

児玉担当講義のスケジュール

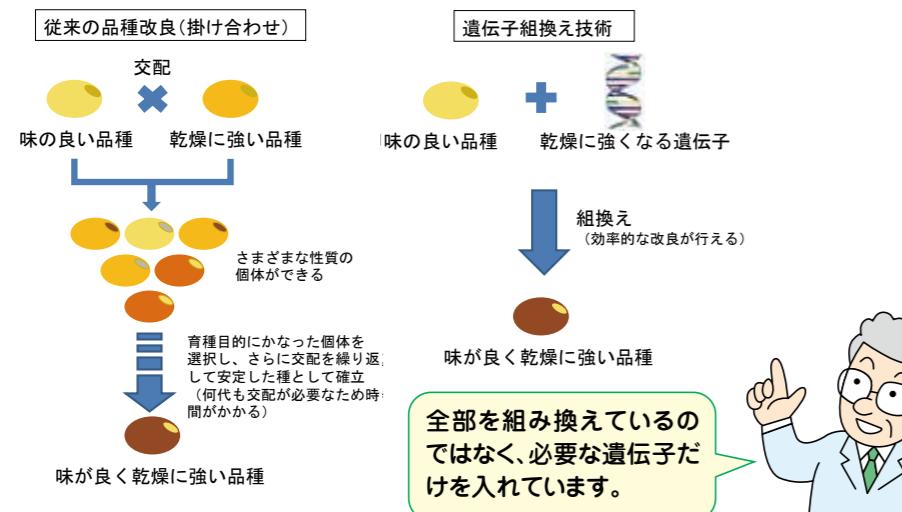
5月24日 遺伝子組換え技術
新育種技術(NBT)

5月31日 バイオイメージング技術

6月7日 児玉研究室の研究内容

※出席とレポートで評価します。

遺伝子組換え技術が用いられる前から、
「掛け合わせ」によって農作物の遺伝子の組合せを変え
て品種改良が行われてきました。



日本で流通する遺伝子組換え食品(作物)
日本で安全性が確認され、販売・流通が認められているのは、
食品8作物(169品種)、添加物7種類(15品目)です(2012年3月現在)。

作物
<名称>
大豆

<性質>
●特定の除草剤で枯れない
●特定の成分(オレイン酸など)を
多く含む

じゃがいも

●害虫に強い
●ウィルス病に強い

なたね
とうもろこし

●特定の除草剤で枯れない
●害虫に強い

わた

●害虫に強い
●特定の除草剤で枯れない

てんさい(砂糖大根)

●特定の除草剤で枯れない

アルファルファ

●特定の除草剤で枯れない

パパイヤ

●ウィルス病に強い

日本で流通する遺伝子組換え食品(作物)
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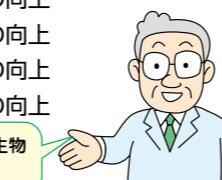
添加物
キモシン

α-アミラーゼ
リバーゼ
ブルナーネ
リボフラビン
グルコアミラーゼ
α-グルコシルトランスフェラーゼ

●天然添加物の代替(安定供給)
(チーズ製造の際の凝乳酵素で、天然の
キモシンは仔牛の第4胃から取る)

●生産性の向上
●生産性の向上
●生産性の向上
●生産性の向上
●生産性の向上
●生産性の向上

添加物は、遺伝子組換え微生物
により作られます。



遺伝子組換え

1. 実は身近な技術

2. 安全なの?

3. 作り方は?

・三回目の講義の最後に出題

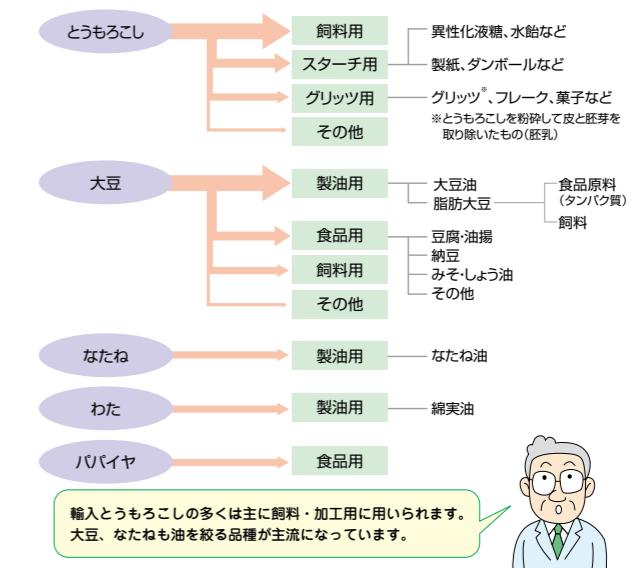
第一回: 5月24日 遺伝子組換え&NBT
第二回: 5月31日 バイオイメージング技術
第三回: 6月07日 児玉研究室の研究内容(出題)

提出期間: 6月07日13時~6月14日9時
提出方法: WEB提出

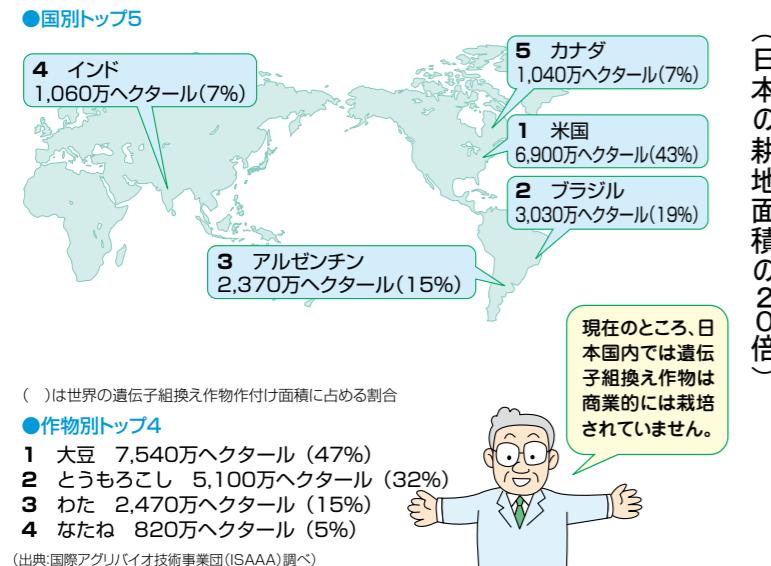
実用化される遺伝子組換え体



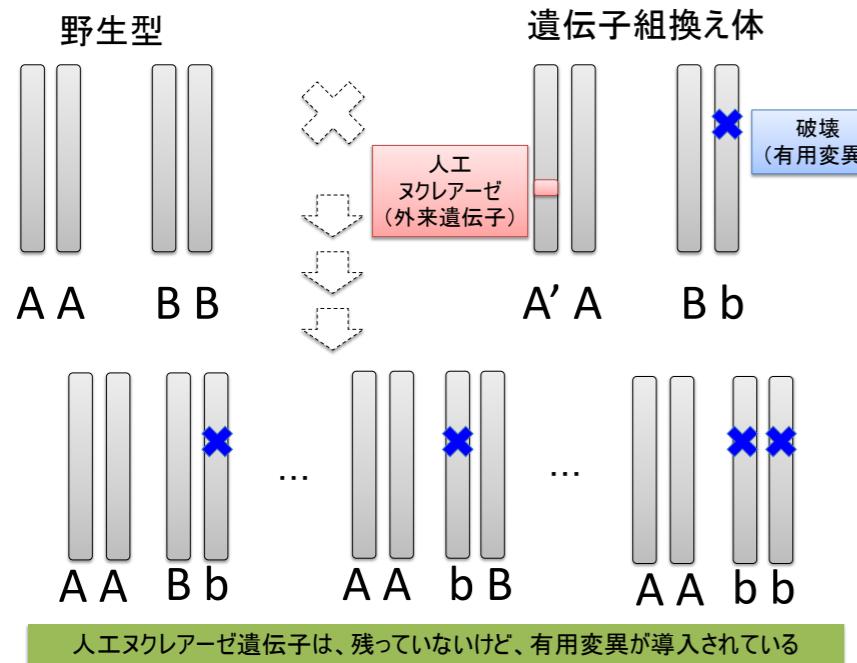
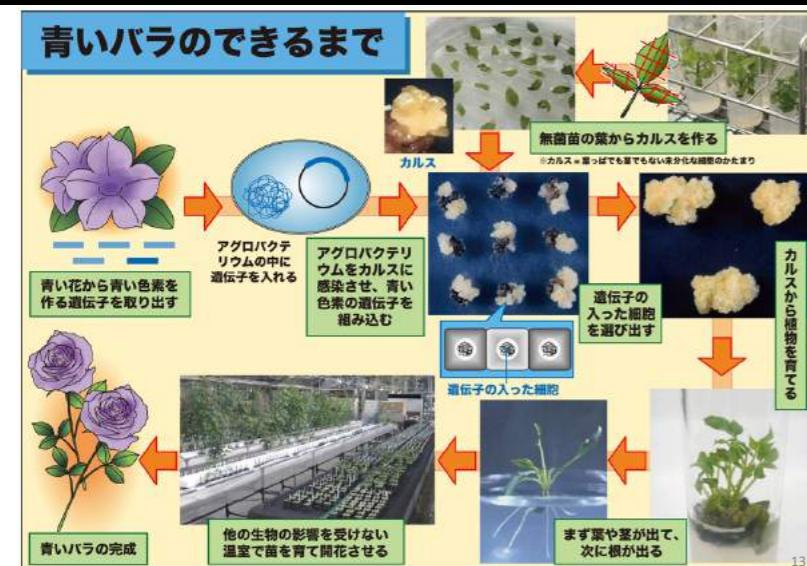
どんな用途があるのか?



どこで作られているのか？



アグロバクテリウム法

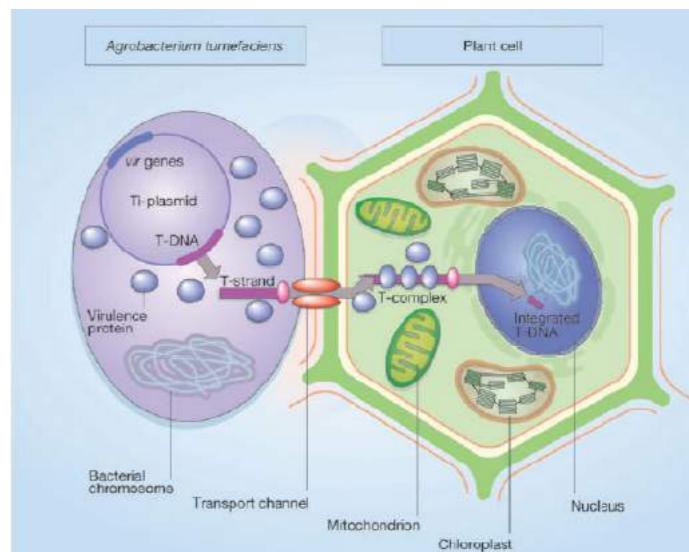


遺伝子組換え植物の作出法

・パーティクルデリバリー法

・アグロバクテリウム法

アグロバクテリウム法

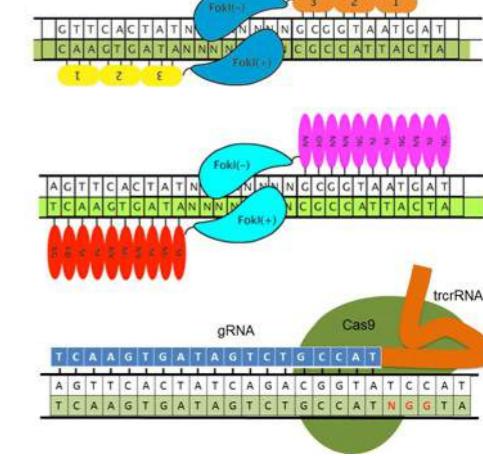


NBT : New Plant Breeding Techniques

1. 人工ヌクレアーゼ(ゲノム編集技術)

2. オリゴヌクレオチド指定突然変異導入技術
 3. シスジエネシス、イントラジエネシス
 4. RNA依存的DNAメチル化
 5. 接ぎ木による新しい遺伝子組み換え技術の開発
 6. 逆育種学
 7. アグロインフィルトレーション
 8. 合成ゲノミクス

人工ヌクレアーゼ(ゲノム編集技術)



ゲノム編集作物をどのように扱うのか？

世界中で議論されています。
(主に、欧州、アジア)

2016年6月のNature Biotechnolに記事

米国・管理せずに市場へ

まずは、ユニコーンとトロフィーです

CRISPR-edited crops free to enter market, skip regulation

The first CRISPR-edited crops presented to the US regulatory system can be edited and sold without oversight by April, the US Department of Agriculture (USA), says a new report. Companies could reduce by billions of dollars the cost of development of the plants, the report claims, by using a corn gene genetically modified with the CRISPR-Cas9. Some companies have installed the decision as a step in the right direction, although media outlets and other interested parties say it goes against the agency's established regulations. Iowa-based DuPont Pioneer (DPP) received the wayward corn from its branch and will release it to the market as early as April.

“DuPont Pioneer is currently undergoing a merger with The Dow Chemical Company,” says DPP, “and it expects the CRISPR-edited variety will have higher yields than conventional corn. The company plans to commercialize the plant within four years and follow it with more production if demand is strong.” This is the first CRISPR-edited crop to be released by a major seed company, according to the USA. Using the same editing tool that CRISPR-Cas9, the team developed the endogenous gene *Wx2*, which encodes the grain protein gliadins, to produce a low-gluten maize. The plant is designed to reduce the risk of coeliac disease in those who eat it.

“The CRISPR-edited plant is the first CRISPR-edited plant likely to bypass USDA review,” says the report. Companies can release their edited plants without oversight, as long as they can demonstrate that the editing did not change the plant’s genetic code. The USA has issued a draft guidance for the industry to help them do that. The report claims that the agency’s new regulations will make it easier for companies to bring their products to market.

“The agency’s first task is to regulate the CRISPR-edited corn. The agency will familiarize itself with the plants transferred from other gene-editing techniques, such as zinc-finger nucleases and transcription activator-like effector nucleic acids,” says the report. Such letters from USA have become essential to small companies attempting to bring a plant to market. GE plants, says Anthony Evans, CEO of the San Francisco-based startup TATA Technologies, “The company in 2010 received a letter for its bioluminescent glowing plant technology. ‘If you don’t get a letter like that, it’s very hard to raise any money because investors are leery of going through the cost-prohibitive regulatory process,’ he says.”

Crops that bypass the USA “will go through the voluntary review process at the US Food and Drug Administration (FDA). And certain traits such as insectical properties, the USA will handle the system,” says the report. The USA has ordered the FDA to review the CRISPR-edited corn and the USA will handle the system, the report claims.

“Bentenon 33 (WRI, Bioverativ),” says the report, “in that the USA has held three public meetings, and the agency is in the last one. It has held three public meetings, including two in March. Many groups weighed in at these meetings and in the literature. The USA is in parallel to updating its own regulations. A public comment period for that ended April 21.”

The agency’s guidance was “from a committee convened by the National Academies of Sciences, Engineering and Medicine. The committee will attempt to predict the likely future products of biotech over the next 5–10 years” and what types of risks those products might pose, according to the committee’s charge. The group met for the first time on April 18 and plans to publish a report by the end of 2016.

Emily Waltz, *Nashville, Tennessee*