011 at the Department of Studies in Botany, University of Mysore, Mysore, India.

31. Participated in the Indian Council of Agricultural Research –All India Coordianted Pearl Millet Improvement Programme organized National Demonstration of Pearl Millet Commercial Hybrids held at Agriculture Research Station (ARS), Mandore, Rajasthan Agricultural Univeristy, Mandore, Jodhpur during 22-24 September 2011.

32. Participated in the one day National Level Workshop on "Modern Trends in Research Methodology" organized by the Research Cell of the SBRR Mahajana First Grade College, during 20, October 2011 at the college.

33. Participated in the 47th Annual Group Meeting of All India Coordianted Pearl Millet Improvement Project held at ARS, Durgapura, Rajasthan during 17-19 March 2012.

34. Participated in the Two day Inter National Lecture Series on "Bioprospecting for sustainable development" during 29-30 November 2012, organized by Institution of Excellence (IOE), Vijnana Bhavan, University of Mysore, Manasagangotri, Mysore, India.

35. Participated in the National Seminar on "Applications of science and technology to promote agricultural growth and value addition" held on 2-3 December 2012 at JSS College, Ooty Road, Mysore.

36. Participated in UGC sponsored one day state level seminar on "Future prospects of agricultural biotechnology" held at the Department of Biotechnology, Biochemistry and Microbiology, Mahajana First Grade College, Jayakaxmipuram, Mysore12 during 30th January 2013.

37. Participated in the Indian Council of Agricultural Research –All India Coordianted Pearl Millet Improvement Programme 48th Annual Pearl Millet Research Workers Group Meeting held at Main Pearl Millet Research Station, Junagadh Agricultural University, Jamnagar-361006, Gujarat during 22-24 March 2013

38. Participated in the two day Workshop on "Self Learning Material Development" held from 7-8, October 2013 organized by the Karnataka State Open University (KSOU), Mukthagangotri, Mysore at KSOU.

39. Participated in the two day Workshop on "Overview and Applications of Scientific Equipment-IOE" held from 13-14, October 2014 at the Seminar Hall, Institution of Excellence, Vijnana Bhavan, University of Mysore, Manasagangotri, Mysore, India.

40. Participated and trained the participants of the "Interactive session for hands on exposure to disease screening and basic research for pearl millet pathologists of the AICRP on pearl millet centers" in histological and biochemical techniques, organized by the ICAR-AICRP on Pearl Millet, DOS in Applied Botany and Biotechnology, University of Mysore, Manasagangotri, Mysore during November 10-15, 2014.

41. Delivered a special invited lecture on "Pearl millet downy mildew host-pathogen interactions: histological analysis" during the "Interactive session for hands on exposure to disease screening and basic research for pearl millet pathologists of the AICRP on pearl millet centers" by the ICAR-AICRP on Pearl Millet, DOS in Applied Botany and Biotechnology, University of Mysore, Manasagangotri, Mysore during November 10-15, 2014.

42. Delivered a special invited lecture on "Pearl millet blast in India: present status and future prospects" during the "Interactive session for hands on exposure to disease screening and basic research for pearl millet pathologists of the AICRP on pearl millet centers" by the ICAR-AICRP on Pearl Millet, DOS in Applied Botany and Biotechnology, University of Mysore, Manasagangotri, Mysore during November 10-15, 2014.

43. Participated in the Department of Higher Education, Govt. of Karnataka and Karnataka State Open University (KSOU), jointly sponsored one day Workshop on "Accelerating gross enrolment ratio in education-issues and challenges" held on May 14, 2015 at KSOU, Mukthagangotri, Mysore, India.

44. Participated in the UGC sponsored National Seminar on "The perpetual threat of emerging and reemerging infectious diseases" held on 18th March 2015 at the Department of Studies in Biotechnology, Microbiology and Biochemistry, Pooja Bhagvat Memorial Mahajana Education Centre, Metagalli, Mysore.

45. Participated in the one day National Seminar on Chemistry and Chemical Biology held on 26th May 2015 on the occasion of Prof. K. S. Rangappa's 60th Birthday Celebration at University of Mysore, Manasgangotri, Mysore, India.

46. Delivered a special invited lecture on "Biotechnology-an overview" on 24-08-2015 for participants of the KAS Main Exam and FDA/SDA Examinations Training Workshop organized by the KSOU Competitive Examination Training Centre at KSOU, Mukthagangotri, Mysore-6 during 18-08-2015 to 27-08-2015.

47. Participated and presented a poster entitled "Immunity stimulation by Trichoderma hamatum cell wall glucan elicitors up regulates defensive proteins in pearl millet and protects against downy mildew disease" during the International Conference on "Plant, pathogens and people" organized by the Indian Phytopathologial Society, during 23-27, 2016 at NASC Complex, Indian Agricultural Research Institute, New Delhi, India.

48. Participated in the 6th International Conference and Indian Chapter of Asian PGPR Satellite Workshop "PGPRs for sustainable crop productivity" on February 25, 2016, organized during the International Conference on "Plant, pathogens and people" organized by the Indian Phytopathologial Society, during 23-27, 2016 at NASC Complex, Indian Agricultural Research Institute, New Delhi, India.

49. Participated in the National Conference on "Food based approaches for translational nutrition" organized in the Nutrition Society of India, Mysore Chapter and Department of Food Science and Nutrition, University of Mysore, Mysore during April 12-13, 2017.

50. Participated and presented a paper entitled "Millets for mitigating malnutrition: value addition for rural health development programs" during the National Seminar on "Sustainable rural development through governmental programmes: vision and action" organized by the ICSSR held at Karnataka State Open University during 28-29 July 2017.

51. Served as a Rapporteur during the technical session – 1: Theme: Rural Development Programmes -Policy Implications during the National Seminar on "Sustainable rural development through governmental programmes: vision and action" organized by the ICSSR held at Karnataka State Open University during 28-29 July 2017.
52. Participated and presented a paper entitled "Millets: climate smart crops for food and nutritional security" during the symposium on the theme "Clinical Nutrition and Dieterics-Current Practices and Future Trends" organized by the Department of Studies in Food Science and Nutrition and Indian Dietetic Association, Mysore chapter, on 6th September 2018 at University of Mysore.
53. Participated in "One-day state level seminar on Thoughts and Philosophy of Mahatma Gandhi" organized by the Gandhi Chair, KSOU on 16th October 2018 at KSOU, Mysuru.
54. Participated in the National Seminar on "Applications of geographic information system and statistics for natural resource management" held at Department of Geography, Kannur University, Kerala during 24th January 2019.
55. Participated and presented a paper entitled "Cell wall glucan elicitors of *Trichoderma harzianum* stimulate pearl millet resistance against downy mildew disease by defense gene upregulation" in the Two-day International Conference on Contemporary Panorama of Biosciences (ICCPoB'19) organized at Sri Sarada College for Women, Salem, Tamil Nadu during 6-7, February 2019.

Research Publications:

1. **Niranjan Raj, S**., Chaluvaraju, G., Amruthesh, K. N., Shetty, H. S., Reddy, M. S. and Kloepper, J. W. 2003. Induction of growth promotion and resistance against downy mildew on pearl millet (*Pennisetum glaucum*) by rhizobacteria. **Plant Disease** 87:340-345.
2. **Niranjan Raj, S**., Deepak, S. A., Basavaraju, P., Shetty, H. S., Reddy, M. S. and Kloepper, J. W. 2003. Comparative performance of formulations of plant growth promoting rhizobacteria in growth promotion and downy mildew disease suppression in pearl millet. **Crop protection** 22: 579-588.
3. Deepak, S. A., **Niranjan Raj, S**., Umemura, K., Kono, T. and Shetty, H. S. 2003. Cerebroside as an elicitor for inducing resistance against downy mildew disease of pearl millet. **Annals of Applied Biology** 143: 169-173.
4. **Niranjan S Raj**, N.P. Shetty, H.S. Shetty. 2004. Seed bio-priming with Pseudomonas fluorescens isolates enhances growth of pearl millet plants and induces resistance against downy mildew. **International Journal of Pest Management** 50:41-48.
5. Sharathchandra, R. G., **Niranjan Raj, S**., Shetty, N. P., Amruthesh, K. N. and Shetty, H. S. 2004. Elexa™- A chitosan formulation induces growth promotion and downy mildew disease resistance in pearl millet. **Crop Protection** 23: 881-888.
6. Deepak, S. A., Oros, G., **Niranjan Raj, S**., Shetty, N. P. and Shetty, H. S. 2004. Iprovalicarb has potential for the control of downy mildew of pearl millet. **Acta Phytopathologica et Entomologica Hungarica** 39: 55-69.
7. **Niranjan S Raj**, Shetty, N.P., and Shetty, H.S. 2004. Proline - An Inducer of Resistance against Pearl Millet Downy Mildew Disease Caused by *Sclerospora graminicola.* **Phytoparasitica** 32: 523-527.
8. **Niranjan S Raj**, Shetty, N.P., and Shetty, H.S. 2005. Synergistic effects of Trichoshield on enhancement of growth and resistance against downy mildew in pearl millet. **Biocontrol** 50: 493-509.

9. Manjunatha, G., **Niranjan Raj, S.,** Amruthesh, K. N., and Shetty, H. S. 2005. Induction of systemic resistance against pearl millet downy mildew disease by endophytic fungal components and its biochemical and histological mechanisms. **International Journal of Current Biosciences** 5: 156-158.

10. **Niranjan Raj, S.,** Sarosh, B. R. and Shetty, H. S. 2006. Induction and accumulation of polyphenol oxidase activities as implicated in development of resistance against pearl millet downy mildew disease. **Functional Plant Biology** 33: 563–571.

11. Chandrashekara, **Niranjan Raj, S.,** Deepak, S.A., Amruthesh, K.N., Shetty, N.P. and Shetty, H.S. 2007. Endophytic bacteria from different plant origin enhance growth and induce downy mildew resistance in pearl millet. **Asian Journal of Plant Pathology** 1: 1-11.

12. Deepak, S., **Niranjan-Raj, S**., Shailasree, S., Kini, K. R., Boland, W., Shetty, H. S., and Mitho¨ fer, A. 2007. Induction of resistance against downy mildew pathogen in pearl millet by a synthetic jasmonate analogon. **Physiological and Molecular Plant Pathology** 71: 96–105.

13. Deepak, S., Manjunath, G., Manjula, S., **Niranjan-Raj, S.,** Geetha, N.P., and **Shetty, H. S.** 2008. Involvement of silicon in pearl millet resistance to downy mildew disease and its interplay with cell wall proline/hydroxyproline-rich glycoproteins. **Australasian Plant Pathology 37**: 498-504.

14. Manjunatha, G., **Niranjan Raj S.,** Nandini P. Shetty., **Shekar Shetty, H**. 2008. Nitric oxide donor seed priming enhances defense responses and induces resistance against pearl millet downy mildew disease. **Pesticide Biochemistry and Physiology** 91: 1-11.

15. Shetty, H.S., and **Niranjan Raj, S.** 2008. PGPR induced histochemcial changes during induction of resistance in pearl millet. **Journal of Plant Pathology** 90: S2-257.

16. **Niranjan-Raj, S.,** Reddy M. S., and Shekar Shetty, H. 2008. Seed Bio-priming with Plant Growth Promoting Rhizobacteria for enhanced growth and health of crop plants. **Vatika** 2: 25-30.

17. Chandra Nayaka, S., Uday Shankar, A. C., **Niranjan Raj, S**., Niranjana, S.R., and Prakash, H. S., 2008. Tebuconazole and Thiabendazole – a novel fungicides for management of Fusarium verticilloides and fumonisins in maize. **Journal of Mycology and Plant Pathology** 38: 430-436.

18. Manjunatha, G., **Niranjan Raj, S.,** Geetha, N.P., Deepak, S., Amruthesh, K.N., and Shetty, H. S. 2009. Nitric oxide is involved in chitosan-induced systemic resistance in pearl millet against downy mildew disease. **Pest Management Science** 65: 737-743.

19. Sudisha, J., **Niranjan-Raj, S**., Shetty, H. S. 2009. Seed priming with plant gum biopolymers enhances efficacy of metalaxyl 35 SD against pearl millet downy mildew. **Phytoparasitica** 37: 161-169.

20. Udaya Shankar, A. C., Chandra Nayaka, S., **Niranjan Raj, S**., Kumar, H. B., Reddy, M. S., Niranjana, S. R., and Prakash, H. S. 2009. Plant growth-promoting rhizobacteria mediated resistance against the blackeye cowpea mosaic strain of bean common mosaic virus in cowpea (*Vigna unguiculata*). **Pest Management Science** 65: 1059-1064.

21. Shetty, H.S., **NiranjanRaj, S.,** Sudisha, J., Thakur, R.P., Rai, K.N., Khairwal, I.S., Negi, S., and Mahala, R.S. 2009. *Pyricularia* blast of pearl millet in India. **Crop Care** 35: 53-58.

22. Manjunatha, S., Deepak, S., Geetha, N.P., **NiranjanRaj, S.,** Kini, K.R., and Shetty, H.S. 2009. Hypersensitive reaction and P/HRGP accumulation is modulated by nitric oxide through hydrogen peroxide in pearl millet during *Sclerospora graminicola* infection. **Physiological and Molecular Plant Pathology** 74: 191-198.

23. Chandrashekhara., **Niranjan Raj.,S.,** Deepak, S., Manjunatha, G., and Shetty, H. S. 2010. Seed treatment with aqueous extracts of *Viscum album* induces resistance to pearl millet downy mildew pathogen. **Journal of Plant Interactions** 5: 283-291.

24. Chandra Nayaka S., Niranjana S.R., Uday Shankar A.C., Niranjan Raj S., Reddy M.S., Prakash H.S., Mortensen C.N., 2010. Seed biopriming with novel strain of Trichodeorma harzianum for the control of toxigenic Fusarium verticillioides and fumonisins in maize. **Archives of Phytopathology and Plant Protection** 43: 264-282.
25. Chandrashekhara, S. **Niranjan-Raj, S.** Deepak, G. Manjunath and H. Shekar Shetty. 2009. Thionins (PR protein-13) mediate Pearl Millet Downy Mildew disease resistance. **Archives of Phytopathology and Plant Protection** 43: 1356-1366.
26. Sarosh, B.R., **Niranjan Raj, S.,** Sivaramakrishnana, S., and Shetty, H.S. 2011. Isolation, cloning and characterization of Resistance Gene Analogues (RGAs) in Pearl Millet based on the conserved nucleotide binding sites. **Journal of Phytopathology** 159: 382-389.
27. **Niranjan Raj, S.,** Lavanya, S.N., Amruthesh, K.N., and Shetty, H.S. 2011. Comparative evaluation of *Pseudomonas fluorescens* and their lipopolysaccharides as implicated in induction of resistance against pearl millet downy mildew. **Achieves of Phytopathology and Plant Protection** 44: 1285-1299.
28. **Niranjan Raj, S.,** Lavanya, S.N., Amruthesh, K.N., Niranjana, S.R., Reddy, M.S., and Shetty, H.S. 2012. Histo-chemical changes induced by PGPR during induction of resistance in pearl millet against downy mildew disease. **Biological Control 60: 90-102.**
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Shetty HS, **Raj Niranjan S**, Kini KR, Bishnoi HR, Sharma R, Rajpurohit BS, Mahala RS, Yadav HP and OP Yadav. 2016. Downy Mildew of Pearl Millet and its Management. All India Coordinated Research Project on Pearl Millet (Indian Council of Agricultural Research, New Delhi), Mandor, Jodhpur – 342 304. pp. 60. Publishers: Indian Council of Agricultural Research (ICAR), Govt. Of India, New Delhi. 53pp.

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Refereed short publications:

1. **Niranjan Raj, S.,** Sarosh, B.R., Shetty, N.P., Shetty, H.S. and Reddy, M.S. 2003. Plausible biochemical and molecular mechanisms involved in plant growth promoting rhizobacteria mediated resistance induction against pearl millet downy mildew disease. In: Proceedings of the 6th International PGPR Workshop, 5-10 October 2003, Calicut, India. M. S. Reddy., M. Anandaraj., S. J. Eapen., Y. R. Sarma and J. W. Kloepper (eds.). Indian Institute of Spices Research, Calicut, India.Pp: 520-528.

2. **Niranjan Raj, S.,** and Shetty, H. S. 2003. Plant growth promoting rhizobacteria for beneficial agriculture: current concepts and future outlook. PGPR Proceedings. VI International PGPR Workshop, Calicut, India. October 5-10. pp 40-47.

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4. Chandrashekhara, **Niranjan Raj, S.,** Deepak, S.A., Shetty, N. P., Amruthesh, K.N., Shetty H.S., and Reddy, M.S. 2003. Endophytic bacteria from different plant species induce growth promotion and reduce downy mildew disease in pearl millet. In: Proceedings of the 6th International PGPR Workshop, 5-10 October 2003, Calicut, India. M. S. Reddy., M. Anandaraj., S. J. Eapen., Y. R. Sarma and J. W. Kloepper (eds.). Indian Institute of Spices Research, Calicut, India. Pp: 115-121.

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6. Amruthesh, K. N., **S. Niranjana Raj,** B. Kiran, H. S. Shetty and M. S. Reddy. **2003**. Growth promotion by plant growth-promoting rhizobacteria in some economically important crop plants. Pages 97-103. In: **6th International PGPR Workshop**. M. S. Reddy., M. Anandaraj., S. J. Eapen., Y. R. Sarma and J. W. Kloepper (eds.). Indian Institute of Spices Research, Calicut, India, 636 p.

7. Manjuantha, G., **Niranjan-Raj, S.,** Shetty, H. S. 2004. Nitric oxide mediates systemic resistance against downy mildew of pearl millet. Proceedings of the International Plant Protection Symposium at Debrecen Univeristy, Debrecen, Hungary. October 20-21, 2004. Gyorgy J. Kovics (ed). Pp 92-101.

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Gene Bank submissions

1. **Niranjan Raj, S**., Sarosh, B.R., and Shetty, H.S. 2005. Polyphenol oxidase gene isolated from pearl millet deposited in the Gene Bank (NCBI, EMBL, DDBJ) Accession number AY 881993.
2. Deepak, S., **Niranjan Raj, S.,** and Shetty, H.S. 2007. *Pennisetum glaucum* silicon transport protein mRNA, partial cds. (NCBI, EMBL, DDBJ) Accession number EU 665681.1.
3. Deepak, S., **Niranjan Raj, S.,** and Shetty, H.S. 2007. *Pennisetum glaucum* membrane-bound peroxidase mRNA, partial cds. (NCBI, EMBL, DDBJ) Accession number EU233818.1.
4. Deepak, S., **Niranjan Raj, S.,** and Shetty, H.S. 2007. *Pennisetum glaucum* membrane-bound peroxidase-like mRNA, partial sequence. (NCBI, EMBL, DDBJ) Accession number EU233819.1.
5. Deepak, S., **Niranjan Raj, S.,** and Shetty, H.S. 2007. *Pennisetum glaucum* chitinase II-like mRNA, partial sequence. (NCBI, EMBL, DDBJ) Accession number EU047915.1.
6. Deepak, S., **Niranjan Raj, S.,** and Shetty, H.S. 2007. *Pennisetum glaucum* chitinase-like mRNA, partial sequence. (NCBI, EMBL, DDBJ) Accession number EU025129.1

Patents

A patent titled "A process of preparing material for seed coating for improved growth and disease immunity". Reference No. 83/05/RQ-CHE/2012 and Patent No. 3371/CHE/2012 (CBR No. 9282) dt. 14-08-2012, Government of India, Patent Office, Intellectual Property Building, Chennai-600 032, India.

A patent titled "A system for stored water quality monitoring, stored water purification and stored water quality data communication". Reference No. 201641011886 A dt. 14-04-2017, Government of India, Patent Office, Kolkata, India.

Software developed

- Software developed for pearl millet downy mildew disease forecasting. Developed a model for pearl millet downy mildew disease forecasting software (PMDM Cast). The model of PMDM Cast software (Visual Basic Windows 98) is for forecasting downy mildew disease of pearl millet.

- ***Administrative Responsibilities***

Chairman – Department of Studies in Microbiology, KSOU-From 21-2-2013 to till date.

Chairman – Board of Studies in Microbiology, KSOU.

Chairman-Board of Examination in Microbiology, KSOU.

Member-Board of Examination in Biotechnology, KSOU

Member-Board of Examination in Biochemistry, KSOU

Member – Board of Examination in Traditional Knowledge, Folklore University.

Membership in Professional Societies:

1. Association of Microbiologist of India.
2. Indian Mycology and Plant Pathology Society.
3. Indian Science Congress Association-Life Member.
4. Indian Phytopathological Society-Life Member
5. National Environmental Science Academy-Life Member/Fellow
6. Society of Biotechnology, DOS in Biotechnology
7. Society of Applied Biotechnologists.
8. Society of Biological Chemists.

International Membership in Professional Societies:

- American Phytopathological Society (2 years Membership).