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Current Research Interests:

1. Plant cell elongation (symplastic and intrusive growth), with special emphasis on the role of cell wall polysaccharides.
2. Highly cellulosic (gelatinous) type of secondary cell wall (present in many fiber crops, tension wood, etc.): development, supramolecular structure and functional role realization.
3. Oligosaccharins - physiologically active fragments of plant cell wall.
4. Spatial organization of complex polysaccharides (rhamnogalacturonan I, glucuronoarabinoxylan).

The main achievements:

1. The concepts about the ways of plant fiber growth have been revised. Marker features of the various stages of fiber formation - initiation, coordinated and intrusive growth, maturation - were identified.
2. Peculiarities of distribution and structure of the major matrix glycans of primary cell walls (type II) - mixed-linkage glucan and glucuronoarabinoxylan - were characterized. These peculiarities corresponded to the different stages of elongation growth and correlated with the rate of cell expansion in various organs.
3. The approaches to the study the mechanisms and regulation of intrusive growth were developed. It was established that fiber intrusive elongation occurred by diffuse growth and led to formation of symplastically isolated domain.
4. New physiologically active fragments of plant cell wall polysaccharides (oligosaccharins) were found and their involvement in the plant adaptive response as endogenous regulators was demonstrated.
5. The specific (gelatinous) type of the secondary cell wall, formed by many fiber crops and tension wood, was characterized. The processes forming the basis for the cell wall biogenesis of this type were identified.
6. A set of approaches for studying the structure and metabolism (in the intact plant) of individual cell wall polymer (stage- and tissue-specific galactan, which plays a key role in cell wall supramolecular structure formation), was developed.
7. It was shown that the galactan got strongly retained by cellulose microfibrils after deposition into the cell wall, and its extraction by even strong alkaline solutions was not

effective. A method for the complete destruction of the fiber cell wall and the release of matrix polysaccharides, strongly retained by cellulose, was developed.

Two well-grounded monographs were published, International Symposium "Plant Fibers: View of Fundamental Biology" (2009) and All-Russia conference "Fundamental Glycobiology" (2012) were held in by our lab team.

List of publications:

1. Mikshina P.V., Chernova T.E., Chemikosova S.B., Ibragimova N.N., Mokshina N.Y., Gorshkova T.A. Cellulosic Fibers: Role of Matrix Polysaccharides in Structure and Function // Cellulose. 2013. Chapter 4. P.91-113. <http://dx.doi.org/10.5772/51941>.
2. Горшкова Т.А., Козлова Л.В., Микшина П.В. Пространственная структура полисахаридов растительных клеточных стенок и её функциональная значимость // Биохимия. 2013. Т.78. №7. С.1069-1089.
3. Mellerowicz E.J., Gorshkova T.A. Tensional stress generation in gelatinous fibres: a review and possible mechanism based on cell wall structure and composition // J. Exp. Bot. 2011. Darwin Review. 2012. V. 63. № 2. P. 551–565.
4. Mikshina P.V., Gurjanov O.P., Mukhitova F.K., Petrova A.A., Shashkov A.S., Gorshkova T.A. Structural details of pectic galactan from the secondary cell walls of flax (*Linum usitatissimum* L.) phloem fibres // Carbohydrate Polymers. 2012. V. 87. P. 853-861.
5. Gorshkova T., Brutch N., Chabbert B., Deyholos M., Hayashi T., Lev-Yadun S., Mellerowicz E.J., Morvan C., Neutelings G., Pilate G. Plant fiber formation: state of the art, recent and expected progress, and open questions // Critical Reviews in Plant Sciences. – 2012. V.31. № 3. P. 201-228.
6. Roach M.J., Mokshina N.Y., Snegireva A.V., Hobson N., Deyholos M.K., Gorshkova T.A. Development of cellulosic secondary walls in flax fibers requires β -galactosidase // Plant Physiology. 2011. V.156. P.1351-1363.
7. Zabolina O.A., Zabolin A.I. Biologically active oligosaccharide functions in plant cell / In Book: Oligosaccharides: Sources, Properties and Applications. 2011, Nova Press, Ed. N.S. Gordon, 209-243.
8. Gorshkova T.A., Mikshina P.V., Gurjanov O.P., and Chemikosova S. B. Formation of Plant Cell Wall Supramolecular Structure // Biochemistry (Moscow). 2010. V.10. P. 159-175.
9. Biogenesis of Plant Fibers / Ed. T.A.Gorshkova. M.: Nauka, 2009. 260c.
10. Gorshkova T.A., Mikshina P.V., Ibragimova N.N., Mokshina N.E., Chernova T.E., Gurjanov O.P., Chemikosova S.B. Pectins in secondary cell walls: modifications during cell wall assembly and maturation // Pectins and Pectinases / Eds Schols H.A., Visser R.G.F., Voragen A.G.J. The Netherlands: Wageningen, Academic Publishers. 2009. P. 149-164.
11. A.I. Zabolin, T.S. Barisheva, O.I. Trofimova, T.E. Toroschina, I.A. Larskaya, O.A. Zabolina Oligosaccharin and ABA synergistically affect the acquisition of freezing tolerance in winter wheat. // Plant Physiology and Biochemistry. V.47. 2009. P.854-858
12. Gurjanov O.P., Ibragimova N.N., Gnezdilov O.I., Gorshkova T.A. Polysaccharides, tightly bound to cellulose in cell wall of flax bast fibre: Isolation and identification // Carbohydrate

Polymers. 2008. V. 72. P.719–729.

13. Gorshkova T.A. Plant Cell Wall as a Dynamic System. M.: Nauka, 2007. 429c.

14. Gur'janov O.P., Gorshkova T.A., Kabel M., Schols H.A. and Jan E.G. van Dam. MALDI-TOF MS evidence for the linking of flax bast fibre galactan to rhamnogalacturonan backbone // Carbohydrate Polymers. 2007. V. 67. P. 86-96.

15. Gorshkova T., Morvan C. Secondary cell-wall assembly in flax phloem fibres: role of galactans.//Planta.-2006.-V.223.-P.149-158.

16. Gorshkova T.A., Nikolovski N., Finaev D.N. Plant Cell Wall Is a Stumbling Stone for Molecular Biologists // Russian Journal of Plant Physiology. 2005. V.52. P. 392-409.

17. Ageeva M.V., Petrovská B., Kieft, H., Salnikov V.V., Snegireva A.V., van Dam J.E.G., Emons, A.M.C., Gorshkova T.A., van Lammeren A.A.M. Intrusive growth of flax phloem fibers is of intercalary type.// Planta.-2005.-V.222.-P.565-574.

18. van Dam J.E.G., Gorshkova T.A. Plant growth and development: Plant fiber formation, Chapter MS 46 Encyclopedia of Applied Plant Sciences, 2003, Academic Press, Elsevier Ltd., p. 87-96.

19. Gorshkova, T.A., Wyatt, S.E., Salnikov, V.V., Gibeaut, D.M., Ibragimov, M.R., Lozovaya, V.V., Carpita, N.C. Cell-wall polysaccharides of developing flax plants // Plant. Physiol. – 1996. – V. 110. – № 2. – P. 721-729.