RIO GRANDE VALLEY HORTICULTURAL SOCIETY
ABSTRACTS FOR THE 2008 ANNUAL MEETING

001

DETECTION OF CHANGES IN VEHICULAR DAMAGE TO COASTAL VEGETATION USING AERIAL COLOR INFRARED IMAGERY

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Studies were conducted to evaluate the feasibility of using aerial color infrared (CIR) imagery to monitor changes in damage to coastal vegetation caused by off-road vehicles. Aerial CIR photographs of a site north of South Padre Island, Texas were acquired at a 1:5000 scale over a two year period (2003-2005) and scanned at 1200 dpi which yielded a pixel resolution of $0.3m^2$. We used a variety of image enhancing techniques (e.g. filters) to accentuate the effects of vehicular damage to coastal vegetation, and used the processed imagery to develop unsupervised image classifications for use in change-detection analyses. Results indicated that damage to vegetation caused by off-road vehicles was detectable in aerial CIR photographs as long as six months after initial detection.

002

Importance of visual stimuli and host plant odor in host finding by the Asian Citrus Psyllid *Diaphorina* citri Kuwayama (Hemiptera: Psyllidae)

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Abstract

The Asian citrus psyllid, *Diaphorina citri* Kuwayama (Hemiptera: Psyllidae), is a phytophagous insect that feeds exclusively on plants from the Rutaceae family. The transmission by *D, citri* of *Candidatus* Liberibacter asiaticus, the bacterial pathogen of citrus greening disease (Huanglongbing) can cause substantial crop losses. The mechanisms of *D. citri* host-plant selection are currently poorly understood. This study was undertaken to investigate the effects of light, substrate color and host plant odor on this host finding process. On yellow sticky traps, the numbers of adult psyllids caught were 3 to 4-fold higher during daytime than nighttime. Peak catches for adults occurred at midday from 12 pm to 3 pm, while the lowest daytime activity of adults was observed during midmorning from 9 am to 12 am. Illumination of the traps at night increased their attractiveness to adult psyllids by 5-fold. On potted plants, light significantly increased plant colonization by adults and female egg deposition. Traps of five colors with different spectral reflectance and attractiveness to adult *D. citri* were tested. In the olfactometer, illumination had a significant effect on the proportion of adults responding to the host plant odor. These results suggest that the flight activity and host selection behavior of adult psyllids are regulated by light and circadian rhythms.

003

Title: **Analysis of gene expression during cold acclimation in *Citrus***

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Abstract

Most of the commercially important citrus species are cold sensitive. *Citrus aurantiifolia* (Christm.) Swingle (Mexican Lime) is a very cold-sensitive and can not tolerate low temperatures even after acclimation. On the other hand, *Poncirus trifoliata* (L.) Raf. is a monotypic genus related to *Citrus* that can tolerate temperatures of -30ºC when fully acclimated. In the present study, 900 putative cold up-regulated genes from a subtractive library are being analyzed using Reverse Northern Dot-Blot and Northern Dot-Blot. cDNA from acclimated (CA) and non-acclimated (NA) *P. trifoliata is* being used as probe. By comparing the genes expressed in CA and NA PT we expect to be able to identify those that are more important during cold acclimation. The identification of these cold-regulated genes is important for the understanding of cold acclimation in *Citrus*.

004

Release of *Diachasmimorpha longicaudata* (Hymenoptera: Braconidae) against Mexican fruit fly in yellow chapote areas of Nuevo Leon, Mexico

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Abstract

In northeast Mexico, there are areas with feral populations of yellow chapote, *Casimiroa* (=*Sargentia*) *greggii* S. Wats (Rutaceae), the main native host of *Anastrepha ludens* Loew (Diptera: Tephritidae), the Mexican fruit fly. Yellow chapote usually grows in areas where other pest control methods are difficult to apply; therefore, biological control offers a good alternative to reduce populations of *A. ludens*, and consequently, might decrease pest infestations in citrus orchards in the proximity to the areas of yellow chapote. The goal of this study was to evaluate the release of *Diachasmimorpha longicaudata* (Ashmead) (Hymenoptera: Braconidae) against *A. ludens* in yellow chapote areas of Nuevo Leon state, Mexico. The parasitoids were released along the Hualahuises, N.L. river (1,887,750 parasitoids/12 weeks) and the Santa Rosa canyon, Linares, N.L. (1,120,000 parasitoids/8 weeks). An area without releasing the parasitoid in Montemorelos, N.L. was used as a parasitoid free control. Parasitism by *D. longicaudata* in the Hualahuises, N.L. river ranged 0-21.4% (mean= 7.1%; 95% confidence interval= 3.0-11.2%). In the Santa Rosa canyon, parasitism ranged 0-20% (mean= 10.4; 95% confidence interval=4.4-16.4%). In the control area in Montemorelos, N.L., the parasitism was 0.68% (95% confidence interval= -0.4-1.8%), probably from released parasitoids in the Hualahuises, N.L. river. Although parasitism was low, it is possible to increase it via aerial inundative releases. The recovery of diapausing individuals of *D. longicaudata* indicates the potential for the temporal establishment of the parasitoids between the seasons of pest attack in the yellow chapote areas and the citrus orchards of the region.

005

Improving trap captures of the Mexican fruit fly *Anastrepha ludens* Loew (Diptera: Tephritidae)

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Abstract

A precise detection of the Mexican fruit fly adults (*Anastrepha ludens* Loew [Diptera: Tephritidae]) in citrus orchards is a key factor to begin opportune control measures. Presently, intensive research has been conducted in order to increase efficiency in monitoring this pest. In this study several attractants and different traps for the capture of *A. ludens* were evaluated. The experiments were carried out in Hualahuises, Linares, and General Teran, N.L., Mexico; they were aimed to compare McPhail, clear multilure and clear plastic jar traps baited with either torula, ammonium acetate + putrescina + propylene glycol, or commercial grape juice. Traps installed in Valencia orange groves and in yellow chapote (*Casimiroa greggii* S. Wats [Rutaceae]) areas were rotated and serviced each week. In the experimental area, 20,000 sterile Mexican fruit flies were released/week. Results showed that clear multilure traps baited with 350 ml grape juice captured more flies than: McPhail traps+torula, multilure traps+torula, or multilure traps+ammonium acetate+putrescina+propylene glycol. When clear multilure and clear plastic jar traps, each baited with 350 ml grape juice were compared, a similar response in the capture of *A. ludens* adults was shown. Traps baited with grape juice registered captures from the very first day after they were installed in the field. The clear multilure or the plastic jar trap baited with 350 ml grape juice could be useful to detect flies when their population is at low density. Effectiveness in the capture of *A. ludens*, as well as the low cost and easy handling of the clear plastic jar trap-grape juice, represent an excellent alternative for monitoring this pest in Mexico and Latin America.

006

Jesus Mata - Abstract

Title: Molecular Identification of Citrus False Spider Mite Species
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Abstract:
Three known species of false spider mite (FSM): Brevipalpus phoenicis, B. californicus and B. obovatus (Acari: Tenuipalpidae) are potential vectors of the Citrus leprosis virus (CLV). Identification of Brevipalpus to species level is difficult because of their small size and morphological similarities. The objective of this study was to develop molecular fingerprinting methods that are accurate and rapid for identifying FSM from the field. Iso-colonies of FSM were cultured on immature citrus fruit and identified using a dichotomous key and high resolution microscope. Amplified fragment length polymorphism (AFLP) and random amplified polymorphic DNA (RAPD) were used to detect banding patterns that can differentiate the two species. Results of AFLP and RAPD revealed several polymorphic bands using three primer combinations in AFLP and fourteen random primers in RAPD. The polymorphic bands from the RAPD will be excised and sequenced to make specific primers that could serve as a sensitive method for identification of the mites.

008

Molecular Identity, Infectivity and Differential Gene Expression Associated with an *Olpidium*-like Fungus in Citrus and Vegetables.
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Abstract

Citrus psorosis disease is widespread and a limiting factor in citrus production, worldwide. It is suspected to be transmitted by a natural vector besides graft transmission, the major mode of psorosis transmission. *Olpidium*-like zoospores were isolated from psorosis infected trees in an orchard in the south research farm of TAMUK- Citrus Center. DNA was isolated from zoospores using MasterPure^{TM} Yeast DNA Purification Kit. Molecular detection of zoospores was carried out by polymerase chain reaction (PCR) with known primers of fungus *Olpidium*. Three fragments of sizes approximately 300 bp, 750 bp and 1100 bp were amplified using the primers NS7-NS8, ITS4-ITS5 and NS7-ITS4, respectively. These fragments will be cloned and sequenced. *Olpidium*-like zoospores were inoculated into six-month-old seedlings of sour orange and C-22 rootstock. Zoospores of *Olpidium* started establishing onto the seedlings within 2 h of inoculation. Hourly observations for 8 h showed that the number of zoospores established on C-22 seedlings were more than in sour orange rootstock. Root samples were collected at 2 h and 8

h and stored at -80^{0}C to study differential gene expression due to *Olpidium* infection. Tomato, cabbage and lettuce seedlings will be inoculated with zoospores for infectivity studies.

009

Gene Expression Studies in Sour Orange and C-22 Rootstocks Challenged with Nematode, *Tylenchulus semipenitrans* and Fungus, *Phytophthora parasitica.*

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ABSTRACT

The aim of this study is to find genes that differentially express in two citrus rootstocks, C-22 and sour orange when challenged with the nematode, *Tylenchulus semipenitrans* and the fungus, *Phytophthora parasitica.* Quantitative study includes: number of female nematodes, larvae, and eggs on root and juveniles in soil, correlated to root mass density. The resistance of citrus rootstocks to nematode and *Phytophthora* infections will be evaluated with length of lesions, reductions in shoot length, root mass and shoot mass. This would help us to explain the resistance of two citrus rootstocks to nematode and *Phytophthora* infections. From inoculation experiments, we found that in both the rootstocks, 10h after inoculation, zoospores of *Phytophthora* were successfully penetrated into the roots. In both the rootstocks, when inoculated with juvenile nematodes, penetration was successful at 12 d after inoculation. In future, these differential gene expression studies will contribute in understanding how plant genes respond to nematode and *Phytophthora* infections.

0010

Liriomyza species and parasitoid guilds on peppers in South Texas.

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In the Lower Rio Grande Valley of Texas (LRGV) dipterous leafminers are causing substantial damage to vegetable crops including onion, celery, tomatoes and peppers. Leafminers can damage plant material in different ways: destroying small plants and seedlings by excessive mining, reducing photosynthetic activity and hence crop yields, causing leaf drop above developing fruit that leads to "sunburning" of the fruit, reducing the plant aesthetics, and by vectoring of plant diseases. In order to develop a program in South Texas that utilizes conservation biological control it is necessary to define which *Liriomyza* species are causing the outbreaks and which parasitoid species are contributing to the mortality of the pest. *Liriomyza* species composition and parasitoid guilds are determined by sampling different growing areas in the Lower Rio Grande Valley. Chili peppers (*capsicum*) have been selected as the research crop for the collection of leafminer species. Mined leaves with larvae are collected and inspected for larval-parasitoids, larval-pupal parasitoids and *Liriomyza* species. Leaves are preserved for specimen emergence and specimens are separated by family and species. From the total amount of leafminers specimens collected on Summer 2007, the 98 % belongs to *L.trifolli* species. There are several hymenopterous parasitoids families contributing to the control of leafminers in south Texas including: Eulophidae representing 59 % of the collected specimes; Figitidae with a 17.4 % of the collected specimens, and Braconidae with a 30 % of the total collected specimens.

0011

EST-Based SSR markers for tagging stress resistance in sugarcane (Saccharum sp.)

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ABSTRACT

The current study was an effort to assess the ability of expressed sequence tag (EST) based simple sequence repeats (SSR) markers to tag the genes controlling drought resistance in sugarcane (Saccharum spp). Drought related ESTs in the sugarcane database (SUCEST) were electronically searched and microstaellites were identified. Trinucleotide simple sequences with a repeat unit with at least 20 bp were selected and primers were designed based on their flanking sequences using primer3 program (http://www.genome.wi.mit.edu/). These primers were first tested on bulk DNA analysis of drought tolerant and drought susceptible varieties. Primers giving polymorphic fragments were later used on the whole population of eighty genotypes. Polymorphic markers were scored and their segregation was investigated to search for correlation with physiological data. Genmod procedure from SAS was used to find association between markers and physiological data. Four loci were found sinificantly (0.05 level) associated with chlorophyll content, four loci were found significantly associated with chlorophyll fluorescence and three loci were found significantly associated with relative water content. No loci was found significantly associated with leaf temperature. Results obtained so far are encouraging and supports the use of EST-derived microsatellite markers as a potential technique for trait selection in sugarcane.

0012

Effect of Host Plant on the Bionomics of Asian Citrus Psyllid *Diaphorina citri* (Hemiptera: Psyllidae)

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Abstract: The Asian citrus psyllid, *Diaphorina citri Kuwayama* (Hemiptera: Psyllidae) is a pest of Asian origin, which has since invaded many countries including the US. In 1998 it was reported in Florida and three years later in 2001 in Texas. *D.citri* is one of the vectors of the bacterial pathogen *Candidatus Liberibacter* asiaticus, casual agent of the deadly citrus greening disease. All species of citrus are susceptible to citrus greening disease regardless of the root stock, but sweet oranges, mandarin and mandarin hybrids are highly susceptible. In addition population densities of D.citri significantly varied with host plants. In Texas, observed densities of *D.citri* are more or less 4 fold higher on Sweet orange than Grapefruit, but the reason for this differential host plant susceptibility are largely unknown. The present study aims at evaluating the host plant preference for adult psyllid for feeding and oviposition and the performance of *D.citri* on selected host plants

0013

Transgenic sugarcane as a platform for the production of high value proteins

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Sugarcane has a great potential for the production of high value proteins and protein-based therapeutics. It produces a very large biomass per acre per year and offers the prospect of inexpensive biopharmaceutical production without sacrificing product quality or safety. A specific goal of this project is to develop sugarcane as a recombinant expression system for the production of a mammalian enzyme that has a broad spectrum antimicrobial activity against Gram-negative and Gram-positive bacteria, plant pathogenic fungi, as well as a potential use in food, cosmetics and agriculture. Expression of this mammalian gene was enhanced in sugarcane by modulating transcription, transcript stability and translation. Expression vectors were generated using a synthetic gene that was codon optimized for expression in a monocot system. A single promoter, either constitutive or stem-regulated, as well as a triple promoter system was used to drive expression. The 5' and 3' untranslated regions of a virus that infects sugarcane were fused to the coding region of the gene to enhance translation. Embryogenic calli and leaf rolls of two commercial sugarcane varieties were transformed biolistically, and the phosphinothricin acetyl transferase (BAR) gene was used as a selectable marker driven by the maize ubiquitin-1 promoter. Immunoblot analysis as well as enzymatic activity assays of stably transformed sugarcane plants showed that the intact mammalian enzyme could be detected, and that it accumulated in stalks at levels as high as 0.36 mg/kg in plants expressing it from a single promoter vector, and up to 0.60 mg/kg in stalks transgenic for co-expression from three different promoters in separate vectors. Each vector did not adversely affect the others as shown by copy number, steady-sate mRNA levels and the presence of the functional enzyme. These results suggest that transcriptional synergism resulted through additive promoter activities and increased gene expression. A greenhouse growth cycle study for an 11-month period showed a substantial increase in enzyme accumulation over time in the transgenic lines. This study suggests the commercial feasibility of producing a stable recombinant enzyme in transgenic sugarcane, and development of transgenic sugarcane as a platform technology.

0014

Shima Chaudhury, UTPA – Biology Dept.

Applications of remote sensing technology in the evaluation of streptomyces for biocontrol of gummy stem blight.

APPLICATIONS OF REMOTE SENSING TECHNOLOGY IN THE EVALUATION OF *STREPTOMYCES* FOR BIOCONTROL OF GUMMY STEM BLIGHT IN CANTALOUPES

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Studies were conducted to evaluate efficacy of *Streptomyces* isolates for biological control of gummy stem blight (GSB) in cantaloupes (*Cucumis melo* var. 'Primo') in south Texas. Mortality of plants infected with the causative agent of GSB (*Didymella bryoniae*) was evaluated in the presence and absence of selected *Streptomyces* strains both *in vitro* and in greenhouse trials. Comparision of plant mortality data indicated a significant impact of each of three *Streptomyces* isolates (MA1F4#2, WI1B#5, and MA2A4 #2), which appear to be most effective when used in combination. Infected plants growing in the presence of *Streptomyces* exhibited substantially higher ratios of near infrared to red (NIR/ R) reflectance, compared to infected plants growing in the absence of *Streptomyces* isolates. Infected plants with biocontrol agent had near infrared to red (NIR/R) ratios similar to uninfected plants (control). These results suggest potential efficacy of *Streptomyces* for biological control of *D. bryoniae*, and demonstrate potential applications of remote sensing technology in evaluation of biocontrol agents for plant pathogen.

0015

Alejandra Gutierrez, UTPA – Biology Dept.

Comparison of Spectral Reflectance by Red and Black Mangrove in Coastal Areas of Southern Texas

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ABSTRACT

Research conducted to evaluate 1) the spectral curves for both black mangrove (*Avicennia germinans*) and red mangrove (*Rhizophora mangle*), 2) image processing technology to enhance differences between the two mangrove species using color infrared or conventional color photography, 3) feasibility of using this technology to survey the distribution of both mangrove species along the Texas Coast. Spectral differences where noted in the blue, red, and near infrared wavebands, although we were unable to distinguish red and black mangrove using color infrared imagery. However, use of unsupervised image classifications developed from ground photographs in conventional color (RGB) detected at least one natural spectral class which was more pronounced in red mangrove (*Rhizophora mangle*) than in the black mangrove (*Avicennia germinans).* These results suggest that distinguishing red and black mangrove plants may require the use of conventional color photography or use of hyperspectral remote sensing technology.