

Controlling disease in paddy rice seeds using hot water disinfection combined with pre-drying

Production

Implementation

Item: Paddy rice

Chemical pesticide reduction

Outline

The heat stress tolerance of rice seeds improved when their water content was reduced to less than 10% before disinfection with hot water (Fig. 1). Based on this finding, a new high-temperature hot water disinfection method that incorporates a pre-drying step was established and adopted into practical use. This technique enables disinfection at a higher temperature (65°C) than that used in the conventional method. Therefore, it can be effective in controlling "Bakanae disease," for which conventional methods have not been sufficient.

Background/effect/note

The hot water disinfection method, in which rice seeds are immersed in water at 60°C for 10 minutes, is a clean technology without pesticides. However, some diseases, such as "Bakanae disease" are not sufficiently controlled by this treatment. Therefore, we developed an improved method that incorporates a pre-drying step. Experimental results using rice cultivars from Thailand (Fig. 3) and Malaysia showed that pre-drying was effective in improving the heat tolerance of rice seeds. This method enables disinfection at a high temperature of 65°C and was shown to be as effective as chemical pesticides in controlling "Bakanae disease" (Fig. 2). Furthermore, pre-drying followed by disinfection at 65°C for 10 minutes was effective in controlling blast as well as bacterial diseases, such as bacterial seedling rot and bacterial seedling blight, which are increasing due to global warming. This method does not require special equipment to dry the seeds or boil the water. Practical applications of this disinfection method in rice-planting areas in Southeast Asia are also expected.



Without pre-drying
(14.0% water content)



With pre-drying
(8.9% water content)

Fig. 1. Germination of "Nipponbare" seeds treated with hot water at 65°C for 10 minutes.

Pre-drying was performed at 50°C for 24 hours. The seeds were soaked in water at 28°C for 10 days under dark conditions.

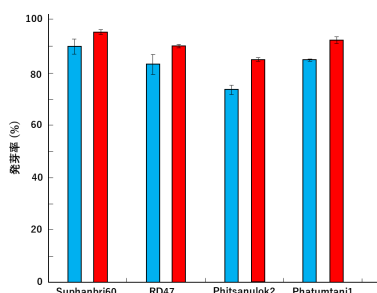


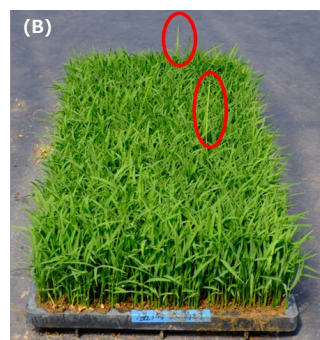
Fig. 3. Pre-drying treatment improves heat stress tolerance of rice seeds in Thailand.

Blue: without pre-drying Red: with pre-drying

The seeds were treated with water at 65°C for 10 minutes.



New technology
(pre-drying +65°C for 10 minutes)



Conventional method
(60°C for 10 minutes)

Fig. 2. Efficacy of high-temperature hot water disinfection (new technology) for control of Bakanae disease.

Seedlings circled in red are infected with Bakanae disease (conducted at Akita Prefectural University).



Technical details:

https://www.jstage.jst.go.jp/article/plantbiotechnology/30/2/30_13.0207a/_article-char/ja

Contact
kanekatu@cc.tuat.ac.jp



Tokyo University of Agriculture and Technology