

## 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<sup>+</sup> and NADP<sup>+</sup> 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](#)

