Balalatha's
CSB IAS ACADEMY
The Road Map to Mussoorie...

PRELIMS EDGE 2025 **09-07-2025**

VITAMIN D

Context: India, the world's most populous country, currently suffers from widespread micronutrient deficiencies, with Vitamin D deficiency emerging as a silent epidemic.

About Vitamin D

- Vitamin D (also referred to as calciferol) is a fat-soluble vitamin that is naturally present in a few foods, added to others, and available as a dietary supplement.
- It is also produced endogenously when ultraviolet (UV) rays from sunlight strike the skin and trigger vitamin D synthesis.
- During periods of sunlight, vitamin D is stored in fat and then released when sunlight is not available.
- Very few foods have vitamin D naturally. The foods with the most are fatty fish (like salmon and tuna), liver, mushrooms, eggs, and fish oils.
- Kids don't eat these foods a lot. That's why food companies often "fortify" milk, yogurt, baby formula, juice, cereal, and other foods with added vitamin D.
- The amount of vitamin D you need each day depends on your age

Importance of Vitamin D

- Vitamin D promotes calcium absorption and helps maintain adequate levels of calcium and phosphorus in the blood, which is necessary for healthy bones and teeth.
- Without sufficient vitamin D, bones can become thin, brittle, or misshapen.
- Vitamin D has many other roles in the body, including reduction of inflammation as well as modulation of such processes as cell growth, neuromuscular and immune function, and glucose metabolism.

Vitamin D Deficiency

- A lack of vitamin D can lead to bone diseases such as osteoporosis or rickets. Osteoporosis is a disease in which your bones become weak and are likely to fracture (break).
- With chronic and/or severe vitamin D deficiency, a decline in calcium and phosphorus absorption by your intestines leads to hypocalcemia (low calcium levels in your blood).
- This leads to secondary hyperparathyroidism (overactive

parathyroid glands attempting to keep blood calcium levels normal).

- Both hypocalcemia and hyperparathyroidism, if severe, can cause symptoms, including muscle weakness and cramps, fatigue, and depression.
- Anyone can have vitamin D deficiency, including infants, children and adults.
- Vitamin D deficiency may be more common in people with higher skin melanin content (darker skin) and who wear clothing with extensive skin coverage, particularly in Middle Eastern countries.
- Vitamin D supplements are commonly used to treat and prevent vitamin D deficiency

Source: Vitamin D deficiency poses public health challenge: experts (The Hindu)

GENOME EDITED RICE

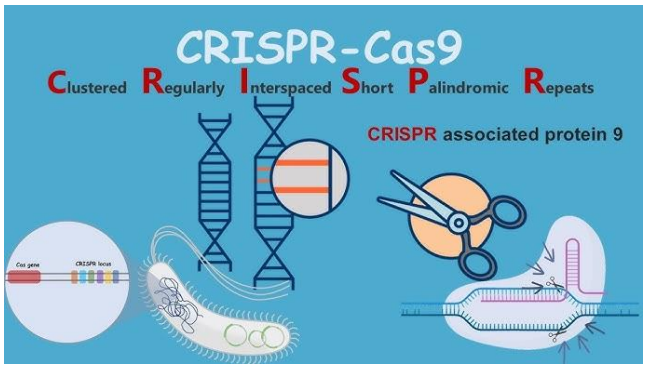
Context: Scientists at the Delhi-based National Institute of Plant Genome Research (NIPGR) have used the CRISPR-Cas9 gene editing technology to increase phosphate uptake and transport in japonica rice varieties

About the Japonica Rice

- Japonica is one of the two major eco-geographical races of O. sativa (O. sativa japonica), the other is Indica.
- It is a group of rice varieties from northern and eastern China grown extensively in some areas of the world.
- It is an Asian rice variety that belongs within the broader sinica rice family.
- It is characterized by its short to medium grain and is harder, thicker, and stickier than traditional white rice.

- Japonica grains are short, roundish, spikelets are awnless to long-awned, grains do not shatter easily, and have 0-20% amylose content.
- It includes several varieties, including the sushi rice and glutinous rice, which despite its name, is entirely gluten free.
- Climate: It is found in the cooler zones of the subtropics and in the temperate zones.
- Major growing areas: It is the primary type of rice grown and consumed in Japan and also in China, Korea, Vietnam, Indonesia.
- The different varieties of Japonica are called cultivars. Each Japonica rice cultivar has been developed to exhibit unique qualities, making them suitable for various culinary uses and growing conditions.

CRISPR/Cas9



- CRISPR, short for Clustered Regularly Interspaced Short Palindromic Repeats, is a gene-editing technology that can be used to alter the genetic sequence of a specific gene by removing, adding, or altering sections of the DNA sequence.
- It makes it possible to correct errors in the genome and turn on or off genes in cells and organisms quickly, cheaply, and with relative ease.

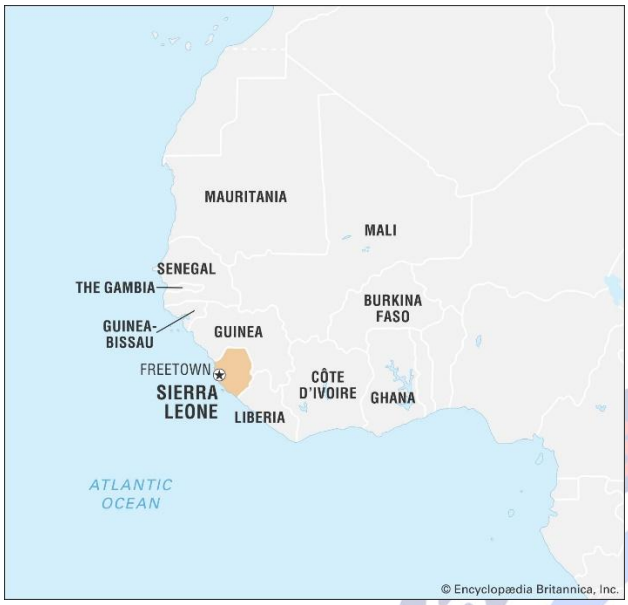
How was it developed?

- Some bacteria have a similar, built-in gene editing system to the CRISPR-Cas9 system that they use to respond to invading pathogens like viruses, much like an immune system.
- Using CRISPR, the bacteria snip out parts of the virus DNA and keep a bit of it behind to help them recognize and defend against the virus next time it attacks.
- Researchers adapted this immune defense system to edit DNA.
- The CRISPR-Cas9 system consists of two key molecules that introduce a change (mutation) into the DNA. These are:
- an enzyme called Cas9. This acts as a pair of 'molecular scissors' that can cut the two strands of DNA, at a specific location in the genome so that bits of DNA can then be added or removed.
- a piece of RNA called guide RNA (gRNA). This consists of a small piece of pre-designed RNA sequence (about 20 bases long) located within a longer RNA scaffold. The scaffold part binds to DNA and the pre-designed sequence 'guides' Cas9 to the right part of the genome. This makes sure that the Cas9 enzyme cuts at the right point in the genome.
- The guide RNA is designed to find and bind to a specific sequence in the DNA.
- Cas9 follows the guide RNA to the same location in the DNA sequence and makes a cut across both strands of the DNA.
- Once the DNA is cut, researchers use the cell's own DNA repair machinery to add or delete pieces of genetic material, or to make changes to the DNA by replacing an existing segment with a customized DNA sequence.
- CRISPR-Cas9 has a lot of potential as a tool for treating a range of medical conditions that have a genetic component, including cancer, hepatitis B, or even high cholesterol.

Source: NIPGR's gene-edited rice has better phosphate uptake, more yield (The Hindu)

PLACES IN NEWS

Sierra Leone



- It is a tropical country in West Africa, on the Atlantic coast.
- **Borders:** It is bordered on the north and east by Guinea, on the south by Liberia, and on the west by the Atlantic Ocean.
- **Geography:** The nation is largely made up of lightly wooded hills with a concentration of mangrove swamps along the coast.
- Rivers: Some of the major ones include the Rokel River, Taia River, Moa River, and Sewa River.

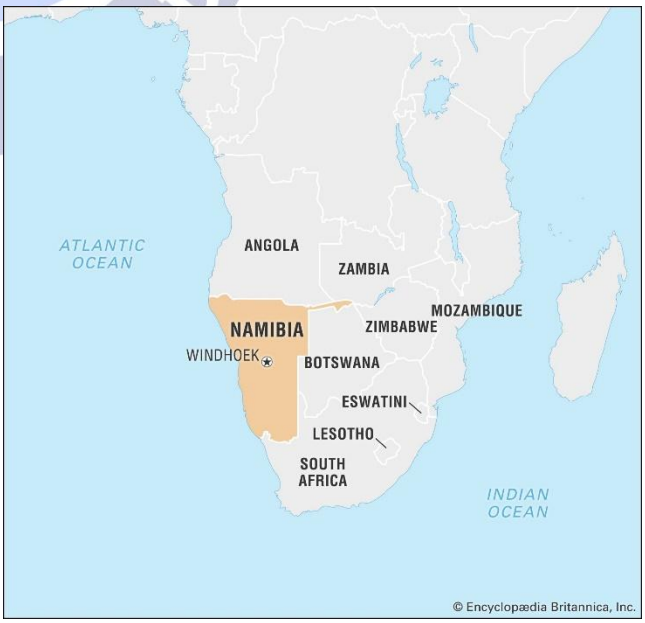
History:

- Sierra Leone was colonized in 1787 by formerly enslaved people arriving from England; other groups followed from Nova Scotia (1792) and Jamaica (1800).
- They were sponsored and governed by the private Sierra Leone Company until 1808, when Britain made Sierra Leone a crown colony.
- In 1961, Sierra Leone became independent of the UK.
- **Population:** It has a population of about 7.5 million people. It is home to 16 ethnic groups. Each group has their own language and traditional attire.
- **Language:** English is the official language; however, Krio is the language that is understood by most of the population.
- **Government:** It is a constitutional republic with a directly elected president and a unicameral legislature.
- **Capital:** The capital, Freetown, commands one of the world's largest natural harbors.

Economy:

- Although most of the population is engaged in subsistence agriculture, Sierra Leone is also a mining centre.
- Its land yields diamonds, gold, bauxite, and rutile (titanium dioxide

Namibia



- **Location:** It is located on the southwestern coast of the African continent in the Southern and Eastern Hemispheres of Earth.

History

- Namibia's history is marked by colonization and a long struggle for independence. Initially inhabited by various indigenous groups, it became a German colony in 1884, known as German South West Africa.
- After World War I, South Africa administered the territory under a League of Nations mandate.
- Following World War II, the UN attempted to establish a trusteeship, but South Africa resisted, maintaining control and implementing apartheid policies.
- A long struggle for independence, led by organizations like SWAPO, culminated in Namibia's independence on March 21, 1990

Geography

- Namibia shares a border with the surrounding countries of South Africa, Botswana, Zimbabwe, Zambia, and Angola. The Atlantic Ocean borders it to the west.
- It has a diverse environment that is home to deserts, marshlands, savannas, mountains, and river valleys.
- Namibia's extent can be divided into three topographic zones from west to east.
- The coastal Namib Desert runs along the country's coast on the Atlantic Ocean. It gives way to the Central Plateau to the west with the Kalahari Desert located further inwards.
- **Rivers:** The only permanent rivers are the Kunene, the Okavango, the Mashi and the Zambezi on the northern border and the Orange on the southern.
- **Mountain:** Brandberg, also known as Mount Brand is Namibia's highest mountain and is located along the plateau's western escarpment.

Economy

- Namibia's economy is characterized by its reliance on natural resources, particularly mining, and its close ties to South Africa.
- While it's a lower-middle-income country with a relatively high per capita GDP compared to other sub-Saharan African nations, it faces challenges related to poverty, inequality, and a shrinking productive sector.
- Tourism and agriculture also contribute to the economy, but mining remains the dominant sector, especially for exports.

PRACTICE QUESTIONS

Q1: Which among the following countries do not share borders with Namibia?

A. Angola
B. Botswana
C. South Africa
D. Ghana

Q2: Which among the following do not share borders with Sierra Leone?

A. Liberia
B. Guinea
C. Atlantic Ocean
D. Morocco

Q3: Consider the following statements regarding CRISPR/Cas9 Technology?

1. It mimics some bacterial system that they use to respond to invading pathogens like viruses, much like an immune system.
2. The guide RNA is designed to find and bind to a specific sequence in the DNA.
3. Cas9 follows the guide RNA to the same location in the DNA sequence and makes a cut across both strands of the DNA.

How many of the above statements are incorrect?

A. Only One
B. Only Two
C. All of the Above
D. None of Above

Q4: The term Japonica often seen in the news is related to which of the following?

A. Gene Edited Rice
B. GI Tagged Mango
C. Indigenous Wheat Variety
D. Invasive Species

Q5: Consider the following statements regarding Vitamin D.

1. Vitamin D also referred to as calciferol is a fat-soluble vitamin that is naturally present in only few foods but received mostly from sunlight.
2. During periods of sunlight, vitamin D is stored in fat and then released when sunlight is not available.
3. Without sufficient vitamin D, bones can become thin, brittle, or misshapen.
4. Vitamin D has many other roles in the body, including reduction of inflammation as well as modulation of such processes as cell growth, neuromuscular and immune function, and glucose metabolism.

How many of the above statements are incorrect?

A. Only One
B. Only Two
C. Only Three
D. None of the Above

Answers

1. D
2. D
3. D
4. A
5. D