NYP senior lecturer Hannah Gardner holding up a prototype of the nano-coated film. The project leader declined to reveal the secret ingredients, but said some of them are available from grocery shops and that they used a normal microwave oven. ST PHOTO: CAROLINE CHIA

A touch of glass to boost plant growth

Veggies nearly triple in height via nanotechnology, with poly's help

Lin Yangchen

Your eyes cannot see the difference, but to the lettuce, it's almost as clear as night and day.

Glass that looks colourless and transparent to the eye is making greenhouse vegetables – including lettuce, coriander and rocket – grow almost thrice as tall as usual, with 40 per cent more leaf area on average.

The nanotechnology-and-glass invention came about when Nanyang Polytechnic (NYP) and local glass-maker Singapore Safety Glass (SSG) came together a year earlier to try to improve agricultural productivity.

NYP students and faculty concocted a potion of nanoparticles that can change the colour of sunlight into blues and reds more readily absorbed by plants for photosynthesis.

The nanoparticles are embedded in the flexible polymer layer found in safety glass.

SSG executive director Gan Geok Chua said: "The rapid growth of population and climate change in the world will lead to insufficient food supply in the next 10 to 20 years. We want to offer a solution that is able to help the world community...every little bit helps."

Mr Gan said his company would consider opportunities for commercialisation in one to three years' time, when the material has undergone further research and refinement.

Nano Glo-n-Grow, as the inventors call it, maximises the available sunlight without using electricity, and is much cheaper than current methods of enhancing plant growth in greenhouses using red and blue LED lighting.

NYP senior lecturer Hannah Gardner, who led the project, declined to reveal the secret ingredients but said the procedure was cheap and simple.

"We used a normal microwave oven, and some of the 'ingredients' are available from grocery shops," she said.

The researchers "grew" the nanoparticles using chemical reactions and heat. The diameter of the particles ranges from 3 to 20 nanometres depending on the desired colour conversion. That is about 10,000 times smaller than the breadth of a human hair.

Smaller particles convert light into shorter, or more bluish, wavelengths, explained Dr Gardner.

Final-year students Zoey Goh and Chng Joe Hui, both 20, spent 12 weeks on the project late last year.

Mr Chng said he signed up as it was not one of the usual projects in a materials science course.

"From planting the vegetables, to growing them, taking care of them, and finally harvesting them, it's very rewarding," he said.

Ms Goh recalled testing nanoparticle samples in a spectrometer, which measured the colour of the converted light.

"I had a hard time finding the right combination of chemicals and heating... but the experience was very fulfilling," she said.

Mr Gan said that working with the polytechnic has been very engaging, "as their students are constantly coming up with creative ideas that work".

Dr Choo Keng Wah, deputy director of NYP's School of Engineering, added: "We push our students to apply today's knowledge to the future economy, industry and nation."

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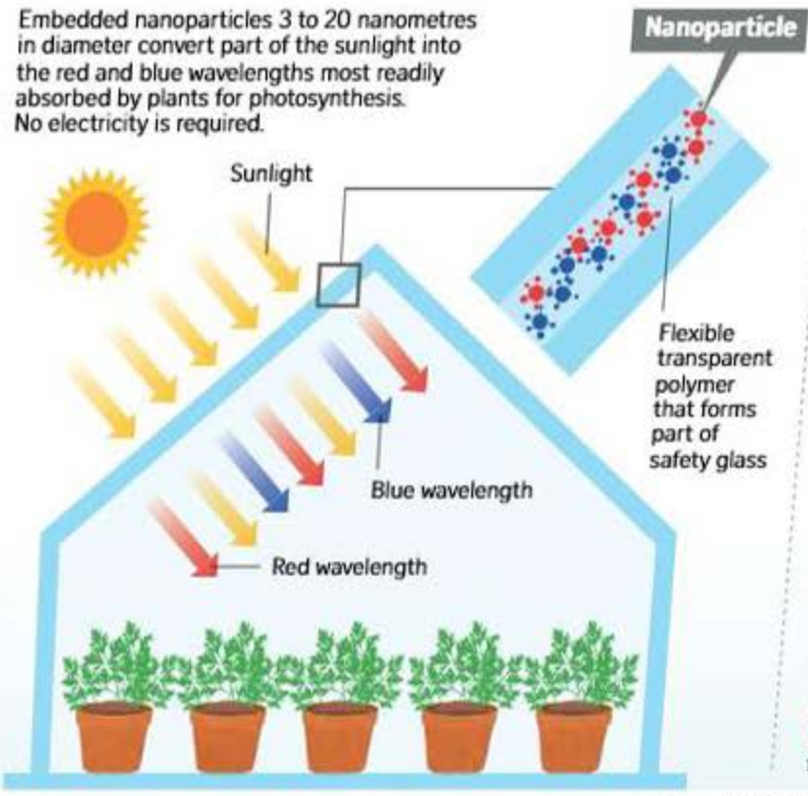
An invisible force that makes plants grow bigger

Nanyang Polytechnic partners Singapore Safety Glass to develop nanoparticles that turbocharge plant growth, with the potential to improve agricultural production.



GREENHOUSE

- Vegetables grown under the converted light, compared to those grown under normal sunlight, were on average:

190% taller, and had

40% more leaf area

- Cost comparison with current method of enhancing plant growth using red and blue LEDs (per square metre of light):

LEDs:

$80 to $130 excluding electricity

Nanoparticle layer:

$18 + $0.20

for polymer for nanoparticles

Source: NANYANG POLYTECHNIC STRAITS TIMES GRAPHICS