

# F1-ATPase relieves the damage caused by a high temperature stress during seed development

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## Purpose of Research

Molecular Genetic Approach to the Exploitation of Plant Resources

All living species on the earth depend on plant biomass such as carbohydrates. Our goal is to develop novel technologies that enable plants to exert their maximum abilities. To fully exploit plant resources and achieve a sustainable and stable society that can withstand the global warming, we are studying the key factors crucial to the productivity of plant biomass, plant genes involved in the tolerance to environmental stresses, and molecular agriculture techniques for producing medicines and chemicals using plants.

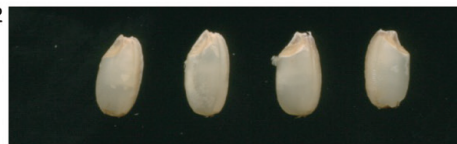
## Summary of Research

**High temperature-tolerant rice**



091130\_rice008\_gluB4-F1ATPase-TF\_hightemp


**Wild-type rice**



091130\_rice015\_NB\_hightemp


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**Wild-type rice**




091130\_rice011\_NB\_normal

**Non-tolerant rice**



091130\_rice013\_ubiq-RNAi

28–33°C



**Overexpression of F1-ATPase  $\beta$  in Rice Seeds Confers Tolerance to High Temperature**

High-temperature stress during seed development resulted in reduced grain quality with chalky endosperm, which was caused by insufficient storage starch synthesis possibly because of shortage of ATP supply and inadequate energy status in developing seeds. In this case, since the expression of genes involved in F1-ATPase was significantly decreased, it is suggested that change in the amount of F1-ATPase and therefore reduction in the ATP content in developing seeds largely affected the grain quality. We created rice transformants in which an F1-ATPase  $\beta$  gene was overexpressed specifically in the endosperm of immature seeds, which relieved the high temperature damage.

## Points

- Creation of high temperature-tolerant plants by overexpressing F1-ATPase
- Screening for/breeding of high temperature-tolerant rice plant lines
- Breeding of high temperature-tolerant rice plant lines

## Future Developments

- Collaboration with seed companies, JA, and other organizations and application for governmental research grants.
- Field testing of the overexpression lines on a collaborative basis.

- Associated System: SIP (Cross-ministerial Strategic Innovation Promotion Program) Agri-innovation Program
- Awards: JSPCMB Excellent Paper Award (2013)
- Intellectual Property: JP2014-102528 “Translational Enhancer”
- Prototype: present
- Sample: available

