

Creating a new life science (sugar life science) and sugar bio-industry using "rare sugar"

Overview

"Rare sugars" are monosaccharides which occur only rarely in nature, and they come in about 50 types, including D-psicose. We have perfected a strategy called "Izumoring" for producing these systematically, and have completed design drawings for producing all rare sugars. The rare sugars produced using Izumoring have been discovered to have previously unanticipated bioactivity.

We intend to create a new "sugar life science" and "sugar bio-industry" by mass producing rare sugars and closely examining their bioactivity.

Cluster Headquarters

- President Takeki Manabe (Governor, Kagawa Prefecture)
- Vice President Koji Kondo (Former President of Kagawa University)
- Project Director Yoshio Tsujisaka
- Chief Scientist (CS) Ken Izumori (Director, Kagawa University Rare Sugar Research Center)
- Deputy Chief Scientist (CS) Masaaki Tokuda (Vice Director, Kagawa University Rare Sugar Research Center)
- Science and Technology Coordinators Syuzo Sakai

Core Organization

Kagawa Industry Support Foundation

Participating Research Organizations

(Bo d: Core Research Organization)

Industry···Fushimi Pharmaceutical Co., Ltd., Teikoku Seiyaku Co., Ltd., Shikoku Research Institute Inc.,
RyuSyo Industrial Co., Ltd., Hayashibara Co., Ltd., Organo Corporation

Academia···**Kagawa University**

Government···AIST Shikoku (National Institute of Advanced Industrial Science and Technology, or AIST),
National Agricultural Research Center for Western Region,
Kagawa Prefectural Industrial Technology Center,
Kagawa Prefecture Agricultural Experiment Station,
Kagawa Prefecture Forestry Research Center,
Research Institute for Solvothermal Technology



Project Director

Yoshio Tsujisaka, Ph.D.

The New Era When People Say, "Mere Sugar, but Rare Sugar"

Due to the previous efforts of many researchers at Kagawa University and the participating companies, it has been determined that even simple sugars have various kinds of latent functionality. These include: inhibition of oxygen free radical production, protection against organ ischemia, inhibition of cancer cell proliferation, preventive effects against diabetes and arteriosclerosis, and inhibition of fat synthesis. This research has reached the stage of animal experiments. All these types of action are wonderful effects. We must not forget that these results were achieved through the efforts not only of each researcher, but of the Chief Scientist, Deputy Chief Scientist, and all the sugar suppliers, advisers and others who are providing support behind the scenes. In the future, our plan is to move ahead with research on mid-size animals, and develop our results into potential applications for commercialization.

On the other hand, previous research has focused mainly on two of the rare sugars, D-psicose and D-allose. We have little information on most of the sugars we aim to produce (like ketoses), so we are waiting for research results on their function. We believe that, in the near future, we will be announcing astonishing new functions of rare sugar. This is another reason why the members of the team are constantly discussing how to achieve high-quality, speed research results. We hope the advent of the rare sugar era arrives soon.

Yoshio Tsujisaka is a former president of the Osaka Municipal Technical Research Institute. He is now a consultant for Hayashibara Co., Ltd.

Outline of the Joint Research by Industry, Academia and Government

We have perfected the Izumorigo production strategy for all rare sugars. Various rare sugars can be produced using this method. Basic research (on biological functions of rare sugars) and applied research are moving ahead, using the rare sugars we have produced ourselves. Rare sugars bring together researchers from diverse fields, and we have created a large team for joint research.

●Rare sugar production (We produce all rare sugars independently!)

The process works like this: starch \Rightarrow glucose \Rightarrow fructose \Rightarrow the world of rare sugar. The entryway is D-psicose. The rare sugar D-psicose is the basis, and new rare sugars like D-allose and allitol are produced using D-psicose as the raw material.

●Application to plants (Plants recognize monosaccharides!)

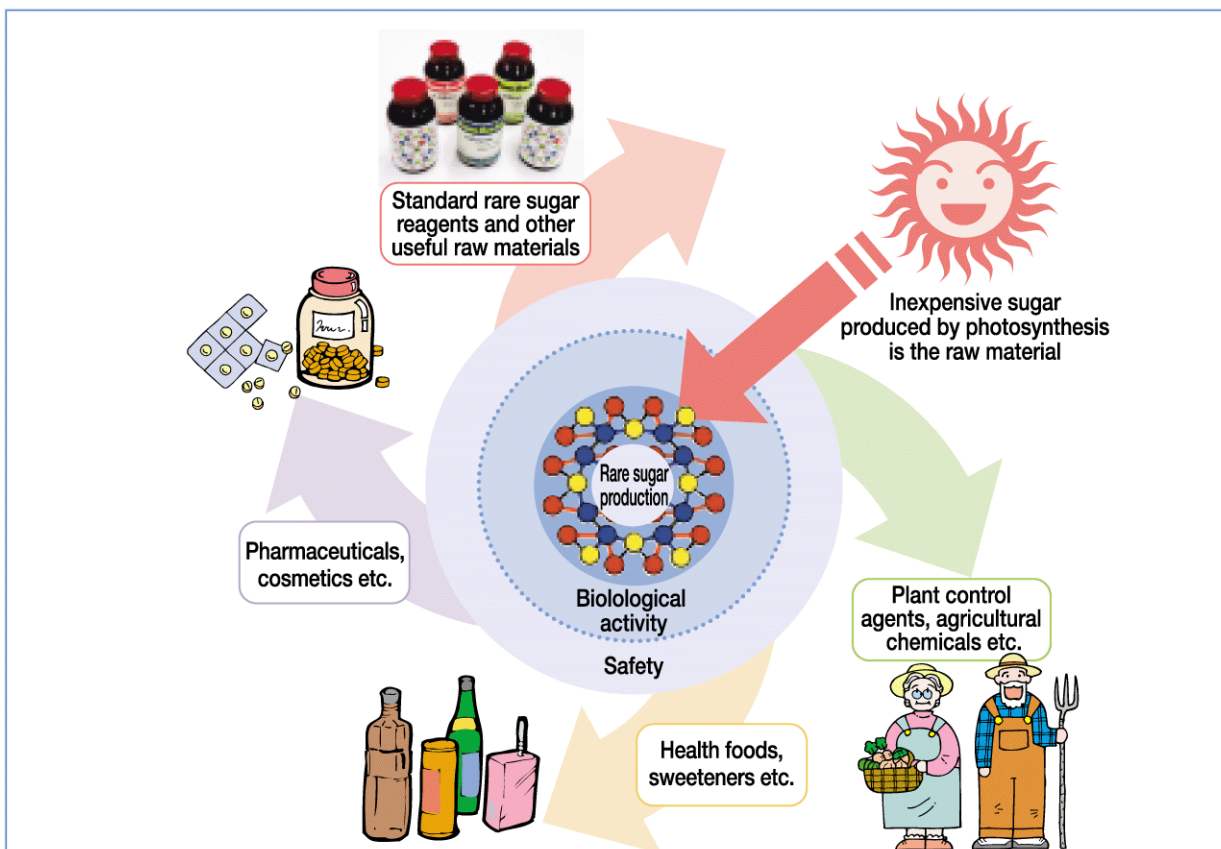
It has been confirmed that plants recognize D-psicose. The fact that monosaccharides have bioactivity on plants was a completely unexpected discovery. We have started application research on safe agricultural chemicals.

●Applications in food products and sweeteners (It's not just sweet!)

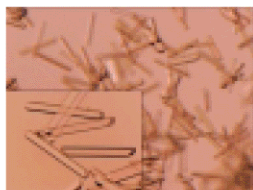
Rare sugar is a form of sugar, so naturally it is sweet. But it isn't just sweet. Positive effects on human health have been discovered. There are potential applications as a food product with new functionality, and as a sweetener.

●Applications in pharmaceuticals (Creating new pharmaceutical products!)

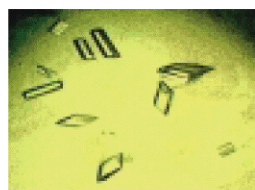
Rare sugars are not just healthy. They have been confirmed to have "functionality as a pharmaceutical product". We have big dreams of using rare sugars in new types of pharmaceuticals.



The two beautiful crystals which are the basis of rare sugar research



Crystals of the rare sugar D-psicose



Crystals of the enzyme DTE which makes rare sugars