

An everyday mushroom that now fights anaemia

Pantnagar scientists have used a simple nanotechnology treatment to pack ordinary oyster mushrooms with iron; a low-cost route to one of the world's most stubborn nutrition problems

Researchers at G.B. Pant University of Agriculture and Technology, Pantnagar, have added a new ingredient to one of India's most familiar kitchen foods: the humble white oyster mushroom, known across the country as Dhingri. Using an innovative nanotechnology treatment which is now patented, the team has learned how to grow oyster mushrooms carrying far more iron than nature gave them, turning a popular side dish into a genuine tool against anaemia and hidden hunger.

During cultivation, the mushrooms are treated with iron sulfide nanoparticles, each only a few billionths of a metre across. At that scale, the particles pass easily into the growing mushroom's tissues, and the edible fruiting bodies absorb the iron as they mature. The result: an oyster mushroom whose iron content rises by as much as 48 percent, without becoming anything unfamiliar. It still looks, cooks, and tastes like the mushroom people already know.

Why a mushroom, and why iron

The oyster mushroom is already one of the quiet success stories of Indian farming. It is among the most widely cultivated mushrooms in the world, growing readily on cheap agricultural waste such as wheat straw, needing no fertile land and very little water. Weight for weight, it delivers substantial protein and dietary fibre alongside very little fat or starch, and regular mushroom consumption has been linked to a stronger immune system and lower risk of several chronic conditions.

But the mushroom has always had one shortfall: it contains very little iron, precisely the nutrient so many people are missing. Iron carries oxygen through the blood, helps build DNA, and powers the chemical machinery inside every cell; when it runs short, the consequences include tiredness, weakened immunity, poor concentration, and stunted growth in children. The World Health Organization estimates around two billion people worldwide are anaemic, roughly half of those cases from a simple lack of iron; a public health emergency hiding in plain sight in a country like India.

A cheaper answer than tonics and pills

Iron tablets and tonics already exist on pharmacy shelves, but they cost money and often reach only those who can already afford them. Genetically modified biofortified crops, wheat in particular have been proposed as another route, but carry safety, ethical, and regulatory concerns that have limited their acceptance. Pantnagar's approach sidesteps both: rather than engineering genes or asking families to buy supplements, it enriches the food naturally, during cultivation itself. A family eating iron-fortified Dhingri gets its dose of the mineral from an ordinary home-cooked meal, which means no pills, no prescriptions. *“The beauty of this method is that it meets people where they love it most i.e. at the dinner table. We are not*

asking anyone to change their diet or their budget. We are simply making a food they already love a little more nourishing”, shared Dr. Sandeep Arora, Dr. K.P.S. Kushwaha, and Dr. Bandana Kumari, the research team behind the innovation

Good for the farmer, too

The benefits extend past nutrition. In the team's trials, the same nanoparticle treatment that boosted iron content also improved the mushrooms themselves, larger caps, sturdier stalks, and a bigger overall harvest from the same batch of substrate. The treated mushrooms also reached peak yield faster, a double reward for small mushroom farmers: a more valuable, iron-rich crop that reaches market sooner, allowing more crop cycles and more income per season.

That combination is unusual. Most nutritional interventions add cost somewhere along the way. Here, the enrichment travels hand in hand with a stronger, quicker harvest so the economics work for the farmer and the family alike.

A quiet revolution on the plate

What makes the innovation appealing is its modesty. It asks nothing new of the people it helps, no changed habits, no expensive medicines, no complex science to understand. It takes a food that's already cheap, sustainable, and widely grown, and quietly upgrades it to fight one of the most widespread deficiencies on Earth.

The road from culture room to living room still has distance to cover, scaling up production, refining growing methods, and getting fortified mushrooms into local markets all present real challenges. But the underlying idea is a strong one. For the millions who quietly carry the weight of iron deficiency, a plate of iron-enriched Dhangri may turn out to be a very big small thing.