

### III. 진균병학(방제)

#### C-01. Control of Pear Scab (*Venturia nashicola*) with Natural Materials. Young-Seob Park<sup>1</sup> and Ki-Youl

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Pear Scab occurs wherever pears are grown. Heavy crop losses from Scab occurred in the commercially important cultivars (Niiitaka, Okusankichi, Whangkeumbae) in Naju, Ulsan and others areas during the last year (1998). In this study, our purpose were focused to control scab with natural materials for blooming season stage. Control was treated with pyroligneous liquor, vinegar (rice), Chitosan, Pyroligneous liguor + fungicide (1/3). Control values of leaf treatment are Niiitaka 29.1%, Okusankichi 51.1%, Whangkeumbae 72.3% respectively. However, Pyroligneovs liquor, vinegar, Chitosan treated plants did not protected them against Pear Scab, the infected fruit in Okusankichi was surveyed 36.5% before bagging, 59.3% after bag removing to treated Pyroligneous liquor + fungicide (1/3). However, Other treatments were infected them with scab 45.1% before bagging, 100% after bag removing.

#### C-02. Purification and Characterization of an Antifungal Protein from *Paenibacillus macerans* PM-1 Antagonistic to Rice Blast Fungus, *Pyricularia oryzae*. Dong Won Bae<sup>1</sup>, Yeon Sik Kawk<sup>1</sup>, Jun Teak Lee<sup>1</sup>,

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An antagonistic microorganism which inhibits the growth of *Pyricularia oryzae* causing rice blast disease was isolated (PM-1) and identified as *Paenibacillus macerans*. The strain PM-1 displayed the broad antifungal spectra against all *P. oryzae* isolates tested. Mycelial growth of rice blast fungi was strongly inhibited by culture supernatant of strain PM-1 compared with untreated control, KJ 301: 93-39, the most predominant race in Korea. The antifungal activity was highest for culture supernatant (CS), followed by CS heat-treated at 80 °C for 20 min, CS at 121 °C for 5 min, and supernatant of sonicated cells in decreasing order. The suppressive effect of CS on the conidial germination of rice blast fungi was 59.2% - 81% for 5 isolates tested. An antifungal protein was purified from strain PM-1. The apparent molecular weight of the purified protein was determined as 8 kDa and 9 kDa by SDS-PAGE, and analytical gel filtration, respectively, suggesting a monomeric structure. The antifungal protein was stable at pH range of 7 - 12 and up to 100 °C. The protein was very stable at 1% Tween 20 and Triton X-100. The N-terminal amino acid sequence of the protein was T-E-L-P-L-G-I-V-M-D-K-Y-T-D-A-F-K-F-D-M-F. Comparison of the determined sequence with other peptide and DNA sequences revealed that the protein was novel. The conidial germination *in vitro* of the fungus KJ 301: 93-39 by the purified protein (5.9 µg/ml) was limited to 9% only, compared with 69% of the control. The conidial germination of the fungus KJ 301: 93-39 was strongly inhibited at the rice leaves treated with the purified protein. The conidia, even though germinated, could not develop further to produce appressoria efficiently.

**C-03. Distribution of Mating Type and Variability in Sensitivity to Chemicals of *Phytophthora infestans* in Daekwallyong Area in Korea.** Whan Hong Chun<sup>1</sup>, Byung-Sup Kim<sup>1</sup>, Jin-Hoe Choi<sup>1</sup>, Kyoung-Yul Ryu<sup>2</sup>, Jeom-Soon Kim<sup>2</sup> and Young-Il Hahm<sup>2</sup>. <sup>1</sup>Dept. of Horticulture, Kangnung National University, Jibyun Dong 123, Kangnung Shi, Korea 210-702. <sup>2</sup> Potato Division, National Alpine Agriculture Experiment Station. RDA, Pyungchang, Kangwon 232-950, Korea.

Isolates of *Phytophthora infestans* from four locations (Hoenggae, Jinbu, Kangnung and Wangsan) in 1998 were examined for mating type distribution and sensitivity to chemicals. Mating type of isolates were differently distributed from Hoenggae to Kangnung area. In 11 isolates collected in Hoenggae, 9 isolates determined A2 mating type. But 14 isolates in 16 isolates collected in Kangnung determined A1 mating type. Sensitivity to metalaxyl of the *P. infestans* isolates was determined by mycelial growth on V8-juice agar amended with 10  $\mu\text{g}/\text{mL}$  metalaxyl. About 45% of the isolates examined were highly resistance to metalaxyl, 55% of the isolates were intermediate resistance. However, sensitive isolate was not detected in this area. Variation on metalaxyl sensitivity among isolates was not correlated within and between mating type. Also resistance to dimethomorph was examined on V8-juice agar containing 0.1, 1, 5, 10  $\mu\text{g}/\text{mL}$  dimethomorph.. Above 1  $\mu\text{g}/\text{mL}$  concentration, collected isolates were highly sensitive to dimethomorph. These results may explain, at least in part, why growers do not attain expected stands when they treated with metalaxyl to control potato late blight.

**C-04. The Suppression Effect of Spent Mushroom Compost on Cucumber Damping off Caused by *Rhizoctonia solani* AG4.** Dong-Bum Shin, Jae-Min Cho, Yeon-Kyu Hong, Hang-Won Kang, Hen-Je Cho, Kyeong-Bae Park<sup>1</sup> and Hyun-Uk Lee<sup>2</sup> <sup>1</sup>National Yeongnam Agricultural Experiment Station, Milyang, Korea 627-130, <sup>2</sup>Kyeongnam Provincial Agricultural Technology Administration, Chinju, Korea 660-370.

To evaluate SMSs (Spent mushroom substrates) for effectiveness in suppression of cucumber damping off caused by *Rhizoctonia solani* AG4, two sources of SMSs from the by-product of *Flammulina velutipes* and *Pleurotus ostreatus* cultivation were applied to nursery soil. Both SMSs were showed suppression effect to cucumber damping off, but were not showed suppression effect to seed germination and root growth of cucumber. When the proportion of SMSs in nursery soil 10% (vol./vol.), the disease was reduced 68% and 60%, respectively. And *Trichoderma* sp. were isolated abundantly, and *Penicillium* sp. and *Aspergillus* sp. also were isolated from these SMSs. When these antagonistic microorganisms were treated nursery soil after incubating in mushroom culture media of *F. velutipes*, cucumber damping off was significantly reduced.

**C-05. Variation in Some Characteristics of *Phytophthora capsici* Mutants Induced by Metalaxyl.** Jeong Young Song and Hong Gi Kim. Department of Agricultural Biology, Chungnam National University, Taejon 305-764, Korea.

*Phytophthora capsici* is known to be one of the most important phytopathogenic fungi infecting a number of plant species including pepper, tomato, watermelon, eggplant and cacao. Isolate CM605 isolated from the red pepper stem, was inhibited over 90% in mycelial growth on V-8 agar medium containing metalaxyl 2 $\mu\text{g}/\text{mL}$ . Metalaxyl is a systemic fungicide widely used for controlling diseases caused by

*Phytophthora* species. Variation in some kinds of characteristics of *P. capsici* was detected during our recent research on the effect of the fungicide on genetic variation. Growing isolates CM605-50 and CM605-1000 of this fungus on medium containing 50 $\mu$ g/ml, 1,000 $\mu$ g/ml metalaxyl, respectively for 4 weeks, were obtained from CM605 used as a parental isolate. These metalaxyl-resistant mutants varied their growth rate, colony morphology, and lasted characters changed to five successive subcultures on the metalaxyl-free medium. In pathogenicity test used ten cultivars including Dabok, CM605-50 lost its virulence, whereas CM605-1000 showed it weakly than parental isolate, CM605. It suggests that genetic variation of *Phytophthora capsici* could be induced by metalaxyl in the culturing fields.

**C-06. Control of Cucumber Powdery Mildew (*Sphaerotheca fuliginea*) by Acidic Electrolytic Water.**

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This experiment was carried out to control powdery mildew by electrolytic water in cucumber. When the acidic electrolytic water (pH 2.5) was sprayed on cucumber after planting in 3 and 7 days intervals, degrees of diseased plants of 3 days, 7days, standard control (triflumizole WP,  $\times$ 2000) and non-treated were 8.5%, 19.2%, 3.0%, and 45.8%, respectively. Conidia germination and formation were investigated to elucidate the effect of electrolytic water on *Sphaerotheca fuliginea*. While conidia formation was inhibited by electrolytic water (pH 2.5, 3.5), it was well formed when adjusted pH 2.5, 3.5) with HCl solution. However, conidia germination was not effected by electrolytic water. Oxidation-reduction potential (ORP) of pH 2.5 and pH 3.5 electrolytic water were 1130mV and 1060mV, but ORP of pH 2.5 and pH 3.5 adjusted with HCl solution were 550mV and 490mV.

**C-07. Control of *Phytophthora* Root Rot of Lettuce by Potassium Phosphonate in Hydroponics.**

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The *Phytophthora* root rot of lettuce caused by *P. drechsleri* was reported as a major disease in hydroponics. Effect of potassium phosphonate (KH<sub>2</sub>PO<sub>3</sub> or K<sub>2</sub>HPO<sub>3</sub>) on control of the disease was evaluated in the greenhouse and farms. The phosphonate 200ppm completely inhibited mycelial growth of *P. drechsleri* and several other species in the genus. However, growth of lettuce, pepper, cucumber and tomato were not affected at the concentration. The phosphonate 200 ppm completely controlled *Phytophthora* root rot of the plants, while untreated control plots showed 100% infection in the greenhouse. When the phosphonate 200 ppm was applied to a severely infested farm revealing over 95% infection rate, most plants but dead were resurrected in 7 days. Population density of the heavily infested unit was ca. 22.0-25.0 ppg / 100 ml, but decreased into 1.3-2.0 ppg at 7 days after treatment. In farm trials, *Phytophthora* root rot of lettuce initiated in 7-14 days after transplanting in hydroponics and developed rapidly up to 83-92% infection at 42 days after in conventional practices. Contrarily, the disease did not occur in the phosphonate 100 ppm treated plot until 28 days and remained <2% infection until end of the cultivation. Phosphonate amendment into nutrient solution was highly successful to control of various *Phytophthora* diseases, which are known the most serious diseases in hydroponics.

**C-08. Tropospheric Ozone Patterns in Korea During 1990-1997 Using Several Ozone Indices for Protection of Vegetation.** Sung-Chul Yun<sup>1</sup>, Yong-Kyu Han<sup>1</sup> and Eun-Woo Park<sup>1</sup>. <sup>1</sup>Seoul National University,

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Ozone has been proved as the most phytotoxic air pollutant. Especially, chronic damages to the plants without typical foliar injury, such as decreasing photosynthesis, changing carbon allocation, and reducing biomass, can be caused at 40-60 ppb which is quite low and frequently occurs in Korea during the summer. In order to assess the chronic impact of tropospheric ozone on vegetation in Korea, ozone exposure has to be quantified in relation to damage of vegetation. The sum of hourly concentrations at or above 0.06 ppm (SUM06) and the accumulated exposure over a threshold of 40 ppb (AOT40) which have been widely used as ozone indices in the US and Europe were calculated based on hourly ozone concentrations at 128 ozone monitoring sites during 1990-1997. The SUM06 levels at most sites were 1-5 ppm·hr. However, several areas in Northern and Eastern Seoul reached approximately 5-7 ppm·hr in 1996-1997. The AOT40 values were also as high as 17-24 ppm·hr. Although the SUM06 levels were not higher enough to expect significant damage to vegetation in Korea, the overall ozone indices and the annual average of hourly ozone concentrations have increased continuously over the last 8 years. In order to protect Korean vegetation, the ambient ozone has to be continuously monitored and the monitoring sites need to be extended out to suburban and rural areas.

**C-09. An Information Delivery System for Implementation of a Forecasting System for Rice Blast Development Based on Real-time Weather Data.** Kyu Rang Kim<sup>1</sup>, Eun Woo Park<sup>1</sup>, Wee Soo Kang<sup>1</sup>, Sung Kee Kim<sup>2</sup>, Soon Sung Hong<sup>2</sup> and Jang Souck Yang<sup>2</sup>. <sup>1</sup>Seoul National University, Suwon, Korea 441-744. <sup>2</sup>Kyonggi Agricultural Research and Extension Services, Hwasong, Korea 445-970.

An information delivery system for implementation of a forecasting system for rice blast development based on real-time weather data was developed on a PC server with the Linux OS. The system is composed of four servers or programs: weather data management server (WDMS), database server (DS), program server (PS), and web server (WS). WDMS regularly retrieves hourly weather data from ten automated weather stations installed at ten experimental rice paddy fields over the country through telephone modems. WDMS transmits the new data to DS, which manages weather and disease tables by updating and providing data in the tables to other servers. In PS, a simulation model (BLAST) for forecasting rice blast development calculates daily leaf blast severity and panicle blast incidence based on hourly weather data provided by DS. The information in the disease and weather tables can be readily distributed through the Internet. WS provides request forms for weather and forecasting data on the web browser. On the browser, users may choose the location and year, and then specify data to be shown. Upon request for specific data, WS searches for stored data in DS and presents the requested data on the web browser in graphic or text form.