

known as the sexual stage, *Cochliobolus miyabeanus*, has not yet been reported in the Philippines.

Temporal shifts in trichothecene profiles of *Gibberella zeae* isolates from barley in North Dakota and Minnesota

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Gibberella zeae (Gz), a principal cause of Fusarium head blight of barley, produces several trichothecene mycotoxins including deoxynivalenol (DON), nivalenol (NIV), and its acetyl derivatives. Mycotoxin contamination in barley grain is a major problem for its various end uses of malt, human food, and animal feed. Little information is available for trichothecene profiles of Gz isolates from barley. Using *TRI* (trichothecene biosynthesis gene)-based PCR assays, 116 Gz isolates collected during 1997 to 2000 from major barley growing districts of North Dakota and Minnesota were compared with 148 Gz isolates collected in 2008 from the same regions. All the Gz isolates had DON markers. The frequencies of isolates with a 3-acetyldeoxynivalenol (3-ADON) marker among isolates collected in 2008 were approximately ten-fold higher than those among isolates collected during 1997 to 2000. Analysis of genetic structure of these populations using microsatellite markers is in progress.

Development and evaluation of canola populations with potential segregation for Sclerotinia stem rot resistance

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Sclerotinia sclerotiorum (Lib.) de Bary is the causal agent of sclerotinia stem rot (SSR) of canola (*Brassica napus* L.) and many other dicotyledonous crops. SSR is endemic to canola producing areas of North Dakota, state that plants more than 90% of the canola produced in the United States of America. The identification of new sources of resistance to SSR and identification of molecular markers (quantitative trait loci) associated with it will contribute to our understanding of the genetic basis of resistance to this important disease and could help in development of materials with improved resistance. To that effect, an F₂ population, produced by crossing two *B. napus* plant introductions (458939 and Ames 26628) previously identified as resistant to SSR was evaluated for their reaction to *S. sclerotiorum* using the petiole inoculation technique under greenhouse conditions. Of the 230 F₂ plants evaluated almost two thirds died within 23 days from inoculation and 69 survived. Seeds produced by these plants will be screened again and surviving plants will be taken to seed production. This selection cycle will be repeated two more times with intent of increasing the level of homogeneity of the surviving population. These lines will be used to develop resistant germplasm for SSR and to develop mapping populations.

Impact of anaerobic soil disinfestation on introduced inoculum of *Phytophthora capsici* and *Verticillium dahliae*

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Anaerobic soil disinfestation (ASD) combines solarization with brief periods of soil saturation and has been investigated as an alternative to soil fumigation. To optimize ASD for Florida vegetable and Coastal California strawberry production, experiments were implemented to examine the effect of ASD on key soilborne pathogens. In Florida, a complete factorial field experiment was established to evaluate three levels of applied water (10, 5, or 0 cm), two levels of poultry litter (amended or unamended), and two levels of molasses (amended or unamended) in combination with solarization. Untreated and methyl bromide (MeBr) controls were established for comparison. Strength of anaerobicity (Eh) was increased by both molasses and poultry litter amendments, however, control of *P. capsici* was equal to that of MeBr for all solarized treatments regardless of applied amendments or water. Numbers of marketable fruit harvested from the bell pepper crop planted after ASD treatments were greater than the untreated control for all solarized treatments and with few exceptions, equal to the harvest from the MeBr control. In California, a greenhouse incubation experiment examining two soil types and several tarping materials determined that the standard 1.25 mil polyethylene tarp (green or black/white) created sufficient anaerobicity without carbon amendments for suppression of *V. dahliae* when compared to an untarped control.

Abiotic and biotic risk factors associated with *Bean pod mottle virus* in Iowa

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Bean pod mottle virus (BPMV) prevalence and incidence were quantified within Iowa counties during a three-year, state-wide soybean disease survey (2005 through 2007). Both BPMV prevalence and incidence were found to occur at non-random among Iowa counties indicating that disease risk may be influenced by abiotic and biotic risk factors. Potential abiotic risk factors evaluated were: number of days the daily mean temperature was below 0°C (October through April), planting date, county centroid latitude, county centroid longitude, and elevation. Biotic factors by county evaluated include: soybean acreage, total alfalfa harvested, and number of soybean farms. The county centroid latitude had a significant linear relationship with BPMV incidence risk increasing from northern to southern latitudes in all three years ($R^2 = 10.4, 57.9, \text{ and } 17.4\%$ for 2005, 2006, and 2007 respectively). Number of days with daily mean temperature <0°C explained 51.1% of the variation in BPMV incidence in 2006. County mean elevation was correlated ($r = 0.49, P < 0.0001$ and $r = 0.20, P = 0.0049$) with county BPMV incidence in 2006 and 2007, but not 2005. Date of planting (before 7 May) was highly correlated with BPMV incidence only in 2006 ($r = 0.67, P < 0.0001$). Number of soybean, and alfalfa acres harvested within a county were correlated with BPMV incidence in 2006 only.

An RNA virus from *Phytophthora infestans* with no apparent similarity to known viruses

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In an effort to examine extrachromosomal genetic elements in *Phytophthora infestans*, five double-stranded RNAs (dsRNA) in four patterns were identified. A large dsRNA, approximately 11.2 kb, was found in two isolates from the United States. The dsRNA in one of the isolates was completely sequenced and it was 11,170 bp in length. A large open reading frame was found on one strand (nt 7-11139), which could encode a protein of 3710 aa (calculated molecular weight 410.94 kDa). Both 5' and 3' UTRs were AU-rich, and the 3' UTR contained a sequence similar to the canonical mRNA polyadenylation signal. Bioinformatic analysis indicated an RNA-dependent RNA polymerase (RdRp) at the C-terminus with marginal *P*-value and visual inspection identified the three conserved motifs of RdRps: D-x(4,5)-D, [S, T]-G-x3-T-x3-N and GDD. However, in BLAST searches, this dsRNA had no significant similarity to known viruses or other sequences. We tentatively named it *Phytophthora infestans* RNA virus 2 (PiRV-2). PiRV-2 was cured in one isolate by chemotherapy. Its potential impact on the host strain is currently being examined.

Mid-infrared and near-infrared spectroscopic properties of *Fusarium* isolates: Effects of culture conditions

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The *Fusarium* genus includes soil saprobes as well as pathogenic or toxin-producing species. Traditional classification of *Fusarium* isolates is slow and requires a high level of expertise. The objective of this project is to describe culture condition effects on mid-infrared (MidIR) and near-infrared (NIR) absorbance spectra of several *Fusarium* species. The ultimate goal of this research is finding diagnostic spectral regions that can be used to quickly differentiate fusaria. We cultured isolates from sections Roseum (*F. graminearum*, *F. avenaceum*) and Gibbosum (*F. equiseti*, *F. acuminatum*). *F. solani* was included as an outgroup from the Nectria clade, along with two non-*Fusarium* (Phoma and Bipolaris). The isolates were grown on two different growth media (potato dextrose broth or V8 broth), under light or dark conditions, and at different temperatures (20°C or 25°C). Principal components analysis of the MidIR spectra shows a strong growth medium influence. The V8 medium separated fusaria from the outgroups better than the PDA. Light and temperature conditions had little effect on the MidIR spectral properties. The multivariate analysis of the NIR separated the fusaria from the Bipolaris and Phoma isolates, and also showed a strong growth medium effect. This results show the possible diagnostic value of infrared spectroscopy to differentiate fusaria from other fungal species, as well as the possible effect of nutritional state on the separation of the taxa.