was the universal cross protecting strain. In the USDA Ft. Detrick quarantine facility a Nartia isolate recently collected from the original field source, a Nartia isolate maintained under protected conditions for 25 yrs, and another mild isolate, Mouton, were used as sources for single aphid transmissions using *Toxoptera citricida*. The resultant subisolates were analyzed by ELISA and RT-PCR of the coat protein gene and a region on the 5′ end of the CTV genome which was amplified by a pair of universal primers. The RTPCR amplified products were screened by the heteroduplex mobility assay to quickly detect genotype differences. Four genotypes were identified by analyses of sequence diversity.

Improved ELISA tests for the detection of barley yellow dwarf virus (BYDV) and cereal yellow dwarf virus (CYDV) isolates in infected plants and aphid vectors. W. O. BLISS, K. Blum, and M. D. Bandla. Agdia Inc., 30380 CR 6, Elkhart, IN 46514. Phytopathology 93:S9. Publication no. P-2003-0058-AMA.

A group ELISA test was developed and optimized for the detection of cereal yellow dwarf virus (CYDV) and barley yellow dwarf virus (BYDV) infections in plants and aphids. This group test detects CYDV-RPV and BYDV-MAV, BYDV-PAV, BYDV-RMV and BYDV-SGV. These tests offer higher sensitivity than has been previously reported. The test detected BYDV infections in artificially infected plant materials that were diluted in healthy tissue up to 4000 times. Tests that specifically detect only BYDV-MAV, BYDV-PAV and BYDV-SGV were also developed from the same biomaterials. Several renowned institutions in the United States of America and in Russia provided the antibodies used in these tests. The virus specific tests do not cross react with serologically related viruses as has been commonly observed in earlier ELISA tests for BYDV. None of the tests react to healthy barley, wheat and corn leaf tissue. In addition to the disease diagnosis, the group specific ELISA test should be useful in monitoring infected aphid populations and screening BYDV resistant germplasm.

* **Fungi associated with a stem disease of amaranth and pigweed weevil infestation.** J. T. BLODGETT (1,2), W. J. Swart (2), and S. vdM Louw (2). (1) USDA-Forest Service, 1730 Samco RD, Rapid City, SD 57702; (2) Univ. of the Free State, Dept. Plant Sciences and Dept. Zoology & Entomology, Bloemfontein 9300, South Africa. Phytopathology 93:S9. Publication no. P-2003-0059-AMA.

Tissue decay in branches, stems, and root collars of *Amaranthus hybridus* was observed in plots near Bloemfontein, South Africa. Examination of stems revealed larval galleries of the pigweed weevil (*Hypolixus haerens*). The most common fungal species isolated from discolored tissues near insect galleries was *Fusarium subglutinans* (42%); from weevil larvae was *F. subglutinans* (29%); from adult weevils was the *Alternaria tenuissima* group (31%); and from cankered stems was the *A. tenuissima* group (40%). Three of the seven most common fungal species produced cankers following inoculation, with *F. sambucinum* and *F. oxysporum* being the most aggressive. Although fungal species compositions differed ($P < 0.01$) among the two plant parts and the two insect stages listed above, all four had the same major fungal species, suggesting the pigweed weevil acts as a vector for the two *Fusarium* spp. There is significant potential for disease loss affiliated with this insect-fungal association.

* **Fertilization decreases resistance of red pine to the Sphaeropsis canker pathogen.** J. T. BLODGETT (1,2), P. Bonello (2), and D. A. Herms (3). (1) USDA-Forest Service, 1730 Samco RD, Rapid City, SD 57702; and Ohio State Univ. (OSU/OARDC); (2) Dept. of Plant Pathology, Columbus, OH 43210; (3) Dept. of Entomology, Wooster, OH 44691. Phytopathology 93:S9. Publication no. P-2003-0060-AMA.

The Sphaeropsis shoot blight and canker pathogen, *Sphaeropsis sapinea*, causes extensive damage throughout the world on trees predisposed by stress. Fertilization is often recommended to increase resistance. In a controlled field study, we examined the effects of fertilization on *S. sapinea* canker development, and on induced lignification and accumulation of soluble phenolics in red pine (*Pinus resinosa*). Wounded branch tips were inoculated with agar plugs colonized by the pathogen; noncolonized plugs were used for controls. Fertilization increased canker size ($P = 0.048$) and nitrogen content ($P < 0.001$), and decreased the C:N ratio ($P < 0.001$), the induction of lignin ($P = 0.014$), and total soluble phenolic accumulation ($P = 0.004$), compared with no fertilization. This suggests that fertilization decreases resistance of red pine to *S. sapinea*, and that lignin and soluble phenolic compounds may be involved in host defense.

Multiplex real-time PCR detection of toxigenic *Fusarium* species. B. H. BLUHM (1), M. A. Cousin (2), and C. P. Woloshuk (1). (1) Dept. of Botany and Plant Pathology; (2) Dept. of Food Science, Purdue University, West Lafayette, IN 47907. Phytopathology 93:S9. Publication no. P-2003-0061-AMA.

Several species of *Fusarium* produce mycotoxins in addition to causing diseases of cereal crops. The objective of this study was to develop a fast and sensitive assay to detect *Fusarium* species in cereal grains, and specifically distinguish *Fusarium* species that produce trichothecenes and fumonisins. To this end, three sets of PCR primers and fluorogenic probes were designed from conserved regions of rDNA, *TRI6*, and *FUM1*. Real-time PCR conditions were optimized for consistent amplification of the three products in a single, multiplex reaction. The detection limit of the multiplex assay was 5 pg of purified genomic DNA from both *F. graminearum* and *F. verticillioides*. No cross reactivity was observed with genomic DNA purified from 34 non-*Fusarium* fungal species. When applied to contaminated barley and cornmeal samples, the assay reliably detected toxigenic *Fusarium* species. The speed, sensitivity and accuracy of the multiplex assay make it well suited for use by food processors as well as plant pathologists.

Identification and characterization of pseudomonads causing basal glume rot of cereals in Russia. V. K. BOBROVA (1), I. A. Milyutina (1), A. V. Troitsky (1), E. V. Matveeva (2), V. K. Polityko (2), A. N. Ignatov (3), and N. W. Schaad (4). (1) Moscow State University; (2) RRI Phytopathology, Moscow, 143080; (3) Bioengineering, Moscow, 117312, Russia; (4) USDA-ARS, Foreign Disease-Weed Science Research Unit, Ft. Detrick, MD 21702. Phytopathology 93:S9. Publication no. P-2003-0062-AMA.

Basal glume rot is a wide spread disease of cereals in Russia. It is normally thought to be caused by *Pseudomonas syringae* pv. atrofaciens (Psa). To confirm the identity of the causal organism, 46 strains isolated from wheat, barley, and rye, and type strain of *P. syringae* a (LMG5095) were characterized by biochemical tests (LOPAT), pathogenicity, BOX-PCR, PCR-RFLP and DNA sequencing of SyrB locus and 16s-23s ITS. The strains were identified as *P. syringae* [23], *P. cichorii* [9], or *P. tolaasii* [14] according to LOPAT results and were pathogenic on original host plants. Despite this, only 11 strains could be typed as Psa by PCR-RFLP and ITS sequencing. ITS of other strains showed more similarity to *P. tolaasii* (>95%). For these strains, primers for SyrB resulted in a PCR product with low similarity to SyrB gene (<89%). BOX-PCR and PCR-RFLP analysis revealed variation within this group. The results suggest that other pseudomonads besides Psa cause basal glum rot in Russia.

Effect of wind on dispersal of splash-borne bacteria from canker-infected citrus trees. C. H. BOCK (1), P. E. Parker (2), and T. R. Gottwald (1). (1) USDA-ARS-USHRL, 2001 S. Rock Rd., Ft. Pierce, FL 34945; (2) USDA-APHIS, Plant Prot. Lab., Moore Air Base, Edinburg, TX 78539. Phytopathology 93:S9. Publication no. P-2003-0063-AMA.

Dispersal of citrus canker bacteria (*Xanthomonas axonopodis* pv. *citri*) in wind driven spray and splash was investigated in several experiments. Storm conditions were simulated using electric blowers to generate turbulent wind (c. 40-90 kph) and sprayer nozzles to simulate rain. The rain was fed into the wind stream 1 m upwind from an inoculum source of canker-infected trees. Samples were taken using panels (0.47 m^2) placed 1 m downwind at 0, 0.5, 1, 3, 5, 9, 14, 19, 24, 27, 30 and 52 h. Up to 12000 bacteria ml^{-1} spray sampled were dispersed at 0 h. This number declined over the first 4 h and <400 bacteria ml^{-1} were subsequently dispersed from 5 to 52 h. Bacteria were collected at all distances sampled (1, 2, 4, 6, 8, 10 and 11 m). Wind speed ranged from 17 to 7 and 5 kph at 1, 6 and 10 m, respectively. The majority of bacteria were recovered at 1 m (≤ bacteria ml^{-1}), with an exponential decline with distance resulting in ≤58 bacteria ml^{-1} beyond 6 m. The results suggest that citrus canker bacteria are dispersed in large numbers in wind driven rain over prolonged periods of time.

Devices to sample airborne propagules of *Aspergillus flavus* in the desert regions of southwest Arizona. C. H. BOCK (1) and P. J. Cotty (2). (1) USDA-ARS-USHRL, 2001 S. Rock Rd., Ft. Pierce, FL 34945; (2) USDA-SRRC-ARS, 1100 Robert E. Lee Blvd., New Orleans, LA 70124. Phytopathology 93:S9. Publication no. P-2003-0064-AMA.

Different devices (Burkard cyclone samplers, filter samplers, and rotorods) were tested to sample airborne propagules of *A. flavus* in an irrigated area of southwest Arizona. Both cyclone and filter samplers caught propagules of *A. flavus*. Although there was no significant difference in the number of propagules caught by the cyclone (7.6-713.8 m^{-3} of air sampled) and filter samplers (2-1414.2 m^{-3}) over a 2 h period, the catches were not correlated. Cyclone samplers were also operated continuously for 168 h and collected a dry sample that was ideal for plating and enumerating, characterizing fungal isolates. Rotorods collected conidia of *A. flavus* under controlled conditions, but failed to collect *A. flavus* in the field. Rotorods did catch propagules of other fungi in the field, but the rotorods became overloaded with dust particles if operated for more than 2 h. Where isolate culture and characterization is required cyclone samplers are ideal for long-term