

# **The Agricultural Extension Team: Enhancing Stakeholder Input and Coordinated Program Planning and Delivery to Agricultural Clientele Statewide (an SPT project)**

## **2012 Grant Report**

### **Goals/Objectives**

- (1) Through a variety of **stakeholder engagement** mechanisms, we will continue to identify research and information needs of agriculture clientele statewide.
- (2) We will further **improve communication** between specialists and agents within Cooperative Extension to enhance program planning and delivery to meet clientele needs.
- (3) We will provide quality up-to-date research-based **education and outreach** to stakeholders via Extension meetings and workshops, e-mail communications and publications.

### **Outputs, Outcomes and Impacts**

#### **1. Stakeholder Engagement**

##### **1a. Needs Assessment**

Identification of agricultural stakeholder research and education needs is a critical and ongoing part of extension program planning. A 2009-2010 Agronomic Crops IPM Needs Assessment determined priority research and education needs for field crops. Shawna Loper and Ayman Mostafa have conducted additional clientele needs assessments to help direct their future efforts and program planning. Preliminary results have pointed to the need for more information on alfalfa and wheat management for insect pests and weeds, needs we have begun to address with new output this past year.

##### **1b. Crop Pest Losses Workshops**

Another form of stakeholder engagement occurs via the Crop Pest Losses and Impact Assessment Working Group. Through this activity, funded by the Western IPM Center, we annually engage pest control advisors working in cotton, lettuce and melons through a series of face to face workshops designed to develop data on crop yield losses due to pests and other factors and the economic impact of pests and pest management practices. In 2011 – 2012, we held 5 workshops (4 for cotton and one for lettuce). Survey data are used to identify pest management research and education needs for our cotton and vegetable IPM programs. (See <http://cals.arizona.edu/apmc/croplosswg.html> for more information on this project and links to related ACIS pages, including survey data). These workshops also serve as a venue for two-way dialog with PCAs on important pest management issues.

##### **1c. Advisory Committees**

Another important source for stakeholder input for program planning is advisory committees. These exist at the state and county level, and some are project-specific. In addition to county advisory groups, we convene the IPM Coordinating Committee, a 22-member multidisciplinary stakeholder committee

that guides our IPM programs statewide. This past year, the committee was expanded to include George Frisvold (Agricultural & Resource Economics) and Jack Peterson (Arizona Department of Agriculture). We met on December 8, 2011 and reviewed program accomplishments by each of our IPM Leadership Teams.

The 1080 database advisory group is made up of PCAs, growers, commercial applicators and ag-chemical industry representatives who provide input into the development of the Arizona Pest Management Center Pesticide Database, which includes 22 years of Arizona agricultural pesticide use data. These data have been useful for identification of pest management research and education needs and extension program planning. For example, we queried the database to determine the most effective locations and target audience for a series of soil fumigation trainings held in Spring 2011. The data have already been used to provide input on federal pesticide information requests that have informed registration issues (see [http://ag.arizona.edu/apmc/Arid\\_SWPMC\\_Info\\_Requests.html](http://ag.arizona.edu/apmc/Arid_SWPMC_Info_Requests.html)).

## **2. Improve Communication within Cooperative Extension**

### **2a. Formation of IPM Leadership Teams**

With the hiring of 3 new Assistants in Extension (Lydia Brown, Agronomic Crops IPM; Bryan Stevens, Community IPM; and Wayne Dixon, IPM Assessment) in 2011, we have formed Leadership Teams which guide the program development and the activities of each Assistant in Extension. Leadership Teams include multidisciplinary faculty and, in some cases, external stakeholders. In addition to the 3 Leadership Teams mentioned above, Marco Peña works under the guidance of the Vegetable IPM Leadership Team. This re-structuring has proven to be a very effective model for keeping these new resources focused on the most important activities and outputs.

### **2b. Team Meetings**

The Extension Ag Team met twice this past year, once in Sept 2011 to plan late season Extension meetings and in again in Mar 2012 to plan early and midseason meetings. We also held a conference call in July 2011. The addition of 2 new county agents, Shawna Loper and Ayman Mostafa, and the 2 Assistants in Extension working in agricultural IPM has greatly energized the team to a new level of activity and outputs. In addition, IPM Leadership Teams and other “Spin-Off” Groups have held their own meetings related to generating Extension outputs. Meeting notes are available on the APMC Integrated Crop Management Team webpage at [http://cals.arizona.edu/apmc/cotton\\_team/index.html#notes](http://cals.arizona.edu/apmc/cotton_team/index.html#notes) and on the Agronomic IPM Team webpage at [http://cals.arizona.edu/apmc/agronomic\\_ipm.html](http://cals.arizona.edu/apmc/agronomic_ipm.html).

## **2c. Team Email List**

Between meetings, the Ag Team maintains an email list to ensure ongoing communication and planning among team members.

## **2e. Team Websites**

The Arizona Pest Management Center website hosts working group web pages (cited above) for the Integrated Crop Management Team, the Agronomic IPM Team and the Crop Pest Losses working group, all subsets of our Agricultural Extension Team. These web pages provide a point of contact for team members to post meeting notes and share current information and resources. In 2011 we added a new page for the Mexicali Cotton IPM Project, which features several Extension publications translated into Spanish.

## **2f. Mentoring**

The existence and regular meetings of this group have facilitated mentoring of new and junior faculty members by tenured and senior faculty. This mentoring aspect has increased with the hiring of new county agents and assistants in extension. For example, new faculty have had one on one sessions with senior faculty on topics such as needs assessment, survey development and grant writing. Al Fournier delivered 3 in-service presentations on writing grants, program evaluation and needs assessment.

## **3. Education and Outreach: Outputs, Outcomes and Impacts**

The Ag Team has sustained the momentum developed last year with the input and contributions of new faculty and has continued to leverage resources to maximize Extension outputs.

### **3a. Leverage**

The activities described in this section were leveraged by a number of grants and other external resources, including the following:

- Brown, L., P.C. Ellsworth, A. Fournier, S. Naranjo & A. Mostafa. 2011. Reduced Risk Pesticide Use in Arizona Cotton. Field Demonstrations-reduced risk pesticide use-FY 2011. Arizona Department of Agriculture. \$16,304.
- Brown, L., V. Barlow, S. Bundy, P. Ellsworth, A. Fournier, P. Goodell, G. Hughes, D. Kerns, A. Mostafa, and S. Naranjo. 2012. Field Guide for Beneficial Arthropods in Summer Crops in the Arid & Semi-Arid Regions of the Southwest. \$20,000.
- Ellsworth, P.C. & A. Fournier. 2010-2012. The Arizona Pest Management Center: Enhancing Capacity for IPM Practice in Diverse Environments. Extension IPM Coordination Program. \$525,000 (3 years).
- Ellsworth, P.C. 2011. Pesticide Safety Education Program (PSEP). \$10,000.
- Ellsworth, P.C. & A. Fournier. 2010. State Funds to Augment Extension IPM Programs. University of Arizona College of Agriculture and Life Sciences. \$55,000.
- Fournier, A. & P. Ellsworth. 2011. Arid Southwest IPM Network. Western IPM Center. \$25,000.

- Fournier, A., P. Ellsworth, J. Palumbo, M. Matheron, B. Tickes & W. McCloskey. 2012. Crop Pest Losses and Impact Assessment Working Group. Western IPM Center. \$12,000.
- Fournier, A., P.C. Ellsworth & J. Peterson. 2010-2013. Pesticide Information Empowers Progressive Vegetable Industry. Arizona Department of Agriculture, Specialty Crops Block Grant Program. \$142,426. (3 years).
- Fournier, A., P.C. Ellsworth, P. Jepson & W. Dixon. 2012. Risk Management for Farmers and Advisors. Arizona Department of Agriculture, Specialty Crops Block Grant Program. \$54,010.
- Palumbo, J. 2012. Bagnada Bug Impact on Desert Vegetables. USDA-AMS, Specialty Crops Block Grant Program. \$103,210.
- Palumbo, J. 2012. Development of an IPM program for the invasive Bagnada bug in southwest desert vegetable productions systems. UC Riverside. \$179,463.
- Palumbo, J. 2012. Host susceptibility, geographic distribution, and management of the invasive Bagnada bug in the United States. USDA-NIFA Critical Issues. \$124,296.
- Palumbo, J. 2012. Whitefly Dispersal and CYSDV. Arizona Department of Agriculture, Specialty Crops Block Grant Program. \$74,600.
- Palumbo, J. 2011-2013. Enhancing Arizona Vegetable IPM in Arizona. Arizona Department of Agriculture, Specialty Crops Block Grant Program. \$87,709. (3 years)
- Support from commodity groups and Industry in excess of \$100,000.

Without these external resources secured by faculty (and others not listed), our Extension program outputs would be severely limited.

### **3b. Extension Meetings, Workshops and Field Days**

The Ag Team organized and delivered 47 extension meetings (up from 28 the previous year) between 7/1/11 and 6/30/12, including 5 Crop Pest Losses workshops, indoor meetings, 4 “tent talks” and 7 field-based meetings and demonstrations. In addition, several faculty (including Ellsworth, Fournier, Loper, Mostafa, Palumbo, Tickes, Nolte, Norton, Olsen and McCloskey) delivered presentations at state and regional conferences including the Desert Agriculture Conference and the Southwest Agriculture Summit. At least 94.5 Arizona Dept. of Agriculture CEUs, 49 California Dept. of Pesticide Regulation CEUs and 35 Certified Crop Advisor CEUs were delivered. Attendees are conservatively estimated at over 2,700 people. (For some meetings I lack data on number of attendees.)

The Southwest Ag Summit held in Yuma in March attracted 1,100 participants and delivered 12.5 AZ, 12.5 CA and 24 CCA CEUs. Presenters for the Ag Team included John Palumbo, Randy Norton, Shawna Loper, Ayman Mostafa and Peter Ellsworth.

In addition to specific trainings mentioned above, and independent from the CEU tally given, a number of pesticide safety trainings were held throughout the state to support initial licensing of new applicators and continuing education of license holders. Meetings were held in remote parts of the state, reaching diverse audiences including many tribal members. Pedro Andrade created a “spray table” for use in demonstrations for pesticide trainings.

### 3c. Advisories

**Agent Advisories.** Agents in Pinal, Maricopa, Graham, Mojave, Cochise, LaPaz and Yuma Counties delivered of timely weekly crop and pest management advisories to over 800 email subscribers. Advisories are reaching all agricultural areas of the state once again. Advisories are reaching all agricultural areas of the state once again. All of these advisories draw upon the important work of specialists, including Paul Brown’s weather advisory data and specific outputs of specialists described in the following section. Advisories have become increasingly diverse, and include meeting announcements, new publications, other sources of crop reports, relevant ag news, cotton weather advisories, links to videos and more.

**Vegetable IPM Updates.** In January 2010, with the coordination of Marco Peña, the Vegetable Crops IPM Leadership Team (Palumbo, Tickes, Matheron and Nolte) began putting out the Veg IPM Updates on a biweekly basis. These updates deliver timely information to end-users via web, email and smart phone. The team delivered 26 biweekly updates this funding period, each one with information on insect, disease and weed management topics. These reached over 450 Arizona and California stakeholders by email list, and at least 300 stakeholders via the Arizona Crop Information Site (<http://ag.arizona.edu/crops/vegetables/advisories/advisories.html>). In addition, the same team has produced and posted 27 vegetable IPM videos to date and created a video archive webpage at <http://ag.arizona.edu/crops/vegetables/videos.html>. Stakeholders have responded with enthusiasm about the quality and timeliness of these updates. We have seen a steady increase in attendance at educational meetings and a 2-fold increase in listserve membership for Veg IPM updates. Two regional agricultural publications, Western Farm Press and Western Agri-Radio Network further distribute these “updates” to much larger audiences throughout the West.

**Field Crops IPM Shorts.** The Field Crops IPM Leadership Team (Ellsworth, Ottman, Norton, McCloskey, Mostafa and Fournier), working with Assistant in Extension Lydia Brown, have followed the tradition of the Vegetable IPM Leadership Team in producing short, timely advisory pieces on field crops pest management and getting these out to the broadest audience possible. Starting in June 2011, they began producing “Field Crops IPM Shorts” on a weekly basis. Each “short” is a one-page article on a timely topic of interest that includes photos, data and/or graphics. Topics have included natural enemies of cotton pests, selective insecticides, cotton pest thresholds and sampling techniques, and a guide to glyphosate products for weed control. The pieces go out weekly to at least 360 stakeholders via agent email lists, and have also been picked up and redistributed by Western Farm Press while some pieces have been distributed by the National Cotton Council and Southwestern Farm Press, reaching many tens of thousands of readers. The pieces are archived on the ACIS site at [http://ag.arizona.edu/crops/cotton/agronomic\\_ipm.html](http://ag.arizona.edu/crops/cotton/agronomic_ipm.html). Since June 2011, we have produced 21 Field Crops IPM Shorts, plus an additional 6 translated into Spanish.

### 3d. Websites

**Arizona Crop Information Website.** The ACIS website (<http://ag.arizona.edu/crops/>) hosts current information and publications for clientele on crop production and pest management and is a primary outlet for Extension outputs. The site also provides clientele with information about upcoming meetings and pesticide regulatory updates. Our ACIS email list includes about 300 participants, and is used to send updates to clientele on new extension publications, emerging pest or pesticide issues and upcoming events.

**Arizona Pest Management Center Website.** The APMC website hosts Team and Working Group pages that facilitate communication among Ag Team Members.

The Ag Team site: [http://cals.arizona.edu/apmc/cotton\\_team/index.html](http://cals.arizona.edu/apmc/cotton_team/index.html)

Agronomic IPM Leadership Team: [http://cals.arizona.edu/apmc/agronomic\\_ipm.html](http://cals.arizona.edu/apmc/agronomic_ipm.html)

Soil Fumigant Education Team: [http://cals.arizona.edu/apmc/soil\\_fumigant\\_education\\_team.html](http://cals.arizona.edu/apmc/soil_fumigant_education_team.html)

Crop Pest Losses Working Group: <http://cals.arizona.edu/apmc/croplosswg.html>

Cross-Commodity Research and Outreach Program (CROP): <http://cals.arizona.edu/apmc/cross-commodity.html>

### 3e. Publications

Below is a summary of new or revised articles and publications that represent outputs of this group. 56 Extension publications including 25 Veg IPM Updates and 21 Field Crops IPM Shorts; 3 abstracts and 3 peer reviewed journal articles; 54 popular press articles including 51 for Western Farm Press.

#### Journals

Carrière, Y., C. Eilers-Kirk, K. Hartfield, G. Larocque, B. Degain, P. Dutilleul, T. J. Dennehy, S. E. March, D. W. Crowder, X. Li, P. C. Ellsworth, S. E. Naranjo, J. C. Palumbo, A. Fournier, L. Antilla & B. E. Tabashnik. 2012. Large-scale, spatially explicit test of the refuge strategy for delaying insecticide resistance. *Proc. Nat. Acad. Sci. (USA)* 109: 775-780.

Carrière, Y., P. B. Goodell, C. Eilers-Kirk, G. Larocque, P. Dutilleul, S. E. Naranjo and P. C. Ellsworth. 2012. Effects of Local and Landscape Factors on Population Dynamics of a Cotton Pest. *PLoS ONE* 7(6): e39862. doi:10.1371/journal.pone.0039862.

Li, X. C. B. A. Degain, V. S. Harpold, P. G. Marçon, R. L. Nichols, A. J. Fournier, S. E. Naranjo, J. C. Palumbo, & P. C. Ellsworth. 2012. Baseline susceptibilities of B- and Q-biotype *Bemisia tabaci* to anthranilic diamides in Arizona. *Pest Manage. Sci.* 68: 83-91. (on-line DOI 10.1002/ps.2227).

Naranjo, S.E., P.C. Ellsworth, D.A. Dierig. 2011. Impact of *Lygus* spp. (Hemiptera: Miridae) on damage, yield and quality of a new oil-seed crop, *Lesquerella fendleri*. *J. Econ. Entomol.* 104(5): 1575–1583; DOI: <http://dx.doi.org/10.1603/EC11089>

Tabashnik, B.E., S. Morin, G.C. Unnithan, A.J. Yelich, C. Eilers-Kirk, V.S. Harpold, M.S. Sisterson, P.C. Ellsworth, T.J. Dennehy, L. Antilla, L. Liesner, M. Whitlow, R.T. Staten, J.A. Fabrick, X. Li, and Y. Carrière.

2012. Sustained Susceptibility of Pink Bollworm to Bt Cotton in the United States. *GM Crops* 3:3, 1-7.  
<http://www.landesbioscience.com/journals/gmcrops/TabashnikGMC3-3.pdf>

### Abstracts

Ellsworth, P.C., L.M. Brown, A. Fournier, and W. Dixon. 2012. Measuring Up! Involving Stakeholders in Assessment of an Industry's IPM Revolution. University of Arizona, Department of Entomology & Arizona Pest Management Center. 7th International IPM Symposium, Memphis, TN, March 27-29, 2012. (Poster)

Fournier, A., Ellsworth, P.C., W. Dixon, J. Palumbo and J. Peterson 2012. 20 years of agricultural pesticide use data reveal dramatic reduction in broad-spectrum insecticides. University of Arizona, Department of Entomology & Arizona Pest Management Center. 7th International IPM Symposium, Memphis, TN, March 27-29, 2012. (Poster)

Ellsworth, P.C., A. Fournier, W. Dixon, J.C. Palumbo, K. Umeda and J. Peterson. 2012. Enhancing Capacity for IPM Practice and Assessment in Arizona. An extended abstract for NIFA IPM Programs: Legacy and Impacts Mini-Symposium, 7th International IPM Symposium, Memphis, TN, March 27-29, 2012.

### Extension

Asiimwe, P., L.M. Brown, T. Vandervoet, P.C. Ellsworth, and S. Naranjo. 2011. *jee-AH-kor-is*, Big-eyed Bugs Have Big Appetite for Pests. Arizona Pest Management Center Field Crops IPM Shorts, University of Arizona Cooperative Extension. <http://ag.arizona.edu/crops/cotton/files/GeocorisShortvFc.pdf>  
Spanish translation: <http://ag.arizona.edu/crops/cotton/files/GeocorisShortvFcSpanish.pdf>

Barlow, V., M. Pena, B. Tickes. 2011. Ditch-bank Weed Management Using Select Herbicides. Postings from the Palo Verde (Extension newsletter). University of California Cooperative Extension, Riverside. [http://ceriverside.ucdavis.edu/newsletters/Postings\\_from\\_the\\_Palo\\_Verde\\_Valley40138.pdf](http://ceriverside.ucdavis.edu/newsletters/Postings_from_the_Palo_Verde_Valley40138.pdf) October, 2011.

Brown, L.M., S. Li., P.C. Ellsworth, M. Sullivan and T. Molet. 2011. Cotton Commodity-Based Survey Reference. USDA-APHIS-PPQ-CPHST Cooperative Agricultural Pest Survey (CAPS) Program. 155 pp. [http://caps.ceris.purdue.edu/cotton\\_reference](http://caps.ceris.purdue.edu/cotton_reference).

Brown, L.M. and P.C. Ellsworth. 2011. *Drapetis*: A Natural Enemy. Arizona Pest Management Center Field Crops IPM Shorts, University of Arizona Cooperative Extension. <http://ag.arizona.edu/crops/cotton/files/DrapetisvF.pdf>  
Spanish Translation: <http://ag.arizona.edu/crops/cotton/files/DrapetisvFspanishvF.pdf>

Brown, L.M., T. Vandervoet, P.C. Ellsworth, and S. Naranjo. 2011. Assassin Bugs: Top of the Food Web. Arizona Pest Management Center Field Crops IPM Shorts, University of Arizona Cooperative Extension. <http://ag.arizona.edu/crops/cotton/files/ZelusShortvFc.pdf>  
Spanish Translation: <http://ag.arizona.edu/crops/cotton/files/ZelusShortvFcSpanish.pdf>

Ellsworth, P.C. 2011. Cotton IPM: A Quiet Revolution Reduces Costs, Losses and Risks for Arizona's Cotton Growers. University of Arizona College of Agriculture and Life Sciences Impact Report.  
[http://ag.arizona.edu/apmc/docs/CottonIPM2011\\_Impacts.pdf](http://ag.arizona.edu/apmc/docs/CottonIPM2011_Impacts.pdf).

Ellsworth, P.C. and L.M. Brown. 2012. Pale-Striped Flea Beetles in Young Cotton Stands. Arizona Pest Management Center Field Crops IPM Shorts, University of Arizona Cooperative Extension.  
<http://ag.arizona.edu/crops/cotton/files/FleaBeetleShort.pdf>

Ellsworth, P.C. and L.M. Brown. 2012. Anatomy of a Cotton Sweep. Arizona Pest Management Center Field Crops IPM Shorts, University of Arizona Cooperative Extension.  
<http://cals.arizona.edu/apmc/docs/SweepsAnatomyv2c.pdf>  
Spanish Translation: <http://cals.arizona.edu/apmc/docs/SweepsAnatomyv2cSpanish.pdf>

Ellsworth, P.C., L.M. Brown, G. Castro, and S. Naranjo. 2012. In 7 Minutes or Less. Arizona Pest Management Center Field Crops IPM Shorts, University of Arizona Cooperative Extension.  
<http://cals.arizona.edu/apmc/docs/WhiteflySamplingShort.pdf>  
Spanish Translation: <http://cals.arizona.edu/apmc/docs/WhiteflySamplingSpanishvF.pdf>

Ellsworth, P.C., L.M. Brown, A. Fournier, X. Li, J. Palumbo, and S. Naranjo. 2011. Keeping Cotton Green! Arizona Pest Management Center Field Crops IPM Shorts, University of Arizona Cooperative Extension.  
<http://ag.arizona.edu/crops/cotton/files/SelectiveChemicalControlsvF.pdf>

Ellsworth, P.C., L.M. Brown, A. Fournier, and S. Naranjo. 2011. \$1+ Cotton? New Thresholds? Arizona Pest Management Center Field Crops IPM Shorts, University of Arizona Cooperative Extension.  
<http://ag.arizona.edu/crops/cotton/files/NewThresholdsvF.pdf>

Ellsworth, P.C., A. Fournier and T.D. Smith. 2007 (revised 02/10). Based on Ellsworth, P.C. and J.S. Jones. 2000. Arizona Cotton Insect Losses. Publ. No. AZ1183. University of Arizona, College of Agriculture and Life Sciences, Cooperative Extension, Tucson, Arizona. URL:  
<http://cals.arizona.edu/crops/cotton/insects/cil/cil.html>.

Ellsworth, P.C., A. Mostafa, L.M. Brown, and S. Naranjo. 2011. Soft-bodied *Collops* Likes Soft Bodies. Arizona Pest Management Center Field Crops IPM Shorts, University of Arizona Cooperative Extension.  
<http://ag.arizona.edu/crops/cotton/files/CollopsvFlo.pdf>

Loper, S. and M. Ottman. 2011. Small Grain Irrigation. Arizona Pest Management Center Field Crops IPM Shorts, University of Arizona Cooperative Extension.  
<http://ag.arizona.edu/crops/cotton/files/SmallGrainIrrigation.pdf>

Loper, S. and M. Ottman. 2011. Fertilizing Small Grains. Arizona Pest Management Center Field Crops IPM Shorts, University of Arizona Cooperative Extension.  
[http://ag.arizona.edu/crops/cotton/files/Fertilizing\\_small\\_grains.pdf](http://ag.arizona.edu/crops/cotton/files/Fertilizing_small_grains.pdf)

Loper, S. and M. Ottman. 2011. Small Grain Planting Dates and Rates. Arizona Pest Management Center Field Crops IPM Shorts, University of Arizona Cooperative Extension.  
<http://ag.arizona.edu/crops/cotton/files/GrainsDatesandRatesShort.pdf>

Matheron, M.E. and M. Porchas. 2012. Comparison of fungicides for management of powdery mildew on muskmelon, 2011. Vegetable IPM Update, Vol 3, No. 9, May 2, 2012. University of Arizona Cooperative Extension.

McCloskey, W., P. Andrade-Sanchez, and L.M. Brown. 2012. Nozzles and Droplets: What do the Colors Mean? Arizona Pest Management Center Field Crops IPM Shorts, University of Arizona Cooperative Extension. [http://ag.arizona.edu/crops/cotton/files/ColorsofNozzles\\_Droplets.pdf](http://ag.arizona.edu/crops/cotton/files/ColorsofNozzles_Droplets.pdf)

McCloskey, W. and L.M. Brown. 2011. Considering Roundup Ready™ Alfalfa. Arizona Pest Management Center Field Crops IPM Shorts, University of Arizona Cooperative Extension. <http://ag.arizona.edu/crops/cotton/files/RR-alfalfaShortF.pdf>

McCloskey, W. and L.M. Brown. 2011. Increasing Glyphosate Activity. Arizona Pest Management Center Field Crops IPM Shorts, University of Arizona Cooperative Extension. <http://ag.arizona.edu/crops/cotton/files/GlyphosatevF.pdf>

Mostafa, A., L.M. Brown, P.C. Ellsworth, and V. Barlow. 2011. Insect Pests of Desert-Grown Alfalfa: Egyptian Alfalfa Weevil. Arizona Pest Management Center Field Crops IPM Shorts, University of Arizona Cooperative Extension. [http://ag.arizona.edu/crops/cotton/files/EAW\\_ShortFc.pdf](http://ag.arizona.edu/crops/cotton/files/EAW_ShortFc.pdf)

Mostafa, A., L.M. Brown, P.C. Ellsworth, V. Barlow, and S. Naranjo. 2011. Untangling the Web... Spiders in Arizona Fields. Arizona Pest Management Center Field Crops IPM Shorts, University of Arizona Cooperative Extension. <http://ag.arizona.edu/crops/cotton/files/SpidersWebsvFc.pdf>  
Spanish Translation: <http://ag.arizona.edu/crops/cotton/files/SpidersWebsvFcSpanishvF.pdf>

Nischwitz, C and M. Olsen. 2011. Beet Curly Top Disease (Curtoviruses) in Spinach and Table Beets in Arizona. University of Arizona Cooperative Extension AZ1552, pp4. <http://cals.arizona.edu/pubs/diseases/az1552.pdf>

Norton, R., G. Wang, and S. Loper. 2011. It's All About Timing. Arizona Pest Management Center Field Crops IPM Shorts, University of Arizona Cooperative Extension. <http://ag.arizona.edu/crops/cotton/files/DefoliationTimingvFc.pdf>

Norton, R., G. Wang, and S. Loper. 2012. Defoliation Timing for Arizona Cotton. University of Arizona Cooperative Extension AZ1561, pp2. <http://cals.arizona.edu/pubs/crops/az1561.pdf>

Norton, R., S. Loper, L. Masters, A. Mostafa, K. Nolte. 2011. Cotton Variety Testing Results. University of Arizona Cooperative Extension AZ1560, pp16. <http://cals.arizona.edu/pubs/crops/az1560.pdf>

Olsen, M., C. Nischwitz and R. Norton. 2011. Effects of seed treatment fungicides and seed vigor on cotton seedling stand and yield in southeastern Arizona in 2009 and 2010. Cotton Research and Outreach Report, 2010-2011. University of Arizona Cooperative Extension. <http://cals.arizona.edu/pubs/crops/az1548/az1548c.pdf>

Olsen, M., M. Matheron, M. McClure and Z. Xiong 2011. Diseases of Citrus in Arizona. University of Arizona Cooperative Extension AZ1154, pp10. <http://ag.arizona.edu/pubs/diseases/az1154.pdf>  
(Revised)

Ottman, M. 2011. Wheat and Barley Varieties for Arizona 2011. University of Arizona Cooperative Extension AZ1265, pp10. <http://cals.arizona.edu/pubs/crops/az1265.pdf>

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[http://extension.arizona.edu/sites/extension.arizona.edu/files/resourcefile/resource/marcop/Knockdown%20and%20Residual%20Control%20of%20Bagrada\\_Greenhouse%20\(2\)082411.pdf](http://extension.arizona.edu/sites/extension.arizona.edu/files/resourcefile/resource/marcop/Knockdown%20and%20Residual%20Control%20of%20Bagrada_Greenhouse%20(2)082411.pdf)

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**Appendix A (next page): Table of Extension Meetings, July 2011 – June 2012.**