Prediction of rice properties for sake making by meteorological data

The properties of rice for sake making is empirically known to be influenced by meteorological condition of harvest year or area even in the same cultivars, and the meteorological condition also affects the process of sake making and the quality of sake. However, the relationship between meteorological condition and sake making properties of rice has not been understood well.

In the present study, we investigated the relationship between rice starch properties, enzyme digestibility of steamed rice grains and meteorological data during rice grain filling. It was shown that higher air temperatures during grain filling cause longer chain of amylopectin, as well as lower enzymatic digestibility during sake making.

From the above result, the enzyme digestibility of steamed rice grains can be predicted by air temperature during grain filling before sake making, and the process of sake making can be easily controlled to make good quality of sake and improve the utilization of rice for sake making.

【Starch and amylopectin structure】

- Starch granules constitute approximately 75-80% of a milled rice grain. Starch granules are made from two types of polymers of glucose: amylose and amylopectin. Amylopectin molecules are highly branched, and amylose molecules are essentially linear. The ratio of amylose and amylopectin in the rice starch granules is approximately 1:4.

- One amylopectin molecule is formed of 10^5 glucose units, and consists of short linear α-1,4 polymer chains linked to other α-1, 6 linkages. Its short linear chains are formed of 18-24 glucose subunits. The chain length of amylopectin differs with cultivating condition.

M. Okuda et al., *Cereal Chem*., **82**, 361-368 (2005)

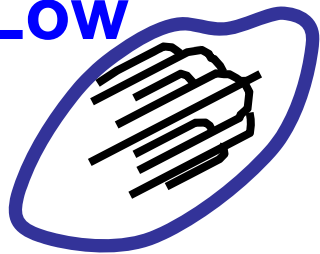M. Okuda et al., *Cereal Chem*., **83**, 143-151 (2006)

Prediction of sake making properties of rice grains by meteorological data

Previous study
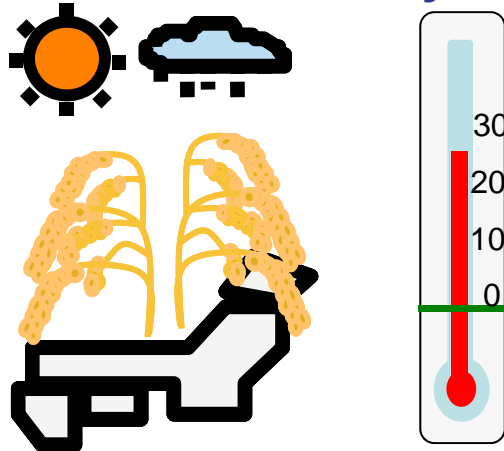
Air temperature during grain filling

Low

High

Short chain amylopectin
→**Slow retrogradation**
→**Easy to digest**

Long chain amylopectin
→**Fast retrogradation**
→**Hard to digest**

The enzyme digestibility of steamed rice grains can be predicted by mean air temperature during grain filling

$y = -1.42x + 49.30$
$R^2 = 0.748$ (n=69)

Enzyme digestibility of steamed rice grains (%)

Mean air temperature during a month after heading (°C)