

MWP – Young Researcher Abstract 2026

Project title: From Forests to Water Security: Cellulose-Based Materials for Atmospheric Water Harvesting and Climate-Resilient Agriculture	
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Abstract (approx. 200 words): Freshwater scarcity is one of the defining challenges of the twenty-first century, affecting billions of people and threatening food production, ecosystem stability, and economic development worldwide. As climate change intensifies drought frequency and water stress, there is an urgent need for sustainable technologies capable of generating freshwater independently of conventional water infrastructure. My research advances a new paradigm in which forest-derived cellulose serves as a platform material for atmospheric water harvesting, enabling the direct capture of water from air using renewable, carbon-neutral resources. By engineering hierarchical porous architectures across multiple length scales and integrating tailored sorptive functionalities, cellulose-based materials can efficiently capture, transport, store, and release atmospheric moisture under low-energy conditions, including passive solar regeneration. The work establishes fundamental principles linking cellulose structure, pore organization, surface chemistry, and water sorption behavior, while translating these insights into scalable materials systems capable of operating across diverse climatic conditions. This research creates new opportunities for the forest sector while addressing two interconnected global challenges: access to clean water and resilience of agricultural systems under a changing climate.	
Key words: Atmospheric water harvesting; Porous cellulosic materials; Resilient agriculture	