

Prof. Bogdan Wolko

Head of the IPG PAS Statute Theme: Structure and organization of plant genomes

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Scientific specialization:

Plant genetics, genomics and breeding, with special consideration of cool legume species.

Research achievements:

- Construction of linkage maps of molecular markers for pea (*Pisum sativum*) and lupin species (*Lupinus angustifolius*, *L. albus*)
- Localization on the pea linkage map of quantitative trait loci (QTL) of yield structure elements and seed protein content.
- Construction of the *L. angustifolius* nuclear genome BAC library.
- Analysis of structure and organization of *L. angustifolius* genome regions containing genes responsible for resistance to pathogenic fungi.
- Generation of markers specific for chromosomes in order to integrate genetic and physical maps of *L. angustifolius* genome.
- Estimation of Old and New World species genome sizes and using these results for discussion on phylogeny and taxonomy *Lupinus* genus.

Current scientific cooperation:

- national

- Gene Bank of *Pisum* i *Lupinus* species, Poznan Plant Breeders, Breeding Station Wiatrowo. Molecular characterization of the *Pisum* and *Lupinus* core collection. Generation of molecular markers linked with domesticated traits for mass selection.
- Prof. Cezary Mądrzak, Dept. of Biochemistry and Biotechnology, Faculty of Agriculture, University of Life Sciences in Poznań. Cooperation in the area of exploitation of lupin BAC library for determining of sequences of genes coding enzymes from the phenylpropanoid pathway and mapping of them on the *L. angustifolius* genetic map..
- Prof. Wojciech Karłowski, Institute of Molecular Biology, Faculty of Biology, Adam Mickiewicz University in Poznań. Functional annotation of the clone BAC-end sequences in the aim to identify candidate genes of resistance for pathogenic fungi.

- international:

- Dr Hu'an Yang Department of Agriculture and Food Western Australia, Perth, Australia. Official cooperation in the framework of the International Genetic Material Transfer Agreement between State of Western Australia i IPG PAS concerning exchange of plant materials (seeds of cultivars, parental lines, and mapping population of the narrow-leafed lupin) and information on sequence of markers linked to domesticated traits.
- Dr Matthew Nelson, University of Western Australia, Perth, Australia. Cooperation concerning the genetic map construction of *L. angustifolius* genome, with the use of

sequence defined markers and analysis of synteny between *L. angustifolius* i *Medicago truncatula*.

- Dr Kader Ainouche UMR CNRS ECOBIO 6553, EGS, University of Rennes-1, France. Identification of SymRK gene sequence from *L. angustifolius* involved with nodulation process and comparison of it with homeologues from other legume species.

Scientific fellowships:

- Cornell University, New York State Agricultural Experiment Station, Geneva NY, USA - 1987/1989, 1992. Studies of molecular markers variability among *Pisum* i *Lupinus* species, gene mapping, linkage map construction.
- PHARE bis, Institut Supérieur Industriel de l'Etat, Huy, Belgium - 1991/1992. *In vitro* culture practical training.

Research projects:

- financed from national sources:

- Project of the State Committee for Scientific Research no. 5 S301 014 05 "Construction of linkage maps molecular markers of *Lupinus* species " (1993 - 1996); main contractor.
- Project of the State Committee for Scientific Research no. 5 P06A 023 18. "Localization on chromosome map and genetic characterization of loci responsible for inheritance of quantitative traits (QTL) involved with yield structure of pea (*Pisum sativum* L.)" (2000 - 2002); manager.
- Project of the State Committee for Scientific Research no. 3 P06A 009 24: "Structure of the *Lupinus* nuclear genome as reflected by molecular and cytogenetic research" (2003 - 2006); main contractor.
- Project of the State Committee for Scientific Research no. 3 P06 043 24: "Characteristics of genes controlling protein and yield structure traits in pea with consideration of the nonallelic interaction". (2003 - 2006); main contractor.
- Project of the State Committee for Scientific Research no. 2 P06B 001 27 " Expression of the HBV antigens in transgenic plants for needs of the new generation vaccine against hepatitis inflammation B type". (2004 - 2007); contractor.
- Project of the Ministry of Sciences and Higher Education no. N301 084 32/3234 „Analysis of the *Lupinus angustifolius* genome structure containing resistance gene to anthracnose". (2007 – 2010); manager
- Project of the Ministry of Sciences and Higher Education no. PBZ-MNiSW-2/3/2006/3 "Identification of molecular markers linked with resistance gene to pathogenic fungus *Diaporthe toxica* causing brown stem spotting of narrow-leafed lupin (*Lupinus angustifolius* L.)" (2007 - 2010); manager.
- Project of the Ministry of Sciences and Higher Education no. N N301 165635 "Structure and organization of the genome region determining resistance to anthracnose of the narrow-leafed lupin (*Lupinus angustifolius* L.)" (2008-2009); manager.
- Project of the Ministry of Agriculture and Rural Development „Molecular markers linked with domesticated traits for genotype characterization of narrow-leafed lupin (*Lupinus angustifolius* L.)" (2008); manager.
- Project of the Ministry of Sciences and Higher Education no. N N301 391939 "Structure and organization selected genes and their genetic and physical nuclear genome of *Lupinus angustifolius* L" (2010-2013), contractor.

- Project of the Ministry of Agriculture and Rural Development "Early flowering trait in narrow-leaved lupin (*Lupinus angustifolius*) – genetic and molecular background" (2011-2013), manager.

- financed from international sources:

- Projekt II Maria Curie-Skłodowska nr MR/USDA/95-218 "Generation of a genetic basis for lupin breeding" (1995 - 1998); main contractor
- FP5 QLK5-CT-2002-30379 Centre of Excellence in Plant Agrobiolgy and Molecular Genetics PAGEN. (2003 - 2006); coordinator
- IP FP6-2002-FOOD-1-506223 "New strategies to improve grain legumes for food and feed" GRAIN LEGUMES (2004 -2008); main contractor

List of publications:

Wolko B., Clements J.C., Naganowska B., Nelson M.N., Yang H. 2011. *Lupinus*. In: Kole C (ed) Wild Crop Relatives: Genomic and Breeding Resources. Chapter 9. Springer-Verlag. 2011 pp. 153-206.

Leśniewska K., Książkiewicz M., Nelson M.N., Mahé F., Ainouche A., Wolko B., Naganowska B. (2010). Assignment of 3 Genetic Linkage Groups to 3 Chromosomes of Narrow-Leafed Lupin. *Journal of Heredity* 102(2): 228-236.

Pniewski T., Kapusta J., Bociąg P., Wojciechowicz J, Kostrzak A., Gdula M., Fedorowicz-Strońska O., Wójcik P., Otta H., Samardakiewicz S., Wolko B., Płucienniczak A. (2010). Low-dose oral immunization with lyophilized tissue of herbicide-resistant lettuce expressing hepatitis B surface antigen for prototype plant-derived vaccine tablet formulation. *J App Genet*, DOI 10.1007/s13353-010-0001-5.

Nelson M.N., Paula M., Moolhuijzen M., Boersma J.G. Chudy M., Leśniewska K., Bellgard M., Oliver R.P., Święcicki W., Wolko B., Cowling W.A., Ellwood S.R. (2010). Aligning a new reference genetic map of *Lupinus angustifolius* L. with the genome sequence of the model legume, *Lotus japonicus*. *DNA Research* 17: 73–83

Kaczmarek A, Naganowska B, Wolko B. (2009). Karyotyping of the narrow-leaved lupin (*Lupinus angustifolius* L.) by using FISH, PRINS and computer measurements of chromosomes. *J. Appl. Genet.* 50 (2): 77-82.

Książkiewicz M., Karłowski W., Yang H., Wolko B. (2008). Physical and genetic analysis of genome region conferring the resistance to fungal pathogens in narrow-leaved lupin. In: *Lupins for Health and Wealth* (Editors: Jairo A. Palta and Jens D. Berger), CSIRO Plant Industry, Wembley, Western Australia, ISBN 0-86476-153-8 pp. 263-266.

Nelson M., Boersma J., Chudy M., Leśniewska K., Ellwood S., Phan H., Moolhuijzen P., Bellgard M., Oliver R., Święcicki W., Wolko B., Cowling W. (2008). A dense reference map of the *Lupinus angustifolius* L. genome: a foundation for building lupin genome research. In: *Lupins for Health and Wealth* (Editors: Jairo A. Palta and Jens D. Berger), CSIRO Plant Industry Wembley, Western Australia, ISBN 0-86476-153-8; pp. 255-258.

Chudy M., Leśniewska K., Wolko B., Święcicki W. (2008). Narrow-leaved lupin (*Lupinus angustifolius* L.) comparative studies. In: *Lupins for Health and Wealth* (Editors: Jairo A. Palta and Jens D. Berger), CSIRO Plant Industry Wembley, Western Australia, ISBN 0-86476-153-8; pp. 332-335.

Kaczmarek A., Naganowska B., Wolko B. (2007). PRINS and C-PRINS: promising tools for the physical mapping of the lupin genome. *Cell. Mol. Biol. Lett.* 12: 16-24.

Nelson M.N., Phan H.T.T., Ellwood S.R., Moolhuijzen P.M., Bellgard M., Hane J., Williams A., Fosu-Nyarko J., Wolko B., Książkiewicz M., Cakir M., Jones M.G.K., Scobie M., O’Lone C.E., Barker S.J., Oliver R.P., Cowling W.A. (2006). The first gene-based map of *Lupinus angustifolius* L. - location of domestication genes and conserved synteny with *Medicago truncatula*. *Theor. Appl. Genet.* 113(2): 225-238.

Kasprzak A., Šafář J., Janda J., Doležel J., Wolko B., Naganowska B. (2006). The bacterial artificial chromosome (BAC) library of the narrow-leafed lupin (*Lupinus angustifolius* L.). Cell. Mol. Biol. Lett. 11: 396 – 407.

Nelson M.N., Phan H.T.T., Ellwood S.R., Moolhuijzen P.M., Hane J., Williams A., O'Lone C.E., Fosu-Nyarko J., Scobie M., Cakir M., Jones M.G.K., Bellgard M., Książkiewicz M., Wolko B., Barker S.J., Oliver R.P., Cowling W.A. (2006). The first gene-based map of *Lupinus angustifolius* L. - location of domestication genes and conserved synteny with *Medicago truncatula*. Theoretical and Applied Genetics 113(2):225-238.