Disease resistance characteristics in PVP Japan

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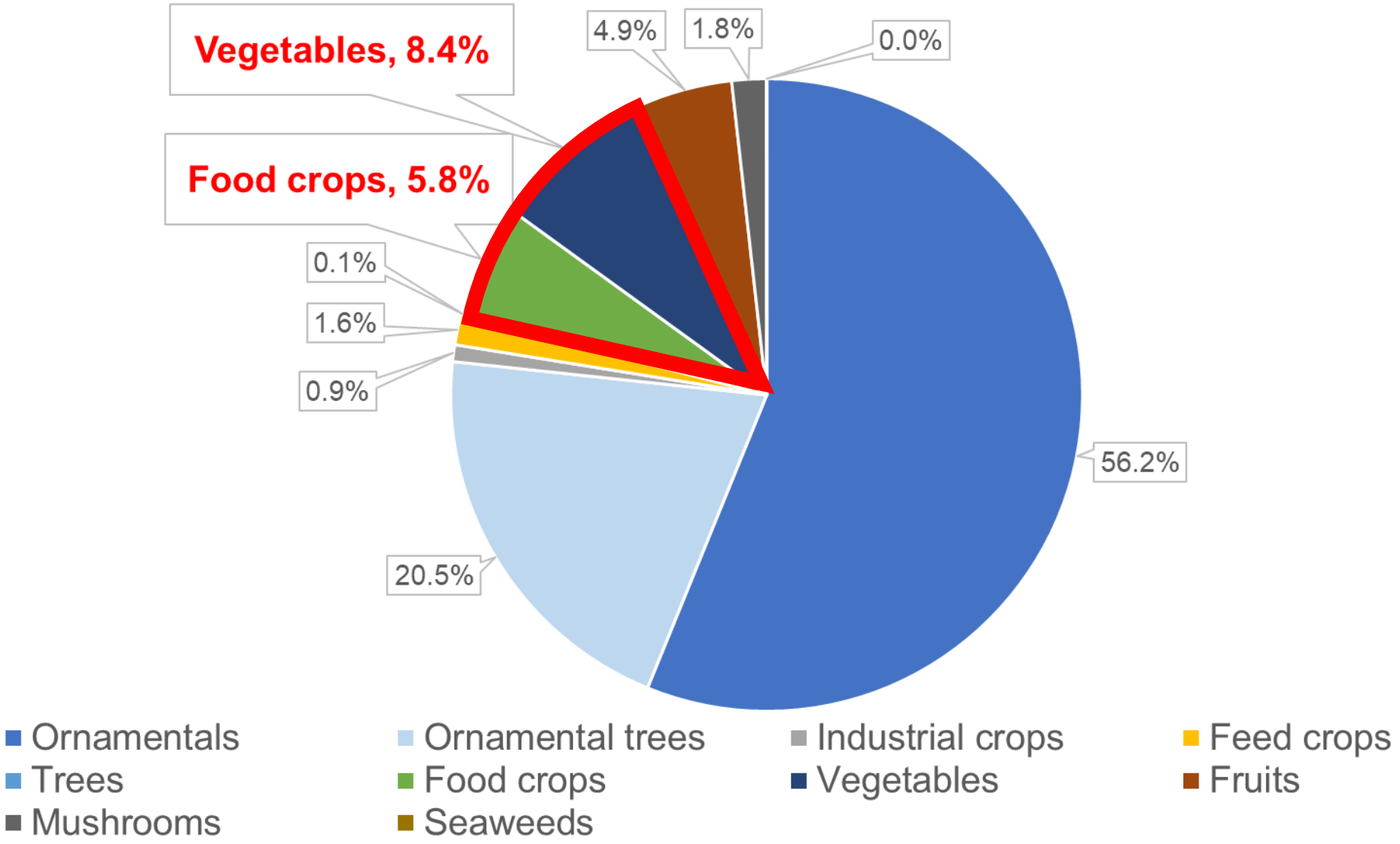
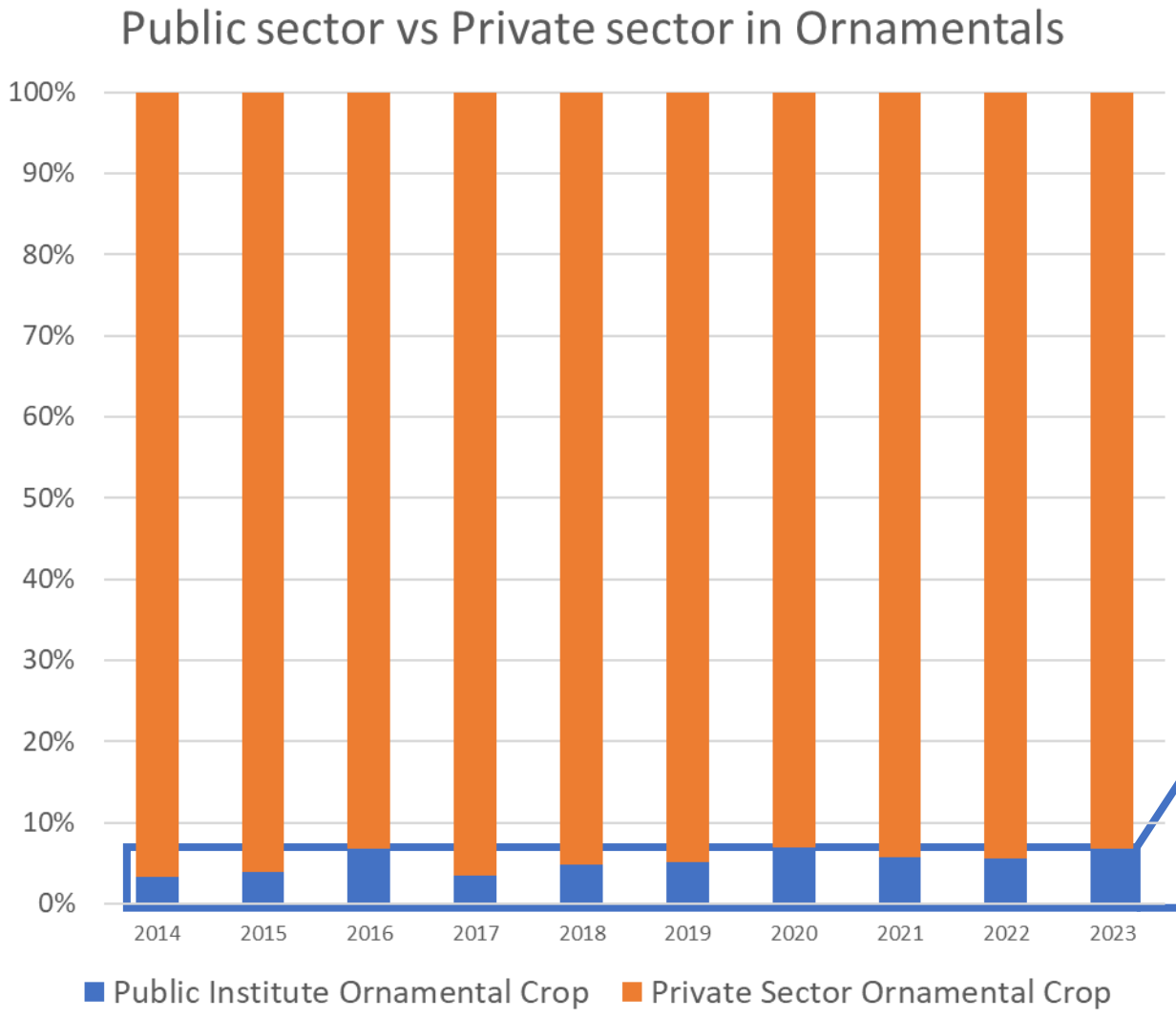
PBR Application Ratio of Crop Categories Past 10 Years in Japan

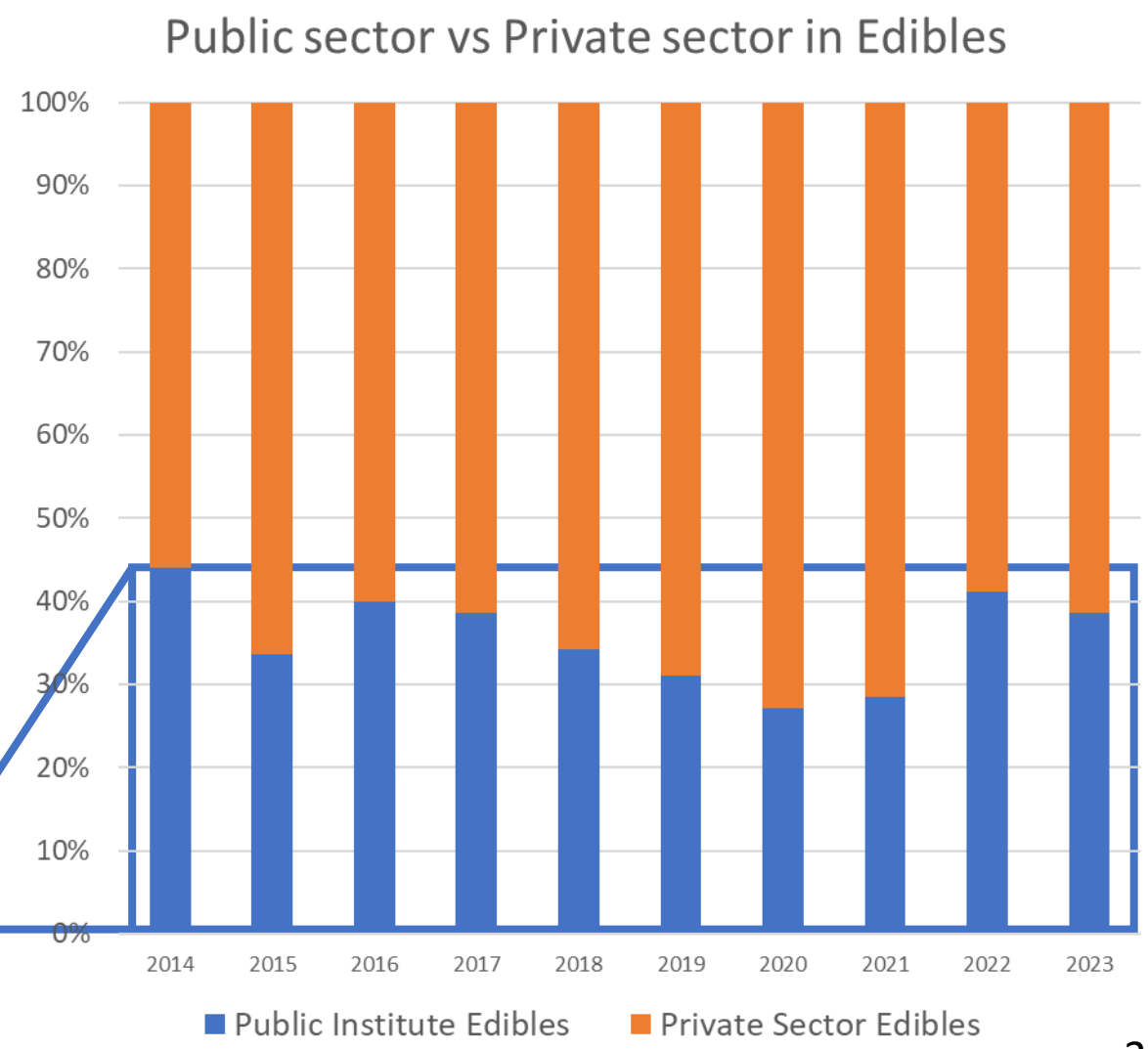
(Resistance characteristics are mainly used in Vegetables and Food Crops)



PBR Application Ratio of Crop Categories Past 10 Years in Japan

(Breeding activities of public sector is increased for Vegetables and Food Crops)





Agricultural Research Policy in Public Sector

Points of the New Basic Plan for Agriculture, Forestry and Fisheries Research Basic concept

【Background】

- Increasingly unstable international food supply/demand due to global population increase and climate change.
- To continue stably supplying quality food while improving our food self-sufficiency ratio, we need to make agriculture, forestry and fisheries, which have experienced a weakening of their production base (e.g., aging of and a decrease in workers), more attractive to young people so these industries can give them hope.

【Aims】

- Give priority to “R&D for promptly solving problems faced by the producers,” thereby facilitating joint R&D with extension services, farmers, and other stakeholders.
- Establish a new system of industry-academia-government collaboration that links seeds for cutting-edge technologies, such as ICT and robot technologies, to the value chain of domestic agricultural, forestry and fishery products.
- Steadily promote R&D on the challenges that should be addressed with medium- to long-term perspectives such as global warming and the falling birth rate/aging population, by setting a basic direction for the future

Addition to New Disease resistance Characteristics at National Level (Vegetables and Food Crops)

- Breeding of new variety of vegetables and food crops is active by public sector and private sector in Japanese market.
- Distribution of food crops varieties in the market in Japan which are mainly distributed the varieties bred by Public sector (National Agricultural Research Organization (NARO) and local governmental institutes etc.).
- Japan is a long national lands from North to South, Hokkaido prefecture is in North part of Japan, and Okinawa prefecture is in the South part of Japan which are totally different climate.
- The agricultural issues which could be resolved by breeding of new varieties, which has different issues at region by region.

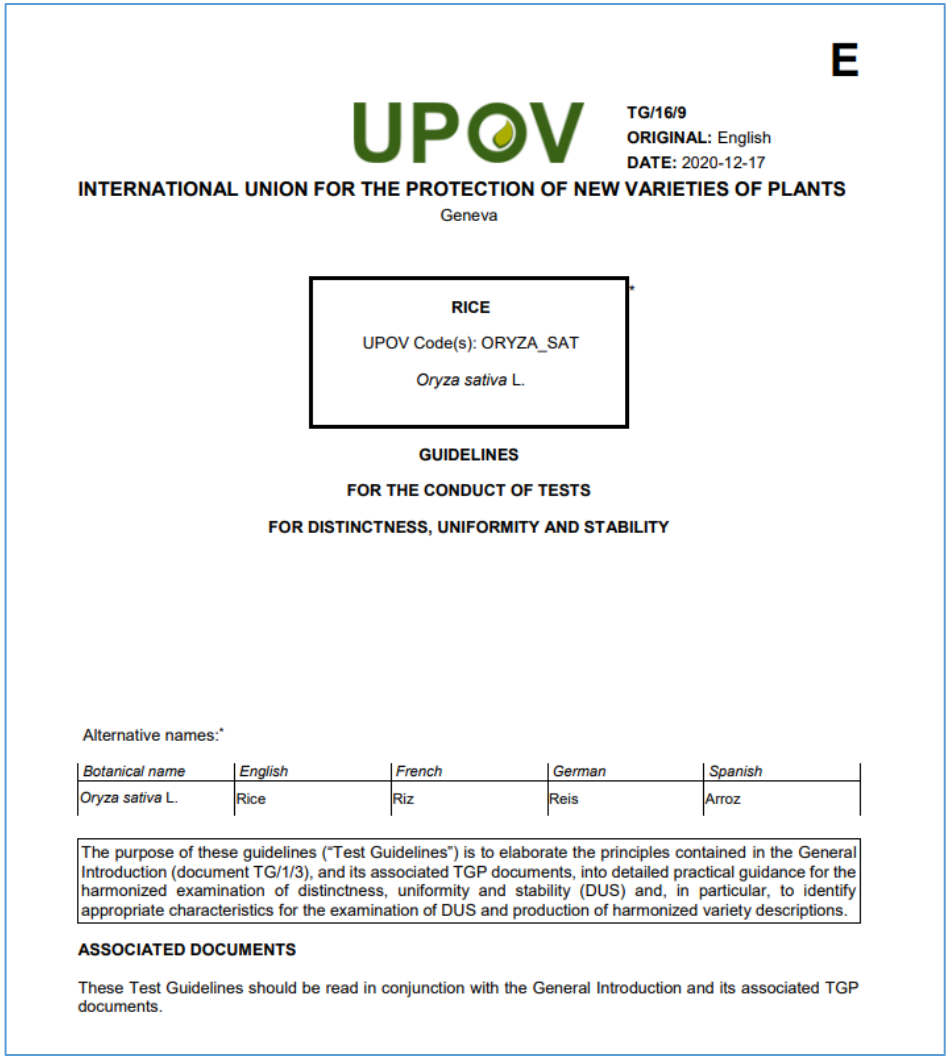
PVP office of Japan takes care of addition new characteristics by breeding activities, particularly agricultural policy of New Basic Plan for Agriculture, Forestry and Fisheries Research Basic.

Example of Rice (Oryza sativa L.)

UPOV TG for Rice

- ➢41 Morphological characteristics
- ➢3 physiological characteristics

- Endosperm: content of amylose
- Lemma: coloration with phenol
- Grain: alkali digestion



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UPOV

TG/16/9
ORIGINAL: English
DATE: 2020-12-17

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS
Geneva

RICE
UPOV Code(s): ORYZA_SAT
Oryza sativa L.

GUIDELINES
FOR THE CONDUCT OF TESTS
FOR DISTINCTNESS, UNIFORMITY AND STABILITY

Alternative names:*

Botanical name	*English*	*French*	*German*	*Spanish*
Oryza sativa L.	Rice	Riz	Reis	Arroz

The purpose of these guidelines ("Test Guidelines") is to elaborate the principles contained in the General Introduction (document TG/1/3), and its associated TGP documents, into detailed practical guidance for the harmonized examination of distinctness, uniformity and stability (DUS) and, in particular, to identify appropriate characteristics for the examination of DUS and production of harmonized variety descriptions.

ASSOCIATED DOCUMENTS

These Test Guidelines should be read in conjunction with the General Introduction and its associated TGP documents.

Addition new characteristics at National Level for Rice
(Oryza sativa L.)

Japanese national TG for Rice

- 45 Morphological characteristics (41 Harmonized with UPOV, 4 characteristics addition at national level)
- 3 UPOV physiological characteristics + 16 national physiological characteristics

1. Endosperm: content of amylose
2. Lemma: coloration with phenol
3. Grain: alkali digestion
4. Damaged type of cold tolerance
5. Lodging resistance of terrestrial
6. High temperature tolerance
7. Glutelin content in endosperm
8. Cadmium absorbency
9. Cesium absorbency
10. Resistance to Pyrimidinyl Carboxy herbicides: bispyribac sodium
11. Genotype of blast resistance
12. Resistance to blast on leaves (leaf blast)
13. Resistance to blast on panicles (panicle blast)
14. Genotype of bacterial leaf blight resistance
15. Resistance to bacterial leaf blight
16. Genotype of rice stripe disease resistance
17. Genotype of green rice leafhopper resistance
18. Genotype of brown rice plant hopper resistance
19. Resistance to brown spot

Addition new characteristics at National Level for Rice
(Oryza sativa L.)

➢Resistance to blast on leaves (leaf blast)

[Definition]

Level of cadmium concentrations

[Testing Method]

1. Maintenance of pathogens

   Medium: Stored and maintained in PSA (potato sucrose agar) medium.

2. Preparation of the inoculation source

   Spores are formed on the PSA medium, and the spores are flushed from the medium with tap water. After filtration with gauze, check under the microscope at 150 times, and the concentration of spores is adjusted to 30 – 50 spores.

3. Growing plants

   Apply a lot of nitrogen fertilizers and cultivate seedlings in the field seedling.

3. Inculcation Evaluation Methods

   When the seedlings are in the 3-leaf stage, spray inoculation with a spore liquid about 50 ml/m2 in the evening.

Addition new characteristics at National Level for Rice
(Oryza sativa L.)

➢Cadmium absorbency

[Definition]

Level of cadmium concentrations

[Testing Method]

1. Growing plants

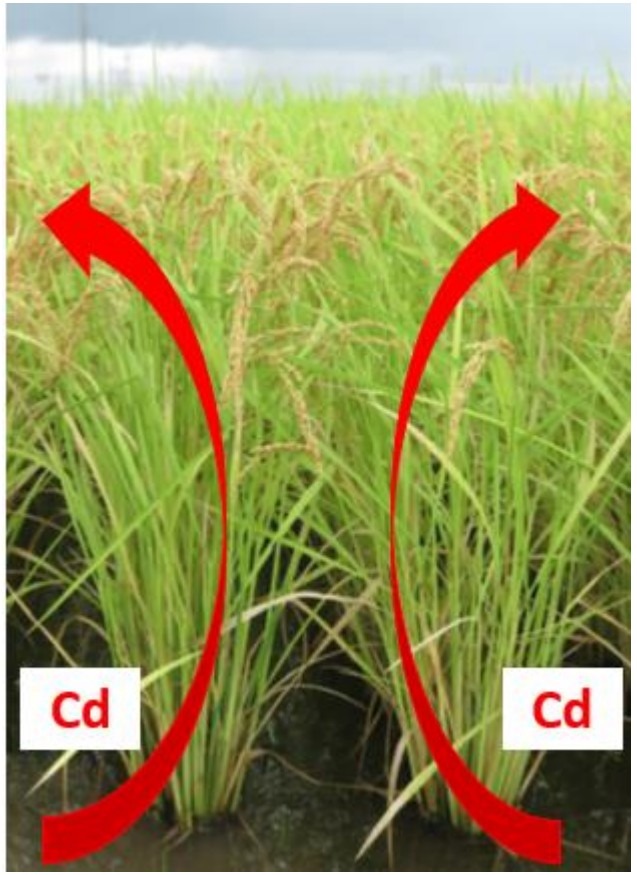
   In a field with a relatively high concentration of soil cadmium, seedlings of the test material are transplanted to 1 plot with 5 plants 2 or more replicates. Water is dropped from the highest tillering period to the earing period and cultivated until the ripening stage.

2. How to analyze cadmium concentration in grain

   The collected decomposition solution is appropriately diluted with ultrapure water, and the cadmium concentration is analyzed with atomic absorption photometer (AA), inductively coupled plasma optical emission spectrometer (ICP-AES, ICP-OES) or inductively coupled plasma mass spectrometer (ICP-MS). By dividing this by the amount of grain used in the analysis (converted to 15% of the water content of polished grain), the cadmium concentration (mg/kg) of grain is calculated.

3. Evaluation method

   Relative evaluation is based on comparison with example varieties.



New facility constructed for disease resistance test in NCSS Tsukuba in 2024

Example of disease resistance and physiological characteristics

***Fusarium oxysporum* f.sp. *lycopersici* race 2**

Fusarium oxysporum f.sp. *lycopersici* race 2

Symptom Assessment Scale

00
healthy

01
part of
plant wilted

02
half of plant
wilted

03
whole of
plant wilted

04
plant died

Conclusion of our challenges resistance test

✓Catch up breeding activity compare with breeding policy

- to add characteristics by agricultural policy and agricultural research policy.
- to check influence ratio and occurrence frequency disease-causing epidemics
- to consider whether disease resistance characteristic need to be added at national level only or expand international level.

✓Our ideas

- to see breeding activity and breeding technology are improving and changing day to day.
- to need to enough experience of resistance test when introducing new characteristic at international level.
- to consider introducing new technology (DNA, Image) to replace handwork inoculation and observation.
- International cooperation (to avoid the phytosanitary issue of import inoculation sources) .

Thank you very much for your attention !!

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