Seminars in Biotechnology BTEC 592 & BTEC 692

"Plant Cell Walls: The Potential"

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Dr. Merve Seven graduated from İstanbul University, Department of Molecular Biology and Genetics in 2011. Then, she completed her Ph.D. degree in biotechnology at Yeditepe University, Graduate School of Natural and Applied Sciences in 2017. During this time, she was also Plant Biotechnology Research Laboratory responsible at Yeditepe University. Between 2018 and 2020 she was a research associate at the Institute of Plant Cell Biology and Biotechnology, Heinrich-Heine University, Germany. Afterward, she worked as a quality control specialist at the Nobel İlaç Biotechnology. She joined the Department of Molecular Biology and Genetics, Bahçeşehir University in 2021 and she is an assistant professor there.

Abstract

Members of Kingdom Plantae, distinctive from other kingdoms, have cell walls made of cellulose microfibrils embedded in a matrix of pectic polysaccharides and cross-linked with hemicelluloses. Xyloglucan, a major hemicellulose, is ubiquitous in the cell walls of non-graminaceous, graminaceous and evolutionarily distant species like Equisetum plants, and it links cellulose microfibrils to form load-bearing structures in the primary cell wall.

The cell walls change during the lifespan of a plant. This necessary change is achieved by enzymes that are capable of modifying cell wall polysaccharides. Xyloglucan endotransglycosylase/hydrolases (XTH) is a big enzyme family divided into several clades and the members play important roles in cell wall remodelling. With their evolutionary relationship to bacterial licheninases, this family holds a potential of a broader activity. Members of 'Ancestral Clade' of XTHs, heterologously produced AtXTH3, PtXTH3 and TaXTH9, demonstrate this potential with their broader activity other than XET. All the

enzymes mentioned had high activity with the cellulose analogue HEC (hydroxyethyl cellulose) as well as with mixed-link β-glucan as donor substrates, when compared with the standard xyloglucan. Acceptor preferences within this family was broader, too. These findings demonstrate the specification of endotransglycosylation role between XTH clades and broader activity of XTH enzymes within plant metabolism. Enzymes capable of cross modifications are a big potential for plant cell wall related industries.