UPSC Daily Current Affairs | Prelim Bits 04-07-2024

Zinc

Researchers have discovered that zinc plays a crucial role in the health of legume crops.

> *Legume crops are plants that belong to the family Fabaceae which includes beans, chickpeas, peanuts, lentils, lupins, mesquite, carob, tamarind, alfalfa, and clover.*

- **Zinc's Role in Nitrogen Fixation-** The researchers found that zinc in plants aids in ***nitrogen fixation.***
- The study identifies a key transcription factor that regulates nodule breakdown under high soil nitrogen levels.
- These discoveries can be applied to legume crops such as ***fava beans, soybeans, and cowpeas.***
- **Fixation Under Nitrate-** Researchers found that legumes use zinc as a secondary signal to integrate environmental factors and regulate ***nitrogen fixation efficiency*** through a transcriptional regulator called Fixation Under Nitrate (FUN).
- FUN is an important transcription factor that controls ***nodule breakdown when soil nitrogen concentrations are high***.
- **Symbiotic relationship-** Legume crops form a symbiotic relationship with ***rhizobia***, a bacterium that fixes atmospheric nitrogen in root nodules.
- **Significance-** The Continued nitrogen fixation is a beneficial trait, increasing nitrogen availability for both legumes and subsequent crops that rely on residual soil nitrogen.
- Understanding how nitrogen fixation is regulated by zinc and FUN enables researchers to develop strategies to ***optimize this process in legume crops.***
- This could lead to increased nitrogen delivery, improved crop yields, and reduced reliance on synthetic fertilizers.

Nitrogen Fixation

• Nitrogen fixation is a crucial natural process through which nitrogen (N_2) in the atmosphere is converted into ammonia (NH_3) or related nitrogenous compounds in soil and in living organisms.
• This process is essential for the synthesis of amino acids, nucleotides, and other cellular constituents required for life.
• The nitrogen-fixing bacteria participate in the process of nutrient fixation.
• Nitrogen-fixing bacteria includes Rhizobium (formerly Agrobacterium), Frankia, Azospirillum, Azoarcus, Herbaspirillum, Cyanobacteria, Rhodobacter, Klebsiella, etc.
• 2 types of Nitrogen Fixation
• Biological nitrogen fixation which is carried out by specific bacteria and cyanobacteria (diazotrophs). For example: Rhizobium bacteria, Azotobacter
• Abiotic nitrogen fixation which occurs naturally through lightning strikes and ultraviolet radiation from the sun.
• **Nitrification-** It is the process that converts ammonia to nitrite and then to nitrate and is another important step in the global nitrogen cycle.
• Most nitrification occurs aerobically and is carried out exclusively by prokaryotes.

References

1. Down to Earth | Zinc
2. Science Direct | Nitrogen Fixation

Senna spectabilis

The forest department of kerela is set to uproot the Senna spectabilis from Wayanad Wildlife Sanctuary.

- It is a deciduous plant species of the ***legume family* (Fabaceae).**
- The species is classified as an ***Invasive Alien Species*** in India.

> *An invasive species is an organism that causes ecological or economic harm in a new environment where it is not native.*

- **Origin-** It is native to America.
- **Geographic Range-** It is widespread in South America, Central America and the Caribbean.
- **Morphology-** It grows up to 15 to 20 metres which can be evergreen in climates with rain all year round.
- **Habitat-** It inhabits moist and seasonally dry forests including pine and coastal forest, disturbed or secondary woodland, caatinga and cerrado.
- **Inhibitors-**The dense foliage of the tree hinders the growth of native trees and grasses, leading to food shortages for herbivores.
- It significantly affects the germination and growth of the native species.
- **IUCN Status-** The plant is classified as **'*Least Concern*'**

Wayanad Wildlife Sanctuary

• The Wayanad Wildlife Sanctuary in ***Kerala*** is formed in 1973.
• The sanctuary was carved out of two territorial divisions- Wayanad and Kozhikode.
• The sanctuary is located on the southern part of Western Ghats.
• It is a part of the ***Nilgiri Biosphere Reserve*** and also an Elephant Reserve.
• The sanctuary is significant because of ecological and geographic continuity with other protected areas such as
- Bandipur Tiger Reserve and Nagarhole National Park of Karnataka in north-eastern portion.
- Mudumalai Tiger Reserve of Tamil Nadu in south-eastern side
• The vegetation comprises of tropical semi-evergreen forests, moist mixed deciduous forests, dry mixed deciduous forests, bamboo forests, and marshy grasslands.

Reference

The Hindu | Senna spectabilis

Down syndrome

A recent research study has discovered first Case of Down Syndrome in Neanderthals.

- It is a genetic disorder caused when ***abnormal cell division*** results in an extra full or partial copy of ***chromosome 21.***
- Human cells normally contain ***23 pairs of chromosomes***, One chromosome in each pair comes from father and mother.
- **Causes-** Down syndrome typically occurs spontaneously during fetal development due to errors in cell division, rather than being inherited.
- This can impact the development of the brain and body, and is usually associated with developmental delays, mild to moderate intellectual disability, and characteristic physical features.
- **Symptoms-** At birth, babies with Down syndrome usually have certain characteristic signs, including:
    - flat facial features
    - small head and ears
    - short neck
    - bulging tongue
    - eyes that slant upward
    - atypically shaped ears
    - poor muscle tone
- **Genetic variations-** Three genetic variations can cause Down syndrome
    - **Trisomy 21-** In about 95% of cases, Down syndrome results from trisomy 21, where a person has ***three copies of chromosome 21 instead of the usual two***, due to abnormal cell division during egg or sperm development.
    - **Mosaic Down syndrome-** In mosaic Down syndrome, some cells have ***an extra copy of chromosome 21*** due to abnormal cell division after fertilization, leading to a mix of normal and abnormal cells.
    - **Translocation Down syndrome-** In this syndrome, a portion of chromosome 21 attaches to another chromosome before or at conception. These individuals have the ***usual two copies of chromosome 21***, along with extra genetic material from

chromosome 21 attached to another chromosome.

- **Treatment-** Presently, there's ***no cure*** for Down syndrome, treatment can help people reach their full potential.

References

1. Earth |Down syndrome
2. Mayoclinic|Down syndrome

Syntrichia caninervis

Recently, Scientists have identified a species of desert moss called 'Syntrichia caninervis'.

- It is also known as the ***tortula moss or twisted moss***.



- **Plant group-** Bryophyte (moss).

  Bryophytes are a familiar group of non-vascular, nonflowering and seedless plants.

- **Habitat-** Found in ***arid and semi-arid regions.***
- It can grow on soil, rocks, and sometimes on other plants.
- **Distribution-** Commonly found in deserts and dry areas around the world, including ***Antarctica and the Mojave Desert, North America, Europe, and Asia.***
- **Features-** It has a remarkable capacity to withstand temperatures as low as **−196°C**.
- The plant can handle extreme ***cold, extreme radiation levels and drought.***
- This land plant is highly tolerant to multiple stresses and can act as a pioneer species, aiding in ecosystem establishment and maintenance by contributing to oxygen production.
- **Adaptations-** It can quickly rehydrate and resume photosynthesis after rainfall or dew.
- **Significance**
  - **Space exploration-** The discovery of new species could be a game-changer for future space exploration and colonisation efforts.
  - The plant could possibly be able to survive and grow in the harsh climate of Mars.

- **Soil Stabilization-** It helps in stabilizing soil in arid regions, preventing erosion.
- **Nutrient Cycling-** It plays a role in the cycling of nutrients in its habitat, especially in nutrient-poor environments.

References

1. NDTV | Syntrichia caninervis
2. Wionews | Syntrichia caninervis

Xenophrys apatani

Researchers from the Zoological Survey of India have recorded new species of forest-dwelling horned frog in Talle Wildlife Sanctuary, Arunachal Pradesh.

- **Nomenclature-** The frog has been named after the dominant ***Apatani community*** in recognition of their ingenuity in the conservation of wild flora and fauna.

  The Apatani, also known as Tanw, Apa, and Apa Tani, are a tribal group of people who live in the Ziro Valley of Arunachal Pradesh, India.

- **Biogeographic distribution-** Along the ***Eastern Himalayan*** and the ***Indo-Burma biodiversity hot spots***.
- **Significance-** The discovery of Xenophrys apatani emphasizes India's diverse biodiversity and underscores the importance of detailed ***taxonomic studies in comprehending our natural heritage***.
- It represents a notable addition to the country's reptile and amphibian diversity.



Talle Wildlife Sanctuary

• Talley Valley Wildlife is a protected wildlife sanctuary as well as a bio-diversity hotspot in Arunachal Pradesh.
• It lies between Subansiri, Sipu and Pange rivers surrounded by densely forested mountains ranging for 2,000 to 4,000 mtr. altitude.
• **Talley –** It is a plateau with dense forest of silver fir trees, pine clad plateau of beautiful grandeur, and a vast wasteland.
• **Forest types-** Sub-tropical broad leafed, temperate broad leafed, and temperate conifer types.
• **Fauna -** The area has some of the most important endangered species including the clouded leopard.
• UNESCO has proposed the Apatani valley for inclusion as a World Heritage Site for its "extremely high productivity" and "unique" way of preserving the ecology.

Reference

The Hindu | Xenophrys apatani

SHANKAR IAS PARLIAMENT
Information is Empowering