

# Effect of hermetic storage in the Super Bag on seed quality and on milled rice quality of different varieties in Bac Lieu, Vietnam

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The IRRI Super bag is a farmer friendly 50 kg storage bag that allows cereal grains to be safely stored for extended periods by using the hermetic storage principle. Hermetic storage systems rely on having the atmosphere within the grain modified through respiration of the grain, insects and fungi. In hermetic systems the oxygen content in the atmosphere surrounding the grains inside the grain bulk is reduced, often to less than 3%, and the carbon dioxide content increases to a level where aerobic respiration is minimized. The Super bag fits as a liner bag inside a conventional storage bag and can therefore be used in ways similar to existing bag storage systems. The objective of this study was to determine the effect of hermetic storage in the Super bag compared with traditional open storage on the quality of seed and milled rice stored for 8 months. The experiments were conducted at the Bac Lieu Seed Center, Vietnam, using two traditional and two modern varieties.

## Experimental Design

Rice seeds of two traditional varieties, Tai Nguyen and Mot Bui Do, and two modern varieties, Jasmin 85 and OM2717, were stored inside the seed storage building of Bac Lieu Seed Center in Super bags with initial moisture content between 11.3% and 13.6%. Seeds from the same lots were stored in conventional woven PVC storage bags in open storage as control. All treatments were replicated three times and the bags were placed on pallets, surrounded by metal sheets and covered with plastic to protect them from birds and rodents. Initial samples were taken at the start of the storage period in February 2005 and final samples were collected after 8 months of storage for seed quality and milling quality analysis.

## Effect on Seed Quality

The Super bags effectively prevented moisture exchange between the surrounding air and the grains, and there was only a slight increase of about 1.2% moisture content in the hermetic systems caused by respiration from grains and insects. In contrast the moisture content of the control treatment increased by an average of 4.7% to a final moisture content of 16.5-18.2%, mainly through moisture exchange with the surrounding air (Figure 1A), levels far above save storage moisture content. The Super bags also effectively reduced living insects to 1 insect/kg without using pesticides, while in open storage, insect levels increased to an average of 53 living insects/kg (Figure 2B). The germination rate in the control treatment dropped to an average of 43% for the traditional varieties and to 6% for the new varieties under the open storage system, while hermetic storage maintained high germination rates between 90% for Mot Bui Do and 99% for Jasmine 85 with an average germination rate of 96% (Figure 2C).

## Effect on Milling Quality

After 8 months of storage the milling recovery in the open storage samples was reduced by an average of 2.9% when compared to the initial sample. In hermetic storage the milling recovery was only 0.76% lower than in the values obtained from the initial sample. Hermetic storage thus led to a 2.14% higher milling recovery on average.



Sampling the Super bags at the end of the trial.



The IRRI Super bag as liner bag inside a regular storage bag



Sealing the bag by twisting the end, bending it back and tying it with rope or tape.



Super bags can be stored as any other storage bag.

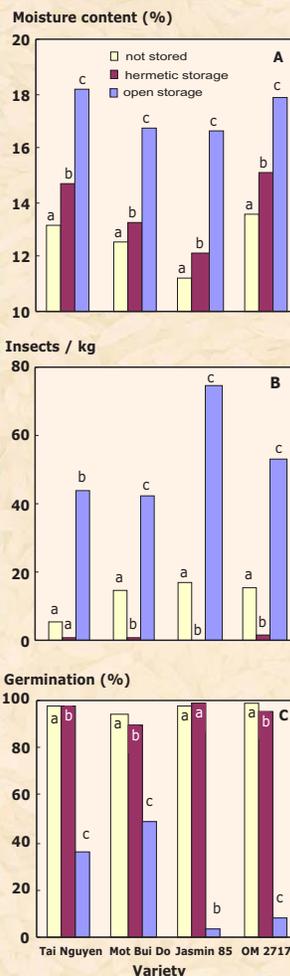


Figure 1. Effect of eight months hermetic sealed storage on A) moisture content, B) life insects and C) germination

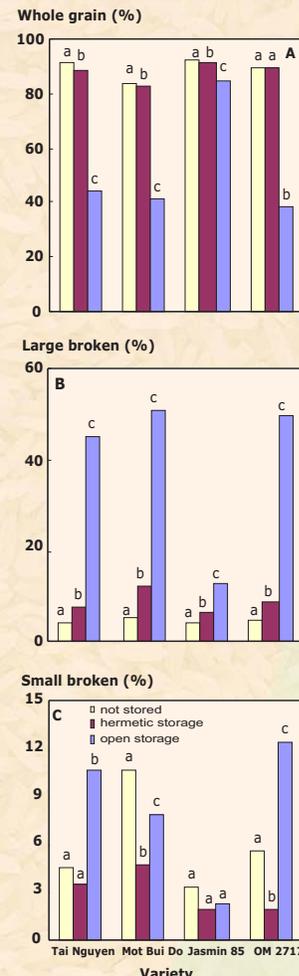


Figure 2. Effect of eight months hermetic sealed storage on milling quality expressed as A) percent whole grain, B) percent large and C) percent small broken grains.

Within a variety, means with the same letter are not significantly different than the 5% level.

The benefit of hermetic storage in terms of maintaining a high percentage of whole grains is much more obvious. In the open storage system, the whole grain percentage was reduced by 37.1 percentage points on average. In comparison, the samples stored hermetically only had 1.2% less whole grain than the initial samples. Using hermetic storage the whole grains was increased by an average of 35.9% compared to open storage (Figure 2A). This was due to an increase in both, small broken and big broken, which were caused by the repeated drying-wetting cycles the grains in open storage went through when being exposed to the ambient air conditions.

## Conclusion

The results of this study showed that hermetic storage provides simple means to retain high seed germination, lower insect infestation and also helps to maintain high percentage of whole grains after milling.

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