Rice from the farm to the table

Rice cultivation
Rice is cultivated in paddy fields with good water retention under suitable sunlight conditions. Seedlings are transplanted in paddy fields, or rice is seeded directly in the field. Rice is harvested in the fall.

Threshing and hulling
In the harvested rice, the husks are removed from the ears by threshing and hulling to produce brown rice.

Polishing
The harvested brown rice is polished, which removes the rice bran. Depending on the proportion of the removed rice bran, 35% or 100% polished (white) rice is produced.

Cooking
Polished rice and brown rice are soaked by soaking or boiling in water. When the rice grains absorb the water and become sticky and fluffy, they are ready to eat.

Research by NARO on countermeasures against radioactive materials
NARO is engaged in research on measures to reduce radioactive materials in food at each stage of production, starting from the farm, where radioactive materials are present in the environment, to breeding and cultivation, and consumption as food.

Studies to manage and remove radioactive materials from the environment

Studies to control the transfer of radionuclides to agricultural and livestock products

Studies to investigate the change in content and concentration of radionuclides that occur during food processing and cooking

NARO
National Agriculture and Food Research Organization
Takasaki Agricultural Research Center
Food Research Institute

New approaches in food safety with respect to radiocesium

Unit of radiocesium concentration: Bq/kg
The unit that represents the measure of radioactivity is becquerel (Bq). "Bq/kg" (becquerels per kilogram) is used to indicate the concentration of radiocesium in food.
Reducing radioesium in cultivation

The concentration of radioesium in brown rice is largely dependent on the content of exchangeable potassium (Ex-K₂O) in the soil that can be absorbed and used by crops. The concentration of radioesium in brown rice is generally reduced when the Ex-K₂O content in the soil is high.

When the Ex-K₂O content in the soil is high

The concentration of radioesium in brown rice tends to remain low

Fig. 1 Relationship between Ex-K₂O in the soil and the transfer factor of radioesium to brown rice

Transfer factor = radioesium concentration in edible crop / radioesium concentration in soil

Hulling is performed

Brown rice can become contaminated if dust containing radioesium settles on the rice huller or sorting/weighing machine used to process the rice without the husk. "Prewashing" can effectively prevent such contamination when a small amount of unmilled rice is placed into the rice huller and the resulting brown rice is discarded.

Circulation operation with a small amount of unhulled rice (prewashing)

Dust in the rice huller is removed by prewashing (first brown rice is discharged)

Reducing radioesium by polishing

Radioesium is also present in the rice bran. By polishing the rice bran during milling, up to 60% of radioesium in brown rice is removed.

Radioesium content | Radioesium concentration ratio
---|---
Brown rice | 100% | 1
Rice bran | 60% | 0.5
Polished white rice | 40% | 0.5

Only brown rice with radioesium below the limit is processed and shipped. The radioesium concentration in polished rice is less than half that in brown rice; thus, polishing ensures that the radioesium concentration in white rice does not exceed the limit.

Reducing radioesium by cooking

Radioesium contained in food easily dissolves in water. Therefore, when brown rice and polished rice are washed, radioesium is transferred into the rice-washing water and is removed from the cooked rice.

Brown rice

Radioesium content | Radioesium concentration ratio
---|---
Culinary brown rice | 100% | 1
Water | 95% | 0.4

Polished white rice

Radioesium content | Radioesium concentration ratio
---|---
Cooked polished white rice | 40% | 0.5
Rice-washing water | 25% | 0.13

The total mass of rice increases upon cooking because of swelling caused by water absorption. Therefore, the radioesium concentration in cooked rice is reduced to less than half that in uncooked brown and polished white rice.