

Patrícia da Conceição Ferreira dos Santos

Department of Biochemistry and Molecular Biology

University of Nevada Reno

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Education

- Python Software for Beginners** **2013**
Technology Training – Information Technology Services
Michigan State University, East Lansing, MI
- Beginner Applied Bioinformatics Workshop** **2013**
Michigan State University, East Lansing, MI
Organizers: Robin Buell, Elsa Gongora, Candy Hirsch, Cody Hirsch,
Peter Hamilton, Kevin Childs, John Johnston
- Oomycete Bioinformatics Training Workshop,** **2013**
Virginia Bioinformatics Institute
Virginia Polytechnic Institute and State University, Blacksburg, VA
Organizer: Brett Tyler
- Ph.D. Cytogenetics and Molecular Biology** **2005**
Madeira University, Madeira, Portugal
Dissertation: "Molecular Aspects of Orange Rust (*Hemileia Vastatrix* Berk & Br)
Resistance Responses in Coffee (*Coffea Arabica* L.)."
Supervisors: Ana Ribeiro, Diana Fernandez, Manuela Gouveia
- Advanced training in Transcriptomics (Macroarrays)** **2002-2003**
Laboratoire de Biologie Moléculaire, UR Résistance des Plantes
Institut de Recherche pour le Développement (IRD), Montpellier, France
Supervisor: Diana Fernandez
- Advanced Training in Construction of Suppressive Subtractive
cDNA Libraries** **2002**
Laboratoire de Biologie Moléculaire, UR Résistance des Plantes
Institut de Recherche pour le Développement (IRD), Montpellier, France
Supervisor: Diana Fernandez
- Cambridge English: First Certificate in English** **1999**
Cambridge School, Lisbon, Portugal
- B.A. + M.S. (Licenciatura) Applied Plant Biology** **1996**
University of Lisbon, Lisbon, Portugal
Dissertation: "Acclimation of *Cynara cardunculus* L (cardoon) to Different
Temperature Regimes."
Supervisors: Maria Manuela Chaves, João Santos Pereira

Research Experience

- Senior Research Associate** **2013-Present**
Michigan State University, East Lansing, MI
Supervisor: Martin Chilvers
(chilvers@msu.edu)

Research Associate Michigan State University, East Lansing, MI Supervisor: Brad Day (bday@msu.edu)	2011- 2013
Postdoctoral Fellowship Tropical Research Institute, Oeiras, Portugal/ Michigan State University, East Lansing, MI/ Stockholm University, Stockholm, Sweden Supervisors: Ana Ribeiro, Katharina Pawlowski and Brad Day (aribeiro@itqb.unl.pt , katharina.pawlowski@su.se , bday@msu.edu)	2008–2011
Postdoctoral Fellowship Universidade Nova de Lisboa, Oeiras, Portugal / Tropical Research Institute, Oeiras, Portugal / Stockholm University, Stockholm, Sweden Supervisors: Ana Ribeiro and Katharina Pawlowski (aribeiro@itqb.unl.pt , katharina.pawlowski@su.se)	2005-2008
PhD Student Madeira University, Madeira, Portugal Tropical Research Institute, Oeiras, Portugal Institut de Recherche pour le Développement, Montpellier, France Supervisors: Ana Ribeiro, Diana Fernandez and Manuela Gouveia (aribeiro@itqb.unl.pt , katharina.pawlowski@su.se , mgouveia@uma.pt)	2001-2005
Research Assistant Universidade Nova de Lisboa, Oeiras, Portugal Supervisors: Cândido Pinto Ricardo and Maria Manuela Chaves (ricardo@itqb.unl.pt , mchaves@isa.utl.pt)	1997–2001
Research Assistant Technical University of Lisbon, Lisboa, Portugal Supervisor: Maria Manuela Chaves and João Santos Pereira (mchaves@isa.utl.pt , jspereira@isa.utl.pt)	1996-1997
Undergraduate Researcher University of Lisbon, Lisbon, Portugal Supervisor: Paulo Pereira	1996
Undergraduate Researcher Technical University of Lisbon, Lisboa, Portugal Supervisor: Maria Manuela Chaves and João Santos Pereira (mchaves@isa.utl.pt , jspereira@isa.utl.pt)	1995-1996
Undergraduate Researcher Technical University of Lisbon, Lisboa, Portugal Supervisor: João Santos Pereira (jspereira@isa.utl.pt)	1995

Peer-Reviewed Publications

1. Zhuang, X.*, **Santos, P.***, Rojas, A., Wang, J., McPhee, K.E., Coram, T.E., Chilvers, M.I. (*Under review*). Transcriptome characterization and gene expression profiling analysis of *Pisum sativum* in response to infection by *Sclerotinia sclerotiorum*.
*First and second authors contributed equally to this work.

2. Kosma DK*, Murmu J, Razeq FM, **Santos P**, Bourgault R, Molina I, Rowland O (2014) AtMYB41 Activates ectopic suberin synthesis and assembly in multiple plant species and cell types. *The Plant Journal*. 80:216-229.
3. Demina, I.V. *, Persson, T. *, **Santos, P.**, Plaszczyca, M., Pawlowski, K. (2013). Comparison of the nodule vs. root transcriptome of the actinorhizal plant *Datisca glomerata*: actinorhizal nodules contain a specific class of defensins. *PLOS One*. 8: e72442.
*First and second authors contributed equally to this work.
4. Schubert, M., Koteyeva, N.K., Zdyb, A., **Santos, P.**, Voitsekhovskaja, O.V., Demchenko, K.N., Pawlowski, K. (2013). Lignification of cell walls of infected cells in *Casuarina glauca* nodules that depend on symplastic sugar supply, is accompanied by reduction of plasmodesmata number and narrowing plasmodesmata. *Physiologia Plantarum*. 147:524-540.
5. Ribeiro, A., Berry, A.M., Pawlowski, K., **Santos, P.** (2011). Actinorhizal plants. *Functional Plant Biology*. 38, v–vii.
6. Ribeiro, A., Graça, I., Pawlowski, K., **Santos, P.*** (2011). Actinorhizal plant defence-related genes in response to symbiotic *Frankia*. *Functional Plant Biology*. 38:639–644.
*Corresponding author.
7. Schubert, M., Koteyeva, N.K., Wabnitz, P.W., **Santos, P.**, Büttner, M., Sauer, N., Demchenko, Kirill., Pawlowski, K. (2011). Plasmodesmata distribution and sugar partitioning in nitrogen-fixing root nodules of *Datisca glomerata*. *Planta*. 233:139–152.
8. **Santos, P.***, Fortunato, A.*, Graça, I., Martins, S.M., Gouveia, M.M., Auguy, F., Bogusz, D., Ricardo, C.P.P., Pawlowski, K., Ribeiro, A. (2010). Characterization of four defense-related genes up-regulated in root nodules of *Casuarina glauca*. *Symbiosis*. 50:27–35.
*First and second authors contributed equally to this work.
9. **Santos, P.**, Fortunato, A., Ribeiro, A., Pawlowski, K. (2008). Chitinases in root nodules. *Plant Biotechnology*. 25: 299-307.
10. Sirrenberg A, Göbel C, Grond S, Czempinski N, Ratzinger A, Karlovsky P, **Santos P**, Feussner I, Pawlowski K. (2007). *Piriformospora indica* affects plant growth by auxin production. *Physiologia Plantarum*. 131: 581-589.
11. Fortunato, A.*, **Santos, P.***, Graça, I., Gouveia, M., Martins, S., Ricardo, C.P., Pawlowski, K., Ribeiro, A. (2007). Molecular characterization of *cgchi3*, a nodule-specific from *Casuarina glauca* encoding a class III chitinase. *Physiologia Plantarum*. 130: 418-426.
* First and second authors contributed equally to this work.
12. Fernandez, D., **Santos, P.**, Agostini, C., Bon, M-C., Petitot, A-S., Silva, M.C., Guerra-Guimarães, L., Ribeiro, A., Nicole, M. (2004). Identification of coffee (*Coffea arabica*) genes upregulated during the hypersensitive response to the rust pathogen (*Hemileia vastatrix*). *Molecular Plant Pathology*. 5: 527-536.
13. Chen, Z.J., Ribeiro, A., Silva, M.C., **Santos, P.**, Guerra-Guimarães, L., Gouveia, M., Fernandez, D., Rodrigues Jr, C.J. (2003). Heat shock-induced susceptibility of green coffee

leaves and berries to *Colletotrichum gloeosporioides* and its association to PR and hsp70 gene expression. *Physiological and Molecular Plant Pathology*. 63(4): 181-190.

Teaching Experience

Guest Lecturer - Plant Pathology (PLP/PLB 884) **(Fall) 2012**
Plant Root Symbioses, PhD Graduate Program
Michigan State University, East Lansing, Michigan

Guest Lecturer - Plant Pathology (PLP/PLB 884) **(Fall) 2010**
Plant Root Symbioses, PhD graduate Program,
Michigan State University, East Lansing, Michigan

Teaching Assistant **(Summer) 2010**
Genetic Engineering and GMOs; Summer course for high school students
Tropical Research Institute, Oeiras, Portugal

Guest Lecturer **(Fall) 2006**
Molecular Responses of Plants to Abiotic Stresses,
M.Sc. Graduate Program in Tropical Crop Production,
Instituto Superior de Agronomia, Technical University of Lisbon, Portugal

Teaching Assistant **(Summer) 2006**
Biotechnology and GMOs, Advanced Training Course for High School Teachers
Centro de Formação de Formadores, "Learning to Teach" Program
Linda-a-Velha, Portugal & Tropical Research Institute, Oeiras, Portugal

Supervisory Activities

Supervised the following numbers of students:

- 8 - Highschool students
- 8 - Highschool teachers
- 8 - Undergraduates
- 4 - Technicians
- 2 - M.S. students
- 6 - Ph.D. students

Professional Service & Administrative Activities

Thesis Defense Committee Member (Jury) - degree in Chemical and Environmental Sciences - "*Aspectos moleculares da resistência à antracnose dos frutos verdes em Coffea arabica: Clonagem de cDNAs correspondentes a genes codificadores de PGIPs*". Inês Castelhana Graça, Instituto Piaget, Almada, Portugal March 2006 - first opponent.

Reviewer for peer-reviewed academic journals including *Plant Science*, *Physiological and Molecular Plant Pathology*, *Folia Microbiology*.

Events Coordinator **2010-Present**
Michigan State University Postdoc Association (MSU-PDA)

Co-chair

Michigan State University Postdoc Association (MSU-PDA)
Travel Award Committee

2010-Present**Guest Editor**

Special issue of *Functional Plant Biology* – “Actinorhizal Plants”
Volume 38 Numbers 8 & 9

2011**Lab Manager**

Molecular Biology and Biotechnology Lab
Plant Ecophysiology, Biochemistry and Biotechnology Center
Tropical Research Institute (IICT), Oeiras, Portugal
Supervisor: Ana Ribeiro

2001**Grant-Writing & Outreach Activities with Developing Nations**

Capacity Building in Biotechnology – Collaborative Project
Tropical Research Institute (IICT) Oeiras, Portugal &
Universidade Eduardo Mondlane (UEM), Maputo, Mozambique
Funded by Instituto Português de Apoio ao Desenvolvimento (IPAD)

2001 - 2011

Patents

Day B, **Santos P**, Knepper C

2012

"METHOD OF ENHANCING PLANT DROUGHT TOLERANCE BY EXPRESSION OF NDR1".

Application for U.S. Letters Patent on March 9

Michigan State University, East Lansing, MI.

Awards

Poster Award

2007

Related Genes during Nodulation of *Casuarina glauca* by *Frankia*

Japan Society for the Promotion of Sciences Colloquium

Frontiers of Plant Biotechnology Meeting

Stockholm University, Stockholm, Sweden

Oral Presentations

P Santos, X Zhuang, C Foster, J Wang, M Chilvers (2014). Expression profiling of the pea-*Sclerotinia sclerotiorum* interaction for genomics-assisted breeding. 12th Annual Sclerotinia Initiative Meeting, January 22-24, Minneapolis, MN, USA (presented by first author).

Santos, P., Knepper, C., Yan, L., Savory, E.A., Carrillo, L.R., Fisher, N., Kramer, D., Day, B. (2012). *Arabidopsis Non-Race Specific Disease Resistance-1 (NDR1)* is Required for Robust Activation of Drought Tolerance and PAMP Triggered Immunity *via* an Abscisic Acid Dependent Pathway. XV International Congress on Molecular Plant-Microbe Interactions, July 29-August 2, Kyoto, Japan (by selection; presented by first author).

Ribeiro A, Graça I, Pawlowski K, **Santos P** (2011). Actinorhizal plant defence-related genes in response to symbiotic *Frankia*. Meeting on Plant-Microbe Interactions, 12th-14th October, University of Minho, Braga, Portugal (by selection; presented by last author).

P Santos, I Graça, B Rashidi, J Liang, A Fortunato, A Melo, J C Ramalho, A Pereira, B Day, K Pawlowski and A Ribeiro (2010). Functional analysis of defense-related genes involved in *Casuarina glauca*-*Frankia* symbiosis. 16th International Frankia and Actinorhizal Plants Meeting, 5th-8th September. Porto. Portugal (presented by last author).

K Pawlowski, B Rashidi, S Mehrabi, M Plaszczyca, T Persson, I Demina, L Jingsi, **P Santos**, S Svistoonoff, C Franche, M Plaszczyca and A Ribeiro (2010). Activity of nodule-specific promoters in heterologous nodules: implications for the evolution of infection pathways. 16th International Frankia and Actinorhizal Plants Meeting, 5th-8th September. Porto. Portugal (presented by first author).

Graça I, Liang J, Fortunato A, **Santos P** et al (2009). Characterization of a chitinase III encoding gene from actinorhizal nodules of *Casuarina glauca*. XXXIV Jornadas Portuguesas de Genética, 28-30th April, Lisbon, Portugal (presented by first author).

Santos P, Fortunato A, Graça I, Martins SM, Gouveia MM, Auguy F, Bogusz D, Pinto Ricardo C, Pawlowski K, Ribeiro A (2008). Characterization of four defence-related genes expressed in root nodules of *Casuarina glauca*. 15th International Frankia and Actinorhizal Plants Meeting, 19th-23rd October. Bariloche. Argentine (by selection; presented by last author)

Santos P, Graça I, Rashidi B, Söderholm N, Wikmark Y, Fortunato A, Pawlowski K, Ribeiro A (2008). Novel insights about two defense-related genes, *CgChi3* and *CgHin1*, during nodulation of *Casuarina glauca*. 8th European Nitrogen Fixation Conference and 11th International Symposium on Nitrogen Fixation with Non-Legumes. August 30th – September 4th. Gent. Belgium (by selection).

Ribeiro A, Graça I, **Santos P**, Fortunato A, Liang J, Gouveia M, Pawlowski K (2008). Genes de plantas envolvidos em simbioses actinorrízicas. I Congresso Luso-Espanhól de Fijación de Nitrógeno-XII Reunión Nacional de Fijación de Nitrógeno. 1 – 4th June. Estoril. Portugal (by selection; presented by first author).

Ramalho JC, Leitão AE, Eichler P, **Santos P**, Pais IP, Campos PS, Lidon FC, Rodrigues AP, Chaves MM, Ribeiro AI (2006). An integrative approach to study environmental stress tolerance in *Coffea* sp.- from leaf to gene. 21st International Conference on Coffee Science, 11-15th September. Montpellier. France (by selection; presented by first author).

Santos P, Fortunato A, Graça I, Gouveia M, Auguy F, Ricardo CP, Franche C, Bogusz D, Pawlowski K and Ribeiro A (2006). Identification of a NDR1 homologue from *Casuarina glauca* nodules. 14th International Conference on Frankia and Actinorhizal Plants. 15-18th July. Umea. Sweden (by selection).

Fortunato A, **Santos P**, Graça I, Gouveia M, Martins S, Ricardo CP, Pawlowski K, Ribeiro A (2006). Molecular characterization of *CgChi3*, a nodule-specific gene from *Casuarina glauca*. 14th International Conference on Frankia and Actinorhizal Plants. 15-18th July. Umea. Sweden (by selection; presented by last author).

Santos P, Machado E, Gouveia M, Silva MC, Guerra-Guimarães L, Ribeiro A, Fernandez D (2004). Identification of genes induced during the interaction of coffee (*Coffea arabica*) – orange rust (*Hemileia vastatrix*). 4^o Congresso da Sociedade Portuguesa de Fitopatologia. Livro de resumos. Faro. Portugal (by selection).

Fernandez D, Silva M, **Santos P**, Petitot A-S, Guerra-Guimarães L, Ribeiro A, Nicole M (2004). La réaction hypersensible du caféier à *Hemileia vastatrix*, agent de la rouille orangée: caractérisation cytologique et moléculaire. Communication aux Journées J. Chevaugéon – Véme rencontres de Phytopathologie/ mycologie. Aussois. France (by selection; presented by first author).

Silva MC, Guerra-Guimarães L, Nicole MR, Loureiro A, Fernandez D, **Santos P**, Ribeiro A, Rodrigues Jr CJ (2003). Early defense responses in coffee – rust interactions. Workshop on Plant Stress Biology. 18-21st June. Livro de resumos. Braga. Portugal (by selection; presented by first author).

3rd Meeting of the project UE/BIO4-CT96-0770, "Environmental conditions influence the growth response in potato plants transformed with *E. coli* polyphosphate kinase gene.", Grenoble, France. January 2000.

2nd Meeting of the project UE/BIO4-CT96-0770, "Growth and photosynthesis of transgenic plants (*Solanum tuberosum* L.) grown under field and controlled environment.", Oeiras, Portugal. October 1998.

1st Meeting of the project UE/BIO4-CT96-0770, "Effects of elevated CO₂ on growth and photosynthesis in *Solanum tuberosum* L. (cv. Désirée) lines - Preliminary results.", Madrid, Spain. November 1997.

Poster Presentations

P Santos, X Zhuang, A Rojas, J Wang, C Foster, M Chilvers (2014). Molecular strategies employed by pea cultivars during the interaction with white mold, *Sclerotinia sclerotiorum*. The American Phytopathological Society: 2014 APS-CPS Joint Meeting, August 9-13, Mineapolis, MN, USA.

P Santos, X Zhuang, C Foster, J Wang, M Chilvers (2014). Expression profiling of the pea-*Sclerotinia sclerotiorum* interaction for genomics-assisted breeding. 12th Annual Sclerotinia Initiative Meeting, January 22-24, Mineapolis, MN, USA.

I Graça, **P Santos**, J Liang, A Fortunato, I Palos, A Pereira, B Day, K Pawlowski, A Ribeiro. Functional analysis of two defense related genes, *CgChi3* and *CgHin1* from nitrogen-fixing nodules of *Casuarina glauca* (2009). 8th Plant GEM, October 7-10, Lisbon, Portugal.

P Santos, J Liang, I Graça, B Rashidi, A Fortunato, B Day, K Pawlowski, A Ribeiro (2009). Functional analysis of defense-related genes involved in the *Casuarina glauca*-*Frankia* symbiosis. XIV International Congress on Molecular Plant-Microbe Interactions, July 19-23, Québec, Canada.

Santos P, Graça I, Rashidi B, Söderholm N, Wikmark Y, Fortunato A, Pawlowski K, Ribeiro A (2008). Novel insights about two defense-related genes, *CgChi3* and *CgHin1*, during nodulation of *Casuarina glauca*. 8th European Nitrogen Fixation Conference and 11th International Symposium on Nitrogen Fixation with Non-Legumes. August 30th – September 4th, Gent, Belgium.

Graça I., Fortunato A., **Santos P.**, Liang J., Ricardo C.P., Tavares P., Pereira A. and Ribeiro A. (2007). Production of *Casuarina glauca* recombinant proteins involved in root nodulation by *Frankia* bacteria. National Congress of MICRO-BIOTEC and XXXIII *Jornadas Portuguesas de Genética*. November 30th – December 2nd, Lisbon, Portugal.

Fortunato, A, **Santos, P**, Graça, I, Gouveia, M, Auguy, F, Franche, C, Bogusz, D, Pinto Ricardo, C, Pawlowski, K, Ribeiro, A (2007). Defense-related genes during nodulation of *Casuarina glauca* by *Frankia*. XIII International Congress on Molecular Plant-Microbe Interactions. July 21-27, Sorrento, Italy.

Eichler P, **Santos P**, Gouveia MM, Lidon FC, Chaves MM, Ribeiro A, Ramalho JC (2006). Cold tolerance evaluation in *Coffea sp.* Impact on the photosynthetic apparatus and the control of oxidative stress assessed by gene expression analysis. 21st International Conference on Coffee Science, Montpellier, France.

Santos P., Machado E., Gouveia M., Fernandez D., Chen Z., Rodrigues Jr C.J., Lidon F.C., Ramalho J., Ribeiro A. (2004). Gene expression analysis of *Coffea* spp. exposed to biotic and abiotic stresses. XIV Congresso Nacional de Bioquímica. Vilamoura, Portugal.

Santos P., Bon-MC, Agostini C, Petitot A-S, Silva, MC, Guerra-Guimarães, Ribeiro, A Fernandez, D (2004). Novel insights about coffee leaf rust: identification of genes involved in the resistance process. 14th Federation of European Societies of Plant Biology. Cracow, Poland.

Fernandez D., **Santos P.**, Agostini C., Bon M-C., Petitot A-S., Silva MC, Guerra-Guimarães L., Ribeiro A. and Nicole M. (2003). Early expressed coffee genes in the hypersensitive reaction

to the rust fungus *Hemileia vastatrix*. 11th International Congress on Molecular Plant-Microbe Interactions. St Petersburg. Russia.

Silva, MC., Guerra-Guimarães, L., Nicole, MR., Loureiro, A., Fernandez, D., Ribeiro, A., **Santos, P.** and Rodrigues Jr., CJ. (2003). Involvement of peroxidases in the hypersensitive reaction of coffee (*Coffea arabica*) plants to orange rust (*Hemileia vastatrix*). 8th International Congress of Plant Pathology. Chirstchurch. New Zeland.

Santos, P., Chaves, M.M. and Pinto Ricardo, C. (2000). Photosynthesis and growth are not improved by the introduction of polyphosphate kinase gene in potato plants, under ambient or elevated CO₂. XII Congresso Nacional de Bioquímica. Livro de Resumos. Póvoa de Varzim. Portugal.

Santos, P., Chaves, M.M., Pinto Ricardo, C. (1999). Are photosynthesis and growth of *Solanum tuberosum* L. improved by the expression of polyphosphate kinase genes? XIII Reunión de la Sociedad Española de Fisiología Vegetal y VI Congreso Hispano- Luso. Sevilha. Espanha.

Santos, P., Osório, M.L., Chaves, M., Pinto Ricardo, C. (1998). Effects of elevated CO₂ on growth and photosynthesis in *Solanum tuberosum* L. (cv. Désirée) lines transformed with an E. coli polyphosphate kinase. XI Congresso Nacional de Bioquímica. Livro de Resumos. Tomar. Portugal.

Santos, P., Chaves, M.M. e Pereira, J.S. (1997). Aclimação a dois regimes de temperatura em *Cynara cardunculus* L. XII Reunión de la Sociedad Española de Fisiología Vegetal y V Congreso Hispano-Luso de Fisiologia Vegetal. Livro de Resumos. Córdoba. Espanha.

Faria T., Canta N., **Santos P.F.**, Chaves M.M., Pereira J.S. (1997). Responses of cork oak (*Quercus suber* L.) to elevated CO₂ under a Mediterranean type of climate. MEDECOS VIII, San Diego, USA.

Talhinhas, P., Cerasoli, S., **Santos, P.**, Neves Martins, J., Pacheco, C.A., Chaves, M.M., Pereira, J.S. (1995). Características Agronómicas e Fisiológicas de Variedades de Tremoceiro (*Lupinus albus* L.) face ao Stress Hídrico." "IV Congresso Luso-Espanhol de Fisiologia Vegetal". Livro de Resumos. Estoril. Portugal.

Foreign Languages

Language	Reading, Writing, Conversation
Portuguese	Excellent, Excellent, Excellent
English	Excellent, Excellent, Excellent
French	Good, Basic, Basic
Spanish	Good, Basic, Good