

Relationship between Rice Variety and Sake Metabolome

In recent year, distinctive varieties of sake-rice have been developed, in addition to the so-called “King of Sake Rice,” Yamada Nishiki. Each variety of sake rice has its own influence on the quality of the *rice-koji* and the subsequent brewing processes and finished products. The relationship between the rice varieties and the compositions of finishes sake has long been a never-ending subject to research, but the effects of brewing conditions are so dominant that the research in this field has been stalled. In the latest study, we applied the same small-batch brewing process to three varieties of sake rice at polishing ratios of 70% and 50%: Omachi, the oldest variety used to make sake; Yamada Nishiki, which is derived from the Omachi lineage; and Hattan Nishiki No. 1, which was bred from a completely different lineage. The results showed that the overall sake metabolome was greatly affected by the rice polishing ratio and in addition, a clear relationship was observed between sake metabolome and rice variety. We formulate the discriminant for rice varieties from metabolome data based on small-batch production, and the discrimination accuracy was 100% when we analyzed commercial sakes made from three rice varieties. Qualities of commercial sakes vary depending on many factors, including *koji* mold, yeast, fermentation and storage conditions, but the effect of the rice varieties was observed in the metabolite composition of sake. The aim of further research is analyzing other sake rice varieties, especially focusing on varieties that are being newly developed.

* Sake metabolome is a phrase that refers to the overall composition of finished sake.

It was possible to distinguish between varieties of sake rice by analyzing the overall composition of finished sake (sake metabolome)

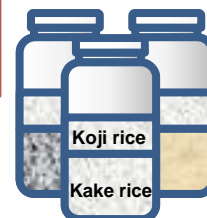
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Three Varieties of Rice

Omachi: This variety of rice was isolated more than 150 years ago. It is one of the oldest varieties of sake rice. Approximately 2/3rd of the existing sake rice is considered to have been derived from this lineage.

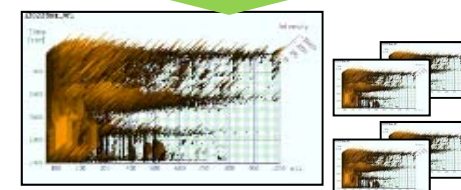
Yamada Nishiki: “King of Sake Rice.” It was obtained in 1923 by cross breeding of “Yamadaho” and “Tankan Wataribune” (selectively bred varieties derived from the lineage **Omachi**). Its production yield is the highest in Japan.

Hattan Nishiki No. 1: The representative sake rice from Hiroshima. It was bred at the Hiroshima Prefectural Agricultural Exp. Station in 1983. It is derived from a lineage different from **Omachi** and has originated from food rice.



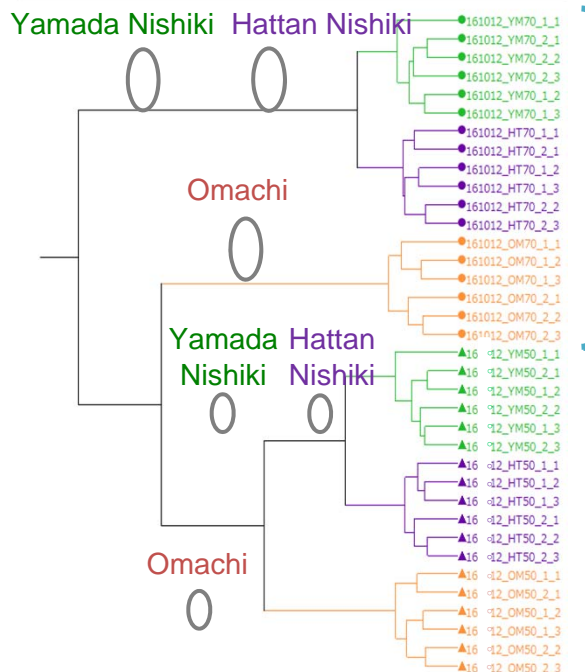
Small Batches
(3 Datasets)

Sake Metabolite Analysis



Cluster Analysis of Sake Metabolome

Tree graph



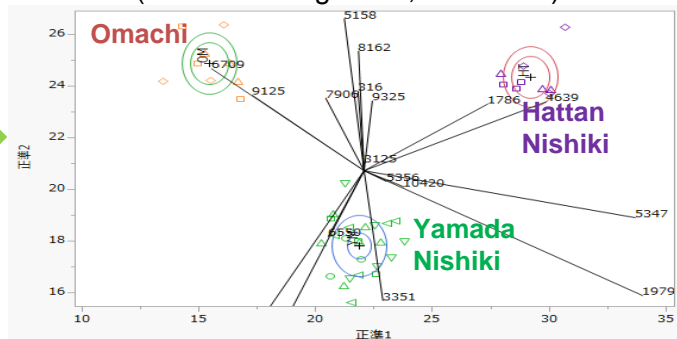
Rice polishing ratio has a high effect, and rice variety also has an effect

Discriminant Creation and Commercial Sake Analysis

Creating Discriminants from Small-Batch Samples

Commercial Sake: Yamada Nishiki 8, Omachi 3, and Hattan Nishiki 3 Samples

Discrimination Analysis of Commercial Sake Using Discriminants Based on a Small Batch of Sake (Rice Polishing Ratio, 23%-70%)



100% ability to distinguish even with different samples

Creating discriminants from metabolome data based on a small batch of sake

- ➡ Distinguish between rice varieties is possible for a small batch
- ➡ Distinguish between rice varieties is also possible for commercial sake