

CURRICULUM VITAE

Name: **Segenet Kelemu**

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Date of Birth: May 20, 1957

Place of Birth: Gojjam, Ethiopia

Citizenship: Ethiopia

Languages: Amharic, English, Spanish

EDUCATION :

1974-1979 B.Sc. Addis Ababa University, Ethiopia. Honors, Plant Science.

1983-1984 M.Sc. Montana State University, Bozeman, Montana, USA
Plant Pathology/Genetics.

1985-1989 Ph.D. Kansas State University, Manhattan, Kansas, USA
Plant Pathology/Molecular Biology

1989-1992 Post-doc Cornell University, Ithaca, New York, USA
Molecular Bacteriology/Enzymology

HONORS AND AWARDS:

1974 Haile Selassie I Honors list.

1979 Addis Ababa University Dean's list (Distinction class).

1981 In service trainee, International Maize and Wheat Improvement Center, Mexico.

1983/84 Montana State University Dean's list

1984 International PEO Scholarship, Montana State University, Bozeman, Plant Pathology.

MEMBERSHIP IN PROFESSIONAL SOCIETIES:

1978-1980	Ethiopian Phytopathological Society
1983-1986	American Phytopathological Society
1992- to date	American Phytopathological Society
1994- 1998	Australasian Phytopathological Society
2001- 2004	Tropical Pathology Committee, American Phytopathology Society
2004-to- date	Member, Editorial Board, Plant Pathology Journal
2005-to-date	Member, Governing Board, International Association for the Plant Protection Sciences (IAPPS)
2005-to-date	Member, Steering Committee, System-wide Program on Integrated Pest Management Member, Inter Institutional Program Committee, System-wide Program on Integrated Pest Management

TEACHING EXPERIENCE:

1979-1980	Graduate Teaching Assistant, Addis Ababa University, Debre Zeit College of Agriculture, Debre Zeit, Ethiopia
1980-1981	Assistant Lecturer, Dept. of Crop Protection, Addis Ababa University, Ethiopia
1982	Lecturer, Dept. of Crop Protection, Addis Ababa University.
1984	Teaching Assistant, Dept. of Plant Pathology, Montana State University (one term in Disease Diagnosis class), USA
1986	Teaching Assistant, Dept. of Plant Pathology, Kansas State University (one semester), USA

SUMMARY OF RESEARCH AND WORK EXPERIENCE:

2005 - to date	Leader, Crop and Agro-ecosystem Health Management, Centro Internacional de Agricultura Tropical (CIAT), Cali, Colombia
1992 - to date	Senior Scientist, Molecular Plant Pathologist, Centro Internacional de Agricultura Tropical (CIAT), Cali, Colombia

Responsible for diseases of tropical forages which include legumes and grasses. The work involves the supervision of 11-15 people with various expertise and research on disease management. Research on endophytes associated with tropical grasses and their role in disease and pest management, bioicidal plant proteins for disease and pest management, transgenic research, new emerging diseases.

1989-1992

Post-doctoral Research Scientist

Supervising Professor: Dr. A. Collmer

Dept. of Plant Pathology, Cornell University, Ithaca, NY. 14853. USA

Isolation of gene(s) involved in the pathogenesis of a mutant of *Erwinia chrysanthemi* strain EC16 deficient in all known extracellular pectic enzymes. Characterization of these genes; protein purification, enzymology of the gene products; regulation.

1985-1989

Ph.D. Graduate Research Assistant

Supervising Professor: Dr. J. E. Leach

Dept. of Plant Pathology, Kansas State University, Manhattan, KS. 66506, USA

Ph.D. Dissertation: Molecular cloning and characterization of an avirulence gene from *Xanthomonas campestris* pv. *oryzae*. Developing efficient gene transfer system in the pathogen; cloning of avirulence genes corresponding to dominant resistance genes in rice cultivars; characterization of cloned DNA fragments by restriction enzyme mapping, transposon mutagenesis, subcloning deletion analysis, Southern blot, etc.; restriction fragment length polymorphism analysis of isolates of the pathogen representing different races, other pathovars of *X. campestris* and other species of the genus *Xanthomonas*.

1983-1984

M.Sc. Graduate Research Assistant

Supervising Professor: Dr. E. L. Sharp

Dept. of Plant Pathology, Montana State University, Bozeman, MT. 59717, USA

M.Sc. thesis: The inheritance of resistance to *Rhynchosporium secalis* in Ethiopian barley cultivars. Determining the number of genes for resistance to barley scald in land race cultivars of Ethiopian barley and their relationship to the previously reported genes for resistance. Seven isolates of the fungus from several geographical regions were used.

1982

Lecturer and Researcher

Dept. of Plant Pathology, Addis Ababa University, Ethiopia

Developing resistant varieties of wheat in collaboration with wheat breeders. Chemical seed treatment experiments.

1981

In Service Trainee

Supervising Scientist: Dr. E. Torres

Wheat Program, International Maize and Wheat Improvement Center (CIMMYT),

Mexico.

Developing disease resistant varieties of wheat, inoculum preservation, pathogen race evolution; work on Karnal bunt of wheat

1979-1981 Assistant Lecturer and Researcher
Dept. of Crop Protection, Addis Ababa University, Ethiopia

Cereal crop pathology. Developing durum wheat varieties resistant to stem rust, leaf rust, stripe rust and other foliar diseases; a task which requires efficient screening methods, inoculation techniques, pathogen race identification, identification of new sources of resistance from plant germplasm collections, crossing and selections among segregating populations for several generations.

1979 Senior Student
Supervising Professor: Dr. M. Hulluka
Dept. of Plant Science, Addis Ababa University, Ethiopia

Senior Project: Effect of Nematicide Treatment on Soil Microflora.

1978 Dept. of Crop Protection, Tendaho Agricultural Corporation, Ethiopia. (One summer)

Control of cotton bollworm, survey and population monitor.

1977 Supervising Professor: Dr. M. Hulluka
Dept. of Plant Science, Addis Ababa University, Ethiopia. (One summer)

Fungicide seed treatment project for control of smut diseases.

MAJOR RESEARCH INTERESTS:

Host plant resistance, development of novel plant disease control strategies including transgenics and biocidal plant proteins, elucidation of the molecular determinants of host-parasite interactions, pathogen population genetics and dynamics.

RESEARCH ARTICLES, ABSTRACTS, BOOK CHAPTERS :

Research Articles:

Badel, J. L., and **Kelemu, S.** 1997. Variacion en crecimiento, esporulacion y sensibilidad a benomil (benlate) de aislamientos suramericanos de *Colletotrichum gloeosporioides*. Pasturas Tropicales 19:2-9.

Cameron, D. F. Charchar, M. J. D'A., Fernandes, C. D. and **Kelemu, S.** and Chakraborty, S. 1997.

- Biodiversity, epidemiology and virulence of *Colletotrichum gloeosporioides*. III. Field evaluation of *Stylosanthes* species for anthracnose resistance in their center of diversity. *Tropical Grasslands* 31: 402-407
- Chakraborty, S., Fernandes, C.D., Charchar, M. J. D'A., **Kelemu, S.** and Cameron, D. F. 1997. Biodiversity, epidemiology and virulence of *Colletotrichum gloeosporioides*. IV. Epidemiology of *Stylosanthes* anthracnose at the centre of host-pathogen diversity. *Tropical Grasslands* 31: 408-416
- Chakraborty, S. Perrott, S., Charchar, M. J. D'A., Fernandes, C. D. and **Kelemu, S.** 1997. Biodiversity, epidemiology and virulence of *Colletotrichum gloeosporioides*. II. Genetic and pathogenic diversity in isolates of *Colletotrichum gloeosporioides* from eight species of *Stylosanthes*. *Tropical Grasslands* 31: 393-401.
- Chakraborty, S., Ghosh, R., Ghosh, M., Fernandes, C. D., Charchar, M. J. and **Kelemu, S.** 2004. Weather-based prediction of anthracnose severity using artificial neural network models. *Plant Pathology* 53: 375 –386.
- Dongyi, H. and **Kelemu, S.** 2004. *Acremonium implicatum*, a seed-transmitted endophytic fungus in *Brachiaria* grasses. *Plant Disease* 88:1252-1254.
- He, C., Masel, A. M., Irwin, J. A. G., **Kelemu, S.**, and Manners, J. M. 1995. Distribution and relationship of chromosome-specific dispensable DNA sequences in diverse isolates of *Colletotrichum gloeosporioides*. *Mycological Research* 99: 1325-1333.
- He, C., Nourse, J. P., **Kelemu, S.**, Irwin, J.A.G., and Manners, J. M. 1996. CgT1: A non-LTR retrotransposon with restricted distribution in the fungal phytopathogen *Colletotrichum gloeosporioides*. *Molecular & General Genetics* 252: 320-331.
- Kelemu, S. and Badel, J. 1994. *In vitro* inhibition of *Colletotrichum gloeosporioides* and other phytopathogenic fungi by an Amazonian isolate of *Bacillus subtilis* and its cell-free culture filtrate. *Australasian Plant Pathology* 23:41-45.
- Kelemu, S., Badel, J. L., and Fernandes, C. 1996. A new dieback disease of the forage legume *Stylosanthes* spp. in South America. *Canadian Journal of Plant Pathology* 19:376-379.
- Kelemu, S., Badel, J. L., Moreno, C. X., and Miles, J. W. 1996. Virulence spectrum of South American isolates of *Colletotrichum gloeosporioides* on selected *Stylosanthes guianensis* genotypes. *Plant Disease* 80:1355-1358.
- Kelemu, S., Badel, J.L., Moreno, C.X., Miles, J.W., Chakraborty, S., Fernandes, C.D. and Charchar, M.J. D'A. 1997. Biodiversity, epidemiology and virulence of *Colletotrichum gloeosporioides*. I. Genetic and pathogenic diversity in *Colletotrichum gloeosporioides* isolates from *Stylosanthes guianensis*. *Tropical Grasslands* 31:387-392.
- Kelemu, S., Cardona, C. and Segura, G. 2004. Antimicrobial and insecticidal properties of a protein isolated from seeds of the tropical forage legume *Clitoria ternatea* (L.). (Abstract)

Phytopathology 94:S50.

- Kelemu, S., Cardona, C. and Segura, G. 2004. Antimicrobial and insecticidal protein isolated from seeds of *Clitoria ternatea* (L.), a tropical forage legume. *Plant Physiology and Biochemistry* 42 (11): 867-873.
- Kelemu, S., Miles, J. W., Bonilla X. P. and Badel, J. L. 1995. Sources of resistance in species of *Brachiaria* to foliar blight disease caused by *Rhizoctonia solani*. *Tropical Grasslands* 29:257-262.
- Kelemu, S. and Takayama, Y. 1998. An endophytic fungus in the tropical grass *Brachiaria brizantha*: Effect on a leaf spot disease (Abstract). *Phytopathology* 88:S46.
- Kelemu, S., Thomas, R. J., Moreno, C.X. and Ocampo, G. I. 1995. Strains of *Bradyrhizobium* from tropical forage legumes inhibit *Rhizoctonia solani* AG-1 *in vitro*. *Australasian Plant Pathology* 24:168-172.
- Kelemu, S., Skinner, D.Z., Badel, J.L., Moreno, C.X., Rodriguez, M.X., Fernandes, C.D., Charchar, M. J. D'A. and Chakraborty, S. 1999. Genetic diversity in South American *Colletotrichum gloeosporioides* isolates from *Stylosanthes guianensis*, a tropical forage legume. *European Journal of Plant Pathology* 105:261-272.
- Kelemu, S., White, J. F., Muñoz, F. and Takayama, Y. 2001. An endophyte of the tropical forage grass *Brachiaria brizantha*: isolating, identifying, and characterizing the fungus, and determining its antimycotic properties. *Canadian Journal of Microbiology* 47:55-62.
- Kelemu, S., Changshun, J., Guixi, H. and Segura, G. 2004. Genetic transformation of the tropical forage legume *Stylosanthes guianensis* with a rice chitinase gene confers resistance to *Rhizoctonia* foliar blight disease. *Plant Pathology* (submitted).
- Kelemu, S., Guixi, H. and Segura, G. 2001. *Stylosanthes guianensis* plants transformed with a rice chitinase gene confer resistance to *Rhizoctonia* foliar blight disease. (Abstract) *Phytopathology* 91:S47. Publication no. P-2001-0340-AMA.
- Kelemu, S., Muñoz, F y Rodriguez, M.X. 2000. Diversidad genética y patogénica de los aislamientos de *Colletotrichum gloeosporioides* que infectan la leguminosa forrajera *Arachis pintoi*. *Pasturas Tropicales* 22:16-21.
- Kelemu, S. and Collmer, A. 1993. *Erwinia chrysanthemi* EC16 produces a second set of plant-inducible pectate lyase isozymes. *Applied and Environmental Microbiology* 59:1756-1761.
- Kelemu, S., Dongyi, H., Guixiu, H. and Takayama, Y. 2002. A PCR-based assay for specific detection of *Acremonium implicatum*, an endophytic fungus in species of *Brachiaria*. *Phytopathology* 92:S41.
- Kelemu, S. and Dongyi, H. 2003. Endophytic fungus *Acremonium implicatum* is seed transmitted in *Brachiaria* spp. (Abstract). *Phytopathology* 93:S43.

- Kelemu, S., Dongyi, H., Guixiu, H. and Takayama, Y. 2003. Detecting and differentiating *Acremonium implicatum*: developing a PCR-based method for an endophytic fungus associated with the genus *Brachiaria*. *Molecular Plant Pathology* 4(2): 115-118.
- Kelemu, S. and Leach, J. E. 1987. Mobilization of cosmid DNA into *Xanthomonas campestris* pv. *oryzae*. (Abstr.) *Phytopathology* 77:1753.
- Kelemu, S. and Leach, J. E. 1988. Complementation for pathogenicity in a spontaneous non-pathogenic mutant of *Xanthomonas campestris* pv. *oryzae*. (Abstr.) *J.Cell. Biochem.*12c:253.
- Kelemu, S. and Leach, J. E. 1988. Isolation of a *Xanthomonas campestris* pv. *oryzae* avirulence gene. (Abstr.) *Phytopathology* 78:1536.
- Kelemu, S. and Leach, J.E. 1990. Cloning and characterization of an avirulence gene from *Xanthomonas campestris* pv. *oryzae*. *Molecular Plant-Microbe Interactions* 3:59-65.
- Kelemu, S., Mahuku, G., Fregene, M., Pachico, P., Johnson, N., Calvert, L., Rao, I., Buruchara, R., Amede, T., Kimani, P., Kirkby, P., Kaaria, S., and Ampofo, K. 2003. Harmonizing the agricultural biotechnology debate for the benefit of African farmers. *African Journal of Biotechnology* 2(11):394-416.
- Kelemu, S., Moreno, C. X., Rodriguez, M. X., and Badel, J. L. 1995. Genetic diversity among isolates of *Colletotrichum gloeosporioides* infecting forage legume *Stylosanthes* spp (abstract). *Phytopathology* 85:1201.
- Kelemu, S. and Sharp, E. L. 1986. Unique symptoms induced in Ethiopia barley cultivars by *Rhynchosporium secalis*. *Plant Disease* 70:800.
- Kelemu, S., White, F. F., Ryba-White, M. L. and Leach, J. E. 1989. Characterization of *avr10*, an avirulence gene isolated from *Xanthomonas campestris* pv. *oryzae*. (Abstr.) *Phytopathology* 79:1178.
- Koga, H., **Kelemu, S.**, and Sanchez, S. 1995. First report of *Balansia* on *Andropogon bicornis* and *Panicum campestre* in the savannas of Colombia. *Plant Disease* 79: 1074.
- Kelemu, S., Muñoz, F. and Rodriguez, M. X. 1999. Genetic and pathogenic diversity of *Colletotrichum gloeosporioides* isolates infecting *Arachis pintoi*. *Phytopathology* 89: S38.
- Weeds, P.L., Chakraborty, S., Fernandes, C.D., Charchar, M. J. d'A., Ramesh, C.R., Kexian, Y. and **Kelemu, S.** 2003. Genetic Diversity in *Colletotrichum gloeosporioides* from *Stylosanthes* spp. at centers of origin and utilization. *Phytopathology* 93:176-185.
- Zuleta, C., **Kelemu, S.** y Cardozo, O. 2002. Identificación de fuentes de resistencia en *Brachiaria* spp. causada por *Xanthomonas campestris* (Dowson 1939). *Manejo Integrado de Plagas y Agroecología* 64:41-47.

Abstracts:

- Badel, J. L., and **Kelemu, S.** 1993. Inhibición *in vitro* de *Colletotrichum gloeosporioides* y otros hongos fitopatogénicos por (un) antibiótico(s) producido(s) por *Bacillus subtilis*. (abstract) XIV Congreso Asociación Colombiana de Fitopatología y Ciencias Afines, Agosto 25-27 de 1993, Santa Marta, Colombia.
- Collmer, A., McGuire, R.G, He, S. Y., Brooks, A. D. and **Kelemu, S.** 1989. Analysis and use of *Erwinia chrysanthemi* mutants deficient in multiple pectic enzymes. (Abstr.) Fallen Leaf Lake Conference, Molecular Biology of Bacterial Plant Pathogens, Fallen Leaf Lake, California.
- Dongyi, H. and **Kelemu, S.** 2002. Un método rápido basado en la técnica de PCR para la detección de hongo endófito *Acremonium implicatum* en semillas de *Brachiaria*. XXIII Congreso ASCOLFI: Nuevas Tendencias en Fitopatología, 3-6 Julio, 2002, Universidad Nacional de Colombia, Bogotá.
- Jiang, C. and **Kelemu, S.** 1999. *Agrobacterium*-mediated transformation of tropical forage legume *Stylosanthes guianensis* with a rice chitinase gene for resistance to anthracnose disease (abstract MPMI meeting in Amsterdam, 25-30 July, 1999).
- Kelemu, S., He, S. Y. and Collmer, A.. 1990. New pectate lyase isozymes produced by *Erwinia chrysanthemi* EC16 cultured on plant cell walls: initial characterization and cloning. (Abstract at 5th Int. Symp. Mol. Gen. Plant-Microbe Interactions, Interlaken, Switzerland, Sept. 9-14, 1990).
- Leach, J.E., **Kelemu, S.** and White, F. 1989. Avirulence genes from *Xanthomonas campestris* pv. *oryzae*. (Abstr.) Fallen Leaf Lake Conference, Molecular Biology of Bacterial Plant Pathogens, Fallen Leaf Lake, California.
- Moreno, C. X., and **Kelemu, S.** 1994. Propiedades antifúngicas y antibacterianas de cepas de *Bradyrhizobium* aislados de leguminosas forrajeras tropicales. (abstract) XV Congreso Ascolfi, Santafe de Bogotá, D. C.
- Plazas, J. J., Roca, W., and **Kelemu, S.** 1994. Regeneración de plantas a partir de explantes de hoja de leguminosas forrajeras tropicales. (abstract) XV Congreso Ascolfi, Santafe de Bogotá, D.C.
- Rodríguez, M., Giraldo, C. and Kelemu S. 2002. Caracterización molecular y patogénica de aislamientos de *Colletotrichum gloeosporioides* aislados del hospedero *Stylosanthes*. XXIII Congreso ASCOLFI: Nuevas Tendencias en Fitopatología, 3-6 Julio, 2002, Universidad Nacional de Colombia, Bogotá.
- Zuleta, C. y **Kelemu, S.** 2001. Marchitez en *Brachiaria spp*: Identificación del agente causal, metodologías de inoculación para evaluación de materiales y dinámica poblacional. (abstract) XXII Congreso Ascolfi, Medellín, Colombia (July).

Zuleta, C., Bonilla, X., Dongyi, H. and Kelemu, S. 2002. Detección de hongos endófitos en *Brachiaria* usando la técnica de PCR. XXIII Congreso ASCOLFI: Nuevas Tendencias en Fitopatología, 3-6 Julio, 2002, Universidad Nacional de Colombia, Bogota.

Book Chapters and Others:

T Amede, E Amézquita, J Ashby, M Ayarza, E Barrios, A Bationo, S Beebe, A Bellotti, M Blair, R Delve, S Fujisaka, R Howeler, N Johnson, S Kaaria, **S Kelemu**, P Kerridge, R Kirkby, C Lascano, R Lefroy, G Mahuku, H Murwira, T Oberthur, D Pachico, M Peters, J Ramisch, I Rao, M Rondon, P Sanginga, M Swift and B Vanlauwe. 2003. BNF: A key input for integrated soil fertility management in the tropics. (a working group paper)

Chakraborty, S., Ghosh, R., Ghosh, M., Maji, A. K., White, N., Fernandes, C. D., Charchar, M. J., Ramesh, C. R. and **Kelemu, S.** 2004. Weather dependency of anthracnose and risk mapping. In: S.Chakraborty (editor) High-yielding anthracnose-resistant *Stylosanthes* for Agricultural systems. Chapter 20, pp 203, ACIAR, Australia.

Chakraborty, S., Fernandes, C.D., Charchar, M.J., Weeds, P.L. and **Kelemu, S.** 2004. *Colletotrichum gloeosporioides* diversity at centres of origin in Brazil and Colombia. In: S.Chakraborty (editor) High-yielding anthracnose-resistant *Stylosanthes* for Agricultural systems. Chapter 15, pp.165, ACIAR, Australia.

Collmer, A., D.W. Bauer, S.Y. He, M. Lindeberg, **S. Kelemu**, P. Rodriguez-Palenzuela, T.J. Burr, and A.K. Chatterjee. 1991. Pectic enzyme production and bacterial plant pathogenicity. In: Advances in Molecular Genetics of Plant-Microbe Interactions, Vol. 1. H. Hennecke and D. P. S. Verma (eds.), Kluwer Academic Publishers, Dordrecht (The Netherlands) pp. 65-72.

Collmer, A., **S. Kelemu**, and D. W. Bauer. 1994. Molecular biology of pathogenicity in *Erwinia chrysanthemi* EC16. In: Bacterial Pathogenesis and Disease Resistance: Proceedings of the Fourth International Symposium on Biotechnology and Plant Protection. D. D. Bills and S.-D. Kung, eds. World Scientific, Singapore, pp. 73-84.

Kelemu, S., Miles, J. W. and Rao, I. M. 2004. Biotic and abiotic constraints to *Stylosanthes* production. In: S.Chakraborty (editor) High-yielding anthracnose-resistant *Stylosanthes* for Agricultural systems' Chapter 8, pp 97. ACIAR, Australia.

Kelemu, S. and Mahuku, G. 2003. Harnessing Biotechnology to Improve Food and Forage Legumes: The Case of Plant Disease Resistance. Paper for the Second National Workshop on Food and Forage Legumes, 22-27 September 2003, Addis Ababa, Ethiopia.

Kelemu, S. 2004. The Role of Agricultural Biotechnology in Crop Protection. Paper for the Workshop on The Ethiopian Agricultural Biotechnology Initiative, 6-8 July 2004, Addis Ababa, Ethiopia

Kelemu, S., J. F. White and I. M. Rao. 2001. The role of endophytic fungi in *Brachiaria*, a

tropical forage grass. Proceedings of XIX International Grassland Congress, 11-21 February, 2001, São Pedro, São Paulo, Brazil.

Kelemu, S. 1993. Seed health testing and phytosanitary procedures for tropical forages. Working Document No. 132. CIAT, Cali, Colombia.

Kelemu, S., Lapointe, S. and Morales, F. 1994. Diseases and pests of wild *Arachis* species. In: Kerridge, P.C. and Hardy, W. (eds). Biology and agronomy of forage *Arachis*. CIAT, Cali, Colombia. PP 95-101.

Leach, J.E., **S. Kelemu**, E.Ardales and H.Leung. 1990. The genetics of *Xanthomonas campestris* pv. *oryzae*. In Proceedings of the International Workshop on Bacterial Blight of Rice, IRRI.

Valerio, J. R., Lapointe, S. L., **Kelemu, S.**, Fernandes, C., and Morales, F. 1996. Pests and Diseases of *Brachiaria*. In : J. W. Miles, B. L. Maass and C. B. do Valle (eds.). *Brachiaria: Biology, Agronomy, and Improvement*. CIAT, Cali, Colombia and EMBRAPA-CNPQC, Campo Grande, Brazil.. pp 87-105.

Weeds, P., Chakraborty, S., Fernandes, C.D., Charchar, M.J., Ramesh, C.R., Guodao, L. and **Kelemu, S.** 2001. Genetic diversity in the anthracnose pathogen infecting *Stylosanthes* in Brazil, India and China. Proceedings of XIX International Grassland Congress, 11-21 February, 2001, São Pedro, São Paulo, Brazil.

Graduate Thesis/Dissertation

Kelemu, S. 1984. The inheritance of resistance to *Rhynchosporium secalis* in Ethiopian barley cultivars. M.Sc.thesis, Montana State University, Bozeman, Montana. USA.

Kelemu, S. 1989. Molecular cloning and characterization of an avirulence gene of *Xanthomonas campestris* pv. *Oryzae*. Ph.D. dissertation. Kansas State University, Manhattan, Kansas, USA

DETAILED SUMMARY OF RESEARCH ACCOMPLISHMENTS:

Research work:

Ethiopia and at the International Maize and Wheat Improvement Center, Mexico.

Several lines of wheat were selected among segregating populations of crosses with good agronomic qualities and disease resistance for subsequent testing and release.

Research experience:

Plant breeding, wheat genetics, statistical analysis, laboratory techniques in plant pathology, plant disease diagnosis, extension.

M.S. Thesis.

Dept. of Plant Pathology, Montana State University.

Advisor: Dr. E. L. Sharp.

Title: The inheritance of resistance to *Rhynchosporium secalis* in Ethiopian barley cultivars.

Objectives:

1. to determine the number of gene loci conditioning resistance to barley scald in several Ethiopian barley cultivars,
2. to relate their genes to some of those previously reported. The conclusions reached are: five resistance genes, which were shown to be different from the previously reported genes, were identified in four Ethiopian barley cultivars. Three of these genes were dominant in action and two recessive. There was some indication for the existence of cytoplasmic effects on scald resistance in some cross combinations.

Research experience:

Barley breeding, genetics of barley, cytogenetics, statistical analysis, disease physiology.

Doctoral Dissertation:

Dept. of Plant Pathology, Kansas State University.

Advisor: Dr. J. E. Leach.

Title: Molecular cloning and characterization of an avirulence gene of *Xanthomonas campestris* pv. *oryzae*.

Objectives:

1. to develop efficient gene transfer system in *X. c. pv. oryzae*,
2. to clone race specificity gene from race 2 of the pathogen,
3. to characterize the gene,
4. to test the validity of using avirulence genes for identification of resistance genes in the host.

The conclusions reached are:

1. A useful gene transfer system in the pathogen was developed in order to study its genome,
2. A gene-for-gene type interaction is operating in *X. c. pv. oryzae*/rice system. An avirulence gene was cloned from a race 2 isolate of the pathogen which activates a dominant resistance gene, *Xa10*, in rice,
3. Both compatible and incompatible races of the pathogen possessed sequence similarity to the DNA fragment containing the avirulence gene,
4. Avirulence genes may be used to detect resistance genes in the host.

Research experience:

Xanthomonas genetics, DNA manipulations including restriction enzyme analysis, plasmid construction, DNA-DNA hybridization, transposon mutagenesis and mapping, plasmid and cosmid library construction and screening, subcloning, deletions, conjugation and transformations in different bacteria, plant disease physiology, developing bacterial mutant strains for many desirable characters, plant bioassays.

Postdoctoral Research:

Dept. of Plant Pathology, Cornell University.

Supervisor: Dr. A. Collmer.

Project:

Identification of factor(s) involved in the pathogenesis of *Erwinia chrysanthemi* EC16 mutant deficient in all known extracellular pectic enzymes.

Conclusions:

1. the mutant produced a group of pectate lyases when grown in the presence of either chrysanthemum plant extract or isolated chrysanthemum cell walls,
2. similar pectate lyases are isolated from infected chrysanthemum stem cuttings inoculated with the mutant,
3. filter-sterilized mutant culture supernatant with pectate lyase activity causes symptoms in chrysanthemum similar to those caused by live bacterial cells,
4. the mutant does not produce the enzymes in the presence of pectate alone,

5. pectolytic clones were isolated from a genomic library of the mutant,
6. characterization of gene products of these clones revealed that some kind of modification system(s) existed in *E. chrysanthemi*.

Research experience:

Enzymology, mutant construction, protein work, screening assays, protein purification, Western blot analysis, glycoconjugate analysis and purification.

Senior Scientist, CIAT, Cali, Colombia

Research in tropical forage (both legumes and grasses) pathology.

Specific projects include:

1. Developing inoculation methods and identification of sources of resistance in *Brachiaria* spp. to *Rhizoctonia* foliar blight disease;
2. Identification and documentation of diseases of *Brachiaria*;
3. Molecular characterization of the pathogen that causes anthracnose of *Stylosanthes* spp.;
4. Development of differential hosts in *Stylosanthes guianensis*;
5. Characterization and identification of sources of resistance to the pathogen that causes dieback disease of *Stylosanthes*;
6. Documentation, inoculation methods and sources of resistance to diseases of the forage *Arachis*;
7. The role of endophytic fungi in tropical grasses;
8. Methods of pathogen long-term storage;
9. General seed health in forage germplasm;
10. Regeneration and genetic transformation of *Stylosanthes guianensis*;
11. New diseases of tropical forages;
12. Antifungal, antibacterial and insecticidal proteins from seeds of tropical forage legumes

SPECIAL PROJECT FUNDS AT CIAT :

1. Project title: **Development of *Stylosanthes* cultivars with stable resistance to anthracnose, high seed yield and seedling vigor**
 Donor: ACIAR, Australia
 Amount: A\$150,000
 Duration: 1993-1995
 Collaborating partners: CSIRO, Australia; EMBRAPA, Brazil; CIAT, Colombia

2. Project title: **Development of Stylosanthes cultivars with stable resistance to anthracnose, and molecular characterization of the pathogen population.**
Donor: ACIAR, Australia
Amount: A\$300,000
Duration: 3 Years (1998-2001)
Collaborating partners: CSIRO, Australia; EMBRAPA, Brazil; Grassland Institute, India; CATAS, China; CIAT, Colombia

3. Project title: **The role of endophytic fungi in tropical grasses**
Donor: Ministry of Foreign Affairs, Japan
Amount: US\$1,000,000.00
Duration : 1995-2000

4. Project title: **The role of endophytic fungi in tropical grasses**
Donor: Ministry of Foreign Affairs, Japan
Amount: US\$249,600.00/year
Duration : 2001 to date

5. Project title: **Molecular analysis of the anthracnose pathogen infecting tropical fruits (submitted 2004)**
Donor: Colcencias, Colombia
Amount: Col\$ 278,410,000 (approx. US\$111,000.00)
Duration: Two years

GRADUATE STUDENTS AND VISITING SCIENTISTS IN MY LABORATORY AT CIAT:

1. Chaozu He, Ph.D., The People's Republic of China. Joint supervisor Dr. J. Manners at the University of Queensland in Australia (1993-1996); PhD thesis: Molecular analysis of the fungal pathogen *Colletotrichum gloeosporioides*. Currently (2004) he is associate professor of molecular biology in Beijing, China.
2. Claudia X. Moreno, Universidad del Valle, Colombia. Undergraduate one year practical studies 1993-1994. Currently a post-doc in New York, USA.
3. Maria Ximena Rodriguez, Universidad de los Andes, Colombia. Undergraduate one year practical studies 1994-1995. Currently a scientist working on tissue culture in Bogota, Colombia.
4. Celso Fernandes, EMBRAPA, Brazil, visiting scientist, 1994. Currently a scientist in EMBRAPA.
5. Dr. D. Skinner, USDA/Kansas State University, USA, visiting scientist in 1995.
6. Dr. H. Koga, JIRCAS, Japan, visiting scientist in 1995
7. Jiang Changshun, South China University of Tropical Agriculture, The People's Republic of

China, 1998/1999, M.Sc thesis: Development of transgenic *Stylosanthes* plants with a rice chitinase gene for resistance to anthracnose. Currently associate professor and Vice Director, Office of International Cooperation and Exchange, CATAS, Hainan Province, China.

8. Dr. Y. Ando, JIRCAS, Japan, visiting scientist, November, 1997.
9. Yuka Takayama, Japan (sponsored by JICAS), visiting scientist, January 1998-2000.
10. Carolina Zuleta, Universidad de Tolima, Colombia, undergraduate thesis, 1999-2000. Currently a graduate student in the USA.
11. Viviana Poso, Universidad de Cauca, Colombia, undergraduate thesis, 1999-2000.
12. Huang Dongyi, South China University of Tropical Agriculture, The People's Republic of China, Ph.D student, 2000-2002, thesis: Endophytes of *Brachiaria*. Currently assistant professor, China.
13. Wu Kunxin, South China University of Tropical Agriculture, The People's Republic of China, Ph.D student, 2000-2002, thesis: Bacterial wilt of *Brachiaria*.
14. Tomoko Sakai, Japan (sponsored by JICAS), visiting scientist, January 2001- December 2004
15. Javeier Abello, Universidad Nacional, Bogota, undergraduate thesis, examining *Acremonium implicatum* as a gene delivery vehicle using green fluorescent protein. January 2004-

REFERENCES

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