endophytic bacteria, a total of 260 bacterial strains were isolated from fresh tissues of 5 plant species. After they were cultured in broth media, their antifungal activities were screened by *in vivo* bioassays against *Botrytis cinerea*(tomato gray mold), *Pythium ultimum*(cucumber damping-off), *Phytophthora infestans*(tomato late blight), *Colletotrichum orbiculare*(cucumber anthracnose), and *Blumeria graminis* f. sp. *hordei*(barley powdery mildew). As the results of screening, 38 bacterial strains showed potent antifungal activities against at least one of 5 plant pathogens. A bacterial strain EB072 displayed potent disease control activities against 3 plant diseases. Among the bacterial strains with a potent antifungal activity against cucumber anthracnose, three bacterial strains, EB054, EB151 and EB215, also displayed a potent *in vitro* antifungal activity against *C. acutatum*, a fungal agent causing pepper anthracnose. A bacterial strain EB215 obtained from roots of cucumber was identified as *Burkholderia cepacia* based on its physiological and biochemical characteristics and 16S rRNA gene sequence. An antifungal substance was isolated from the liquid cultures of *B. cepacia* EB215 strain by ethyl acetate partitioning, repeated silica gel column chromatography, and *in vitro* bioassay. Its structural determination is in progress by various instrumental analyses.

2-20. Enhancement of Biocontrol Activity of *Serratia plymuthica* A21-4 Toward Phytophthora Blight of Pepper by Amendment of Nutritional Condition

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Serratia plymuthica A21-4 strongly inhibits the mycelial growth, zoospore formation, and cystospore germination of *Phytophthor* spp and *Pythium* species. The bacterial isolate produced antifungal substance and chitinase. The bacteria also enhanced to plant growth remarkably in low nutritional condition. The application of cell suspension of A21-4 to pepper seedlings in greenhouse experiments and soil drenching in farmer's field was proved successfully to control the phythophthora blight of pepper. For the effective control, however, relatively high density of cell number(10^9cfu/㎖) is required. Density effect was similar in plant growth promoting activity of A21-4. Though this investigation we improved the problem with changes of culture condition of bacteria and some nutritional amendment.

2-21. Antagonistic activity of *Streptomyces halstedii* and *S. violaceusniger* to pepper anthracnose fungus *Colletotrichum gloeosporioides*

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More than 1200 microorganisms were isolated from soil samples collected from various sources and localities. Among the isolates, 2 actinomyces (TH-04 and BA313) and 1 *Bacillus* sp. (CJ3) were selected as antagonists to pepper anthracnose fungus *Colletotrichum gloeosporioides*. These 3 isolates inhibitied mycelial growth of *C. gloeosporioides* and the inhibition rates were over 70% on PDA. When the isolates were co-cultured with conidia of *C. gloeosporioides* in potato

dextrose broth, conidial germination was severely inhibited and the inhibition rates of TH-04, BA313, and CJ3 at 24 hours were 75%, 72%, and 68%, respectively. The inhibition rates at 48 hours incubation were not much different from the rates at 24 hours. To check the activity on the plant, each isolate was mixed with equal volume of conidial suspension of *C. gloeosporioides* and wound-inoculated on green pepper fruit. After 6 days, the anthracnose lesions on the fruits inoculated with the mixture were much smaller than the lesions caused by the *C. gloeosporioides* itself. The lesion areas of TH-04 or BA313 treated pepper were less than 30% of the check. TH-04 and BA313 also showed antagonistic activity to *Phytophthora* spp. and *Botrytis cinerea*. By scanning electron microscopy and fatty acid analyses (MIDI), TH-04 and BA313 were identified to *Streptomyces halstedii* and *S. violaceusniger*, repectively.

2-22. Identification of an Antagonistic Bacterium, KJ1R5, for Biological Control of Phytophthora Blight of Pepper

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An antagonistic bacterium, KJ1R5, to *Phytophthora capsici* was obtained from root interior of a healthy pepper plant. To identify the bacterial antagonist, 16S rDNA sequence analysis, Biolog system, fatty acid methyl-esters (FAMEs), and physiological and biochemical characterization were conducted. The determined 16S rDNA sequence of KJ1R5 showed higher similarities to those of a group consisting of several *Chryseobacterium* strains with 95.2, 95.2, and 95.1% similarity to *C. defluvii*, *Chryseobacterium* sp. FR2, and *C. scophthalmum*, respectively. In addition, *Haloanella gallinarum*, B*ergeyella zoohelcum*, and *Riemerella anatipestifer* are another group for KJ1R5 with 94.1, 89.7, and 87.2% similarities, respectively. When identification of the antagonistic bacterium, KJ1R5 was conducted using BIOLOG system, the strain KJ1R5 was identified as *Flavobacterium tirrenicum* (similarity; 0.75%). Fatty acid profiles of the strain KJ1R5 were composed mainly of iso-17:0 w9c and iso-15:0 and identified as *Chryseobacterium balustinum* (similarity 0.524%). KJ1R5 was Gram-negative, regular short rods ranging from 0.8 μm to 1.0 μm and had no flagella. Phenotypic characterization of the antagonistic bacterium indicated that KJ1R5 were included in the genus *Chreseobacterium*, which belongs to the family Flavobacteriaceae. The strain was distinguished from these six existing species. These results indicated that strain might be placed as a new species in the genus *Chryseobacterium*.

2-23. Development of the stable liquid formulation of *Burkholderia cepacia* YC5025, a biocontrol agent for cucumber anthracnose

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