CAPTS System Sets a New Standard for Canopy Gas Exchange Measurement

SHANGHAI, CHINA, May 21, 2025 /EINPresswire.com/ -- In plant photosynthetic gas exchange research, precise measurement technologies are vital for understanding ecosystem carbon cycles and advancing agricultural science. Millet Hill Biology, a pioneering company with deep expertise in this area, has consistently prioritized technological innovation, continuously exploring cutting-edge canopy photosynthetic gas exchange measurement technologies. After years of dedicated research and development, a team led by Ms. Yu Wang systematically investigated the impact of sampling tube diameter on the accuracy of canopy photosynthetic gas exchange measurements, establishing a strong theoretical foundation for the next generation of plant photosynthesis measurement technologies.

Wang's paper, "Discussion on the potential influence of sampling pipeline diameter on measurement results during canopy photosynthetic gas exchange measurement," published in Probe - Environmental Science and Technology, comprehensively examines how the diameter of sampling tubes affects gas collection, transmission, and measurement accuracy. The study reveals that small-diameter

tubes, due to higher flow resistance and increased molecular collisions, can lead to uneven gas flow and sampling bias. Conversely, large-diameter tubes can reduce flow resistance and stabilize transmission, but may result in unstable flow rates and signal fluctuations if paired with inadequate pumping systems. These insights have directly informed the optimization of measurement systems, and Millet Hill Biology's independently developed Canopy Photosynthetic Gas Exchange Measurement System (CAPTS) exemplifies the successful application of these theoretical findings in engineering innovation.

Unlike traditional leaf-level photosynthesis measurement instruments such as the LI-6800 by LI-COR (USA) and the CRAS-3 by PP Systems, the CAPTS system is specifically designed for canopy-level photosynthesis research, overcoming the limitations of single-leaf measurements. By integrating a multi-channel CO□ analyzer with multiple measurement chambers, CAPTS creates a fully automated, all-weather monitoring system that can capture the overall photosynthetic dynamics of the entire aboveground plant canopy, even unattended. Traditional photosynthesis instruments often overestimate canopy performance by sampling only the most active leaves. CAPTS, through simultaneous multi-chamber monitoring and integrated data analysis, delivers authentic and comprehensive group-level photosynthetic data, effectively addressing a critical gap in ecosystem carbon flux research.

In its technical design, CAPTS incorporates the core findings of Wang's research. To mitigate sampling bias associated with small-diameter tubes, the system optimizes internal wall materials and tube structures to minimize molecular collisions and wall adhesion effects. To ensure stable gas flow in large-diameter tubes, CAPTS utilizes high-performance pumping and gas control systems—such as the multi-channel main unit featured in the CAPTS-100 model—ensuring stable transmission of gas samples for high-precision measurements. Moreover, CAPTS includes an environmental parameter synchronization module, enabling real-time recording of temperature, humidity, light intensity, and other environmental factors, providing multi-dimensional support for canopy photosynthesis research.

Since 2017, as General Manager of Millet Hill Biology, Yu Wang has led the team in continuously advancing technological innovation and expanding market reach, firmly establishing CAPTS as a leading research tool in the field. Wang's interdisciplinary background in Physics and Financial Engineering—with a bachelor's degree in Applied Physics from Shanghai Jiao Tong University, followed by advanced studies in Financial Engineering and Computational Finance at Nanyang Technological University and Carnegie Mellon University—has been instrumental to her success. Her early academic training provided her with strong skills in complex systems modeling, fluid dynamics, data analysis, and optimization algorithms. These skills, seemingly unrelated at first, proved to be crucial enablers when she transitioned to plant photosynthetic gas exchange research. Her physics background allowed for precise analysis of microscopic gas transmission mechanisms, while her engineering modeling experience facilitated the development of stable and efficient group-scale data acquisition and analysis systems. This interdisciplinary approach empowered Wang to lead the team in achieving comprehensive innovation from theoretical research to system design, culminating in the creation of the CAPTS system and filling a major

technological gap in group-level plant photosynthesis research.

Since its launch, the CAPTS system has rapidly gained widespread recognition and has been successfully adopted by leading universities and research institutions. In agriculture, CAPTS has been instrumental in improving crop group photosynthetic efficiency and optimizing yield and quality in tea cultivation. In ecology, it provides critical data for assessing forest carbon sequestration capacities and monitoring wetland photosynthetic dynamics. These successful applications not only validate the technical reliability of the CAPTS system but also demonstrate the immense practical value of translating fundamental research into real-world solutions.

As canopy-level photosynthesis research continues to gain prominence in leading international journals, the field has emerged as a key area of focus in agricultural science and ecology. Global demand for specialized group-level photosynthesis measurement systems is on the rise. Millet Hill Biology, as one of the few companies worldwide mastering core technologies in this area, is rapidly expanding into international markets, leveraging its strong technical foundation and first-mover advantages. Compared to modular or assembled alternatives, CAPTS offers superior ease of use, robust performance, and scientific validation through multiple authoritative publications, making it the preferred solution for research teams worldwide.□By Adam White□

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