

domain (amino acid residues 551 to 580). Recombinant *E. coli* Top10<sup>1</sup> harboring the cloned chitinase gene (pCHI-N1 and pCHI-1) showed chitinase activity on media containing colloidal chitin. Among two chitinases, N1 chitinase was overexpressed driven by T7lac promoter in *E. coli* BL21 by pET42-a vector. The reconstruction of biocontrol agent *B. amyloliquefaciens* A-2 to improve biocontrol efficacy is in progress by introducing the cloned chitinase gene into the strain A-2.

**D-49 Antifungal activity of *Bacillus* sp. against various plant pathogens.** Hui-Seon Jeong<sup>1</sup>, Sang-Pyo Lee<sup>1</sup>, Kwon-Jong Kim<sup>1</sup>, Jong-Sang Cheong<sup>2</sup>, Sun-Ju Moon<sup>2</sup>, Kwang-Ho Cha<sup>2</sup>, Hyun-gon kang<sup>1</sup>, Min-Seob Yeo<sup>1</sup>, Hyun-Sik Lim<sup>1</sup>, Sang-Woo Kim<sup>1</sup> and Youn Su Lee<sup>1</sup> <sup>1</sup>College of Agriculture and Life Sciences, Kangwon National University, Chuncheon 200-701, Korea; <sup>2</sup>B.I.G Co., Ltd, Taejeon 306-230 Korea,

We conducted in vitro tests with *Bacillus* sp. to show the inhibition of growth of various plant pathogenic fungi. A wide range of antifungal activity of *Bacillus* sp. was found against the plant pathogenic fungi. Pathogenic fungi tested included *Alternaria solani*, *Colletotrichum gloeosporioides*, *Fusarium oxysporum*, *Phytophthora capsici*, and *Rizoctonia solani*. *Bacillus* sp. was the most effective to inhibit the growth of *Colletotrichum gloeosporioides*, *Alternaria solani*, and *Rizoctonia solani*. As a result, *Bacillus* sp. was proved to be a potential biocontrol agent for tested plant pathogens. In addition, diluted *Bacillus* sp. broth was also suppressed the mycelial growth of nearly all test fungi. *Bacillus* sp. was the most effective for the control of the mycelial growth of *Alternaria solani*.

**D-50 Screening of a antagonistic actinomycetes against *Plasmodiophora brassicae* causing clubroot disease of Chinese cabbage.** Chang-Guk Kim, Shun-Shan Shen and Chang-Seuk Park. Division of Plant Resources and Environment, Gyeongsang National University, Jinju 660-701, Korea.

Total of 681 actinomycetes isolates were collected from rhizosphere soils of various plant species growing in high mountain, forest fire area, or reclaim land. The isolates were proliferated in liquid media then mixed into pot mixer prior to inoculated in resting spores of *Plasmodiophora brassicae*. Chinese cabbage were planted in pathogen inoculated soil and evaluated the disease suppression of each isolate. In preliminary screening trials, 32 isolates showed significant disease reduction compare to

untreated control. Among the isolates, *Streptomyces* sp. IA12-2 was selected as promising biocontrol agent to control the clubroot of chinese cabbage. In addition to inhibition of *Plasmodiophora brassicae*, IA12-2 showed antifungal activities against seven pathogenic fungi, *Rhizoctonia solani*(sheath blight), *Pythium ultimum*, *Phytophthora capsici*, *Fusarium oxysporum*, *Sclerotinia sclerotiorum*, *Botrytis cinerea*, *Colletotrichum gloeosporioides*. Control value of cell suspension of IA12-2, supernatant of liquid culture and cells plus culture extract showed 53%, 81% and 100% respectively.

**D-51 Antifungal activity of semipurified antifungal substance from culture filtrate of *Ulocladium atrum*.** Eun Mi Kwon, Jin-Cheol Kim<sup>1</sup>, and Seung Hun Yu. Department of Agricultural Biology, College of Agriculture and Life Sciences, Chungnam National University, Daejeon 305-764, Korea; <sup>1</sup>Korea Research Institute of Chemical Technology, Daejeon, 305-606, Korea

The antagonistic isolate, CNU 9054 isolated from tomato leaves was identified as *Ulocladium atrum* based on morphological characteristics and rDNA ITS sequence analysis. From the culture filtrate of CNU 9054, antifungal substance(UA-1) was isolated by ethyl acetate partitioning, silicagel column chromatography, and high performance liquid chromatography. UA-1 effectively controlled the development of rice blast (*Pyricularia grisea*), tomato gray mold (*Botrytis cinerea*) and barley powdery mildew (*Blumeria graminis* f. sp. *hordei*) in green house experiment. UA-1 showed strong inhibitory activity against mycelial growth of plant pathogenic fungi. It completely inhibited mycelial growth of *P. grisea* at concentrations of less than 33.3mg/L, *Alternaria alternata* at concentrations of less than 11.1mg/L, and *B. cinerea* at concentrations of less than 0.33mg/L. It also showed inhibitory activity against mycelial growth of *Colletotrichum gloeosporioides*, *C. acutatum* and *Fusarium oxysporum*. UA-1 was tested for its inhibitory activity of conidial germination of the fungus *B. cinerea*. It significantly decreased the germination rate of conidia of *B. cinerea*.

**D-52 Biocontrol efficacy of lyophilized mycelium of *Ophiostoma quercus albino* strain against sapstain of wood caused by ophiostomatoid fungi.** Byung-Ju Cho<sup>1</sup>, Dong-Won Son<sup>2</sup>, Dong-Heub Lee<sup>2</sup>, and Jong Kyu Lee<sup>1</sup> <sup>1</sup>Tree Pathology and Mycology Laboratory, Division of Forest Resources, Kangwon National University, Chunchon, 200-701, <sup>2</sup>Wood Preservation Laboratory, Division of Wood Product and Technology, Forest Research Institute, Seoul, 130-712, Korea