

ized, or *Rhizoctonia*-infested soil. In both soils suppressiveness was eliminated by chloroform fumigation. Furthermore, in one soil the suppression was diminished after 30 minutes exposure to 55°C in a water bath while complete loss of this potential occurred at 65°C. In the other soil, the suppression potential remained unchanged at 55°C but was eliminated at 65°C. The results indicate a biological component of the suppression but suggest potentially different causal agents.

38.6 NEW DEVELOPMENTS WITH TOMATO GRAFTING AS ALTERNATIVE TO METHYL BROMIDE IN MOROCCO.

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Soil-borne disease problems were relatively uncomplicated and of lesser importance in the early years, but increased in importance as intensive cultivation continued. Soil fumigation with methyl bromide to control soil-borne pathogens was until recently considered a major factor for successful production in plastic greenhouses. With consumer demand for untreated and organic products, the withdrawal of methyl bromide and its unavailability on the market, growers are increasingly looking for alternative approaches. Grafting, which was considered at one time too expensive, is now widely used on a commercial level. Resistant rootstocks provide excellent control of many soil-borne pathogens and have many other advantages. In addition, grafting does not require major adaptations in farming practice. When grafted plants are used, higher yield and quality are obtained. In 2006-2007, 95% of the protected tomato-producing areas were planted with grafted plants. A wide range of rootstocks with multiple resistances to infectious and non-infectious diseases are available and their number is increasing every year, driven by high demand and by the interest of seed companies.

38.7 BIOLOGICAL AND CHEMICAL CONTROL OF RHIZOCTONIA DRY ROOT ROT AND LEAF BLIGHT OF SOYBEAN CAUSED BY RHIZOCTONIA SOLANI. M.K.A. Bhuiyan and M. Haider.

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An attempt was made to control dry root rot and leaf blight of soybean caused by *Rhizoctonia solani* in a pot culture experiment followed by a field experiment in which soybean seedlings inoculated with *R. solani* were treated with *Trichoderma harzianum* isolate HT7 integrated with Vitavax-200. Before setting up the integration experiment, a series of preliminary tests was made including a pathogenicity test of *R. solani* isolates against soybean seedlings to select a virulent isolate, and a screening test of the selected *T. harzianum* isolates against the growth of the test pathogen following dual culture. To select a suitable fungicide against the growth of *R. solani*, several fungicides were also evaluated *in vitro* at different concentrations. Compatibility of the growth of *T. harzianum* with fungicides was also evaluated. In the pot culture and field trial, integration of *Trichoderma* with Vitavax-200 appeared to be the most effective in controlling seedling mortality, dry root rot and leaf blight of soybean. Individual components of integrated measures significantly reduced the infection of soybean seedlings both in the pot culture and field trial but efficacy of the individual components was much improved when they were applied in the integrated approach. In conclusion, integration of wheat grain colonized with *Trichoderma* and seeds treated with Vitavax-200 appeared to be best in

controlling seedling mortality and dry root rot, and also increased germination.

38.8 INTEGRATED MANAGEMENT OF FUSARIUM EQUISETI AND SCLEROTIUM ROLFSII OF TUBEROSE (POLIANTHES TUBEROSA). M.K.A. Bhuiyan, M.T.Rahman and J.A. Begum.

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An attempt was made to control the most prevalent pathogens *Fusarium equiseti* causing blossom blight and *Sclerotium rolfsii* causing stem rot of tuberose through an integrated approach including fungicides, *Trichoderma* and organic amendments in pot culture. The experiment was carried out at Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Gazipur, Bangladesh during March 2005 to July 2006. Altogether six fungi were found to be associated with the 21 tuberose plant samples tested, collected from different locations of Chuadanga district. Among the fungi isolated, *F. equiseti* and *S. rolfsii* were predominant. A total of 18 isolates of *Trichoderma harzianum* were screened against the virulent isolates *F. equiseti* F15 and *S. rolfsii* SR4 following the dual plate culture technique. *T. harzianum* TH6 was found to be the most effective against the test pathogens. In a preliminary laboratory trial Aimcozim and Mustard oilcake appeared to be the most effective in inhibiting the radial growth of the test pathogens and also compatible with the antagonist *T. harzianum* TH6. In pot culture, integration of *T. harzianum* TH6 with Aimcozim and Mustard oilcake appeared to be best in controlling leaf blight and stem rot of tuberose in comparison to any individual component of the integration, although individual components also significantly reduced leaf blight and stem rot.

38.9 SOIL-BORNE VIRUSES OF SUGAR BEET: A MORE COMPLEX PICTURE THAN PREVIOUSLY THOUGHT. C. Bragard, M. Merhvar, C. Nagy, F. Crutzen and A. Legrève.

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Sugarbeet is affected by numerous soil-borne viruses transmitted by *Polymyxa betae*, like the Benyviruses *Beet necrotic yellow vein virus*, and *Beet soil-borne mosaic virus*, the Pomoviruses *Beet soil-borne virus* and *Beet virus Q*, or like the Necrovirus *Beet black scorch virus* transmitted by *Ospidium brassicae*. Multiple infections are often recorded, raising questions about potential synergism or competition between the viruses and their respective vectors. Recent data gathered both in Europe and in Asia will be presented.

38.10 EFFECTIVENESS OF STREPTOMYCES SPP. ISOLATES TO CONTROL COLLETOTRICHUM SUBLINEOLUM IN SORGHUM. W. Bressan and J.E. Figueiredo.

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Anthraxnose of sorghum, *Sorghum bicolor* (L.) Moench, caused by the fungus *Colletotrichum sublineolum* Ces. Wils. has been reported in most sorghum-growing regions of Brazil. The high genetic variability of the fungus is one of the most limiting factors for its control by genetic resistance. The effectiveness of four *Streptomyces* spp. isolates (DAUFPE 14632, DAUFPE 11470, CMS2A,

CMS4A) were evaluated to control nine sorghum physiologic races of *C. sublineolium* (13A, 15A, 31B, 30B, 15B, 13B, 31C, 30C, 29E) and four additional isolates (51, 57, 126, 148) from different locations in Brazil. Evaluations *in vitro*, were made by measuring the diameter of the inhibition halo formed by *Streptomyces* spp. isolates. Sorghum seeds were also inoculated with *Streptomyces* spp. isolates for evaluating the incidence of the pathogen *C. sublineolium* and coleorhizal protrusion during germination. The resistance of *C. sublineolium* to control by *Streptomyces* spp. isolates varied among races and isolates of *Streptomyces* spp. Isolate DAUPFE 11470 was the most efficient in controlling all *C. sublineolium* races and isolates both *in vitro* and in seed inoculation experiments. Fungus incidence in seeds inoculated with this isolate ranged from 88.5% to 99.1%, respectively for the most virulent race (31A) and the less virulent isolate (148). No control was detected by the *Streptomyces* spp. isolates CMS4A and CMS2A *in vitro* or with sorghum seed inoculation. These results indicate that *Streptomyces* spp. isolates are potential control agents against *C. sublineolium*.

38.11 SUPPRESSION OF FUSARIUM MONIFORME BY STREPTOMYCES SPP. ISOLATES IN RELATION TO DOSE-RESPONSE RELATIONSHIP. W. Bressan and J.E. Figueiredo, Embrapa – Maize and Sorghum Research Center, P.O. Box, 151, 35701-970 Sete Lagoas, MG, Brazil. Email: bressan@cnpms.embrapa.br

Fusarium moniliforme J. Sheldon (*Giberella fujikuroi* Sawasa Wollen) commonly infects a wide range of crops. On maize (*Zea mays* L.) the fungus causes seedling blight as well as root, stalk, ear and kernel rot. Two isolates of *Streptomyces* spp. DAUFPE 11470 and DAUFPE 14632, were evaluated to determine the suppression of *Fusarium* disease through antagonist-pathogen relationship under greenhouse conditions. Control plants were grown in soil without antagonist *Streptomyces* spp. isolates. Pathogen (10^3 , 10^4 , 10^5 , 10^6 Chl/ml) and antagonist (10^3 , 10^4 , 10^5 , 10^6 Cf/ml) concentrations, significantly affected the development of *Fusarium* disease with a significant interaction between pathogen and antagonist concentration. Both *Streptomyces* spp. isolates demonstrated effective control of *Fusarium* disease, regardless of pathogen concentration. The highest disease suppression for both isolates occurred at low pathogen concentration (10^3 Chl/g soil) and high antagonist concentration (10^6 Cf/ml). The isolate DAUFPE 11470, provided the most effective control for all antagonist-pathogen inoculum concentration. Disease suppression by isolate DAUFPE 11470 (10^6 Cf/ml) did not differ significantly ($p \leq 0.05$) when the pathogen inoculum concentration ranged from 10^3 to 10^5 Chl/g soil. In relation to control plants, the highest disease suppression, for both antagonist isolates, occurred at the highest antagonist-pathogen concentrations. These values were 62% and 55% for DAUFPE 11470 and DAUFPE 14632, respectively. The results indicated that the effectiveness of suppression of *Fusarium* disease by *Streptomyces* spp. isolates depends on antagonist-pathogen concentration.

38.12 SURVIVAL AND INFECTION POTENTIAL OF VERTICILLIUM DAHLIAE IN WOOD CHIP MULCH FROM INFECTED OLIVE TREES. E. Cabeza-Fernández and J. Bejarano-Alcázar, IFAPA. Centro Alameda del Obispo, Apartado 3092, 4080 Córdoba, Spain. Email: jose.bejarano@juntadeandalucia.es

Mulching with wood chips from olive trees could serve as a source of inoculum in olive orchards if these materials come from *Verticillium dahliae* (Vd)-infected trees. Two experiments were

conducted in two olive orchards infested with Vd in southern Spain in 2003 and 2004. Eleven trees seriously affected by *Verticillium* wilt were selected in each field. Single-spored Vd isolates from selected trees were characterized as defoliating (D) or non-defoliating (ND) pathotypes using a pathogenicity test on cotton cultivar Acala SJ-2. Pruned wood of each tree was chipped, placed in mesh bags and kept on the soil under field conditions. The chips without leaves were analyzed monthly for Vd, and the potential of D-infected chips to cause disease was determined in bioassays on Acala SJ-2. Seeds of Acala SJ-2 were sown in pots filled with a mixture of ground chips and sterile soil. All trees were infected by the D pathotype, except two trees in 2003 that were infected by the ND pathotype. Vd was isolated from 0.4 and 7.3% of D-infected chips 150 and 120 days after the start of experiments in 2003 and 2004, respectively. On the contrary, the fungus only survived in ND-infected chips for 30 days. Cotton plants showed severe *Verticillium* wilt symptoms with variable incidence, even when the soil was infested with D-infected chips maintained in the field for 120 days. These results suggest that chipped wood from infected olive trees used as mulch is a potential source of Vd inoculum in olive orchards.

38.13 EFFECT OF CROPPING SYSTEMS ON THE DYNAMICS OF BEAN WEB BLIGHT EPIDEMICS. A.C. Café-Filho, G.R. Costa and M. Lobo-Júnior. Departamento de Fitopatologia, Universidade de Brasília, 70910-900, Brasília, DF, Brazil. Email: cafeFILB@unb.br

Web blight, caused by *Thanatephorus cucumeris* (anamorph *Rhizoctonia solani*) is one of the main tropical diseases of common bean (*Phaseolus vulgaris*). Grain yield losses may reach 100% in favourable conditions and high inoculum levels. Even at lower severity levels, grain from affected fields is unfit for use as seed or human consumption. *T. cucumeris* survives in cultivated or wild plants, crop debris, infested soil and seeds. No commercial bean cultivar is highly resistant, and control relies mainly on seed treatment and fungicide application. Despite its importance in several microclimates, especially during the rainy season, there has been very little study on the bean-*Thanatephorus* pathosystem, particularly in Brazil. We report the results of three years of field trials using different planting systems on the dynamics of web blight epidemics. Experiments followed a randomized complete block design with four replicates, with treatment units composed of four 5-meter lines planted with cv. Pérola. Three crop systems were compared: (1) No-till, over *Brachiaria* grass mulch; (2) Minimum till; and (3) Conventional tillage. Disease severity was rated several times during each cropping season and disease progress curves were drawn. Results indicated that the no-till system gave the lowest disease levels and lowest disease progress rates, possibly due to the presence of the grass mulch over the soil, which may have served as a physical barrier against basidiospore dispersion. Choice of cropping system has a significant impact on the severity of bean web blight.

38.14* GLOBAL POPULATION GENETICS AND PHYLOGEOGRAPHY OF THE MAIZE, RICE, AND SOYBEAN PATHOGEN RHIZOCTONIA SOLANI AG-1 IA. P.C. Ceresini, J. Bernardes de Assis, M.B. Ciampi, A.D. Gonzalez-Vera, M. Zala and B.A. McDonald. ETH Zurich, Institute of Integrative Biology (IBZ), Plant Pathology, Universitaetstrasse 2, LFW B28, 8092, Zurich, Switzerland. Email: paulo.ceresini@agrl.ethz.ch

One of the most important groups within the Basidiomycete