UPM researchers create 'photosynthesis enhancer' for plants

A GROUP of researchers from Universiti Putra Malaysia (UPM) has successfully produced photosynthesis enhancer using carbon dots technology which can increase crop yields between 20 and 30 percent.

Through the innovation, photosynthesis rate increases between 20 to 80 per cent depending on the types of crop.

The increase in photosynthesis rate encourages plant growth, shortens harvest period and increases yields.

Associate Professor Dr Suraya Abdul Rashid, who led the research team, said the product — HARVAST — uses carbon dots which has a particle size of less than 10 nanometers.

"The liquid form of photosynthesis enhancer is sprayed on the leaves allowing the small sized particle to absorb into the leaves till the chloroplasts.

"The carbon dots help in the process of exchanging electrons during the photosynthesis process, which can directly increase the rate of photosynthesis rapidly," she said.

Suraya, who is also UPM's Institute of Advanced Technology (ITMA) Laboratory of Material Processing and Technology head, said the technology produces better harvest compared to other plant growth enhancers available in the market which focus more on plant nutrient requirements and root growth.

The members of the research group (from left), Dr. Muhammad Nazmin, Dr. Suraya, Muhammad Zhafir and Dr. Tan Tong Ling testing the photosynthesis enhancer spray on plant leaves. PIC COURTESY OF UPM

She added that enhancing the photosynthesis rate also involved reducing the use of light and water consumption during the photosynthesis process.

"This is a form of agricultural technology of the future which allows indoor and vertical farming as the photosynthesis process can occur in a dim light environment as in the house by using ordinary lights," Suraya said.

HARVAST can be used for all types of plants except C4 categorised trees such as maize and sugar cane as their photosynthesis process is different from C3 trees such as vegetables and fruits including durian.

"Because it is made of carbon, its production method does not include any harmful chemicals, hence the crop yields are safe to consume," she said.

The study on photosynthesis enhancer began in 2015 and has been tested on vegetables, chillies and paddy trees at the UPM Faculty of Agriculture.

"Through HARVAST, photosynthesis enhancer, crop yields are better, water use is more efficient, reduces light usage during photosynthesis and more carbon dioxide is absorbed by plants, and its green technology," she said.

In addition, she added, carbon dots can also be used in energy sector such as solar cells and supercapacitors as well as various sensor systems. Its electrical and optical characteristics help in the transfer of electrons that indirectly make the process more effective.

The other members of the research group are co-researchers Dr. Muhammad Nazmin Yaapar from the Faculty of Agriculture, post-doctoral Tan Tong Ling from ITMA, and InnoHub project manager Muhammad Zhafir Abdul Razak.

HARVAST's photosynthesis enhancer won the gold medal at the 2016 Research and Innovation Exhibition (PRPI), silver at International Invention, Innovation and Technology Exhibition (ITEX) 2017 and bronze at the International Institute of Higher Learning and Expo Creations (PECIPTA) 2017.