PROCEEDINGS
OF THE
42nd ANNUAL MEETING

Caribbean Food Crops Society
42nd Annual Meeting
July 9-15, 2006

Intercontinental Resort and Casino
Carolina, Puerto Rico

"Food Safety and Value Added Production and Marketing of Tropical Crops".

United States Department of Agriculture,
T-STAR Sponsored Invasive Species Symposium

OPERATIONALIZING CRISIS AS A REGIONAL INVASIVE SPECIES SAFEGUARDING MODEL: EXPLORING MULTIPLE PLATFORM INITIATIVES

Special Workshop Edition
Edited
by
Waldemar Klassen, Carlton G. Davis,
Rosa Amelia Franqui and Héctor L. Santiago

Published by the Caribbean Food Crops Society

Proceedings of the Caribbean Food Crops Society. 42(1):62-69. 2006

SESSION III: TECHNICAL CHALLENGES FACING THE IMPLEMENTATION OF A CARIBBEAN INVASIVE SPECIES STRATEGY

PROPOSED CARIBBEAN INVASIVE SPECIES SURVEILLANCE AND INFORMATION PROGRAM

Waldemar Klassen[1], Carlton G. Davis[2], William F. Brown[3], [4]Martha R. Roberts and [5]M. Tim Momol. [1]Tropical Research and Education Center, 18905 SW 280 Street, Homestead, Florida, USA 33031-3314. Klassen@ufl.edu . [2] Food and Resource Economics Department, IFAS, University of Florida, Gainesville, Florida, USA 32611-0240. cgdavis@ufl.edu . [3] Animal Science Department, IFAS, University of Florida, Gainesville, Florida, USA 32611-0910. wfbrown@ufl.edu ; [4]Director, Industry Relations, Institute of Food and Agricultural Sciences University of Florida, 155 Research Road, Quincy, Florida 32351-5677; robertm@ufl.edu; [5]North Florida Research & Education Center, University of Florida, 155 Research Road, Quincy, FL 32351-5677; Phone: (850)-875-7100 ext. 154; Fax: 850-875-7188; tmomol@ufl.edu

Since accurate and timely information is key to warding off or coping with threatening or newly introduced harmful exotic organisms, the Caribbean Invasive Species Working Group has proposed a Caribbean Invasive Species Surveillance and Information Program to serve as the foundation of a coordinated safeguarding mechanism to defend the entire Greater Caribbean Region against the influx or further spread of invasive alien species, i.e., highly damaging pests and pathogens (Davis and Klassen, 2005).

As a result of major increases in trade and tourism in recent decades the Greater Caribbean Region has been suffering grievous damages from a surge in arrivals of alien invasive species, most of which originated either in Asia and the Pacific or in South America, and much smaller portion of which originated in Europe and Africa (Ambrose and Iton, 2004; Kairo et al. 2003; Klassen et al., 2002; 2004). Examples include classical swine fever, African swine fever, the tropical bont tick, the varroa and tracheal bee-attacking mites, West Nile virus, the silverleaf whitefly and the viruses it transmits such as bean golden mosaic virus and tomato yellow leaf curl virus, the pink hibiscus mealybug, soybean rust, the citrus canker bacterium, the citrus greening bacterium, Black Sigatoka, and many others (Madden, 2001). Such invasive species undermine the benefits of international trade. Yet the Greater Caribbean Region lacks a coordinated mechanism to throttle back the influx of invasive alien species. We have come to realize that not a single sovereign country in North America, the Caribbean or Central and South America can unilaterally protect itself from the introduction of invasive species (Davis and Klassen, 2005; Shannon, 1999; 2003).

Table 1. Establishment of exotic arthropods in California, Florida and Hawaii.

State	Period	No. Established	Average/Year	Reference
California	1955-88	208	6.3	Dowell and Gill (1989)
Florida	1970-89	270	14.2	Frank and McCoy (1992)
Hawaii	1962-76	287	19.1	Beardsley (1979)

Source: Klassen et al., 2002.

Between 1970 and 1989, 270 species of alien insects and mites became established in Florida (Table 1) for an establishment rate of 14.2 per year (Frank and McCoy, 1992; 1995). Also during this period many species of plant pathogens, weeds, reptiles and other undesirable species gained entry into Florida. It seems likely that the rate of establishment of invasive alien species is higher in the Greater Caribbean as a whole than just in Florida (see Pollard and Pegram, 2004; Kairo, 2004).

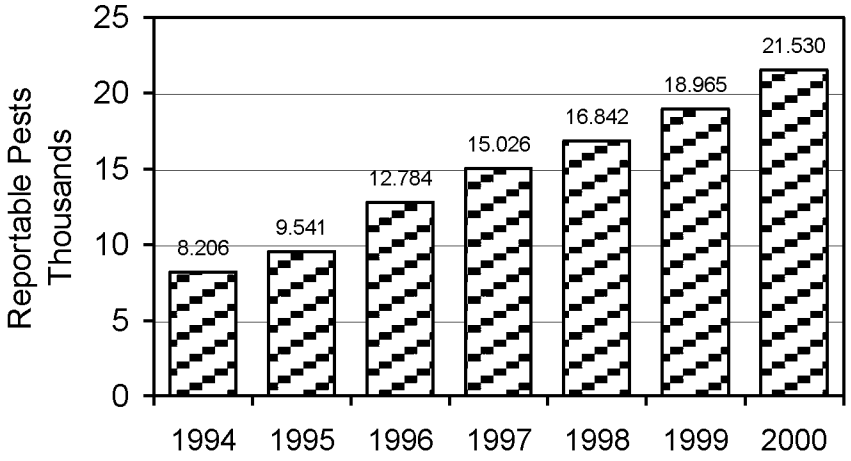

Figure 1. Interceptions of quarantine-significant pests at all ports of entry in Florida. Source: USDA-APHIS-PPQ. Reproduced from Klassen et al. (2002).

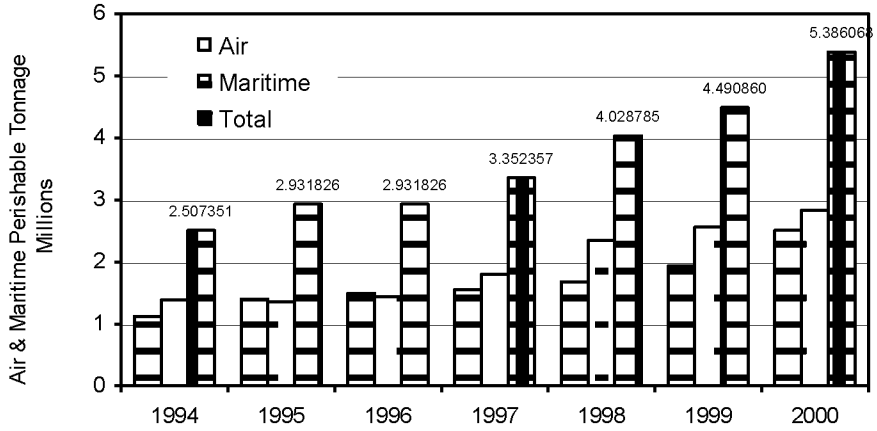

Figure 2. Tonnage of perishable products imported into Florida as air and maritime cargo. Source: Book of International Trade, U.S. Department of Commerce. Reproduced from Klassen et al. (2002).

The number of invasive species arriving at ports of entry (Figure 1) appears to be directly proportional to the volume of imported agricultural/forestry products (Figure 2) (Klassen et al., 2002). Thus the greater the volume of trade, the greater the number of dangerous organisms that arrive at our ports of entry is likely to be. Therefore the worst is yet to come as trade liberalization arrangements come into effect. Regional free trade arrangements in the making

include the CARICOM Single Market and Economy (CSME), the Dominican Republic – Central American Free Trade Agreement (DR-CAFTA), The Free Trade Area of the Americas, the CARICOM-Dominican Republic Agreement, the CARICOM-Costa Rica Agreement, etc. (Blake, 2004; Narine, 2004).

A substantial number of invasive species already have gained footholds within the Greater Caribbean Region, but have not yet spread widely including *Scirtothrips dorsalis* Hood, the chilli thrips, *Solanum viarum* Dunal, the tropical soda apple and West Nile Virus. In addition, several hundred very significant invasive species are known to be lurking outside the Region (APHIS, 2000; EPPO/CABI, 1997; Madden, 2001); a few examples are the H5N1 avian influenza virus, *Boiga irregularis* Merrem, the brown tree snake and *Phytophthora ramorum*, sudden oak death fungus.

It is not only agriculture and trade that are damaged by invasive species. The environment and natural resources are harmed, since many invasive species alter the structure of ecosystems and impair their ability to provide a range of ecosystem services including provision of clean water, flood and erosion control, carbon sequestration, pollination of crops and native vegetation, etc. (Kairo, 2004). Invasive species have caused the extinction of species and they pose a horrendous threat to biodiversity especially of islands and peninsulas such as Florida. Clearly the fate of the tourist industry is closely coupled to that of biodiversity and to our capacity to cope with invasive species (Murphy, 2004; UNEP, 2003).

The average cost of coping with just one significant invasive species in Florida is greater than $24 million per year (Table 2; Roberts, 2004); so for the Greater Caribbean Region, the corresponding cost probably is in excess of US$ 50 million per year. If four moderately damaging species become established in the Greater Caribbean each year, then each year they add US$ 200 million of annually recurring costs. Of course a major invasive such as bird flu virus would alone incur costs in the order of one billion US dollars (see FAO, 2005). Would the investment of US$ 20-30 million per year for a coordinated Greater Caribbean Regional

Table 2. Annual Costs in Agriculture of Coping with Some Invasive Species in Florida. Data from Roberts (2004).

Invasive Exotic Species	Control Cost/Year in millions	Sales Lost/Year in millions
Citrus Canker	$29	$375-750
Thrips palmi, melon thrips	$20	$3.5
Brown Citrus Aphid	$30	$5.2
Citrus Leaf Miner	$32	$5.5
Silverleaf Whitefly	$22	????
Leatherleaf Fern Anthracnose	$33	$15-20
AVERAGE[1]	$27.7	$81.0

[1] excluding silverleaf whitefly

safeguarding mechanism be worthwhile if it would reduce the rate of establishment of invasive species by one-half, and if it would facilitate the rapid eradication of incipient infestations of the most dangerous invasive species? Prevention is decisively the cheapest option (Simberloff, 2002; Sklad et al., 2003).

A full-fledged regional invasive species safeguarding paradigm would include mitigation of risk in the country where the imported product is produced, pre-clearance so that clean product is being shipped (McDonell, 2004), monitoring the pathways of entry, inspection at the port of entry, treatment or destruction or refusal of entry of infested product, conducting domestic surveillance and timely sharing of information with all trading partners, etc. (Klassen, 2004; Narine, 2004). The Caribbean Invasive Species Working Group recommends that a comprehensive safeguarding system should be constructed incrementally, and that the first step should be the establishment of a Regional internet-assisted Caribbean Invasive Species Surveillance and Information System, CISSIP.

By way of background to the development of the CISSIP proposal, at the 2003 annual meeting of the Caribbean Food Crops Society in Grenada, the Caribbean Invasive Species Working Group (CISWG) was formed. The Working Group developed the "Caribbean Regional Invasive Species Intervention Strategy" (CRISIS) and proposed various projects including:

1. Timely internet-based tracking of invasive pest interceptions and introductions, and
2. Caribbean Pest and Disease Diagnostic System based on distance digital imaging and internet-based communications.

The Working Group combined the two proposed projects to form the CISSIP. Both CRISIS and CISSIP were submitted for consideration to CARICOM's Council for Trade and Economic Development (COTED). COTED has endorsed CRISIS and has urged that funding for CISSIP be sought.

CISSIP will consist of three interdependent sub-systems connected to the internet:

1. a Caribbean Regional Diagnostic Network, CRDN,
2. a Pest Survey and Inspection Program, PSIP, and
3. An umbrella information management tool (the Invasive Species Information System, ISIS).

CISSIP will help the Project to perform the following functions:

1. Facilitate the rapid identification of harmful organisms
2. Survey each Country/Territory for newly arrived invasives
3. Monitor the status of target pest populations and pathways so as to facilitate risk mitigation by identifying:
    a. Changes in pest distribution patterns
    b. Pest outbreaks
    c. New trade patterns, etc.
4. Collate, synthesize and evaluate information
5. Communicate the information to regulatory officials in the individual countries and in the Greater Caribbean Region
6. (However, each Country will retain control over sensitive information, and decide when it can be released to the Region), and
7. Develop Risk Assessments using all available data

CISSIP will maintain various resources including a Global Invasive Species Database and Target Pest Lists. The Database will be a compendium of biological/ecological information on

about 1000 species of insects, mites, plant pathogens, animal pathogens, nematodes, mollusks, invasive plants, birds, snakes, rodents, etc., which seem most threatening to the Greater Caribbean Region. There will be a Target Pest List for each country, and one for the Region. Perhaps the Target Pest List for the Region will have approximately 100 "priority" target pests. The list is needed organize and focus the program.

CISSIP will help define risk management options, For example, suppose a dangerous invasive alien species is intercepted at a port of entry. Regulatory officials throughout the Region could then:

1. Modify port-of-entry inspection procedures
2. Organize early detection domestic surveys
3. Re-evaluate sanitary and phytosanitary policies
4. Initiate pest management/risk mitigation measures at origin to reduce further incursions of the invasive species into the Region.

CISSIP will provide secure web-based information management, require immediate electronic input of collected information – except sensitive data that must first be cleared by an official of the Ministry, issue timely pest alerts and news, provide both public and password-protected information, and provide links to a variety of pest information.

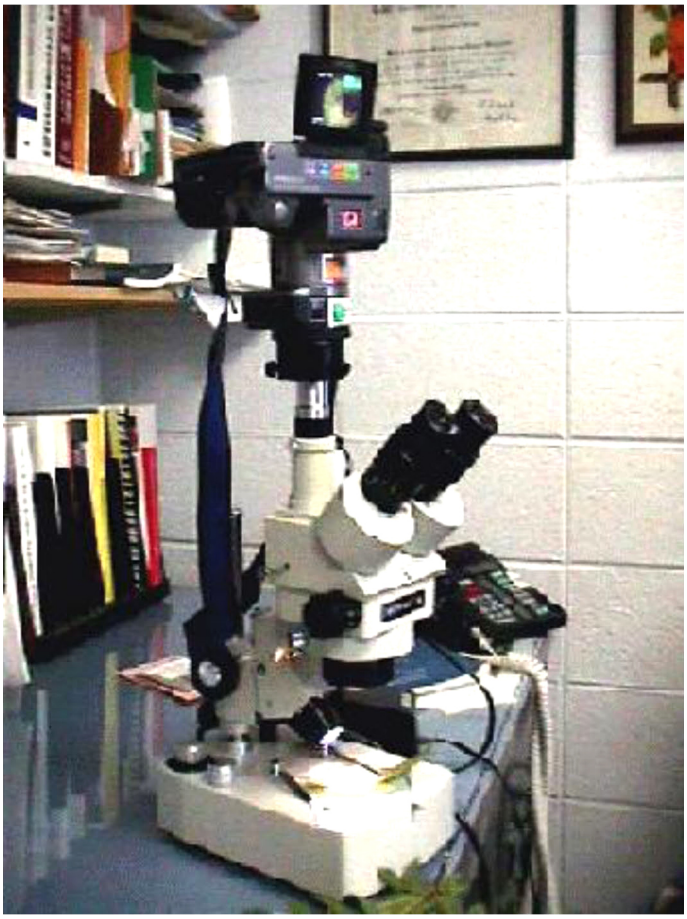

Figure 3. Compound Microscope Equipped with a Digital Camera for Use in Distance Digital Diagnosis.

The Caribbean Regional Diagnostic Network will be based on the Distance Diagnostic and Identification System (DDIS) developed at the University of Florida (Xin et al. 2001; 2002). The hardware includes a digital camera, and compound and stereo microscopes with high speed internet connection. DDIS will be provided free of charge except for the cost of installation and maintenance. The Caribbean Regional Diagnostic Network will link all participating countries/territories into a cohesive distributed system connecting first detectors, diagnosticians, regulatory officials, etc. It will include "Expert Laboratories" as the hubs of the system in Belize, Costa Rica, Dominican Republic, Jamaica, Martinique and Trinidad & Tobago. Further it will include "Standard Laboratories" as the first "spokes" in the system in The Bahamas, Barbados, Guyana, St. Lucia and Suriname.

Each Country/Territory will conduct pest surveys. In each country the Pest Survey and Information Program will be managed by a Country Program Director and a National Pest Survey Committee. They will draw up a Country Target Pest List, while a Regional Pest Survey Committee will draw up a Greater Caribbean Target Pest List. These Target Pest Lists will be used to develop an Annual Plan of Work. The Country Program Director will implement pest surveys and port of entry inspections for targeted pests.

The Pest Survey Committees will develop Pest Risk Assessments, coordinate surveys, and work with the Country Program Directors and to assure rapid response, and risk communication.

Grant funding will be sought to meet most of the costs of implementing CISSIP during the first five years. The proposed CISSIP budget provides for a very capable Project Administrator and a very capable Information Technology Coordinator. Each Country or Territory Director would be paid US$ 30,000 per year. During the first two years the salaries of the latter would be paid entirely from the grant, and in years 3, 4 and 5 the Ministries would contribute a progressively increasing portion of the salaries. With respect to infrastructure, the largest outlay will be for the equipment for diagnostic laboratories. To purchase equipment for the Expert laboratories, US$ 91,000 will be provided for each so that they can perform molecular diagnostic procedures. The Standard laboratories will each be funded at US$ 30,000. Each country or territory will be allowed US$ 20,000 to purchase a vehicle for use by the Pest Survey and Information Program. Diagnosticians and first detectors will be funded to attend two training events per year. The total budget without indirect costs will come to US$ 6.2 million over the five years of the Project.

It is expected that each Ministry, which elects to be a partner in CISSIP, will assist in strengthening the CISSIP proposal and in defining policies and procedures, and be willing to pay for progressively greater portions of the salaries of the Country Program Director.

Also each participating Ministry would have to agree to provide infrastructure support to project, including office support for the Country Program Director if the latter is housed at the Ministry, housing of the CRDN and the database activities if these are housed at the Ministry, the infrastructure for laboratory space associated with diagnostics, laboratory equipment and personnel above that purchased from grant funds, and provide the first detectors/responders, which will be critically important for Pest Survey and Information Program.

Your comments and criticisms of CISSIP are most welcome. We will rely on your strong support as we move forward to attempt to secure the needed grant funds.
Thank you!

REFERENCES

Ambrose, E. and A. Iton. 2004. Invasive species: implications for Caribbean intra-regional trade. Proceedings of the Workshop, Facilitating Safer US-Caribbean Trade: Invasive Species Issues, Port of Spain, Trinidad and Tobago, West Indies, 2-4 June 2004. Pp. 90-92.

APHIS, USDA. 2000. Regulated plant pest list. http://www.invasivespecies.org/RegulatedPestList.pdf .

Beardsley, J. W. 1979. New immigrant insects in Hawaii 1962 through 1996. Proc. Hawaiian. Entomol. Soc. 23: 35-44.

Blake, B. W. 2004. Update on matters arising from the invasive species symposium at the Grenada 2003 CFCS Meeting. Proceedings of the Workshop, Facilitating Safer US-Caribbean Trade: Invasive Species Issues, Port of Spain, Trinidad and Tobago, West Indies, 2-4 June 2004. Pp. 17-18.

Davis, C. G. and W. Klassen. 2005. The T-STAR supported Caribbean Basin/Florida Invasive Species Coordinating and Facilitating Initiative. Proceedings of the 41th Annual Caribbean Food Crops Society Meeting, Vol. 41 (1): 61-67.

Dowell, R. V. and R. Gill. 1989. Exotic invertebrates and their effects on California. Pan-Pacific Entomol. 65(2): 132-145.

EPPO/CABI. 1997. Quarantine pests for Europe. 2nd edition, edited by I. M. Smith, D. G. McNamara, P. R. Scott and M. Holderness. CAB International, Wallingford, U. K.

FAO. 2005. Potential socioeconomic impact of avian influenza. in Latin America and the Caribbean: approximate orders of magnitude. www.rlc.fao.org/prior/segalim/animal/aviar/pdf/ImpactoIA_en.pdf .

Frank, J. H. and E. D. McCoy. 1992. The immigration of insects to Florida, with a tabulation of records published since 1970. Fla. Entomol. 75(1): 1-28.

Frank, J. H. and E. D. McCoy. 1995. Invasive inventive insects and other organisms in Florida. Fla. Entomol. 78(1): 1-15.

Kairo, M. T. K. 2004. Invasive species: A Caribbean environment and natural resources perspective. Proceedings of the Workshop, Facilitating Safer US-Caribbean Trade: Invasive Species Issues, Port of Spain, Trinidad and Tobago, West Indies, 2-4 June 2004. Pp. 93-100.

Kairo, M.T.K., Ali, B.S., Cheesman, O., Haysom, K. & Murphy, S.T. (2003) Caribbean Invasive Species Threats. Report for The Nature Conservancy. 116 pp. www.iabin-us.org/projects/i3n/caribbean_invasives_paper_tnc.PDF

Klassen, W., C. F. Brodel and D. A. Fieselmann. 2002. Exotic Pests of Plants: Current and Future Threats to Horticultural Production and Trade in Florida and the Caribbean Basin. Micronesica, Suppl. 6; Invasive Species and Their Management. pp. 5-27.

Klassen, W. 2004. The Florida and the Third Border perspectives. Proceedings of the Workshop, Facilitating Safer US-Caribbean Trade: Invasive Species Issues, Port of Spain, Trinidad and Tobago, West Indies, 2-4 June 2004. Pp. 48-60.

Klassen, W. C. G. Davis, E. A. Evans; B. Lauckner, H. Adams and M. T.K. Kairo. 2004. Facilitating Safer US-Caribbean Trade: Invasive Species Issues. Proceedings of a Workshop, Port of Spain, Trinidad and Tobago, West Indies, 2-4 June, 2004. Florida Agricultural Experiment Station, Gainesville, Florida. 159 p.

Madden, L.V. 2001. What are the Nonindigenous Plant Pathogens that Threaten U.S. Crops and Forests? http://www.apsnet.org/online/feature/exotic/

McDonell, I. 2004. Essential elements of a regional approach to safeguarding. Proceedings of the Workshop: Facilitating Safer US-Caribbean Trade: Invasive Species Issues, Port of Spain, Trinidad and Tobago, West Indies, 2-4 June 2004. Pp. 61-62.

Murphy, S. T. 2004. Invasive alien species: a global perspective of issues and responses. Proceedings of the Workshop, Facilitating Safer US-Caribbean Trade: Invasive Species Issues, Port of Spain, Trinidad and Tobago, West Indies, 2-4 June 2004. Pp. 13-16.

Narine, J. 2004. Feature address on invasive species and trade. Proceedings of the Workshop, Facilitating Safer US-Caribbean Trade: Invasive Species Issues, Port of Spain, Trinidad and Tobago, West Indies, 2-4 June 2004. Pp. 1-3.

Pollard, G. V. and R.G. Pegram. 2004. FAO and alien invasive species: policy and experiences in the Caribbean Sub-Region. Proceedings of the Workshop, Facilitating Safer US-Caribbean Trade: Invasive Species Issues, Port of Spain, Trinidad and Tobago, West Indies, 2-4 June 2004. Pp. 68-76.

Roberts, M. R. 2004. The impacts of invasive species on agriculture-related industries and natural resources in Florida: Is there any relief in sight? Proceedings of the Workshop, Facilitating Safer US-Caribbean Trade: Invasive Species Issues, Port of Spain, Trinidad and Tobago, West Indies, 2-4 June 2004. Pp. 121-135.

Shannon, M. 1999. Challenges in safeguarding Florida and the U.S. against invasive pests. p. 11-13. In W. Klassen (chair), Mitigating the effects of exotic pests on trade and agriculture, Part A. The Caribbean. Proceedings of T-STAR Workshop-X, Homestead, Florida, June 16-18, 1999, sponsored by the Cooperative State Research, Education, and Extension Service, USDA. 292 pp.

Shannon, M. 2003. Challenges in Safeguarding the Greater Caribbean Basin against Invasive Pests, Diseases, Weeds and other agents: A Florida Perspective. Proceedings of the Caribbean Food Crops Society. 39: 1-5.

Simberloff, D. 2002. Today Tiritiri, tomorrow the world! Are we aiming too low in invasives control? Pages 4-12 in Veitch, C. R. and Clout M. N. (eds.). Proceedings of the International Conference on Eradication of Island Invasives. Occasional Paper of the IUCN Species Survival Commission No. 27.

Sklad, E. A., A. M. Bartuska, J. M. Randall, B A Rice, M. Tu, and D. R. Gordon. 2003. The Nature Conservancy's Conservation Accomplishments at Risk – Abating the Threat of Invasive Species. Proceedings of the Caribbean Food Crops Society. 39 (1): 95- 100.

United Nations Environment Program (UNEP). 2003. Tourism and Biodiversity: Mapping Tourism's Global Footprint. http://www.uneptie.org/pc/tourism/library/mapping_tourism.htm .

Xin J, Beck HW, Halsey LA, Fletcher JH, Zazueta FS, and Momol MT. 2001. Development of a distance diagnostic and identification system for plant, insect and disease problems. Applied Engineering in Agriculture 17 (4): 561-565.

Xin, J., Momol, M. T., Halsey, L. A., Roberts, P. D., Beck, H. W.2002. A Web-based Distance Diagnostic and Identification System for Extension. EDIS: University of Florida, IFAS, Extension, ABE327 July, 2002. 3 pg.