Coenzyme Q (ubiquinone)

Prelims – *Current events of national and international importance.*

Mains (GS III) – *Science and Technology- developments and their applications and effects in everyday life.*

Why in news?

Recent study reveals that CRISPR-edited rice producing CoQ10, coenzyme can play critical role in human food.

Enzymes and Coenzymes
• **Enzymes –** These are proteins that catalyse reactions in a cell, making metabolism efficient. • **Coenzymes** –Many enzymes require some molecules as cofactors, for efficient functioning. These helper molecules are called coenzymes. • They are naturally occurring *non-protein molecules organic* molecules that bind to and support enzyme activity. • **Types** – Based on the chemical nature, coenzymes can be classified as - Vitamins or vitamin-derived coenzymes (Eg, NAD+ and NADP+ are derived from vitamin B3). - Nonvitamins or metabolite coenzymes.

- **Coenzyme Q (ubiquinone)** – It is a *metabolite coenzymes type* of coenzymes that is present in every cell membrane.
- It is a ***fat-soluble*** and *water insoluble* naturally occurring molecule.
- **Types -** It comes in 10 different types (CoQ1 to Q10).
- **Function** – All these coenzymes play a vital role in the *function of the mitochondrion*, which is the powerhouse of a cell.
- **CoQ9** – It is a rich source of nutrition and is abundant in cereals (wheat, rice, oats, barley, corn, rye, millet) and plants like bamboo and avocado.
- **CoQ10** – It is critical for high-energy organs like the heart, supports the mitochondrial electron transport chain.
- While humans naturally produce CoQ10, most plant-based foods like rice and wheat primarily synthesize CoQ9.
- The researchers used ***CRISPR gene editing*** to modify the native Coq1 gene in rice, specifically targeting the *"DdsA" gene.*
- This modification allows the rice to synthesize the desired CoQ10.
- **Advantages -** Developing CoQ10-enriched crops offers a cost-effective and sustainable way to enhance nutritional value and improve health benefits.
- The gene-edited rice demonstrated over 75% CoQ10 accumulation in both grains and leaves.
- This offers a potential solution for increasing CoQ10 intake in the diets of individuals,

particularly those at risk of deficiency.
- Supplementing CoQ10 has been shown to help patients with neurological problems.

Reference

The Hindu| Role played by coenzymes in human food

