

From Laboratory to Kitchen: IIT Indore Scientists Reveal the Science Behind Why Some Rice Grains Burst During Cooking

Researchers at Indian Institute of Technology Indore have uncovered the science behind a common kitchen observation: why some rice grains become long, soft and fluffy after cooking, while others bend, crack or burst open.

The study, published in the Journal of Food Science, was led by **Dr. Ankur Miglani**, **Prof. Pavan Kumar Kankar** and **Dr. Aman Khurana**, along with Ph.D. scholars **Mr. Niteen Sapkal**, **Mr. Anoop K. R.** and **Mr. Sourav Kumar**.

Using high-resolution imaging and microscopic analysis, the researchers found that opaque white rice grains, known as “chalky grains”, contain tiny internal cracks and air pockets. These microscopic defects act like rapid pathways for water during soaking, causing chalky rice to absorb water nearly 2.7 times faster than healthy translucent rice. This explains why excessive soaking can sometimes weaken rice grains even before cooking begins. The study also provides a scientific explanation for a common kitchen question, “How long should rice be soaked?”

Experiments on Pusa 1121 basmati rice showed that nearly 67% of fully chalky grains burst during cooking, compared to only 13% of healthy grains. The work also explains why some rice grains bend during cooking: different regions inside the grain absorb water and expand at different rates, creating internal mechanical stresses that gradually curve the grain. Similarly, the tiny white rings or bumps often seen on cooked long-grain rice were traced back to small transverse cracks formed during soaking, which create localized swelling and compartment-like expansion inside the grain.

Director of IIT Indore, **Prof. Suhas S. Joshi**, said, “This research is an excellent example of how scientific investigation at IIT Indore is helping explain everyday phenomena while generating knowledge that can benefit agriculture, food quality assessment and the rice-processing industry.”

Dr. Ankur Miglani, Principal Investigator of the study, said, “The study explains how tiny hidden cracks and internal structures inside rice grains control the way water enters during soaking and cooking, ultimately determining why some grains become long and fluffy while others bend, crack, or burst open.”

The researchers also identified a critical microscopic crack-width threshold that can predict whether a grain is likely to burst during cooking. This finding could help rice breeders, food scientists and the rice-processing industry develop better methods for evaluating cooking quality and consistency in the future.

The study suggests that a rice grain carries a kind of “mechanical memory” of how it developed inside the plant. In other words, whether rice elongates beautifully on the plate or breaks apart during cooking may be determined long before it reaches the kitchen.

Rice Cooking Stages

