

# No wood is waste

**Author(s):** [Shruti Chowdhari](#)

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*Nano-onions from wood shavings can deliver nutrients to plants*



Photo: Sunil Kumar Singh

ACROSS the globe hundreds of tonnes of wood enters the waste stream daily. Some of it finds use in the renewable energy sector, pulp and paper industry, wood-based boards and animal bedding; the rest goes into landfills. Indian researchers have now found a new use for waste wood—as a vehicle for delivering nutrients to plants.

A study, published online on October 25 in *Nanoscale*, shows that a type of nanoparticles, known as carbon nano-onions, obtained from wood shavings can promote plant growth. Lead researcher Sabyasachi Sarkar, former head of the chemistry department at IIT Kanpur, says since nano-onions are carbon-based they are non-toxic and safe for living systems. “Carbon is an essential element of all molecules in our food. We have tested the particles on fruit flies, roundworms and bacteria. These do not show any toxicity,” says Sarkar.

The method involves synthesis of carbon nano-onions from wood without using any toxic metal catalyst. Wood is formed of cellulose, which is mostly carbon and water. When wood shavings are heated in absence of oxygen, a process known as pyrolysis, the water is driven away, leaving extremely thin carbon layers behind. Several such layers can curl up one-inside-the-other, forming multi walled nanotubes.

When cut in small pieces, these multi walled nanotubes take the shape of a ball with concentric layers of carbon. Due to a similarity with the layers of an onion, the structure is known as carbon nano-onion.

The researchers found that spongy carbon nano-onions, 30 nanometres in size, can trap micro-nutrients like iron, cobalt, copper and zinc in their peripheral layers. These nutrient-loaded nanoparticles can enter the plants through natural nanoscale openings on the plant surface and slowly release the nutrients as they move inside. The researchers showed that gram plants to which these carbon nano-onions were added showed an overall higher growth, increased flowering and enhanced fruit productivity in comparison to those grown without the nano-structures.

“More work needs to be done to confirm that nano-onions are indeed non-toxic to soil microorganisms too, but it is certainly a very promising study,” says Maria Derosa, associate professor at the Institute of Biochemistry, Carleton University, in Canada.

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