

inoculation decreased stem length by 14 percent and fresh weight by 38 percent. In conclusion, flower quality and the stem length of Longiflorum hybrid cultivar were affected by LMoV and CMV infection.

2-44. Antimicrobial active clones from soil metagenomic library.

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Soil metagenome is untapped total microbial genome including that of the majority of unculturable bacteria present in soil. We constructed soil metagenomic library in *Escherichia coli* using DNA directly extracted from two different soils, pine tree rhizosphere soil and forest topsoil. Metagenomic libraries constructed from pine tree rhizosphere soil and forest topsoil consisted of approximately 33,700 clones and 112,000 clones with average insert DNA size of 35-kb, respectively. Subsequently, we screened the libraries to select clones with antimicrobial activities against *Saccharomyces cerevisiae* and *Agrobacterium tumefaciens* using double agar layer method. So far, we have a clone active against *S. cerevisiae* and a clone active against *A. tumefaciens* from the forest topsoil library. *In vitro* mutagenesis and DNA sequence analysis of the antifungal clone revealed the genes involved in the biosynthesis of antimicrobial secondary metabolite. Metagenomic libraries constructed in this study would be subject to search for diverse genetic resources related with useful microbial products.

2-45. Internet-based Information System for Agricultural Weather and Disease and Insect fast management for rice growers in Gyeonggi-do, Korea

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The Gyeonggi-do Agricultural Research and Extension Services has developed a web-site (www.epilove.com) in collaboration with EPINET to provide information on agricultural weather and rice disease and insect pest management in Gyeonggi-do. Weather information includes near real-time weather data monitored by automated weather stations (AWS) installed at rice paddy fields of 11 Agricultural Technology Centers (ATC) in Gyeonggi-do, and weekly weather forecast by Korea Meteorological Administration (KMA). Map images of hourly air temperature and rainfall are also generated at 309m x 309m resolution using hourly data obtained from AWS installed at 191 locations by KMA. Based on near real-time weather data from 11 ATC, hourly infection risks of rice blast, sheath blight, and bacterial grain rot for individual districts are estimated by disease forecasting models, BLAST, SHBLIGHT, and GRAINROT. Users can diagnose various diseases and insects of rice and find their information in detail by browsing thumbnail images of them. A

database on agrochemicals is linked to the system for disease and insect diagnosis to help users search for appropriate agrochemicals to control diseases and insect pests.

2-46. Characterization of A cDNA encoding A Novel Phenazine Compound in Hot Pepper

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From the PMMV (pepper mild mottle virus)-inducible ESTs differentially expressed in *Capsicum chinense* PI257284, we isolated a full-length cDNA (CcPHZF: *Capsicum chinense* phenazine), encoding a phenazine biosynthesis protein which catalyzes the hydroxylation of phenazine-1-carboxylic acid to 2-hydroxyphenazine-1-carboxylic acid. Phenazine compound has been known to exhibit broad-spectrum of antibiotic activity against various species of bacteria and fungus. The entire region of CcPHZF is 879 bp in length and the open reading frame predicted a polypeptide of 292 amino acids. The homolog of CcPHZF is not present in database except clones of AC004044 and NM100203 from *Arabidopsis* with 58 and 59%, respectively. Genomic Southern analysis indicated that the pepper genome contains a single copy of CcPHZF. The CcPHZF was strongly induced in the pepper leaves 3 days after PMMV treatment, when HR occurs on the leaf surface. Characterization of CcPHZF is underway to investigate if the CcPHZF is related to disease resistance against pathogens.

2-47. Development and Improvement of fungicidal spray program for apple production.

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A basic spray program for apple in which fungicides are scheduled to spray at 15-day interval from petal fall to late August was formulated on the properties of several selected fungicides. In order to improve it, experimental plots, completely randomized block with 3 replications, were prepared in an orchard of 15 years old Fuji cultivar, and the spray programs in which only one chemical in the basic spray program was substituted with others were applied to each plot. It was revealed that only single substitution of the fungicide in the basic spray program makes a great differences in the control of white rot and bitter rot, and that the control property of the fungicides against the two diseases was quite variable even by the time of application. A similar trial was conducted in 2002 with a new basic spray program that was formulated with fungicides that have shown best control in each spraying time in the previous trial, similar results were obtained. Applying this method, the usefulness of certain fungicide in the spray program for apple could be properly assessed. Anthracnose of *Robinia pseudo-acacia* L. caused by *Collectotrichum* spp.