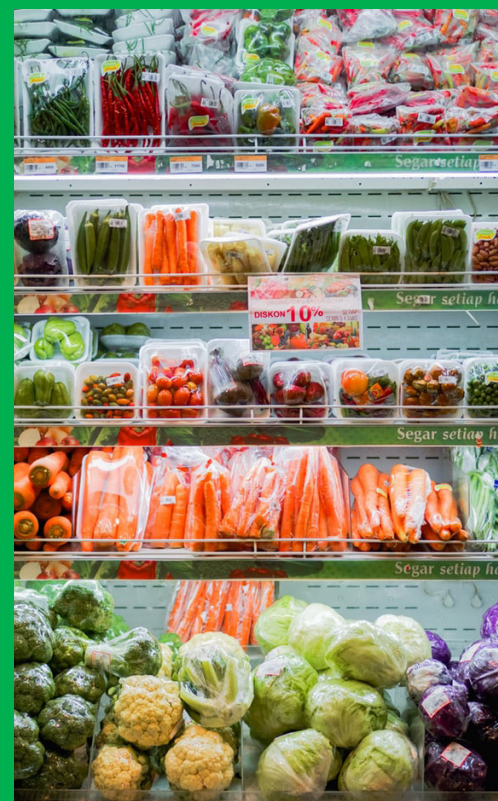




## A Solution for Longer Shelf-Life of Fruits & Vegetables

It happens to all of us – stocking fresh produce outside or in the refrigerator only to find it a few days later looking shrivelled and rotten. Different technologies such as controlled atmospheric packaging, physical & chemical preservatives, etc. have been explored to prolong the shelf-life but there is a growing need for cheaper and safer methods.

To address the issue, scientists from the Shri A.N. Patel Post Graduate Institute of Science and Research, Gujarat have come up with an innovative solution. Their research work is focused on cucumber which is a rich source of vitamins, minerals and antioxidants. But it normally loses water, shrivels and becomes yellowish within five to ten days of storage below 7-10 °C. In the laboratory, the team soaked the cucumbers in different concentrations of the starch-glucose mixture and then stored them at 4 °C. It was fascinating to see the fresh cucumbers even up to 30 days of storage when coated with 1.5 μM starch and 2.5 μM glucose mixtures. These cucumbers displayed remarkable extension of shelf-life as compared to those devoid of this coating. The skin colour remained green or merely faded to light green gradually and didn't suffer much water loss. Their work has been published in the journal, *Food Chemistry* (2019, **288**: 208-214). This new, safe and simple technology could be a boon for farmers and traders for improving the shelf-life of fruits and vegetables.



## Moringa oleifera: A Herbal Formula for Weight Loss

Obesity is a concern worldwide which affects 30% of the world's population. Obese people are at a higher risk of developing serious problems such as heart disease, high blood pressure, type-2 diabetes, etc. Although anti-obesity drugs are commercially available but are expensive and possess side effects. Hence, there is a demand for novel weight loss products for the treatment of obesity.

For the effective treatment of obesity, it has to be a 'killing two birds with one stone' strategy. A drug should inhibit the fat cell synthesis by preventing the differentiation of pre-adipocytes to adipocyte (fat cells) and simultaneously, the mature fat cells should undergo apoptosis mediated cell death. Thanks to the work of a group of Indian and Korean researchers who have reported a flavonoid present in *Moringa oleifera* leaves extract (MLE) called isoquercetin that has the potential to inhibit adipocytes formation and to induce fat cell death (*Journal of Functional Foods* 2019, **59**: 251-260).

The team focused on evaluating the ability of the MLE as well as the active principle, isoquercetin, in mouse cell lines. They observed that increasing the dose of MLE significantly downregulated the genes involved in fat cell synthesis as well as triglyceride (type of fat stored in fat cells) content. At the same time, MLE treatment led to the upregulation of genes involved in fat cell death. The results were also confirmed by molecular docking studies. Thus, moringa could be the next superfood, however, this research requires further clinical trials to access its beneficial activities in humans.



## Role of Giloy (*Tinospora cordifolia*) in alleviating Anemia of Inflammation

Anemia is a condition caused due to either less number of red blood cells (RBCs) or lower levels of hemoglobin in RBCs. There are more than 400 different types of anemia. One of them is anemia of inflammation or anemia of chronic disease. This type mostly appears in people with chronic conditions such as infections, rheumatoid arthritis, inflammatory bowel disease, chronic kidney disease, HIV/AIDS and certain cancers that cause inflammation. The presently available effective treatments include unpleasant side effects.

Prasad P Kulkarni and his team from Agharkar Research Institute, Pune, India tested the effectiveness of *Tinospora cordifolia* for the treatment of anemia of inflammation. The results have been published in the journal, *Scientific Reports* (2019, 9: 10969). The authors first injected the inflammation-causing compound in the rats. The rats developed anemia characterized by low levels of hemoglobin, lower iron levels and reduced iron stores in the liver and spleen. It also resulted in increased concentration of TNF- $\alpha$  (damages RBCs), hepcidin (a molecule involved in regulating iron levels) and NO production. This inflammation stimulated hepcidin expression which subsequently limited iron availability for the production of red blood cells. The study of liver tissue showed swelling or necrosis.

Now the researchers treated these anemic rats with *T. cordifolia* extract. There was a significant increase in the hemoglobin and RBCs count. It also revealed a reduction in the hepcidin and TNF-  $\alpha$  levels. The liver cells were also protected from inflammation-induced cellular damage. Tinosporaside (a compound present in the stem bark of *T. cordifolia*) inhibited NO production in a dose-dependent manner. In conclusion, this plant can be employed for safe and effective herbal treatment of anemia of chronic disease.



## Vetiver grass: Uprooting Toxic Metals from Poisoned Soils

Soil and water pollution by toxic heavy metals is one of the major problems related to mining activities. They also pose a threat to human health. There are several methods for the removal of heavy metals from the polluted sites. But, using green plants to contain, degrade, or eliminate metals, is an efficient, eco-friendly and cost-effective method.

Now a research team led by Indian scientists Anita Mukherjee and U.C. Lavania has found a potential candidate for phytoremediation of iron ore mine soil or spoil dumps by re-vegetation of vetiver grass (*Vetiveria zizanioides*). As they describe in *Ecological Engineering* (2019, 132: 120-136), the researchers tested four specific genotypes of vetiver grass: S2 (diploid variety), S4 (tetraploid derivative of S2), TH (from Thailand) and BL (broadleaf).

The team collected soil samples from Joda East Iron mine, Odisha. They observed that the mine soil was slightly acidic than the garden soil with a high concentration of iron, chromium, zinc, manganese, copper and lead. The team members then grew vetiver plants in earthen pots containing mine and garden soil for 12 months. They used three sets of four genotypes for each sampling period (0, 6 and 12 months). They observed that initially, the plants on mine soil grew less but by the end of the year, they showed normal growth. Similarly, the shoot and root lengths of the plants grown on mine soil were lower than garden soil. Excluding copper, roots accumulated higher concentrations of heavy metals than shoot in all genotypes.

The authors recorded reduced chlorophyll content, up-regulation of antioxidant enzymes and an increase in carotenoids in plants grown on mine soil. Iron depositions were seen in the vascular bundle region of leaves and in the hypodermal and cortical regions of roots. The team also noted a high level of phytochelatins in the leaves of plants grown on mine soil. In conclusion, vetiver grass can tolerate high concentration of iron along with heavy metals in its tissue. The genotypes, BL and S4 were better adapted to the iron mine soil condition and were effective for reclamation of mine spoil dumpsites. Thus, vetiver grass can be useful in the future to clean up all heavy metals from the contaminated sites.



## Discarded Eel Fish Skin: A New Source of Collagen for Tissue Engineering

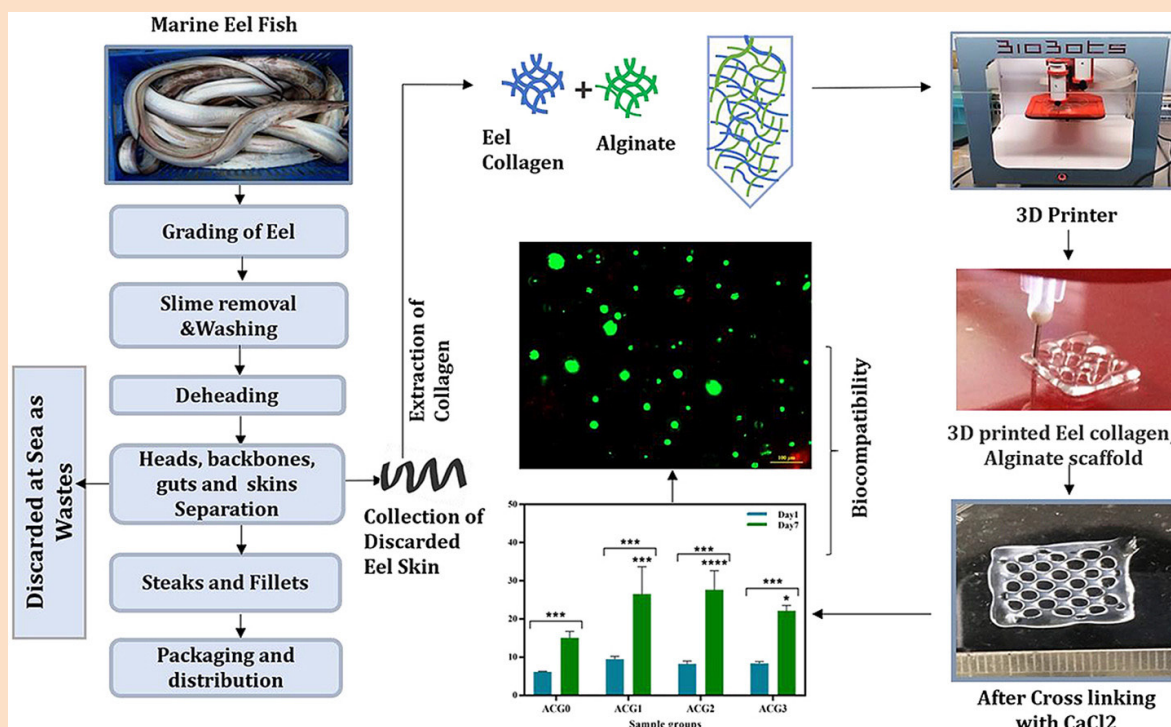
Collagen, the most abundant protein in the body, is found in the bones, skin and connective tissues. Biomedical researchers regularly use a mix of stem cells and collagen-like materials in their endeavours to create laboratory-grown tissues that can be employed as biomaterial to repair and replace the damaged tissue or organ. Despite the abundance of collagen in the body, recreating it has not been easy for scientists. It is mostly extracted from humans, cows, pigs, or sheep but possesses the risk of immunological rejection, transmitting diseases and is a complicated and expensive process.

In a significant advance for tissue engineering, scientists at Indian Institute of Technology, Hyderabad have unveiled a new method for extracting a collagen (*Journal of Cleaner Production* 2019, **230**: 412-419). The researchers have extracted collagen from the discarded skin of marine Eel fish by treating it with

acetic acid, common salt and pepsin. The isolation process of collagen from the Eel skin is easy and the collagen is less immunogenic. The team members then assimilated this discarded marine Eel skin waste-derived collagen with alginate hydrogel and employed a 3D printing process to obtain scaffolds and checking their biocompatibility. These scaffolds showed excellent growth of stem cells.

Eel skin and fish skin wastes are commonly discarded at the seashore or even disposed of in the sea causing marine environmental pollution. Transforming this discarded Eel skin into a beneficial compound is a perfect example of sustainable development. It would not only provide a low-cost biomaterial for commercialization but would also promote cleaner collagen production and reduce marine pollution. This study provides a practical approach to improve both the marine environment and human health.

The paper's co-authors include Mano Govindharaj and Uday Kiran Roopavath. The research was funded by the SERB-NPDF Scheme, Department of Science and Technology, Govt. of India.



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