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[1], and Seung Hun Yu. Department of Agricultural Biology, College of Agriculture and Life Sciences,Chungnam National University, Daejeon 305-764, Korea; [1]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[1], Dong-Won Son[2], Dong-Heub Lee[2], and Jong Kyu Lee[1] [1]Tree Pathology and Mycology Laboratory, Division of Forest Resources, Kangwon National University, Chunchon, 200-701, [2]Wood Preservation Laboratory, Division of Wood Product and Technology, Forest Research Institute, Seoul, 130-712, Korea

Pre-treatment of albino strain of *Ophiostoma quercus* on pine wood had been proven to be effective in both laboratory and field trials for the biocontrol of sapstain of wood caused by ophiostomatoid fungi (*The Plant Pathology Journal* 2000. 16(4):200-205). In order to keep viability and activity of the biocontrol agent, mycelial slurry from liquid culture of albino strain was harvested, freeze-dried, and then the powderized mycelium was vacuum-packed in polystyrene tubes with screw cap, stored at a cryotank with liquid nitrogen, refrigerator, and root temperature. Viability and efficacy after long term storage under different conditions were estimated and compared by plating diluted suspension(10^{-3}) with sterilized water on solidified culture medium and spraying directly on sterilized wood chips of *Pinus densiflora* and *P. rigida* in petri dishes, respectively. Mycelial growth of albino strain was also compared in various liquid culture media, and the medium composed of the mixture of brown sugar(30%) and yeast extract(3%) showed the best growth among compared.

D-53 Inhibition of mycelial growth of *Botrytis cinerea* by various essential oils. NG Kim, SW Kang, MH Nam, SJ Yoo, HG Kim. Dept. of Agricultural Biology, Chungnam National University, Daejeon, 305-764, Korea;

As nontoxic environmental-friendly bio-fungicides, several essential oils were tested for antifungal activity against *Botrytis cinerea*, gray mold pathogen of strawberry. *In vitro* bioassay, carvacrol, thymol, eugenol and methyl eugenol were selected and the inhibition rate of the mycelial growth on PDA containing each essential oil was achieved at 100ppm with 82.9%, 94.8%, 76.7% and 43.3%, respectively. In the test for volatile effect, carvacrol, thymol and eugenol showed the inhibition rate of 55%, 52%, 34%, respectively in 4 cm distance and methyl eugenol was ineffective with 15%, at 500μg/disk. Under microscopic observation, cytoplasmic outflow of cell wall from mycelia was shown by treatment of eugenol and methyl eugenol, while carvacrol and thymol showed little cytoplasmic outflow and more inhibition of mycelial growth. *In vivo* test, each essential oil had high level of disease suppression with thymol 41.7%, eugenol 33.3% and methyl eugenol 90.7% at 100ppm concentration after treated 3 times every one week. This result presents that the essential oils should be utilized for environmental-friendly cultivation as a bio-fungicide against *Botrytis cinerea*.

D-54 Antifungal activity of asarone against *Botrytis cinerea* isolated from *Acorus gramineus*. NG Kim, JB Kim, HG Kim. Dept. of Agricultural Biology, Chungnam National University, Daejeon, 305-764, Korea