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DEPARTMENT OF BOTANY
PRESENTS

GULMOHAR NEWSLETTER

FROM THE EDITOR'S DESK

by Raghavi Vasanth Kumar
TY B.Sc.

A warm welcome to our first edition of the year 2021-2022. In this edition we have tried to publish some interesting articles and photographs. Cardiovascular health has become a major concern in todays world. In this edition we all can know about spinach as a boon in developing the human heart. Ever heard about soilless farming? If not in this edition we have introduced an article regarding Hydroponics. There are other articles like Mermaid plant, Blushing plant. Last but not the least do not forget to check out the photography section which shows some beautiful photography skills of the students.

HAPPY READING !

IN THIS EDITION

INDIAN SCIENTISTS DISCOVER 'MERMAID' PLANT SPECIES

Indian scientists have discovered a new plant species in India's Andamans archipelago.

Biologists found a marine green algae during a trip to the island in 2019. Identification is laborious, and it took the scientists nearly two years to confirm that the species had been discovered for the first time.

Scientists say this the first discovery of a species of algae in the islands in nearly four decades. Scientists from the Central University of Punjab have named the specie *Acetabularia jalakanyakae*. *Jalakanyaka* in Sanskrit literally means mermaid and a goddess of oceans. The scientists say they were influenced by the fictional character Little Mermaid in the eponymous fairy tale by Danish writer Hans Christian Anderson.

"The newly discovered species is so stunning. It has caps with intricate designs as if it were umbrellas of a mermaid," said Dr Felix Bast, who led the study.

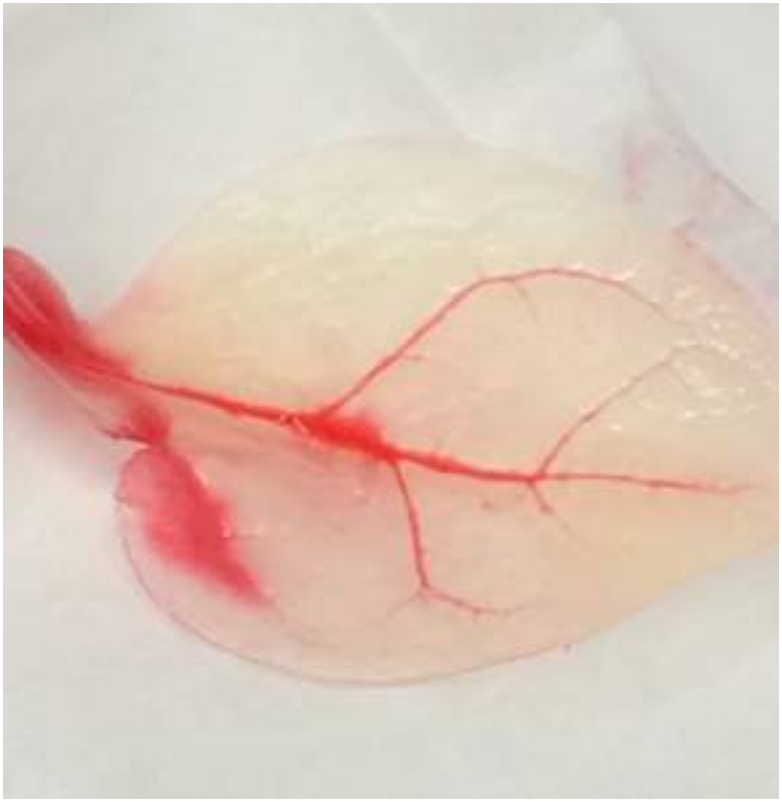
The main feature of the newly discovered species is that the plant is made up of one gigantic cell with a nucleus. The scientists spent more than 18 months sequencing the plant DNA and comparing its form with other plants in the lab.

A paper describing this discovery has been accepted in the the journal Indian Journal of Geo-Marine Sciences.

Andaman and Nicobar Islands has some of the last remaining healthy coral reefs in the world. These reefs support a host of other organisms, including a rich diversity of algae.

Source: bbc.com

BEATING HUMAN HEART TISSUE GROWN FROM SPINACH LEAVES



Vegetables are good for your health, but now there's a whole new way that one veggie could help your heart: Spinach leaves can be used as a scaffold for beating human heart cells, a new study finds. In several experiments, scientists grew beating human heart cells on spinach leaves by perfusing them with a detergent solution, which stripped them of their plant cells. This proof-of-concept study suggests that multiple spinach leaves could be used to grow layers of healthy heart muscle that could one day be used to treat heart attack patients, the researchers said.

We have a lot more work to do, but so far this is very promising,"GlennGaudette, the study's senior researcher and a professor of biomedical engineering at the Worcester Polytechnic Institute (WPI) in Worcester, Massachusetts, said in a statement. "Adapting abundant plants that farmers have been cultivating for thousands of years for use in tissue engineering could solve a host of problems limiting the field."

In addition, the researchers said they think they could deliver blood and oxygen to developing tissues by pouring fluids through the spinach leaves' veins."When I looked at the spinach leaf, its stem reminded me of an aorta," said Joshua Gershlak, a graduate student of biomedical engineering at WPI and the study's lead researcher. "So I thought, let's perfuse [the fluids] right through the stem."

Spinach leaves make a good scaffold because once the plant cells are washed away, a cellulose structure remains, the researchers said."Cellulose is biocompatible [and] has been used in a wide variety of regenerative medicine applications, such as cartilage tissue engineering, bone tissue engineering and wound healing," the researchers wrote in the study.

Source: livescience.com

BLUSHING PLANTS REVEAL WHEN FUNGI ARE GROWING IN THEIR ROOTS

Almost all crop plants form associations with a particular type of fungi -- called arbuscular mycorrhiza fungi -- in the soil, which greatly expand their root surface area. This mutually beneficial interaction boosts the plant's ability to take up nutrients that are vital for growth.

The more nutrients plants obtain naturally, the less artificial fertilisers are needed. Understanding this natural process, as the first step towards potentially enhancing it, is an ongoing research challenge. Progress is likely to pay huge dividends for agricultural productivity.

In a study published in the journal PLOS Biology, researchers used the bright red pigments of beetroot -- called betalains -- to visually track soil fungi as they colonised plant roots in a living plant.

"We can now follow how the relationship between the fungi and plant root develops, in real-time, from the moment they come into contact. We previously had no idea about what happened because there was no way to visualise it in a living plant without the use of elaborate microscopy," said Dr Sebastian Schornack, a researcher at the University of Cambridge's Sainsbury Laboratory and joint senior author of the paper.

To achieve their results, the researchers engineered two model plant species -- a legume and a tobacco plant -- so that they would produce the highly visible betalain pigments when arbuscular mycorrhiza fungi were present in their roots. This involved combining the control regions of two genes activated by mycorrhizal fungi with genes that synthesise red-coloured betalain pigments.

The plants were then grown in a transparent structure so that the root system was visible, and images of the roots could be taken with a flatbed scanner without disturbing the plants.

Using their technique, the researchers could select red pigmented parts of the root system to observe the fungus more closely as it entered individual plant cells and formed elaborate tree-like structures -- called arbuscules -- which grow inside the plant's roots. Arbuscules take up nutrients from the soil that would otherwise be beyond the reach of the plant.

Other methods exist to visualise this process, but these involve digging up and killing the plant and the use of chemicals or expensive microscopy. This work makes it possible for the first time to watch by eye and with simple imaging how symbiotic fungi start colonising living plant roots, and inhabit parts of the plant root system over time.

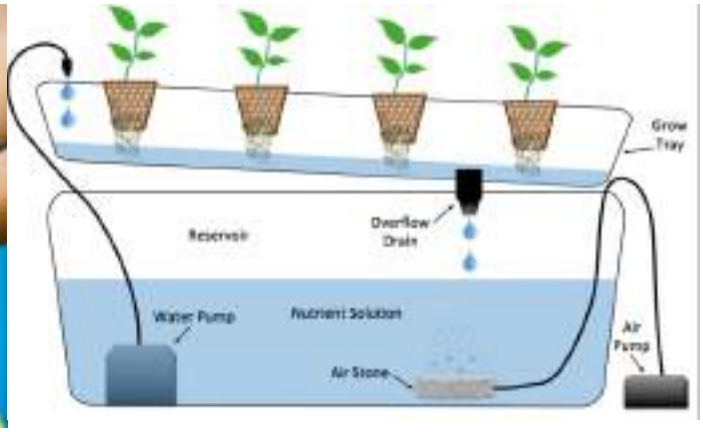
Beetroot pigments are a distinctive colour, so they're very easy to see. They also have the advantage of being natural plant pigments, so they are well tolerated by plants," said Dr Sam Brockington, a researcher in the University of Cambridge's Department of Plant Sciences, and joint senior author of the paper.

Mycorrhiza fungi are attracting growing interest in agriculture. This new technique provides the ability to 'track and trace' the presence of symbiotic fungi in soils from different sources and locations. The researchers say this will enable the selection of fungi that colonise plants fastest and provide the biggest benefits in agricultural scenarios.

Understanding and exploiting the dynamics of plant root system colonisation by fungi has potential to enhance future crop production in an environmentally sustainable way. If plants can take up more nutrients naturally, this will reduce the need for artificial fertilisers -- saving money and reducing associated water pollution.

Source: sciencedaily.com

INTRODUCTION TO HYDROPONICS



What is hydroponics?

Plants grow through a process called **photosynthesis**, in which they use sunlight and a chemical inside their leaves called chlorophyll to convert carbon dioxide (a gas in the air) and water into glucose (a type of sugar) and oxygen. Write that out chemically and you get this equation:

$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

There's no mention of "soil" anywhere in there—and that's all the proof you need that plants can grow without it. What they *do* need is water and nutrients, both easily obtained from soil. But if they can get these things somewhere else—say, by standing with their roots in a nutrient-rich solution—they can do without soil altogether. That's the basic principle behind hydroponics. In theory, the word "hydroponics" means growing plants in water (from two Greek words meaning "water" and "toil"), but because you can grow plants without actually standing them in water, most people define the word to mean growing plants without using soil.

Why grow things hydroponically?

Although the benefits of hydroponics have sometimes been questioned, there seem to be many advantages in growing without soil. Some hydroponic growers have found they get yields many times greater when they switch from conventional methods. Because hydroponically grown plants dip their roots directly into nutrient-rich solutions, they get what they need much more easily than plants growing in soil, so they need much smaller root systems and can divert more energy into leaf and stem growth. With smaller roots, you can grow more plants in the same area and get more yield from the same amount of ground (which is particularly good news if you're growing in a limited area like a greenhouse or on a balcony or window-ledge inside). Hydroponic plants also grow faster. Many pests are carried in soil, so doing without it generally gives you a more hygienic growing system with fewer problems of disease.

Since hydroponics is ideal for indoor growing, you can use it to grow plants all year round. Automated systems controlled by timers and computers make the whole thing a breeze. It's not all good news; inevitably there are a few drawbacks. One is the cost of all the equipment you need—containers, pumps, lights, nutrients, and so on. Another drawback is the ponic part of hydroponics: there's a certain amount of toil involved. With conventional growing, you can sometimes be quite cavalier about how you treat plants and, if weather and other conditions are on your side, your plants will still thrive. But hydroponics is more scientific and the plants are much more under your control. You need to check them constantly to make sure they're growing in exactly the conditions they need (though automated systems, such as lighting timers, make things quite a bit easier). Another difference (arguably less of a drawback) is that, because hydroponic plants have much smaller root systems, they can't always support themselves very well. Heavy fruiting plants may need quite elaborate forms of support.

How does hydroponics work?

There are various different ways of growing things hydroponically. In one popular method, you stand your plants in a plastic trough and let a nutrient solution trickle past their roots (with the help of gravity and a pump). That's called the nutrient-film technique: the nutrient is like a kind of liquid conveyor belt—it's constantly sliding past the roots delivering to them the goodness they need. Alternatively, you can grow plants with their roots supported by a nutrient-enriched medium such as rockwool, sand, or vermiculite, which acts as a sterile substitute for soil.

PHOTO GALLERY

Pentas lanceolata
Raghavi Vasanth Kumar (TY B.Sc)
Location : Go Green Nursery, Karnala

Hymenocallis littoralis
Raghavi Vasanth Kumar (TY B.Sc)
Location : Go Green Nursery, Karnala

Echinops sphaerocephalus
Ruchika Dani (M.Sc Botany Part I)
Location: Hubballi

Ruellia simplex
Dr. V. Vishnuprasad
Location: MIDC, Dombivli

Calvatia nipponica
Jeba Reshma (TY.BSc)
Location:Thisayinvilai,Tamilnadu,India

Nymphoides
Shubham Patkar (M.Sc. Botany Part I St.Xavier's College)
Location: St. Xavier's College, Mumbai.

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