Chalkiness in Rice

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Why in News?

Recently, scientists from Yangzhou University's Agricultural College in China discovered a gene that helps prevent rice grains from breaking during milling.

- **Rice –** It is a stable food for over ***half of the world's population.***
- The cultivated rice plant is an annual grass and grows to about 1.2 metres (4 feet) in height.
- The leaves are long and flattened and are borne on hollow stems.
- The fibrous root system is often broad and spreading.
- Varieties differ greatly in the length, shape, and weight of the panicle and the overall productivity of a given plant.
- **Layers –** A rice grain can be made up of several layers.
    - **Husk** – The outermost layer of the rice has to be removed.
    - **Bran** - Often, the next layer is also removed to whiten the rice.
- Traditionally, these layers have been removed by pounding the paddy rice with pestles in a mortar, then winnowing the grains from the chaff.
- Present day, mechanical rollers graze the layers in a process called ***milling***.
- **Chalkiness –** It is a trait found in rice grains that significantly increases breakage during milling.
- It reduces the recovery of commercially acceptable grain and downgrades the quality.
- It disappears during cooking and does not affect the taste & aroma.
- **Chalky grain rate –** It is measured by the proportion of chalky grains among all rice grains and the degree of chalkiness, which reflects the extent of chalkiness in them.
- **Properties –** Chalky rice grains have an *opaque appearance after milling* and a *brittle structure*, which ***leads to higher breakage during milling***.
- However, it has no impact on the taste, aroma, or cooking quality of the

rice.

- **Genetic determinants –** Chalkiness in rice varieties is influenced by many genes and by environmental factors like high temperature and nutrient availability.
- The researchers identified a small stretch of DNA on **chromosome 9** whose presence was strongly associated with low chalkiness in rice varieties and absence with high chalkiness.
- Low-chalkiness varieties contained the segment and showed higher expression of *Chalk9* in endosperms compared to high-chalkiness varieties.
- The endosperm is the part of the paddy grain that makes up the bulk of the milled rice.
- **Impact –** Higher chalkiness leads to more breakage during milling, and it reduces the yield of whole, marketable grains and affects rice quality**.**
- The modern breeding has unintentionally selected for the low-chalkiness version (Chalk9-L), improving rice quality over time.
- Breeders can directly introduce the Chalk9-L variant into high-chalkiness varieties to reduce breakage and enhance grain quality.

Reference

The Hindu| Chalkiness in Rice