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SIII-2

Plant quarantine: another way to control plant diseases

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Plant pathology ultimately tries to develop control methods for plant diseases. The various control methods are classified as regulatory, cultural, biological, and chemical, depending on the agents employed (Agrios, 1997). Plant diseases can be more effectively controlled when these methods are integrated. However, the importance of the regulatory methods has been overlooked rather than that of other methods. Regulatory methods aim at excluding pathogens from hosts or from certain areas by means of legal procedures including plant quarantines.

When foreign pests are carelessly introduced to new areas of the world, serious losses can result (Waterworth and White, 1982). The Dutch elm fungus, the chestnut blight fungus, the grape downy fungus and the citrus canker bacterium are examples of pathogens that caused severe damage after introduction in Europe and USA. The examples are also found in Korea. Introduced pathogens from overseas are listed up to 22 species since 1910. Among the pathogens, the potato blight fungus, the rice blight bacterium and the carnation leaf spot fungus cause severe damage (Lee, 1996). Recently the diseases caused by the tomato Verticillium wilt fungus and the gourd root rot fungus have been severely occurred over the country.

Plant quarantine aims to prevent the introduction and spread of harmful pests to new areas. The first evidence of the plant quarantine was in France in 1660 when a barberry suppression edict was issued in order to prevent the spread of wheat stem rust (Palm, 1999). Many countries began to enact plant quarantine legislation from the end of 19C. In Korea, quarantine legislation was first enacted on imported cherry trees and other fruit trees in 1912, but the real quarantine practices had not been conducted until promulgation of the Plant Protection Act in 1961.

In order to develop more precise requirement for international phytosanitary measures, the Agreement on Sanitary and Phytosanitary Measures (SPS) under the World Trade Organization was adopted in 1994 (WTO, 1994). The main goal of

the SPS is to ensure that phytosanitary measures on trade are applied only for plant health and are based on scientific principles. For harmonization with the SPS, the Plant Protection Act of Korea was revised in 1995. Under the act, the National Plant Quarantine Service (NPQS) has conducted quarantine inspection on all imported plants and plant products at the international ports to prevent the introduction of exotic pests. The NPQS also inspects agricultural products for export to meet the requirements of the importing countries.

When quarantine pathogens are detected from the agricultural products during the inspections, appropriate actions including destruction, re-shipment or treatment are taken. Quarantine pest is defined as a pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled. More than 300 shipments of agricultural products were destroyed or re-shipped in 2003 in Korea, because they were infested by quarantine pathogens including Arabis mosaic virus.

In order to support science-based plant quarantine activities, 13 researchers including myself are responsible for conducting research and teaching port inspectors. Our research fields are mainly focused on:

- Development of detection and identification methods for plant quarantine pests
- Study of distribution, ecology and management options of plant pests
- Development of treatment methods for importing and exporting plants

Seeds can be efficient means of moving pathogens between geographical regions (McGee, 1997). Therefore I carried out the project on the identification of seed-borne fungi having quarantine significance from 2001 to 2003. Using the results, the identification manual was published for port identifiers this year.

In summary, plant quarantines are important control methods that exclude exotic pathogens. For the best control effect, it should be based on scientific principles.

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SIII-3

Molecular taxonomy and speciation in *Pythium* and *Phytophthora*

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Pythium and *Phytophthora* are genera of the algae-like Oomycetes in the Straminipile clade of the kingdom Chromista . They comprise many plant pathogens with an important impact on agriculture and forestry including some species among *Phytophthora* that have caused very severe outbreaks. Classic taxonomy is based on morphology. Unfortunately, characters often vary among isolates of the same species, and show significant overlap among species. Therefore, species delimitation and identification is notoriously difficult. Molecular methods may overcome these problems and are increasingly being used for identification and phylogenetic studies.

Pythium: phylogeny, species delimitation and detection

In a study of *Pythium*, we used a variety of molecular methods to study more than 500 isolates, representing all species presently available in pure culture (approx. 100). One representative isolate of each species was used for sequencing of the ribosomal internal transcribed spacer (ITS): all ex-type, neo-type, authentic or otherwise well defined representative strains. For half of the species, the D1-D3 regions of the large subunit