静岡県における薬剤耐性菌の発生と防除対策　ー茶病害の場合ー

／Occurrence and control of fungicide - resistant pathogens in Shizuoka prefecture – In case of tea diseases

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Shizuoka prefecture is the greatest tea production center in Japan. The tea cultivar with much planting is “Yabukita”, it occupies more than 80% of all cultivation area of tea plant in Japan. However, fungicides are overused to ”Yabukita” for disease control, because it is susceptible to many diseases. Therefore, fungicide-resistant pathogens were easy to appear, and outbreak of benzimidazole-resistant strains of *Colletotrichum theae-sinensis* (Anthracnose), *Pestalotiopsis longiseta* (Gray blight), and *Pseudocercospora ocellata* (Brown round spot) have been confirmed already. Recently, DMI fungicides become overused for control of tea diseases in Shizuoka prefecture, and outbreak of DMI-resistant strains is concerned in future. As a result of investigated sensitivity to triflumizole and difenoconazole of 36 isolates of *Colletotrichum theae-sinensis* collected from the tea field where DMI fungicides overused in 1999, two isolates of slightly low sensitivity against triflumizole and difenoconazole were confirmed, but the remarkable fall of sensitivity wasn’t recognized in overall. In addition, sensitivity to difenoconazole of strains of *Pseudocercospora ocellata* collected from the fungicide-free tea field in 1996 was investigated, and baseline was clarified.

青森県におけるリンゴの散布回数削減防除体系と耐性菌

／Reduced　application programs and fungicide resistance on apple in Aomori prefecture

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青森県では毎年、リンゴ病害虫防除謄を作成し、これに基づいて指導している。 防除暦における殺菌剤の散布回数は 1981 年の 16 回をピークに除々に減り、2004 年には 11 回に削減された。 この散布回数削減のために散布体系を 10 日から 15 日間隔にする試験が数多く行われた。 試験成果は新しい系統のＤＭＩ剤やストロビルリン系殺菌剤などによるところが大きかった。 最近はリンゴ生産現場においてストロビルリン系殺菌剤は各種病害に対して防除効果が優れ、また収穫前日まで使用できるので早生品種の収穫時期にあたる 8 月後半から 9 月上旬に多用されていた 。

ナシ減農薬栽培の現地事例

／Efficacy of reduced fungicidal applications in controlling diseases of Japanese pear

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A supervised disease management system that halves the number of fungicide applications on Japanese pear was investigated from 2002 to 2004 in two commercial orchards of Fukuoka Prefecture. Scab on leaves and fruit caused by *Venturia nashicola* commonly occurs at the orchards in the hillside of Fukuoka Prefecture. The recommended number of sprays (seven times) were compared with reduced (four times) fungicide applications during autumn to spring seasons. Severity of scab was higher in reduced applications when compared to recommended applications. During summer season, significant reduction in scab incidence was noticed in reduced applications (five times) over recommended eight sprays. However, the incidence of fruit ring rot caused by *Botryosphaeria berengeriana* was higher in reduced fungicide treatments. On the other hand, at the orchard in a plain land, scab tends hardly to develop in reduced applications. Further, there were not much significant differences in scab severity between recommended and reduced spray treatments. During summer season, both scab and fruit ring rot diseases in reduced applications were on par with recommended applications. It is suggested that reduced applications be recommended on plain lands to control scab and fruit ring rot diseases of Japanese pear.

イネ種子の流通実態について

／Domestic distribution of rice seed

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日本の稲種子は法律「主要農作物種子法」のもと、各都道府県の種子協会が中心となり、奨励品種をはじめとする品種群の県内ならびに県間の需給調整を行っている。 種子の生産にあたっては圃場審査や生産物審査が行われ、通常のコメ生産以上に厳密な審査が行われており、これにより種子の種類も決定される。平成１５年の種子流通量は全国で４６千トンであり、このうち約3.9 千ト

ンが県間流通分である。北陸東海や近畿地区は県外向けの種子販売量が著しく多く、逆に関東甲信越や中四国、九州では県外からの種子購入の割合が高い。種子更新率は年々高まっており、平成１６年では ７９％ となっている。

イネにおける MBI-D 剤、Qol 剤耐性菌対策
／Management strategies for MBI-D and Qol-fungicide resistance in the rice blast fungus (*Pyricularia oryzae*)

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Scale-free ネットワークとしてのいもち病伝染経路と耐性菌対策
／Management strategies of fungicide resistance for rice blast fungus (*Pyricularia oryzae*) considering the nature of the infection cycle behaving as a scale-free network

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第 15 回殺菌剤耐性菌研究会シンポジウム講演要旨(2005, P45-52) ／Abstracts of the 15th Symposium of Research Committee on Fungicide Resistance

It is very hard to give experimental evidence to show that any possible measures could be effective on preventing resistant types of a fungal plant pathogen against a fungicide from the build-up, because conducting appropriate filed experiments is difficult. Elegant mathematical models could be a useful tool to explore effective management strategies for reducing the development of fungicide resistance. Conventional mathematical models do not include a few essential components of the rice blast-fungicides system: the bottleneck effect during overwintering and migration of the pathogen. In particular, the migration is caused by short- and long-distance spore dispersals and distribution of infected seed. Since use of commercial seed from the local seed farms has currently dominated in major rice growing areas, the infection routes can be considered as a scale-free network, where the seed farms play a role as “hub”. A lattice-structured model including these components suggested that the rotation of alternative fungicides may not be so effective without a fitness cost of the resistance. On the other hand, the model demonstrated that extremely dominant use of commercial seed in the regions is effective to reduce the risks of build-up of fungicide resistance, probably because of the nature of a scale-free network. At the same time, isolation of seed farms from ordinary farms should be also recommended to avoid contamination of resistant strains resulting from long-distance dispersal of the spore.

Impact of drug transporters on virulence, fungicide sensitivity and multidrug resistance

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Drug transporters are membrane proteins that can provide organisms protection against natural toxic products and fungicides. In plant pathogens drug transporters may function in virulence on host plants, baseline sensitivity to fungicides, and multidrug resistance. This paper describes drug transporters in *Aspergillus nidulans*, *Botrytis cinerea*, and *Mycosphaerella graminicola* and cases of multidrug resistance in agriculture. Prospects for future development of MDR in plant pathogens and implications for drug discovery are discussed.