TRANSACTIONS

of the

ILLINOIS STATE HORTICULTURAL SOCIETY

for the year 2008
Volume 142

and the

12th ANNUAL ILLINOIS FRUIT AND VEGETABLE

CROP RESEARCH REPORT

Transactions Compiled by Don H. Naylor
Research Report Compiled by John Masiunas
Published by the Society

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INTRODUCTION

It is always a pleasure to prepare another volume of Transactions of the Illinois Horticulture Society and the Annual Illinois Fruit and Vegetable Crops Research Report. Another year always brings changes. I have been hopelessly delayed in completing the Transactions and Research Report. Age, paralysis and teaching seem to make everything take longer than I plan. I apologize to Don Naylor, the Illinois Horticulture Society, researchers contributing to this publication, and the fruit and vegetable growers in Illinois.

Another change is that fewer paper copies of the Transactions and Research Report are being printed. The Transactions and Research Report is now available on the University of Illinois Extension Integrated Pest Management, Illinois Fruit and Vegetable News website (http://ipm.illinois.edu/ifvn) as an Adobe pdf file. Many more people are able to access the Transactions and Research Report compared to the past. The current recession has also limited funding for printing the Transactions and Research Report. The pdf format allows us to provide this excellent publication free to growers.

Horticulture at the University of Illinois is facing challenges and undergoing changes. This August, the Horticulture group will be moving from the Department of Natural Resources and Environmental Sciences (NRES) to the Department of Crop Sciences. The association with the Department of NRES has provided opportunities to develop new collaborations and focus on horticultural research related to environment and sustainability. But the association has presented challenges related to shrinking resources, leadership, visibility, and cohesiveness. Undergraduates majoring in Horticulture have shrunk dangerously low with only five freshman admitted for fall 2009. Who will be the future leaders of Illinois horticulture? Is there a need for horticulture and faculty at the University of Illinois? The good news is that the move into the Department of Crop Sciences has brought the horticulture faculty together to face the challenges.

The Research Report would not have been possible without the excellent and hard work done by Bill Shoemaker, Bronwyn Aly, Jeff Kindhart, Mosbah Kushad, Mohammad Babadoost, Maurice Ogutu, Rick Weinzierl, and their colleagues. It is an honor to work with them. I especially want to thank all the farmers and industry personnel who have provided encouragement and direction during the year.

The research articles are in alphabetical order by the research group responsible for the project. Contributions this year came from many researchers but not every scientist contributed articles. The articles were compiled as they were received with no editing. In general, the articles are short summaries of preliminary research. Most articles have not been formally peer reviewed and are not recommendations of any practice or product by the University of Illinois, the Illinois State Horticultural Society, the authors, or myself.

A number of articles discuss research with experimental pesticides. Many of the pesticides are not registered on these specific fruit and vegetable crops in Illinois. Use of unregistered pesticides is illegal, and may cause crop damage or residues that could harm consumers.

The purpose of the Transactions and Research Report is to inform the Illinois fruit and vegetable industry. The next pages contain the names, addresses, and telephone numbers of researchers submitting articles. Contact the individual researcher if you have any questions or want more detail about the research. Also we welcome your suggestions and input on future research.

John Masiunas, April 2009

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TRANSACTIONS

of the

ILLINOIS STATE HORTICULTURAL SOCIETY

for the year 2008
Volume 142

Including the

PROCEEDINGS
of the
ONE HUNDRED FIFY-FIRST
ANNUAL CONVENTION

Held in Conjunction with the Illinois Specialty Crops Conference and the
The Illinois Specialty Growers Association Annual Meeting
at
Springfield, Illinois
January, 7-10, 2009

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Celebrate 150 years

One Hundred-Fifty Years
and Still Going Strong
By Jerry Mills (Sept. 08)

A partial history of the beginnings of the Illinois State Horticulture Society.

Before there was a state horticulture society, there was a state agriculture society. It came into being in the early 1800s. The Agricultural Society sponsored fairs around the state and promoted agricultural interests. The fairs featured livestock exhibitions as well as machinery, food, ornamental crops, and homemaking skills much as we still have today. Anything of general interest was included.

In 1856, there was an exhibit at the Illinois State Fair of three different sewing machines and a discussion of their merits. Singer was one of them. Such fairs were a great way to disseminate information and gain knowledge, and the state and local governments encouraged them. Visitors did not have to be literate or even speak the language to learn something from these events.

The fairs were the social highlight of the year for many rural families. By 1855, when many of the railroads began functioning, some of them allowed free transportation for fair exhibitors. Imagine getting to go across the state on a new fangled train and see your friends and family without a long wagon ride!

As late as the 1930s, some farm families still spent a week or more camping at state fairs. It was their one vacation of the year. Neighbors in our neck of the woods took turns doing chores for one another so one family could be gone for a week.

Railroads contributed to the growth of the horticultural societies. In the early days, officers often got passes which allowed them to travel around the state, assessing crops, exchanging information, and promoting their organizations.

In the summer of 1856, a committee composed of members of the Illinois Agricultural Society met to investigate the possibility of forming a state horticulture society. Thirty-two men, mostly fruit growers or academics from around the state, gathered in Decatur of that year, and the Society was launched: "Pursuant to the committee appointed for the purpose, a meeting of the friends of horticulture was convened this day.

The convention was called to order by the Honorable M.L. Dunlap. The Honorable D.J. Baker of Alton was chosen chairman and C.R. Overman of Bloomington, secretary.

The Chairman, in an appropriate and spirited address, explained at length the object of the meeting, the necessity for the organization of a state horticulture society and the cheering prospect which were before those who embarked in the cause.

A committee of five was appointed to draft a constitution and by-laws," most of which we still have today. The first election committee was composed of a representative of each county represented. They adjourned to make a slate of officers. When they returned, E.F. Hull of Alton was proposed as president and nine vice presidents, one from each state district, were proposed. The slate won by acclimation---not much different from the way we do things today.

"Dr. Hull, the new president, gave thanks for the honor. He felt that on this day a new era in horticulture had commenced---that the people should be aroused to a subject so replete with interest, one which appealed to their sense of the beautiful, one that appealed to them pecuniary; indeed one which was scarcely second to any other interests in our state."

A committee was appointed to present to the state legislature a proposal for a charter for the Society. Another committee was appointed to petition the state legislature for an appropriation to promote the interests of the Society. This support lasted almost 100 years and was valued at approximately $6,000 per year when it ended in the 1950s.

Following the business meetings, apples were presented for evaluation by the group. This was a common activity all through the early history of the society. Growers presented fruit and heard comments on them by others. There was a common interest in finding new and better varieties, which continues to this day.

Most of the fruit were from individuals who had discovered or developed new varieties. Committees had to determine if these varieties were indeed new or true to form for established varieties. Here are some that were presented, as recorded in 1857:

"Newtown Pippin; a medium bearer, slow to mature but second only to Lady Apple in price. Keeps until March."

Hawkins Schwartz Farms Wins Illinois Cider Contest

By Dr. Elizabeth Wahle, Cider Contest Coordinator
UI Extension Specialist
Edwardsville Extension Center

The Illinois State Horticulture Society sponsored its 19th Annual Illinois Cider Contest, held in conjunction with the Illinois Specialty Crop and Agritourism Conference on January 10 in Springfield, Illinois. Hawkins Schwartz Farms, located at Centralia, IL, produced the No.1 overall rated cider at this year's contest, thus winning First Place National and Illinois Cider. Tom Schwartz pressed his winning cider in a bladder press on November 20, using a blend of Golden Delicious and Jonathan.

Second Place Illinois Cider was awarded to Broom Orchards, located at Carlinville, IL and Edwards Apple Orchard West of Winnebago, IL won Third Place Illinois Cider. Our out-of-state neighbors took home the remaining National Cider awards, with Hill Bros. of Grand Rapids, Michigan, taking home Second Place National Cider and Engelsma's Apple Barn of Walker, Michigan winning Third Place National Cider. Midwest Cider of Merit 1st Runner-up was awarded to Edwards Apple Orchard of Poplar Grove, IL. The 2nd Runner-up went to Honey-Hill Orchards, located at Waterman, IL, and the 3rd Runner-up was awarded to Tanners Orchard, located in Speer, IL.

Judges evaluated the entries using a 25-point rating scale for cider quality characteristics. The jconducted "blind" evaluations where only a randomly chosen sample number identified each cider entry. The judging team was made up of a diverse group, including: Megan Pressnall, Illinois Grape Growers and Vintners Association; Brad Taylor, Associate Professor at Southern Illinois University; Daniel Becker, student at Southern Illinois University; Ben Wright from Cerexagri; Jim Shannon from Southern FS; David Robson from University of Illinois Extension, Susan Rick from DuPont; and Jim Wallace from Helena. The Illinois State Horticultural Society (ISHS) has annually conducted the contest since the contest started in 1990. The contest presents awards in three different categories: National, Illinois and Midwest Cider of Merit. National awards are open to all US producers, and Illinois awards are open to all Illinois producers. The Midwest Cider of Merit awards are open to Illinois producers, plus producers from other adjoining states that do not place in the National or Illinois categories.

ISHS also sponsored the Sixth Annual Hard Cider Contest, where contestants vied for the top honor. Michael Seneczko, a new grower from Plainfield, IL, was awarded the Champion Hard Cider Award, using a blend of Red Delicious, Golden Delicious, Granny Smith, and Jonathan.

Brad Taylor, Southern Illinois University, instructed judges on the important characteristics of hard cider before the start of the contest. Each cider was individually awarded points based on characteristics like clarity, color, bouquet, balance of alcohol, acidity, sweetness, sugar/acid balance, body, flavor, astringency and bitterness, any off-flavors, and the overall quality.

The ISHS gratefully acknowledges the dedication and hard work of our judging team. Thank you! Most importantly, thanks are extended to all who entered the contest this year. Start planning now for the next contest in 2009.

A summary of more contest notes is outlined below.

National Awards	Firm	Address	Cultivar Blend
First Place	Hawkins Schwartz Farms	Centralia, IL	Golden Delicious, Jonagold
Second Place	Hill Bros.	Grand Rapids, MI	Golden Delicious, Gala, Jonathan, MacIntosh
Third Place	Engelsma's Apple Barn	Walker, MI	Jonathan, Golden Delicious, Gala, Red Delicious, Northern Spy, Empire, Mutsu (Crispin)
Illinois Awards			
First Place	Hawkins Schwartz Farms	Centralia, IL	see above
Second Place	Broom Orchard	Carlinville, IL	Mutsu (Crispin), Jonathan, Golden Delicious, Scarlett Beauty
Third Place	Edwards Apple Orchard West	Winnebago, IL	Golden Delicious, Jonathan, Jonagold
Midwest Cider of Merit			
First Runner-up (tie)	Edwards Apple Orchard	Poplar Grove, IL	Golden Delicious, Jonagold, Granny Smith, GoldRush
Second Runner-up	Honey-Hill	Waterman, IL	Honeycrisp, Jonathan, Golden Delicious, Jonagold
Third Runner-up	Tanner Orchard	Speer, IL	Jonathan, Golden Delicious, Red Delicious, Jonagold, Honeycrisp
Hard Cider			
Champion	Michael Seneczko	Plainfield, IL	Red Delicious, Jonathan, Golden Delicious, Granny Smith

Tanner's Host 2008 Summer Orchard Day
By Mosbah Kushad, University of Illinois

The 150-Year Celebration of the Illinois Horticultural Society Field Day was celebrated at Tanner's Orchard in Speer, Illinois, on June 12, 2008. More than 140 growers, exhibitors, and university specialists celebrated the 150 year milestone of the Illinois State Horticultural Society at Tanner's Orchard in Speer, Illinois. The day started with a sweet breakfast which included pastries baked in the kitchen of the Tanner's family along with a very large assortments of pies, donuts, and sweet breads provided by the exhibitors.

After breakfast, Richard and Craig Tanner gave an overview of the history of Tanner's Orchard. In 1947, at the age of 34, the late John Tanner, his wife Margaret, and their four children bought the farm and started to build a direct marketing operation that has blossomed into one of the best in the Midwest. After the introduction, the group took a wagon tour of the orchard. The Tanner's grow about 65 acres of apples, pumpkins, and sweet corn which they sell at their store.

University of Illinois and Southern Illinois University specialists were available to answer questions and talk about expectations and challenges for the new growing season. A separate segment of the program included a demonstration and discussion about baking kitchens, gift shops, gourmet food display, and merchandising.

At noon, Jerry Mills, Mills Apple Farm, gave a very delightful presentation about the 150-year history of the Illinois Horticultural Society. Mr. Tom Jennings, Director of Illinois Agriculture, talked about state programs that benefit the Illinois Specialty Growers. The program also included a presentation by Jane Eckert, of Eckert Agrimarketing, Inc., about basic steps that will make and keep your business successful.

A panel of four growers including Sherry Mills, Richard Tanner, Chris Eckert, and Pat Curran talked about the challenges of pricing in light of the rapid rise in energy cost and the need for charging admission into the farm. Steve Bock, President of the Illinois Horticulture Society thanked the Tanners family for hosting the event and making it one of the best.

Women's Event at Hort Field Day

While orchard managers were touring the fields, the women attended two workshops which included a tour and an explanation of the bakery area, as well as a tour with presentations in the market.

Joy Grose, Tanner's Bakery Manager, led a tour of the bakery areas, explaining each area. Menu, production records, job descriptions, labeling, and equipment were discussed among many other topics.

Debbie Dietrich then presented a short program on how to properly display gift merchandise and an explanation of how to choose the right gifts for your area. A tour of the market area was led by Marilyn Tanner and Jennifer Beaver.

2008 Illinois Specialty Crops and Agritourism Conference Recap

The 2008 Illinois Specialty Crops and Agritourism Conference, held January 9-12 at the Crowne Plaza Hotel in Springfield, once again featured programming for both the Illinois Specialty Growers Association and the Agricultural Tourism Partners of Illinois (ATPI). The successful joint effort featured two pre-conference workshops, the traditional breakout sessions, and a new Saturday program called Buy Local, Eat Healthy which is described on page 7.

Two pre-conference workshops were held on Wednesday, January 9: (1) High Tunnels and Greenhouses for Extending Seasons and Increasing Markets; and (2) Growing Grapes in Illinois. Both were crowd pleasers, with over 100 in attendance between the two workshops. The Greenhouse Workshop featured topics on high tunnel designs, bedding plant production, organic production, integrated pest management, weed management, and a grower's perspective by Matt Klein, President of IVGA.

The Grape Workshop included topics on information resources, the importance of site selection, risk management options, choosing varieties and their sources, vineyard establishment, and insect, disease, and weed management.

On Thursday, January 10, the conference was kicked off by keynote speaker, Charlie Touchette, Executive Director, North American Farmers Direct Marketing Association, who talked on farm direct marketing and agritourism. Following were five tracks of breakout sessions on fruits, vegetables, herbs, and agritourism, as well as a more general track for all the member organizations that included talks on marketing and legal issues, pest monitoring, pesticide application, invasive organisms and pollinator health, and lastly, labor, i.e. H2A.

Invited speakers for the fruit sessions included Guido Schnabel, Clemson University, with two presentations on peaches (brown rot and root rot); Donn Johnson, University of Arkansas, (right) who held two talks on insect management in peaches and brambles; and Desmond Layne, Clemson University, who spoke on canopy management of peaches. Janna Beckerman, Purdue University presented two talks on apples (scab resistance and crown rot). ISHS member and producer Tom Ringhausen (right) spoke on growing and marketing peaches and apples in southwestern Illinois. U of I presenters included Rick Weinzierl (apple and peach insect management) and Jeff Kindhart (strawberries).

For vegetable growers, John Biernbaum, Michigan State University, talked on vegetable transplant production. Lewis Jett, West Virginia University, spoke on high tunnel systems, and Doug Doohan, Ohio State University, (right) on weeds in vegetable production. U of I presenters included Mohammad Babadoost (peppers, tomatoes, and cucurbits), Rick Weinzierl (vegetable insects), Jeff Kindhart and Bill Shoemaker (vegetable trials), and John Masiunas (snap beans). IVGA producer Lloyd Nichols spoke on vegetable varieties.

Agritourism sessions featured talks on marketing, making the sale, increasing sales, and promotional design, with speakers from Purdue, U of I, U of Kentucky, U of Missouri, Missouri Dept of Ag, tourism bureau professionals, and many agritourism producers. A summary of the

herb sessions can be found in the herb section on page 13. The Thursday night banquet featured Andrew McCrea, radio broadcaster, author, farmer and rancher, who provided input on "Moving our Industry from Ordinary to Extraordinary." The cider contest results were announced at the banquet as well with those results provided on page 11 in the ISHS section of the newsletter.

From the President (Sept. 08)

by Steve Bock, Waterman

Hello everyone. Well, this year has certainly been a great challenge for many of you. There have been a lot of mixed comments so far in regards to weather and crop conditions. Up in the northern part of the state, they have been experiencing some heavy infestation of Japanese beetles. Apples are sizing well, and some varieties are a little on the light side.

From the President (June 08)

by Steve Bock, Waterman

Hello everyone! Well, this sure has been a different Spring for just about everyone. But, from what I'm hearing and what I've read so far, we should have a crop to sell. A lot of doom and gloom with the State support programs. Keep talking to your state representatives. Hope to see everyone at summer Hort Day on June 12. Take care.

From the President (March 08)

by Steve Bock, Waterman

Hello Everyone. What a wild weather pattern we have had over the past couple of months. I am sure glad to have some great and loyal employees that have been willing to work to the end of the work week and weekends to prune trees since the bad weather seems to happen toward the beginning of the week. At least we should have plenty of moisture going into the spring in northern Illinois. Let's all hope that Mother Nature will cooperate this year for everyone.

Your ISHS board has been busy since the conference with a couple of teleconference meetings and personal assignments plus the C-FAR meetings coming up in March.

Please mark your calendars for our summer field day at Tanners Orchard on June 12. At this event, we will be celebrating the ISHS' 150th year! Now that's something of which to be proud! Perhaps with the more central location, we'll have a great turnout. I wish you well in 2008 and hope to see you in June. Take care!

Notes From Home

by Jerry Mills, June 2008:

Killing the Geese that Lay the Golden Eggs

I hope that by the time you read this the political foolishness in denying funding for Extension, C-FAR, etc., has passed and that such funding has been restored.

Whoever advised the State to reduce or cancel those programs simply has no idea of their importance in the overall scheme of modern agriculture in Illinois or of the essential role they have played and continue to play in sustaining the state's ability to contribute to the nation's food supply. It is just plain short sighted.

Illinois will go from being one of the leaders in developing modern agricultural technology to a follower who has to rely on neighboring states to do the research, testing and educating necessary to compete in an increasingly world-wide ag arena.

As we become a third rate state, we can probably borrow information from the neighboring states and adapt it to our conditions. Never mind that their soils are different and their rainfall patterns don't fit ours or that their seed grains are not adapted to Illinois soils.

Illinois farmers are resourceful. They will adapt, but without the brains that fuel continued progress in the various aspects of Illinois agriculture, we will slowly fall behind. And worst of all, the hundreds of dedicated researchers and educators who have given their lives for us will have to retire or migrate somewhere else where their talents are appreciated.

What gripes me most is that a small group of unappreciative political leaders can make decisions that literally take the lifeblood out of an industry and kill the systems that have served us so well for the last ninety years.

With that off my chest, I hope to see you all at Tanner's on the 12th.

Notes From Home
by Jerry Mills, March 2008:

Nifty Peach Orchard System
Saw an interesting cultural system for growing quality peaches in Colorado. Trees are planted four feet apart and trained to a two scaffold "Y" system with the branches perpendicular to the rows. The scaffolds extend outward at 45-60 degree angles and have no branches on them that are older than two years.

Pruning crews count the year old branches and leave only 25 year old branches per scaffold. Later, after bloom, crews go through again and remove excess fruit leaving only two peaches per branch. This then totals 100 peaches per tree. Tree rows are 12 feet apart giving a population of just over 900 trees per acre. If the peaches size well, this yields over 1,000 bushels of good, quality fruit per acre.

The biggest advantage as I see it is that untrained pruning crews can be easily instructed on what they have to do and do a good job pruning—once the trees are established. I wish my trees were as easy to prune as those are. I haven't gotten around to seeing many peach orchards in Illinois. This may not be a new idea, but it is to me....I might try it.

Pruning
Pruning is underway as I write this and I have many trees to go. If it were not for my trusty pruning tower, I couldn't do it. The tower allows me to work looking out and down, not upward which is hard to do with these old bones. It also keeps the arms close to my body, easing strain on the elbows. The best part of all is my cable and counterweight system which carries most of the weight of the hydraulic pruner. Without this help, I couldn't do anything. With it, I can go almost all day. The system isn't hard to make. It only takes a length of steel electrical conduit pipe, a pulley from a garage door opener and cable, and a soda can full of lead plus some PVC pipe and clamps. Lead is readily available at tire shops and you can melt it in a pan on an electric stove. The can of melted lead almost equals the weight of the pruner and hoses. Chris Doll (upper right) tries out the pulley and weight system.

ISHS - 150 Years Old!
This year starts the 150th year of the ISHS. It was originally organized in Decatur in December 1857, and the first convention was held the following January. It is one of, if not the, oldest such organizations in the United States. In those days, there were numerous hort societies. Some were at county level, some encompassed larger areas, and the overall society was the Illinois State. Apparently, the state politicians recognized the value of such groups in educating the members and promoting the industry. There were hundreds of members around the state and records were kept of all of their activities. These were published by the State printers in hard copies of the proceedings of each year. They make fascinating reading as members discussed varieties, pest control, cultural practices, and problems with marketing….not much different from today.

The biggest difference is that the state government subsidized the Society for almost a hundred years. That made membership cheap. That changed some years ago, and we are on our own and one of the continuing problems of Society leadership is collecting enough revenue to keep going, especially in the face of dwindling numbers of fruit growers and membership. Now the many societies are reduced to one, and it continues its mission of education; but it has also added a bigger mission of trying to influence state and national politicians to be friendly to the fruit industry. We have already seen where mandatory regulations have changed how we do things. Some changes were needed, but some were not, and no one will look out for our welfare but us.

So….I think we have a pretty good heritage and a very important mission. I hope you do, too. If you know someone who is not a member who is growing fruit, gently ask him or her if they wouldn't like to add their names as members of this venerable and valuable organization.

Anniversary?

This might be the beginning of my tenth year in writing these columns. Memory doesn't serve me too well these days. Anyhow, I just want to say that it has been fun and rewarding to make up these words and put them on paper. I recognize that most of them are just words but maybe, once in a while, someone has gained a benefit from them. I appreciate the feedback that I get from them and the opportunities I have had as a result of them. I hope to be able to continue for a long time. And besides they help Diane fill up the empty spaces in the *Specialty Grower's News* which isn't all bad.

I.S.H.S. **Board of Directors**
January 10, 2008 to January, 2009

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DR= District Representative
MAL= Member-at-Large

ILLINOIS STATE HORTICULTURAL SOCIETY

MINUTES

Board of Directors Meeting
Wednesday, January 9, 2008
Crowne Plaza — Springfield, Il — Lincoln Room

The meeting was called to order by President Dennis Ringhausen at 7:40 p.m.

A motion was made by Steve Bock, seconded by Tom Schwartz, and it carried, to place the minutes of the December 18, 2007 board meeting on file.

A motion was made by Chris Eckert, seconded by Raoul Bergersen, and it carried, to place the Treasurer's Report on file.

A motion was made by Dennis Ringhausen, seconded by Jeff Broom and it carried, to appoint Chris Eckert to represent the Society at upcoming EQIP meetings including those scheduled on Feb 27, June 11, and Nov 12 in Urbana.

A motion was made by Tom Schwartz, seconded by Jeff Broom, and it carried, to adjourn the meeting at 924 p.m.

President's Report. President Ringhausen reported on submitting to the Illinois Department of Agriculture AgriFIRST grant program which is a request for funding to print and distribute brochures at interstate rest stops to promote Illinois orchards. The grant request was for $12,050. The department asked for additional information about the Society that is due before January 14, maybe a good sign of the grant receiving serious consideration.

(Note: Jon Sommerhof, The Nature Institute, based in Godfrey, has submitted a grant request on behalf of the Society. The grant request is for $12,050 and requires $800 in matching cash contribution and $2,150 of in-kind contributions [for distribution]).

Treasurer's Report. Don Naylor presented the Treasurer's Report. As of December 31, 2007 the bank account balance was $9,915.86. Cumulative income for the year totaled $8,284.25 and expenses year to date were reported at $9,915.86. Estimated outstanding bills total $1,126 leaving an estimated bank balance of $8,789.86. The budget for 2008 estimating income at $9,950 and expenses of $10,090 will be presented at the annual meeting.

Summer Horticulture Field Day. The field day will be held at Tanners Orchard on Thursday, June 12, 2008 . Tanners Orchard is located north of Peoria near Speer. Due to the rural location, additional educational opportunities will be developed. The board will meet the evening before at an undetermined location.

Transactions. The 150th edition will be distributed during the conference. Celebration activities for the 150th will be included in the next transactions. Mohammad discussed the issue of a lack of funds to pay for the printing of the transactions. The Society contributes $250 toward the printing that is estimated to cost between $700 and $1,000. IVGA was going to be asked to contribute to help defray some of the out of pocket costs for the university.

C-FAR. Jeff Broom volunteered to attend the annual meeting on February 12th in Springfield in place of Denise who cannot attend.

Marketing. The effort will be focused on completing and distributing brochures if the grant is received.

Membership. At the December meeting the board set a goal of 101 members for 2008. After that meeting, a lifetime members list and a delinquent members list was provided to board members. A delinquent member list will be distributed during the annual meeting with a request to contact one or two nearby growers to invite them to rejoin. The board began working on the lifetime list by removing those deceased or out of business.

Cider Champion for Excellence. No report.

Cider Contest. The committee has purchased smaller frames and certificates that dropped the cost by half. It should help in making a small profit for this program.

Grants. Reported by the President

Hall of Fame**.** No report

Academic Service Recognition**.** A selection has been made but the announcement and presentation will be delayed until the 2009 Specialty Growers Conference.

Nominating Committee. The committee announced that Pat Curran will move from Past President to a Member at Large position for District #1 (North). Chris Eckert will fill the 2nd Vice President position vacated by Craig Tanner who is moving to the 1st Vice Presidents spot. An effort will be made to identify a grower for a Member at Large position in District #2 (Central).

Old Business

Disaster Assistance Update. The grant program funded in the Iraq funding bill was passed and signed into law recently. It was reported that payments of up to $80,000 are being made to those that applied for grants for crop losses due to the freeze on Easter weekend last year.

Anniversary. The 150th Anniversary of the Society will be marked by announcement at the annual meeting and commemorative pens to be distributed in the next year. Other activities will be planned for the summer field day.

Committee Members**.** No action was taken with committees.

New Business

EQIP. This is a program to give grants for environmental and conservation improvements. Presently the State of Illinois is granting to the livestock industry but the orchard industry is not part of the program. Upcoming Illinois State Technical Committee meetings are scheduled for February 27, June 11, and November, will review and set the guidelines for the next program year. It is possible that orchards could be added if a request is made. Chris Eckert volunteered to represent the Society to present a request for adding orchards to the program. It was reported that the funding made available is not being completely used. (The Environmental Quality Incentives Program (EQIP) is a voluntary conservation program administrated by the USDA Natural Resources Conservation Service (NRCS). It supports production agriculture and environmental quality as compatible goals. Through EQIP, growers may receive financial and technical assistance to implement structural and land management conservation practices on eligible agricultural land.)

Agri-Lite. Adjusted Gross Revenue–Lite Crop Insurance program to Illinois. Agri-Lite is a whole-farm revenue protection plan of insurance which would provide a risk management tool for many specialty growers beginning in FY 2009.

C-FAR has called for suggestions for strategic initiatives from member groups. Suggestions to be forwarded to C-FAR include:

1. Rootstocks for Illinois
2. Irrigation management
3. Codling moth control/eradication
4. Peach density plantings
5. Fire Blight control/eradication
6. Deer control

Attendance. Board members in attendance included: President Dennis Ringhausen, Raoul Bergensen, Steve Bock, Denise Boggio, Jeff Broom, Pat Curran, Chris Eckert, Tom Schwartz, Craig Tanner, and Mohammad Babadoost, adviser. Not present: Jerry Mills, Wayne Sirles, and Adviser Brad Taylor.

ILLINOIS STATE HORTICULTURAL SOCIETY

M I N U T E S
Annual Meeting
Crown Plaza Hotel — Springfield, IL
Thursday, January 10, 2008

President Dennis Ringhausen called the 2007 Annual Meeting to order at 4:51 p.m.

A motion was made by Raoul Bergersen, seconded by Denise Boggio, and it carried, that the minutes of the January 12, 2007 Annual Meeting be accepted as printed.

A motion was made by Craig Tanner, seconded by Raoul Bergersen, and it carried, to accept the Treasurer's Report.

A motion was made by Randy Graham, seconded by Joe Ringhausen, and it carried to accept the slate of nominees presented for the Board of Directors. (see attached list)

A motion was made by Chris Hall, seconded by Bernie Colvis, and it carried, to issue a resolution of support for Ken and Barb Hall loss due to a tornado that destroyed several buildings at the orchard recently.

A motion was made by Steve Bock, seconded by Raoul Bergersen, and it carried, to adjourn the meeting at 5:17 p.m.

Treasurer's Report. Income for 2007 totaled $ 8,492 (down $353) including: a $ 2,610 payment from I. S.G. A. for 87 (81 year before) memberships in the Society; $ 3,785 member contributions; 1,460 meeting registrations; $350 cider contest; and $192 transactions sales.

Expenses for the year totaled $ 8,270 (up $2,235 from year ago) including: $285 for cider contest; $ 790 membership dues; $70 annual meeting; $ 1,140 field day; $12 for miscellaneous; $138 for postage; $ 279 office supplies; $10 for publications; $ 470 executive secretary reimbursement; $3 829 for salary.

Membership. Membership was reported at 87 members up six from the previous year.

Summer Field Day. The date has been tentatively set for June 12, 2008 at the Tanner's Orchard near Speer, Illinois.

Cider Contest. There were 16 (down 2) entries plus some hard cider entries. The winners will be announced late today at the banquet this evening.

Transactions. Transactions are to be delivered shortly and may be picked up at the registration center.

There was some discussion about insurance programs, Agri-Lite, EQI

Resolution of Support

Whereas Edwards Apple Orchard was struck by a major tornado that destroyed several building and severely damaged the home,

Be it Resolved that the Illinois State Horticultural Society offers moral support to Ken and Barb Hall because of the disaster.

Approved by the Members at the January 10, 2007 Annual Meeting

ILLINOIS STATE HORTICULTURAL SOCIETY

MINUTES

Board of Directors
Teleconference Meeting
Monday, January 21, 2008

The meeting was called to order by President Steve Bock at 9 a.m.

Motions

A motion was made by Chris Eckert, seconded by Dennis Ringhausen, and it carried, to place the minutes of the June 13, 2007 board meeting on file.

A motion was made by Christ Eckert, seconded by Tom Schwartz, and it carried, to approve the following resolutions:

Resolved that Busey Bank of Bloomington, IL is hereby designated a depository of this corporation, and that a checking or deposit account be maintained with Busey Bank, subject to the terms and conditions contained in the Deposit Accounts Agreement and Disclosure, said account to be entitled, and,

Resolved that Don Naylor, Executive Secretary; SteveBock, President; and Craig Tanner, 1st Vice President be authorized to sign checks for payment of bills of the Society, and,

Resolved that Don Naylor is designated as the Secretary-Treasurer and shall collect all moneys due the Society, pay all bills for the Society and to provide fiscal accountability to the board and membership on a regular basis, and,

Committee appointments/re-appointments include:

Cider Contest
- Pat Curran
- Steve Bock
- Elizabeth Walhe

Cider Champion For Excellence
- Chris Doll
- Brad Taylor

Hall of Fame
- Bob Edwards
- Chris Doll

Industry Recognition Award
- Chris Eckert
- Ken Hall
- Wayne Sirles

Cider Champion for Excellence
- Chris Doll

C-FAR

Wayne Sirles	- Voting Delegate
Tom Schwartz	Grp #1- Expanding Agricultural Markets
Don Naylor	Grp #2- Rural Development
	- Research Committee
Craig Tanner	Grp #3- Agricultural Production Systems
Randy Graham	Grp #4- Human Nutrition and Food Safety
Denise Boggio	Grp #5- Natural Resources

A motion was made by Wayne Sirles, seconded by Craig Tanner, and it carried, to adjourn the meeting at 9:00 a.m.

Discussion

Summer Horticulture Field Day. The summer horticulture field day was again announced for Thursday, June 12, 2008 at Tanner's Orchard new Speer, Illinois. Suggestions for celebrating the 150th anniversary included a birthday cake and a reading of early history. A board meeting will be held the previous evening and details will be announced later.

Membership. Board members will be attending various fruit meeting sponsored by the Extension Service and invite attendees to join the Society. Wayne will send Don a copy of a handout he uses to be updated and provided for use at the meetings.

The board agreed to divide the delinquent list into regions and then contact former members to ask them to rejoin.

Steve reported on his initiating discussion with the Specialty Grower board about looking at dues disparity. The primary concern is concern about losing members if lower dues organizations were to raise theirs to be more in line with the Society.

Illinois MarketMaker. The U of I Extension service offers a free service to advertise ag businesses and several reported they have registered. The address is: www:marketmaker.uiuc.edu.

Attendance. Board members in attendance included: President Steve Bock, Chris Eckert, Wayne Sirles, Tom Schwartz, Kurt Range, and Dennis Ringhausen Not present: Raoul Bergenson, Denise Boggio, Jeff Broom, Pat Curran, Craig Tanner, and advisers Mohammad Babadoost, and Brad Taylor.

ILLINOIS STATE HORTICULTURAL SOCIETY

MINUTES

Board of Directors
Teleconference Meeting
Monday, February 11, 2008

The meeting was called to order by President Steve Bock at 9:05 a.m.

Motions

A motion was made by Dennis Ringhausen, seconded by Kurt Range, and it carried, to place the minutes of the January 21, 2008 board meeting on file.

A motion was made by Wayne Sirles, seconded by Denise Boggio, and it carried, to adjourn the meeting at 9:57 a.m.

Membership. Board members reported on recent or upcoming extension meetings. Board members promoted (or will promote) joining the Society. General theme of invitations to join included discussing C-FAR, the winter special crop conferences, and the summer field day as benefits of belonging. Steve reported that he, Pat and Raoul would be going to an upcoming extension meeting attended by Illinois and Wisconsin growers. Wayne and Kurt reported about 70 attended the Mt. Vernon meeting. Some were on the delinquent list. Kurt reported handing out about 10 applications and also making a story board for the registration table. Dennis attended the Calhoun meeting with one attendee expressing interest. Elizabeth will be asked to promote the Society at the Quincy meeting. Wayne volunteered to call all of the former members in his region. Other board members agreed to divide up lists in their regions for calling before the next board meeting.

Revision of the membership application was discussed with a decision to produce a Society stand alone model and remove the rates for other organizations. Chris volunteered to prepare one and to incorporate it into a new brochure.

June Board Meeting. A dinner board meeting will be held on June 11, at 7 p.m. at Tanner's.

Summer Field Day. The Society will invite the Director of Agriculture to speak at the field day. Another decision was made to offer a survey to learn of growers interests and what the organization could be doing better to serve the industry.

EQIP. There are upcoming meetings of EQIP (Environmental Quality Incentive Program) coordinated by the Natural Resources Conservation Service. EQIP provides matching funds for environmental improvements for growers. Craig Tanner volunteered to attend the meeting and Randy Graham will be asked to attend also. Don planned to attend as well. A request will be made to include specialty crops in the program. Information about EQIP can be

found at http://www.nrcs.usda.gov/PROGRAMS/EQIP/ and/or http://www.il.nrcs.usda.gov/programs/eqip/index.html.

Next Meeting. The next teleconference meeting of the board is scheduled for Monday, March 10, 2008 beginning at 9: a.m.

Attendance. Board members in attendance included: President Steve Bock, Denise Boggio, Jeff Broom, Chris Eckert, Kurt Range, Dennis Ringhausen, Tom Schwartz, Wayne Sirles, and Craig Tanner. Not present: Raoul Bergenson, Pat Curran, and advisers Mohammad Babadoost, and Brad Taylor.

ILLINOIS STATE HORTICULTURAL SOCIETY

MINUTES

Board of Directors
Teleconference Meeting
Monday, March 10, 2008

The meeting was called to order by President Steve Bock at 9:07 a.m.

Motions

A motion was made by Dennis Ringhausen, seconded by Kurt Range, and it carried, to place the minutes of the February 11, 2008 board meeting on file.

A motion was made by Dennis Ringhausen, seconded by Tom Schwartz, and it carried, to hold a panel discussion on marketing. Panelists would include representatives from Tanner's, Eckert's, and Hall's.

A motion was made by Wayne Sirles, and it carried, to adjourn the meeting at 9:48 a.m.

Finance. Don reported on income of $2,545 for two months ending in February, expenses of $3,093 with available cash at $9,328. Income from contributions totaled $2,195, down from a year ago, probably due to the crop losses last year.

Membership. Board members will continue to make contacts of former members and invite them to rejoin and ask them what more we can be doing for growing the industry. Steve reported that he and Pat attended the Northern Illinois/Wisconsin growers meeting and was given a few minutes on the program to promote the Society. Denise submitted a report of contacts made. Chris will ask his marketing people to develop a simpler membership application and create a new brochure before the field day.

June Board Meeting. A dinner board meeting will be held on June 11, at 7 p.m. at Tanner's.

Summer Field Day. Mohammad will visit Tanner's in late March to prepare for the field program. He asked if there were additional activities that could replace the normal time spent with a peach tour, as Tanner's have no peach planting. Chris volunteered to ask Jane Eckert to speak on marketing, effective market pricing, charging admission, etc. It was also decided to have a panel discussion on marketing that would include Tanner's, Eckert's, and Halls representing three geographical areas of the state.

Next Meeting. A dinner board meeting will be held on June 11, at 7 p.m. at Tanner's.

Attendance. Board members in attendance included: President Steve Bock, Denise Boggio, Jeff Broom, Chris Eckert, Kurt Range, Dennis Ringhausen, Tom Schwartz, Wayne Sirles, and Craig Tanner. Not present: Raoul Bergenson, Pat Curran, and adviser Brad Taylor.

ILLINOIS STATE HORTICULTURAL SOCIETY

MINUTES

Board of Directors
Teleconference Meeting
Monday, April 14, 2008

The meeting was called to order by President Steve Bock at 9:11 a.m.

Motions

A motion was made by Pat Curran, seconded by Chris Eckert, and it carried, to place the minutes of the March 10, 2008 board meeting on file.

A motion was made by Pat Curran, and it carried, to adjourn the meeting at 9:46 a.m.

Finance. Don reported on an income of $75 for the month of March, expenses of $44.60 with available cash at $9,358.

Membership. No reports. Don will begin collecting names of orchards listed on the web.

Summer Field Day. Little new information was added. There was some discussion on the panel topic of price vs admission. Jane Eckert general topics will include gourmet food, local food, advertising on the web plus other topics.

Next Meeting. The next meeting via teleconference call was set for May 12, at 9 a.m.

Attendance. Board members in attendance included: President Steve Bock, Denise Boggio, Pat Curran, Chris Eckert, Dennis Ringhausen, Tom Schwartz, and adviser Mohammad Babadoost. Not present: Raoul Bergersen, Jeff Broom, Kurt Range, Wayne Sirles, Craig Tanner, and adviser Brad Taylor.

ILLINOIS STATE HORTICULTURAL SOCIETY

MINUTES

Board of Directors
Teleconference Meeting
Monday, December 1, 2008

The meeting was called to order at 9:14 a.m.

Summer Field Day. Craig Tanner was complimented on hosting a very successful field day. A mix of production an marketing programming was thought to be very well received. A discussion for 2009 centered on asking Ken and Barb Hall. It was thought that an excellent marketing program could be planned coupled with new facilities. Steve Bock will give them a call.

January Board Meeting. With a program added to Wednesday night at the specialty grower's conference it will require the board to find a new time slot to meet. It was decided to explore moving the board meeting to Thursday morning at 7 a.m. with a breakfast to be paid for you each board member.

Industry Recognition Award. Moving forward with The Industry Recognition Award was discussed. A meeting of the committee was set for Monday, December 8, 2008 at 9 a.m. via conference call. Committee members to participate are: Chris Eckert, Jerry Mills, and Wayne Sirles (Note: Ken Hall was originally named rather than Chris). Plans call for presenting the award for the first time at the winter conference rather than waiting for the summer field day.

C-FAR Board. Two C-FAR board positions are open and two individuals were solicited for interest but both declined. Chris will check to see if Jim was interested and Denise expressed interest.

There was discussion about crop loss protection plans. One of the key sessions at the winter conference will focus on this topic.

Attendance. Board members in attendance included: Denise Boggio, Jeff Broom, Chris Eckert, Tom Schwartz, Craig Tanner, and Wayne Sirles. Not present: Steve Bock, Pat Curran, Raoul Bergersen, Kurt Range, Dennis Ringhausen, and advisers Mohammad Babadoost, and Brad Taylor.

With no further business to conduct the meeting adjourned at 9:47 a.m.

2008 Balance Sheet

	2004	2005	2006	2007	2008
Assets:					
Through November 30	$5,139	$6,885	$10,549	$9,916	$8,823
Liabilities:					
Through November 30	$525	$476	$2,400	$1,126	$0
Net Worth: (est)	$4,614	$6,409	$8,149	$8,790	$8,823

INCOME	2004	2005	2006	2007	2008	2008 Budget
Bank Interest	$26	$18	$0	$0	$0	$0
Cider Contest					$310	
Dues	$2,580	$2,460	$2,430	$2,610	$2,610	$3,000
Contributions	$3,115	$3,650	$3,600	$3,785	$2,580	$4,000
Exhibitor Fees	$385	$590	$0	$95	$825	$300
Grants	$0	$0	$0	$0	$0	$0
Mtg. Regis.	$1,485	$2,350	$2,500	$1,460	$2,180	$2,500
Miscel.	$0	$0	$0	$0	$200	$0
Other*	$0	$180	$0	$0	$0	$0
Sales, Cider	$0	$0	$180	$350	$0	$0
General	$260	$0	$0	$0	$0	$0
, Trans	$222	$194	$135	$192	$78	$150
Total	$8,073	$9,442	$8,845	$8,492	$8,783	$9,950

EXPENSE	2004	2005	2006	2007	2008	2008 Budget
Bank charge	$0	$0	$0	$0	$20	$0
Cider Contest	$223	$130	$146	$285	$80	$150
Dues	$250	$250	$830	$0	$790	$790
Equipment					$1,802	
Grant Reimb.	$0	$0	$0	$0	$0	$0
Insurance	$0	$0	$0	$750	$0	$0
Meetings, ann.	$65	$116	$75	$70	$0	$50
Mtgs, SHFD	$1,480	$1,949	$300	$1,140	$1,370	$1,500
Miscel.	$5	$0	$5	$12	$257	$100
Office, copies	$43	$19	$0	$85	$141	$100
Office, gen	$22	$0	$0	$0	$64	$100
Office, postal	$181	$148	$31	$138	$223	$200
Office, supl	$39	$64	$8	$279	$84	$100
Other	$0	$5	$0	$5	$10	$1,000
Printing	$0	$69	$29	$0	$31	$100
Publications	$500	$40	$150	$10	$2	**$150**
Public Rel.	$0	$0	$0	$0	$0	$0
Reimb-E.D.	$570	$321	$655	$470	$379	$500
Reimb-gen	$0	$0	$0	$0	$0	$0
Ind. Support	$0	$0	$0	$0	$0	$0
Salary	$3,650	$3,493	$3,511	$3,829	$2,872	**$3,900**
Sales exp	$0	$0	$0	$1,197	$0	$0
Subscr.	$15	$0	$0	$0	$0	$50
Taxes	$1,049	$1,096	$295	$0	$997	$1,300
Telephone	$0	$0	$0	$0	$0	$0
Total	$8,092	$7,700	$6,035	$8,270	$9,122	$10,090
Inc over (Exp)	**($19)**	$1,742	$2,810	$222	($339)	**($140)**

Financial Note: Financial Statement is reconciled with Busey Bank statements

ILLINOIS STATE HORTICULTURAL SOCIETY

HALL OF FAME

The following Guidelines were established June 6, 1966 shortly after the award was established. They were published in Transactions # 100: page 7 & 8.

Guidelines

A. To be recognized and made a member of the Illinois State Horticultural Society Hall of Fame, a candidate must have the following qualifications:

1. Be a past or present citizen of Illinois.

2. Be a member of the Illinois State Horticultural Society.

3. The contribution must be related to the production and marketing of Illinois Fruit.

B. Years of service should not necessarily be a consideration. For example, if a man or woman spends 40 years in Illinois without making an outstanding contribution or performing above and beyond the normal call of duty, then he should not be eligible for this award. On the other hand, if a man makes a significant contribution early in his career, he should be so recognized.

C. A Hall of Fame award need not be given annually. It should be presented only when appropriate.

D. A standing committee including the Society Secretary, should be appointed by the Board of Directors of the Illinois State Horticultural Society, with an annual review and change, if necessary of its membership. The committee is to select the candidate or candidates and report to the Board. The Board should pass upon the selection before it can be officially recognized by the Society.

E. There need be no limit upon the number of candidates chosen within any one year. This is especially true if an award is not to be presented annually. A limit can be imposed at the discretion of the Board if and when the Hall of Fame is brought up to date. For posthumous awards, a certificate will be presented. All others will receive a plaque.

F. Criteria to be used in evaluations:
   1. Leadership.
   2. Outstanding original discoveries.
   3. Outstanding ability to perform service.

4. Publications (especially of University people).
5. Affiliation in National Horticulture organizations.
6. Affiliation in State Horticulture organizations.
7. Outstanding service (over and above normal duties).
8. Breadth of motivation to unselfishly help the Illinois fruit industry
9. Interest in participating and contributing to the Illinois State Horticultural Society meetings.

G. This recognition program will be called the "Illinois State Horticultural Society Hall of Fame."

CURRENT MEMBERS OF HALL OF FAME

"For Outstanding Service to the Illinois Fruit Industry"

MR. STEWART C. CHANDLER	1964	DR. HARRY W. ANDERSON	1965
MR. DAVE B. PERRINE	1966	DR. THOMAS BURRILL	1966
DR. W.S. HULL	1966	MR. ALVIN O. ECKERT	1966
MR. W.S. PERRINE	1966	DR. MAXWELL J. DORSEY.	1966
MR. CURT E. ECKERT	1967	DR. RICHARD V. LOTT	1967
DR. RICHARD V. LOTT	1967	DEAN JOSEPH C. BLAIR	1967
MR. ARTHUR BRYANT SR.	1967	DR. ARTHUR S. COLBY	1967
MR. HENRY M. DUNLAP	1967	PROF. W. P. FLINT	1967
MR. HARRY W. DAY	1968	MR. PAUL C. STARK	1968
DR. DWIGHT POWELL	1969	MR. JOHN L. BELL SR.	1971
MR. LESTER R. STONE	1974	MR. CORNELL H. ECKERT	1975
MR. EDWARD D. Mc GUIRE	1976	MR. FRANK W. CHATTEN	1977
MR. CLAUD J. BOYD	1978	MR. JOHN D. SURGEION, JR.	1979
MR. ALSON MEYERS	1980	DR. JAMES D. MOWERY	1981
MR. JOHN TANNER	1982	DR. ROSS A. KELLY	1983
DR. ROY K. SIMONS	1984	MR. ROBERT M. EDWARDS	1985
MR. C. CHRIS DOLL	1986	DR. RONALD H. MEYER	1988
DR. DANIEL B. MEADOR	1991	MR. MARION A. KOELLER	1993
MR. JAMES A. ECKERT	1993	MR. DANIEL D. McGUIRE	1996
MR. FRANK W. OWEN	1996	MR. BERNARD E. COLVIS	1997
MR. J. BOND HARTLINE	1998	MR. THOMAS MILNAMOW	2003
MR. RICHARD J. TANNER	2004	MR. JERRY MILLS	2006

ILLINOIS STATE HORTICULTURAL SOCIETY

Serving Illinois fruit growers since 1856

INDUSTRY RECOGNITION AWARD

The ISHS Industry Recognition Award recognizes and honors individuals who have made exemplary contributions and influenced the fruit tree industry either as a current or retired industry activist, or as an industry supporter.

Purpose.

- To recognize individuals and for outstanding achievement or enhancement to the fruit industry.
- To demonstrate to ISHS members and others that ISHS values such achievement.
- To motivate ISHS members and others, improve and enhance meetings and conferences.
- To encourage volunteerism in ISHS and the industry through recognition of service, new and innovative ideas or practices.

Criteria for Nomination.

- Numerous years as an industry educator, practitioner or supporter.
- Active involvement and outstanding contributor/volunteer at local, state and national levels including relevant positions held on committees and boards, and/or academic rank.
- Professional/career achievements and designations, including articles and publications, speaking, general involvement in industry meetings, or other activities.
- Recognition as a mentor by their peers (students, new members, growers, new staff, etc).
- Quality and impact of education program/research development and participation level.
- Involved in community service (local, state, national) relating to the industry.

How to Nominate

Submit nominations to the ISHA Executive Secretary by November 1, by any current member of ISHS. The application should address the criteria listed above that will enable the Selection Committee to review and determine who may receive recognition. The committee has the option to accept or reject candidates and has discretion to select a winner on a periodic basis.

Nomination Form: Industry Recognition Award

ILLINOIS STATE HORTICULTURAL SOCIETY

Please provide the following information before November 1st to ISHS, 15962 Old Orchard Rd, Bloomington, IL 61705. Limit information to no more than two pages. Please attach this sheet. It is not necessary to restate questions but identify with a corresponding number given below.

1. Name, then state the number of years as an industry educator, practitioner or supporter and in what capacities. (Example: John Smith, Smith Orchards in Oblong, Illinois has owned and operated a 55 acre orchard, retail outlet store including a bakery, children's play area for 32 years.)

2. Give details of nominee's active involvement and outstanding contributor/volunteer at local, state and national levels, including relevant roles on and boards and positions held, and/or academic rank.

3. Describe Professional/career achievements and designations, including articles and publications, speaking, general involvement in industry meetings, or other activities.

4. Relate any recognition as a mentor (of students, new members, growers, new staff, etc).

5. Describe the quality and impact of education program/research development and participation.

6. Describe involvement in community service (local, state, national) relating to the industry. (Example: Participation in festivals, farm markets, charitable causes, and/or other activities)

7. Give reasons nominee should be considered.

Signature of Nominator: _____

Contact Information: Telephone Number: _____

Email address: _____

Illinois State Horticultural Society
PAST PRESIDENTS

Dr. E. S. Hull
1856-57
Dr. J. A. Kennicott
1861
Smiley Shepard
1864
Elmer Baldwin
1867
Willard C. Flagg
1870
M. L. Dunlap
1873
A. C. Hammond
1876
T. J. Burrill
1879
E. Hollister
1882
Arthur Bryant
1886
H. M. Dunlap
1889
Henry Augustine
1893-1894
H. A. Aldrich
1903-1905
F. D. Voris
1911-1912
A. W. Brayton
1917-1919
J. B. Burrows
1924-1925
John A. Garnier
1930-1931
George L. Smith
1936-1937
Logan N. Colp
1942-1943
David B. Perrine
1948-1949

C. R. Overman
1858-1859
O. B. Galusha
1862
John P. Reynolds
1865
A. M. Brown
1868
Arthur Bryant
1871
Robert Douglas
1874
Dr. A. G. Humphrey
1877
Parker Earle
1880
O. B. Galusha
1883
E. A. Riehl
1887
Jabez Webster
1890-1891
T. E. Goodrich
1895-1897
George J. Foster
1906-1907
J. Mack Tanner
1913
J. R. Lambert
1920-1921
L. M. Smith
1926-1927
Alvin O. Eckert
1932-1933
C. F. Heaton
1938-1939
Hugh L. Hale
1944-1945
Dr. Dwight Powell
1950-1951

Sammuel Edwards
1960
George W. Miner
1863
Parker Earle
1866
Tyler McWhorter
1869
James E. Starr
1872
Dr. E. S. Hull
1875
J. W. Robison
1878
C. N. Dennis
1881
John M. Pearson
1884-1885
Milo Barnard
1888
T. E. Goodrich
1892
Henry M. Dunlap
1898-1902
R. O. Graham
1908-1910
W. S. Perrine
1914-1916
F. H. Simpson
1922-1923
W. R. Soverhill
1928-1929
George M. Schoff
1934-1935
O. G. Jones
1940-1941
Frank E. Penstone
1946-1947
Lester R. Stone
1952-1953

PAST PRESIDENTS, continued

Curt Eckert
1954-1955
J. Bon Hartline
1960-1961
Richard Crowell
1966-1967
Allen Meyers
1972-1973
Bernard E. Colvis
1978-1979
Harold Tanner
1984-1985
Richard Tanner
1990-1993
Randy Graham
2001-2003
Steve Bock
2008-

Frank Chatten
1956-1957
John Surgeon
1962-1963
Cornell Eckert
1968-1969
John L. Bell, Jr.
1974-1975
Robert M. Edwards
1980-1981
William Hartline
1986-1987
Jerry Mills
1994-1997
Patrick Curran
2004-2005

Paul Mallinson
1958-1959
John Tanner
1964-1965
Daniel McGuire
1970-1971
James A. Eckert
1976-1977
William R. Broom
1982-1983
Tom Schwartz
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Tom Milnamow
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Dennis Ringhausen
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Our thanks to those who provided additional financial support.

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4	Chris Doll	Doll Horticultural Services
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6	James Hong	All Season Farm & Nursery
7	Dale Jefferies	Jefferies Orchard
8	Richard Mazanek	Richard Mazanek Orchard
9	Brad Mazanek	Richard Mazanek Orchard
10	Jerry Mills	Mills Apple Farm
11	Dennis Ringhausen	Tom Ringhausen Orchards
12	Richard Tanner	Tanner Orchard, Ltd.
13	Jane Weir	Weir Fruit Farm
14	Dan Willett	Willett's Sandy Oak Orchard

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47	Irvin	Sager	Sager Farms	5251 Kell Rd	Kell	IL	62853	618/822-6637
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50	Wayne D.	Sirles	Rendleman Orchards	P.O. Box 89	Alto Pass	IL	62905	618/893-2771
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52	Richard	Tanner	Tanner Orchard, Ltd.	740 State Rte 40	Speer	IL	61479	309/493-7781
53	Jane	Weir	Weir Fruit Farm	R. R. #1, Box 25	Gladstone	IL	61437	309/627-2106
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55	William	Whiteside	Horticultural Consultant	624 Shabbona Trail	Batavia	IL	60510	630/879-7573
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57	Dan	Williams		16 Apple Look	Petersburg	IL	61675	217/899-1823
58	Ronald	Wolfe	Wolfe Farms	P. O. Box 168	Monticello	IL	61856	217/762-7180
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60	LeRoy	Yoder	Echo Valley Orchard	492 Grammer Rd	Carbondale	IL	62903	618/684-3618
61	Dennis	Zellerman	Edgewood Orchards	1628 Edgewood Orchard Ln	Quincy	IL	62305	217/224-5414
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70	Lloyd E.	Nichols	Nichols Farm & Orchard	2092 Hawthorne Rd.	Marengo	IL	60152	815/568-6782
71	Kurt	Range	Southwestern Illinois College	2500 Caryle Ave.	Belleville	IL	62221	618/234-7118
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73	Sarah M.	Frey	Frey Produce	R. R. #1, Box 89	Keenes	IL	61851	618/835-2536
74	Gary	Hiller	Garden Patch Farm & Orchard	14154 N 159th	Homer Glen	IL	60491	708/301-7720
75	Sheila	Thomas	Covel Creek Farms	1848 N 24th Rd	Grand Ridge	IL	61325	815/434-7048
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81	Lawrence E.	Peceniak	Peceniak's Apples on Oak	16146 Oak Ave	Joliet	IL	60431	815/726-0386
82	Leslie	Copperband	Prairie Fruits Farm, LLC	4410 N Loncoln Ave	Champaign	IL	61822	217/643-2314
83	Jennifer	Lester	Lester	4671 E. Crosson	Macon	IL	62544	217/433-5292
84	Thomas	Schwartz	Schwartz Farms	P. O.Box 885	Centralia	IL	62801	618/532-8058
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86	Vatren	Jurin	Brandt Consolidated	211 W. Rte 125, Box 350	Pleasant Plains	IL	62677	217/626-1123
87	Sandra	Streed	Ill. Center for Food Safety	6502 S. Archer Rd.	Summit-Argo	IL	60501	708/563-8271

Research Report

A Wetness-Based Disease-Warning System for Control of Summer Diseases in Commercial Apple Orchards in Illinois in 2008

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Summary

This study was conducted to evaluate performance of a wetness-based disease-warning system for management of diseases of apple in 8 commercial orchards in different locations in Illinois in 2008. The disease prediction system saved the growers from 2 to 5 (mean 3.50) - 29 to 71% (mean 50%) - sprays on a two-week spray schedule. The disease warning system was effective in controlling summer diseases in all of the eight orchards. Implementation if this weather-based warning system could lower the costs of production considerably, reduce pesticide risk to the environment and human health, and prevent or delay development of resistance to fungicides in the pathogens.

Introduction

Major summer diseases of apples in Illinois are sooty blotch (*Peltaster fructicola*, *Leptodontium eliatus*, and *Geastrumia polystigmatis*), flyspeck (*Zygophiala jamaicensis*), black rot (*Botryosphaeria obtusa*), bitter rot (*Glomerella cingulata*), and white rot (*Botryosphaeria dothidea*). Other diseases that usually develop in spring and may continue spreading in summer are scab (*Venturia inaequalis*), cedar-apple rust (*Gymnosporangium junieri-virginianae*), fire blight (*Erwinia amylovora*) and powdery mildew (*Podosphaeria leucotricha*). These diseases could cause yield losses of up to 100%. This study was conducted to evaluate performance of a wetness-based disease-warning system for management of summer diseases of apple in 8 commercial orchards in different locations in Illinois in 2008.

Materials and Methods

Trials were conducted in eight apple orchards located at Malta (Dekalb county), Speer (Marshal county), Metamora (Woodford county), Champaign (Champaign county), Urbana (Champaign county), Millstadt (St. Clair county), Alto Pass (Union county), and Dixon Springs (Pope county) (Table 1). A Watchdog Wetness/Temperature sensor (Spectrum Technologies, Inc., Plainfield, Illinois) was placed at a 5 ft height and a 45-degree angle under the canopy of a representative tree within a selected block of trees at each orchard. All trees in the orchards were sprayed according to the standard spray schedule through the first-cover spray. After the first-cover spray, a 0.1- to 3-acre block of the same apple cultivar was set aside to receive the second-cover spray after accumulation of 175 hours of wetness (IPM block). Whole orchards in Speer

(Marshal county) and Metamora (Woodford county) were under disease-prediction system (IPM block). In Dixon Spring (Pope county), an unsprayed block of trees were included in the trial. The data from the sensor were downloaded weekly, or more often, and used to determine the accumulated hours of wetness. When the number of hours was close to 175, the grower was asked to apply fungicides to the IPM block, as they would spray the rest of the orchard.

Approximately 10 days prior to harvest, 60 apples from each tree were examined for the incidence (percentage of fruit infected) and severity (percentage of surface area of fruit with disease symptoms) of sooty blotch and flyspeck. In each tree, five apples from each of upper, middle, and lower canopies on each of the four sides (northern, eastern, southern, western) were examined. Also, occurrence of fruit rots (black rot, bitter rot, white rot), scab, rust, fire blight, and powdery mildew on fruit and foliage was determined. Incidence of fruit rot and scab was assessed as percent of fruit affected. Severity of rust, fire blight, and powdery mildew was assessed as percent leaf area or percent foliage affected. Yield and quality were assessed using a scale of 0-4, as 0 = no fruit and 4 = highest yield and quality. The data were analyzed using the GLM procedure of SAS (SAS Institute, Cary, NC) and comparisons were made using Fisher's protected LSD ($P<0.05$).

Results and Discussion

The weather-based system predicted for the second cover spray later than the conventional two-week spray schedule. The disease prediction system saved the growers from 2 to 5 (mean 3.50) - 29 to 71% (mean 50%) - sprays on a two-week spray schedule (Table 1). Overall, sooty blotch and flyspeck (SBFS) were the most widespread summer diseases in Illinois in 2008 (Tables 2 and 3).

The disease warning system was effective in controlling the summer diseases in all of the eight orchards (Table 2). Occurrence of SBFS and fruit rot in Alto Pass orchard was related to ceasing application of fungicides long before harvesting fruit while the continues rainfalls provided conducive conditions for development of SBFS and fruit rots (particularly white rot).

The tested IPM system appeared to be effective against summer diseases, as well as other diseases, of apple in Illinois and its implementation could lower the costs of production considerably, reduce pesticide risk to the environment and human health, and prevent or delay development of resistance to fungicides in the pathogens.

Table 1. Location, apple variety, cover spray dates, and wetness hours for cooperating orchards in Illinois in 2008

Location					2nd-cover spray (warning system)		
Town	County	Variety	1st cover spray	2nd-cover spray (calendar-based*)	Date	Wetness hours	Sprays saved (number)
Malta	Dekalb	Golden Delicious	10-June	24-June	28-July	171	3
Speer	Marshal	Golden Delicious	28-May	-----	12-August	155	4
Metamora	Woodford	Golden Delicious	24-May	-----	10-July	202	4
Champaign	Champaign	Golden Delicious	29-May	10-June	9-July	183	2
Urbana	Champaign	Golden Delicious	24-May	8-June	15-August	159	5
Millstadt	St. Clair	Golden Delicious	6-May	16-May	15-June	160	2
Alto Pass	Union	Golden Delicious	16-May	30-May	6-August	199	5
Dixon Spring	Pope	Golden Delicious	9-May	20-May	26-June	181	3
		Mean				**176**	**3.50**

* Sprays were applied on a two-week interval schedule.

Table 2. Incidence and severity of sooty blotch and flyspeck in conventional and IPM blocks in cooperating orchards in Illinois in 2008

Location	Sooty blotch						Flyspeck					
	Incidence (%)[u]			Severity (%)[v]			Incidence (%)[u]			Severity (%)[v]		
	Calendar[w]	IPM[w]	*LSD*[x]	Calendar	IPM	*LSD*	Calendar	IPM	*LSD*	Calendar	IPM	*LSD*
Malta	0.0[y]	0.0 0	*NS*	0.0	0.0 0	*NS*	0.0	0.00	*NS*	0.0	0.0 0	*NS*
Speer[z]	-----	0.67	-----	-----	<0.01	-----	-----	0.83	-----	-----	<0.01	-----
Metamora[z]	-----	0.0 0	-----	-----	0.0 0	-----	-----	0.00	-----	-----	0.0 0	-----
Champaign	0.0	0.0 0	*NS*	0.0	0.0 0	*NS*	0.0	0.00	*NS*	0.0	0.0 0	*NS*
Urbana	0.0	0.0 0	*NS*	0.0	0.0 0	*NS*	0.0	0.00	*NS*	0.0	0.0 0	*NS*
Belleville	0.0	0.0 0	*NS*	0.0	0.0 0	*NS*	0.0	0.00	*NS*	0.0	0.0 0	*NS*
Alto Pass	28.7 a	24.3 a	*5.0*	0.32 a	0.25 b	*0.06*	20.3a	21.3 a	*4.6*	0.23 a	0.24 a	*0.06*
Dixon Spring	0.0	0.0 0	*NS*	0.0	0.0 0	*NS*	0.0	0.00	*NS*	0.0	0.0 0	*NS*

[u] Average percent of 60 fruit per tree (10 trees per treatment) with signs of sooty blotch or flyspeck.

[v] Percentage of surface area of fruit affected.

[w] Calendar = sprays applied on a two-week schedule (standard); IPM = sprays applied after accumulation of 175 hour wetness after the first-cover spray.

[x] Least significant difference at P<0.05.

[y] Values for the incidence and severity of each disease in each location followed by the same letter are not significantly different according to Fisher's protected LSD (*P*=0.05).

[z] There was no calendar-based spray in these orchards; whole orchard was under weather-based disease-warning system.

Table 3. Incidence and severity of sooty blotch and flyspeck in the apple orchard in Dixon Spring in 2008

Treatment[v]	Sooty blotch		Flyspeck	
	Incidence[w]	Severity (%)[x]	Incidence (%)[w]	Severity (%)[x]
Calendar	0.0 b[y]	0.00 b	0.0 b	0.00 b
IPM	0.0 b	0.00 b	0.0 b	0.00 b
Unsprayed	100 a	38.68 a	100 a	26.37 a
LSD[z]	**0.0**	**0.79**	**0.0**	**0.67**

[v] Calendar = sprays applied on a two-week schedule (standard); IPM = sprays applied after accumulation of 175 hour wetness after the first-cover spray. Unsprayed = trees were not sprayed.

[w] Average percent of 60 fruit per tree (10 trees per treatment) with signs of sooty blotch or flyspeck.

[x] Percentage of surface area of fruit affected.

[y] Values for the incidence and severity of each disease in each location followed by the same letter are not significantly different according to Fisher's protected LSD (*P*=0.05).

[z] Least significant difference at P<0.05.

Table 4. Occurrence of diseases and fruit yield in apple orchards in summer in Illinois in 2008

Location	Treatment[t]	Disease occurrence					Fruit yield	
		Fruit rot (incidence)[u]	Fruit scab (incidence)[u]	Leaf rust (severity)[v]	Shoot fire blight (severity)[v]	Foliage powdery mildew (severity)[v]	Yield[w]	Quality[w]
Malta	Calendar	0.0[x]	0.0	0.00	0.00	0.00	3.00 b[x]	3.00 b
	IPM	0.0	0.0	0.00	0.00	0.00	3.20 a	3.20 a
	LSD	***NS***[y]	***NS***	***NS***	***NS***	***NS***	***0.03***	***0.03***
Speer[z]	Calendar	-----	-----	-----	-----	-----	-----	-----
	IPM	0.0	0.0	0.00	0.00	0.00	3.80	4.00
	LSD	-----	-----	-----	-----	-----	-----	-----
Metamora[z]	Calendar	-----	-----	-----	-----	-----	-----	-----
	IPM	0.0	0.0	0.00	0.00	0.00	3.20	3.80
	LSD	-----	-----	-----	-----	-----	-----	-----
Champaign	Calendar	0.0	0.0	0.00	0.00 b	0.00	3.10	3.90
	IPM	0.0	0.0	0.00	0.10 a	0.00	3.00	3.90
	LSD	***NS***	***NS***	***NS***	***0.02***	***NS***	***NS***	***NS***
Urbana	Calendar	0.0	0.0	0.00	0.00	0.00	3.00	3.00
	IPM	0.0	0.0	0.00	0.00	0.00	3.00	3.00
	LSD	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***
Belleville	Calendar	0.0	0.0	0.10	1.00 a	0.00	4.00	4.00
	IPM	0.0	0.0	0.10	0.80 b	0.00	4.00	4.00
	LSD	***NS***	***NS***	***0.03***	***0.09***	***NS***	***0.00***	***0.00***
Alto Pass	Calendar	2.1	0.0	0.00	0.00	0.00	3.40 b	3.50 a
	IPM	2.0	0.0	0.00	0.00	0.00	3.90 a	3.40 b
	LSD	***NS***	***NS***	***NS***	***NS***	***NS***	***0.05***	***0.05***
Dixon Spring	Calendar	0.0	0.0	3.40 b	0.40 c	0.00	3.30 a	2.10 a
	IPM	0.0	0.0	3.10 c	0.50 b	0.00	3.00 b	2.10 a
	Unsprayed	0.0	0.0	3.70 a	0.70 a	0.00	2.90 c	1.00 b
	LSD	***NS***	***NS***	***0.05***	***0.07***	***NS***	***0.04***	***0.02***

[t] Calendar = sprays were applied on a two-week schedule (standard); IPM = sprays applied after accumulation of 175 hour wetness after the first-cover spray.

[u] Incidence = mean percent of 60 fruits per tree (10 trees per orchard).

[v] Severity = percentage of tissues affected.

[w] Yield and quality were assessed using a scale of 0-4, 0 = no yield and 4 = highest yield and quality.

[x] Values for the incidence and severity of each disease in each location followed by the same letter are not significantly different according to Fisher's protected LSD (P=0.05). NS = not significant.

[y] NS = not significant.

[z] There was no calendar-based spray in these orchards; whole orchard was under weather-based disease-warning system.

Evaluating Selected Fungicides for Control of Powdery Mildew and other Diseases of Jack-O-Lantern Pumpkin in Champaign, Illinois - 2008

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Summary

This study was conducted to evaluate effectiveness of eight fungicides, including Bravo Weather Stik 6F, Kocide-3000 46.1DF, LEM 17 SC, Nova 40W, Pristine 38WG, Procure 480SC, QFA61, and Quintec 250SC, for control of powdery mildew and other diseases of jack-o-lantern pumpkin in Illinois. Severity of powdery mildew in all of the treated plots with fungicides was significantly lower than that of untreated plots. All of the fungicide treatments were effective for control of powdery mildew throughout the season. No downy mildew, gummy stem blight, black rot of fruit, or Plectosporium was observed in the plots throughout the season. Moderate incidence of bacterial spot, high incidence of Fusarium rot, high overall-rot, and moderate viral infection of fruit were observed. Also, high viral infection of foliage was recorded in the plots. There were no significant differences in fruit numbers and fruit weight among the treatments.

Introduction

Powdery mildew (*Podosphaera xanthii*), downy mildew (*Pseudoperonospora cubensis*), Phytophthora blight (*Phytophthora capsici*), gummy stem blight and black rot (*Didymella bryoniae*), Plectosporium blight (*Plectosporium tabacinum*), Fusarium wilt and fruit rot (*Fusarium* spp.), Sclerotina rot (*Sclerotinia sclerotiorum*), bacterial spot (*Xanthomonas campestris* pv. *cucurbitae*), bacterial wilt (*Erwinia tracheiphila*), and viral diseases (cucumber mosaic, papaya ring spot, squash mosaic, tobacco ring spot, watermelon mosaic, zucchini yellow mosaic) occur in pumpkin fields in Illinois every year. These diseases can cause up to 100% yield losses, if effective control measures are not applied. This study was conducted to evaluate effectiveness of selected fungicides for control of powdery mildew and other diseases of jack-o-lantern pumpkin in Illinois.

Materials and Methods

A field trial was conducted at the University of Illinois Vegetable Research Farm near Champaign, IL, to study efficacy of selected fungicides for control of powdery mildew and other diseases of jack-o-lantern pumpkins. The soil was a silt clay loam with pH 6.5. Soil was deep-tilled in September 2007 after sweet corn was harvested and disked on 4 April, 2008. Fertilizers, 115 lb nitrogen, 101 lb phosphorus, and 120 lb potassium, per acre, were broadcast and incorporated on 11 April. Jack-o-lantern pumpkin cultivar Howden was planted on 16 June. Seeds were sown 18 in. apart in single-row plots, 20-ft long. The plots were spaced 35 ft apart in a randomized complete block design with four replications. Strategy 0.5+1.6EC herbicide (6 pt/A), in 20 gal of water/A, was applied over entire field on 17 June. Furadan 4F insecticide (2 pt/A) was broadcast over the field on 17 June. During the season, weeds were controlled by cultivation and hand weeding. Cucumber beetles (*Acalymma vittatum* and *Diabrotica*

undecimpunctata) and other insects were managed by applying Capture 2EC (4 fl oz/A) during the growing season.

Eight fungicides, including Bravo Weather Stik 6F, Kocide-3000 46.1DF, LEM 17 SC, Nova 40W, Pristine 38WG, Procure 480SC, QFA61, and Quintec 250SC, in 15 different combinations (treatments), were spray-applied onto plants (Table 1). Application of fungicides began on 21 July and continued (at 7-day intervals) until 1 September (Table 1). Fungicides were applied with a backpack sprayer, using 50 gal of water per acre. Average monthly high and low temperatures (°F) were 83/62, 84/66, 83/63, and 78/59, during 16-30 June, July, August, and 1-24 September, respectively. Recorded precipitation in the area was 5 days (0.35 in.) during 16-30 June, 12 Days (7.96 in.) in July, 3 days (0.66 in.) in August, 9 days (7.92 in.) during 1-24 September. Severity of powdery mildew (percent total area of vines and leaves affected) and severity of downy mildew (percent leaf area affected) was visually evaluated on 6, 18, and 26 August and 2, 9, and 17 September. Severity of the diseases was assessed at four spots (43 sq ft each) in each plot, and at the same locations, throughout the season. Area under disease progress curve (AUDPC) for each treatment was calculated by plotting mean disease severity of the four evaluations. Incidence and severity of fruit diseases, including bacterial spot, Fusarium rot, black rot, Plectosporium blight, viral infection, and overall-fruit rot were assessed on 17 September and at harvest on 24 September. Also occurrence of gummy stem blight was monitored throughout the season. Numbers of marketable fruit were recorded and their weight was measured on 24 September. The data were analyzed using GLM procedures of SAS (SAS Institute, Cary, NC).

Results and Discussions

Powdery mildew was first observed in the untreated plots on 1 August. Severity of powdery mildew in all of the treated plots with fungicides was significantly lower than that of untreated plots (Table 2). All of the fungicide treatments were effective on controlling powdery mildew throughout the season.

No downy mildew, gummy stem blight, black rot of fruit, or Plectosporium was observed in the plots throughout the season. Moderate incidence of bacterial spot, high incidence of Fusarium rot, high overall-rot, and moderate viral infection of fruit were observed. Also, high viral infection of foliage was recorded in the plots. There were no significant differences in fruit numbers and fruit weight among the treatments.

Table 1. Schedule of fungicide applications in jack-o-lantern pumpkin plots at Champaign, Illinois, in 2008.

Treatment	Dates fungicides applied[x]							
	Week-0[y] Jun 16	Week-5 July 21	Week-6 July 28	Wek-7 Aug 4	Wek-8 Aug 11	Wek-9 Aug 18	Wek-10 Aug 25	Wek-11 Sep 1
Control (untreated) – [No spray]	—	—	—	—	—	—	—	—
[LEM 17 SC (3.5 oz a.i.=16.8 fl oz)] [7 sprays]	—	**LS**[z]	**LS**	**LS**	**LS**	**LS**	**LS**	**LS**
[LEM 17 SC (3.5 oz a.i.=16.8 fl oz)] *alt* [Quintec 250SC (4 fl oz)] [7 sprays]	—	**LS**	**QU**	**LS**	**QU**	**LS**	**QU**	**LS**
[Nova 40W (5 oz)] *alt* [LEM 17 SC (3.5 oz a.i.=16.8 fl oz)] [7 sprays]	—	**NO**	**LS**	**NO**	**LS**	**NO**	**LS**	**NO**
[LEM 17 SC (3.5 oz a.i.=16.8 fl oz)] + [Bravo Weather Stik 6F (2 pt)] [7 sprays]	—	**LS+ BWS**	**LS+ BWS**	**LS+ BWS**	**LS+ BWS**	**LS+ BWS**	**LS+ BWS**	**LS+ BWS**
[QFA 61F (1 L)] [7 sprays]	—	**QFA**	**QFA**	**QFA**	**QFA**	**QFA**	**QFA**	**QFA**
[LEM 17 SC (5 oz a.i.=24.0 fl oz)] [7 sprays]	—	**LS**	**LS**	**LS**	**LS**	**LS**	**LS**	**LS**
[Nova 40W (5 oz)] *alt* [Quintec 250SC (4 fl oz)] [7 sprays]	—	**NO**	**QU**	**NO**	**QU**	**NO**	**QU**	**NO**
[Bravo Weather Stik 6F (3 pt)] [7 sprays]	—	**BWS**	**BWS**	**BWS**	**BWS**	**BWS**	**BWS**	**BWS**
[Procure 480SC (8 fl oz) + Silwet (2 fl oz)] [7 sprays]	—	**PR + Sil**	**PR + Sil**	**PR + Sil**	**PR + Sil**	**PR + Sil**	**PR + Sil**	**PR + Sil**
[Quintec 250SC (8 fl oz) *alt* [Procure 480SC (6 fl oz) + Silwet (2 fl oz)] [7 sprays]	—	**QU**	**PR + Sil**	**QU**	**PR + Sil**	**QU**	**PR + Sil**	**QU**
[Procure 480SC (8 fl oz) + Silwet (2 fl oz)] *alt* [Quintec 250SC (6 fl oz)] [7 sprays]	—	**PR + Sil**	**QU**	**PR + Sil**	**QU**	**PR + Sil**	**QU**	**PR + Sil**
[Quintec 250SC (6 fl oz)] [7 sprays]	—	**QU**	**QU**	**QU**	**QU**	**QU**	**QU**	**QU**
[Pristine 38WG (18.5 oz) + Kocide-3000 41.6DF (1.5 lb)] *alt* [Procure 480SC (8 fl oz) + Kocide-3000 41.6DF (1.5 lb)] [7 sprays]	—	**PE + KO**	**PR +KO**	**PE + KO**	**PR +KO**	**PE + KO**	**PR +KO**	**PE + KO**
[Pristine 38WG (18.5 oz) + Kocide-3000 41.6DF (1.5 lb)] *alt* [Procure 480SC (8 fl oz) + Kocide-3000 41.6DF (1.5 lb)] [4 sprays]	—	**PE + KO**	—	**PR +KO**	—	**PE + KO**	—	**PR +KO**

[x] Seeds were planted on 16 June; fungicide application began 5 weeks after sowing seeds.
[y] Week after planting seeds.
[z] BWS= Bravo Weather Stik 6F; KE= Kocide-3000 46.1DF; LS= LEM 17 SC; NO= Nova 40W; PE= Pristine 38WG; PR= Procure 480SC; QFA= QFA61; QU= Quintec 250SC; Sil= Silwet.

Table 2. Occurrence of powdery mildew and fruit rot and yield in jack-o-lantern pumpkin plots following application of selected fungicides in Illinois in 2008

Treatment, rate/A (application)[w]	Powdery mildew severity (%)						Fruit rot (%)	Marketable fruit yield per plot	
	26 August		17 September		AUDPC[y]				
	Vine	Leaf	Vine	Leaf	Vine	Leaf		Number	Weight (lb)
Control (untreated)	19.1 a[z]	29.4 a	56.3 a	63.1 a	186.1 a	223.9 a	10.9 ab	13.5 a	176.0 a
LEM 17 SC, 16.8 fl oz (1-7)	0.0 b	0.0 b	2.1 bc	6.7 b	3.1 b	10.7 bc	6.8 b	12.0 a	174.0 a
LEM 17 SC, 16.8 fl oz (1,3,5,7) *alt* Quintec 250SC, 4 fl oz (2,4,6)	0.0 b	0.0 b	0.6 cd	1.6 cde	0.6 b	1.6 c	6.2 b	10.2 a	158.0 a
Nova 40W, 5 oz (1,3,5,7) *alt* LEM 17 SC, 16.8 fl oz (2,4,6)	0.0 b	0.0 b	0.4 cd	1.5 cde	0.4 b	2.3 c	10.9 ab	11.0 a	173.0 a
LEM 17 SC, 16.8 fl oz + Bravo Weather Stik 6F, 2 pt (1-7)	0.0 b	0.0 b	0.4 cd	1.4 cde	0.4 b	1.6 c	26.9 a	9.8 a	132.7 a
QFA 61F, 1 L (1-7)	0.0 b	0.4 b	0.0 d	0.2 e	0.0 b	0.2 c	19.6 ab	10.7 a	130.0 a
LEM 17 SC, 24.0 fl oz (1-7)	0.0 b	0.6 b	1.9 bcd	5.7 bcd	1.9 b	7.1 c	11.6 ab	13.0 a	192.7 a
Nova 40W, 5 oz (1,3,5,7) *alt* Quintec 250SC, 4 fl oz (2,4,6)	0.0 b	0.0 b	0.0 d	0.1 e	0.1 b	0.3 c	20.2 ab	10.2 a	168.0 a
Bravo Weather Stik 6F, 3 pt (1-7)	0.3 b	1.1 b	1.3 bcd	6.0 bc	4.1 b	22.9 b	18.5 ab	11.5 a	150.2 a
Procure 480SC, 8 fl oz + Silwet, 2 fl oz (1-7)	0.0 b	0.0 b	0.3 cd	0.9 de	0.3 b	1.1 c	3.7 b	14.5 a	194.0 a
Quintec 250SC, 8 fl oz (1,3,5,7) *alt* Procure 480SC, 6 fl oz + Silwet, 2 fl oz (2,4,6)	0.0 b	0.0 b	0.0 d	0.0 e	0.0 b	0.1 c	18.2 ab	12.7 a	169.0 a
Procure 480SC, 8 fl oz + Silwet, 2 fl oz (1,3,5,7) *alt* Quintec 250SC, 6 fl oz (2,4,6)	0.0 b	0.0 b	0.1 cd	0.2 e	0.1 b	0.2 c	2.3 b	12.5 a	179.7 a
Quintec 250SC, 6 fl oz (1-7)	0.0 b	0.0 b	0.0 d	0.0 e	0.0 b	0.0 c	13.3 ab	16.5 a	200.0 a
Pristine 38WG, 18.5 oz + Kocide-3000 41.6DF,1.5 lb (1,3,5,7) *alt* Procure 480SC, 8 fl oz + Kocide-3000 41.6DF, 1.5 lb (2,4,6)	0.1 b	0.2 b	0.1 cd	0.9 de	1.2 b	5.4 c	20.7 ab	11.0 a	176.2 a
Pristine 38WG, 18.5 oz + Kocide-3000 41.6DF, 1.5 lb (1,5) *alt* Procure 480SC, 8 fl oz + Kocide-3000 41.6DF, 1.5 lb (3,7)	0.8 b	1.7 b	3.2 b	9.1 b	7.2 b	23.6 b	5.6 b	12.5 a	167.7 a
LSD (*P*=0.05)	***3.3***	***3.6***	***2.1***	***4.8***	***11.8***	***15.8***	***19.5***	***7.3***	***115.5***

[w] Application time: 1 = 21 July, 2 = 28 July, 3 = 4 August, 4 = 11 August, 5 = 18 August, 6 = 25 August, and 7 = 1 September.

[y] AUDPC = area under disease progress curve.

[z] Values within each column with a letter in common are not significantly different (*P*=0.05) from each other according to Fisher's protected LSD test.

Evaluating Effectiveness of Reduced-Risk Fungicides and a Wetness-Based Warning System for Control of Summer Diseases of Apple in Illinois, 2008

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Summary

This study was conducted to evaluate performance of reduced-risk fungicides and a wetness-based disease-warning system for management of summer diseases of apple in Illinois. Use of the wetness-based disease-warnings system saved five fungicide applications (71% of summer fungicide applications). There was no sooty blotch, fruit rot, scab, or powdery mildew infection in the experimental plots. Less than 1% of fruit in unsprayed plots had flyspeck infection, with less than 1% severity. Leaf infection with the cedar-apple rust was observed in sprayed and unsprayed plots. The reduced-risk fungicide kresoxim-methyl (Sovran) and the organic fungicide, potassium bicarbonate (Kaligreen), provided control of all diseases equal to the conventional control.

Introduction

Major summer diseases of apple in Illinois are sooty blotch/flyspeck and fruit rots. The sooty blotch/flyspeck (SBFS) disease complex (fungi: *Peltaster fructicola*, *Leptodontium eliatus*, *Geastrumia polystigmatis*, and *Zygophiala jamaicensis*) blemish the fruit cuticle, which can make 100% of the crop unmarketable. Fruit rots, including bitter rot (*Glomerella cingulata*), black rot (*Botryosphaeria obtusa*), and white rot (*Botryosphaeria dothidea*) are fungal diseases that occur commonly in Illinois and can cause significant yield losses if effective control measures are not applied. This study was conducted to assess effectiveness of selected reduced-risk fungicides and a wetness-based warning system for control of summer diseases, and other diseases that usually develop in spring and may continue spreading in summer [scab (*Venturia inaequalis*), cedar-apple rust (*Gymnosporangium junieri-virginianae*), fire blight (*Erwinia amylovora*) and powdery mildew (*Podosphaeria leucotricha*)], of apple.

Material and Methods

A trial was conducted on Golden Delicious apple trees at the University of Illinois Pomology Research Farm at Urbana, IL, to evaluate efficacy of a reduced-risk fungicide [kresoxim-methyl (Sovran)], an organic fungicide [potassium bicarbonate (Kaligreen)], and a wetness-based warning system for control of apple diseases. Trees were approximately 10 ft tall, and canopies were well pruned. The experimental design was a randomized complete block with four, two-tree replications of six treatments. Trees in all plots were sprayed through the first-cover spray on 23 May. The conventional spray schedule received the second-cover spray on 6 June, and subsequent cover sprays every two-week until 29 August (a total of 8 sprays). The treatments directed by a wetness-based warning system received the second-cover spray after accumulation of 175 leaf wetness hours (LWH) on 15 August.

LWH were recorded with the Watchdog Leaf Wetness and Temperature Logger (Spectrum Technologies, Inc., Plainfield, IL). One sensor was placed on the northern side of the canopy of a tree in the orchard 5-feet above the ground facing north at an angle of 45º to horizon. Data were downloaded to a computer at least once per week, and accumulated LWH for all wetting periods greater than 4 hours were calculated beginning on 23 May, the date of the first-cover spray (14 days after petal fall). Following application of the second-cover spray on 15 August, the trees were sprayed once again on 29 August. Sprays were applied to both sides of the tree rows with a hydraulic hand-gun tractor sprayer. Insect pests in all plots were controlled according to the recommended conventional practices for commercial apple orchards in Illinois. On 9 September, approximately 10 days before harvest, 60 apples from each tree were examined for incidence (percentage of fruit infected) and severity (percentage of surface area of fruit affected) of sooty blotch, flyspeck, fruit rots, and scab. In each tree, five apples from each of upper, middle, and lower canopies of all four sides (northern, eastern, southern, western) were examined.

Leaves and shoots were also assessed for occurrence of scab, powdery mildew, and fire blight. In each tree, 60 leaves were examined for incidence and severity of leaf scab. Similarly, 40 shoots in each tree were examined for incidence and severity of powdery mildew. Severity of fire blight was assessed by estimating percentage of the shoots infected. Fruit yield and quality were assessed using a scale of 0-4, as 0 = no fruit and 4 = highest yield and fruit quality.

Average monthly high/low temperatures (ºF) were 69/49, 84/64, 87/66, 83/63, and 78/58 in May, June, July, August, and September, respectively. Precipitation occurred on 15 days (5.87 in.) in May, 11 days (5.66 in.) in June, 10 days (5.39 in.) in July, 3 days (0.66 in.) in August, and 11 days (7.95 in.) in September.

The data were analyzed using the GLM procedure of SAS (SAS Institute, Cary, NC) and comparisons were made using Fisher's protected LSD ($P<0.05$).

Results and Discussion

Use of the wetness-based disease-warnings system saved five fungicide applications (71% of summer fungicide applications). There was no sooty blotch, fruit rot, scab, or powdery mildew infection in the trees (Table 1). Less than 1% of fruit in unsprayed plots had flyspeck infection, with less than 1% severity. Leaf infection with the cedar-apple rust was observed in sprayed and unsprayed plots (Table 2). But, its incidence and severity were very low. Also, fire blight was detected in one shoot in one tree (Table 2). There were no significant differences in fruit yield or fruit quality among the treatments (Table 2). The reduced-risk fungicide, Sovran, and the organic fungicide, potassium bicarbonate (Kaligreen), provided control of all diseases equal to the conventional control. The results showed that the wetness-based disease-warning system, the reduced-risk fungicide Sovran, and the organic fungicide Kaligreen are effective in controlling apple diseases.

Table 1. Effects of reduced-risk fungicides and reduced-spray programs on the incidence and severity of sooty blotch and flyspeck of apple, 2008

Treatment, rate/100 gal (application)[u]	Sooty blotch[v]		Flyspeck[v]	
	Incidence (%)[w]	Severity (%)[x]	Incidence (%)[w]	Severity (%)[x]
Untreated check ……	0.0[y]	0.00	0.6 a[y]	<0.01 a
Topsin-M 70WSB, 6 oz + captan 50WP, 1 lb (1,2,3,4,5,6,7,8) ……..……...	0.0	0.00	0.0 b	0.00 b
Sovran 50WG, 1.6 oz (2,4,6,8) *alt* Topsin-M 70WSB, 6 oz + captan 50WP, 1 lb (1,3,5,7) ……..……	0.0	0.00	0.0 b	0.00 b
Kaligreen 82WP, 2 lb (1,2,3,4,5,6,7,8) …...…..	0.0	0.00	0.0 b	0.00 b
175 LWH[z]-based Topsin-M + captan 50WP, 1 lb (1,7,8) ……	0.0	0.00	0.0 b	0.00 b
175 LWH[z]-based Sovran 50WG, 6 oz (7) *alt* Topsin-M 70WSB, 6 oz + captan 50WP, 1 lb (1,7,8) ……..…...……	0.0	0.00	0.0 b	0.00 b
LSD (P<0.05)	***NS***	***NS***	***0.4***	***0.004***

[u] Product rate per 100 gallons of water. Application time: 1=23 May, 2 = 6 June, 3 =20 June, 4 = 5 July, 5 = 18 July, 6 = 1 August, 7 = 15 August, and 8 =29 August.

[v] Mean number of 120 apples per plot with sooty blotch or flyspeck signs.

[w] Average percent of 120 fruit per plot with signs of sooty blotch or flyspeck.

[x] Percentage of surface area of fruit affected.

[y] Values in each column followed by the same letter are not significantly different according to Fisher's protected LSD (*P*=0.05).

[z] Leaf wetness hours, measured with Watchdog Leaf Wetness/Temperature Logger (Spectrum Technologies, Inc., Plainfield, IL).

Table 2. Effects of reduced-risk fungicides and reduced-spray programs on the occurrence of diseases and fruit yield in the apple orchard in Urbana in 2008

	Disease occurrence					Fruit yield	
Treatment, rate/100 gal (application)[u]	**Fruit rot incidence (%)[v]**	**Fruit scab incidence (%)[v]**	**Leaf rust severity (%)[w]**	**Shoot fire blight severity (%)[w]**	**Foliage powdery mildew severity (%)[w]**	**Yield[x]**	**Quality[x]**
Untreated check …….	0.0[y]	0.00	1.12 a[y]	0.0 b	0.00	3.00	4.00
Topsin-M 70WSB, 6 oz + captan 50WP, 1 lb (1,2,3,4,5,6,7,8) ……..…..…...	0.0	0.00	1.00 b	0.00 b	0.00	3.00	4.00
Sovran 50WG, 1.6 oz (2,4,6,8) *alt* Topsin-M 70WSB, 6 oz + captan 50WP, 1 lb (1,3,5,7) ……..…	0.0	0.00	0.87 c	0.00 b	0.00	3.00	4.00
Kaligreen 82WP, 2 lb (1,2,3,4,5,6,7,8) …...…..	0.0	0.00	0..75 d	0.00 b	0.00	3.00	4.00
175 LWH[z]-based Topsin-M + captan 50WP, 1 lb (1,7,8) ……..…..…	0.0	0.00	0.87 c	0.25 a	0.00	3.00	4.00
175 LWH[z]-based Sovran 50WG, 6 oz (7) *alt* Topsin-M 70WSB, 6 oz + captan 50WP, 1 lb (1,7,8) ……	0.0	0.00	0.87 c	0.00 b	0.00	3.00	4.00
LSD (P<0.05)	***NS***	***NS***	***0.04***	***0.02***	***NS***	***NS***	***NS***

[u] Product rate per 100 gallons of water. Application time: 1=23 May, 2 = 6 June, 3 =20 June, 4 = 5 July, 5 = 18 July, 6 = 1 August, 7 = 15 August, and 8 =29 August.

[v] Incidence = mean percent of 120 fruits per plot.

[w] Severity = percentage of tissues affected.

[x] Yield and quality were assessed using a scale of 0-4, 0 = no yield and 4 = highest yield and quality.

[y] Values in each column followed by the same letter are not significantly different according to Fisher's protected LSD (*P*=0.05).

[z] Leaf wetness hours, measured with Watchdog Leaf Wetness/Temperature Logger (Spectrum Technologies, Inc., Plainfield, IL).

Bell Pepper Evaluation for Resistance to Phytophthora Blight (*Phytophthora capsici*)

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Introduction

Pepper is an important vegetable grown throughout Illinois. Phytophthora blight, caused by *Phytophthora capsici*, is one of the important diseases of peppers, particularly bell pepper cultivars. Yield losses up to 100% occur in commercial pepper fields. The objective of this study was to evaluate reaction of selected bell pepper cultivars to *P. capsici* in the field.

Materials and Methods

Ten bell pepper cultivars, Alliance, Aristotle XR3, California Wonder, Declaration, King Arthur, Paladin, Polaris, Revolution, Snapper F1, and 9941819 SVR (Table 1) were tested for resistance to Phytophthora blight. Seedlings were grown in a greenhouse. Six-week-old seedlings were kept outside the greenhouse for 6 days, and then transplanted in a commercial field near Bradley (Kankakee county), Illinois, on 10 May. The field was naturally infested with *P. capsici*. The soil was a silt clay loam with pH 6.5. Soil was deep-tilled in Oct 2007 after tomato crop was harvested and was disked on 8 May, 2008. Raised beds with drip irrigation and black plastic mulch were prepared on 9 May, 2008. The experiment was performed in a completely randomized block design with four replications. Seedlings (10/plot) were planted in one straight row with plants spaced 18 in. apart within rows centered 6 ft apart. Weeds were controlled by hand weeding. Plants received 0.3 in. water every week or as needed through the drip. Recorded precipitation in the area was 12 days (2.60 in.) during 10-31 May, 12 days (1.86 in.) in June, 12 days (2.84 in.) in July, 7 day (1.81 in.) in August, and 5 day (3.41 in.) during 1-8 September. Average monthly high and low temperatures (°F) were 66/44, 81/59, 81/59, 79/56, and 74/55, during 10-31 May, June, July, August, and 1-14 September, respectively. The percent plants wilted or dead was determined on 19 and 26 May; 2, 9, 16, 23, and 30 June; 7, 14, 21, and 28 July; 4, 11, 18, and 25 August; and 1 and 8 September. Data were analyzed using the LSD test.

Results and Discussion

Phytophthora lesions were observed on the crowns and at the base of stems beginning 7 days after transplanting the seedlings. Symptomatic plants gradually wilted and died. Significantly higher percentage of plants of cultivar California Wonder, a susceptible pepper to *P. capsici*, lost during the season (Table 1). In cultivars Aristotle XR3, Declaration, Paladin, Revolution, and Snapper F1, ≥ 90% of the plants were asymptomatic at the end of the season. Percentage of asymptomatic plants of cultivars Declaration (97.50%) was the highest at the end of the season.

Average weight of marketable fruit ranged from 11.46 pounds (California Wonder) to 27.90 pounds (Aristotle XR3) per plot (Table 1). Marketable fruit weight of cultivars Aristotle XR3, Paladin, Polaris, and Snapper F1 were higher than 26 pounds per plot. Total yield and marketable yield of cultivar California Wonder was significantly lower than those of other cultivars, except cultivar 9941819 SVR.

We would like to thank John Rietveld for providing field area and facilities to carry out this research.

Table1. Reaction of bell pepper cultivars to *Phytophthora capsici* in field in Illinois in 2008.

Cultivar	Seed source[x]	Plant stand (%)[y]						Fruit yield/plot			
		10 May	9 June	30 June	21 July	11 August	8 September	Total		Marketable	
								Number	Weight (lb)	Number	Weight (lb)
Alliance	HM	100	100 a[z]	100 a	97.50 ab	95.00 a	85.00 abc	79.00 a	28.17 a	68.75 a	25.26 a
Aristotle XR3	SM	100	100 a	100 a	100 a	97.50 a	95.00 ab	75.25 a	29.91 a	67.00 a	27.90 a
California Wonder	ST	100	97.50 ab	92.50 b	85.00 c	72.50 b	60.00 c	43.75 c	12.60 b	38.25 c	11.46 c
Declaration	HM	100	100 a	100 a	100 a	97.50 a	97.50 a	77.75 a	27.46 a	68.00 a	24.96 a
King Arthur	SM	100	100 a	97.50 ab	87.50 bc	82.50 ab	70.00 abc	62.50 abc	21.22 ab	58.75 ab	20.19 ab
Paladin	SY/RG	100	97.50 ab	97.50 ab	95.00 abc	95.00 a	90.00 ab	82.00 a	29.31 a	70.75 a	26.35 a
Polaris	WN	100	97.50 ab	97.50 ab	97.50 ab	90.00 ab	82.50 abc	75.00ab	29.59 a	66.00 a	27.18 a
Revolution	HM	100	95.00 b	95.00 ab	95.00 abc	95.00 a	95.00 ab	80.00 a	29.78 a	68.50 a	25.57 a
Snapper F1	EZ	100	100 a	97.50 ab	97.50 ab	97.50 a	92.50 ab	78.00 a	27.72 a	74.25 a	26.61 a
9941819 SVR	SM	100	100 a	100 a	92.50 abc	72.50 b	67.50 bc	52.75 bc	17.82 b	43.50 bc	15.12 bc
LSD (*P*=0.05)		***NS***	***4.75***	***6.85***	***10.79***	***17.79***	***28.40***	***22.28***	***9.30***	***20.16***	***8.47***

[x] HM = Harris Moran; SM = Seminis; ST = Stokes; SY/RG = Syngenta, Rogers Brands; EZ = Enza Zaden; WN = Western.

[y] Symptomless plants.

[z] Values within each column followed with the same letter are not significantly different (*P*=0.05) from each other according to Fisher's protected LSD test.

Evaluation of an Experimental Fungicide for Control of Phytophthora Blight (*Phytophthora capsici*) in Processing Pumpkin in Illinois, 2008

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Summary

This study was conducted to evaluate an experimental fungicide (BAS 65100F) for control of Phytophthora blight (*Phytophthora capsici*) of cucurbits. There was not a measurable Phytophthora leaf infection in the plots. The first vine infection was observed on 16 July, and the first fruit infection was observed on 22 July. Percentage of vine infection with *P. capsici* in all seven treatments with fungicides was lower than that of untreated check. Percentage of infected fruits with *P. capsici* in all seven treatments was ≤ 50% of that of untreated plots. The most effective treatment on controlling Phytophthora foliar and fruit infection was spray application of Ridomil Gold MZ. Additional studies are needed to determine the effectiveness of the new experimental fungicide for control of Phytophthora foliar blight and fruit rot of cucurbits.

Introduction

More than 90% of commercial processing pumpkins produced in the United States are grown and processed in Illinois. Phytophthora blight, caused by *Phytophthora capsici*, is one of the most serious threats to production of processing pumpkins, other cucurbit crops, eggplant, and peppers in Illinois, as well as worldwide. *P. capsici* can infect plants at any growth stage during the growing season, causing seedling death, leaf spot, vine infection, and fruit rot. *P. capsici* causes up to 100% crop losses in cucurbit and pepper fields. This study was conducted to evaluate efficacy of a new experimental fungicide (BAS 65100F) for control of Phytophthora blight of processing pumpkin.

Materials and Methods

A trial was conducted in a commercial field near Pekin, IL, to evaluate the efficacy of a new experimental fungicide, BAS 65100F, for control of Phytophthora blight of processing pumpkin, caused by *Phytophthora capsici*. The experimental fungicide was tested in combination with Mefenoxam (Ridomil Gold MZ 65WP) and Mandipropamid (Revus 2.09SC) fungicides (Table 1). The field was naturally infested with *P. capsici*. Soil was chisel-plowed in October, 2007, and was deep plowed on 10 May 2008. Fertilizers (60 lb phosphorus, 200 lb potassium, and 140 lb anhydrous ammonium per acre) were broadcast and incorporated into soil on 24 October 2007. Seeds of processing pumpkin cultivar Dickinson were slurry-treated with Apron XL LS (0.64 fl oz/100 lb seed) and planted on May on 19 May.

Seeds were sown 18-in. apart. The plots were set up on 2 July in the field with already established crop. Single-row plots, 20 ft long, were arranged. The plots were spaced 30 ft apart

in a randomized complete block design with four replications. Command 3ME herbicide (1.67 pt in 25 gal water/A) was applied over the entire field before planting seed. During the season, weeds were controlled by cultivating and hand weeding. Spray-applications of the fungicides began 9 July and continued until 20 August at 7-day intervals (a total of 7 fungicide applications) (Table 1). Fungicides were applied with a backpack sprayer using 50 gal of water per acre. Average monthly high and low temperatures (°F) were 70/50, 82/62, 83/64, 81/60, and 78/62 during 19-31 May, June, July, August, and during 1-5 September, respectively. Recorded precipitation in the field was 3 days (0.9 in.), 7 days (4.95 in.), 7 days (6.0 in.), 1 day (5.1 in.), and 0 days (0.0 in.), for 19-31 May, June, July, August, and 1-5 September, respectively.

Plants were examined biweekly for Phytophthora foliar blight and fruit rot from 9 July to 5 September. Disease incidence and severity were assessed by examining 40 leaves in four spots (10 leaves per spot), 20 vines in four spots (five vines per spot), and all fruit in each plot. Severity of downy mildew on leaves (i.e., percentage of total leaf area affected), and severity of powdery mildew on vines and leaves, were assessed by examining 40 leaves in four spots (10 leaves per spot) and 20 vines in four spots (five vines in each spot) in each plot on 25 August and 4 September. Plots were harvested on 5 September and the fruit yields were measured. The data were analyzed using GLM procedures of SAS.

Results and Discussion

There was not a measurable Phytophthora leaf infection in the plots. The first vine infection was observed on 16 July, and the first fruit infection was observed on 22 July. Percentage of vine infection with *P. capsici* in all seven treatments with fungicides was lower than that of untreated check (Table 2). Percentage of infected fruits with *P. capsici* in all seven treatments was ≤ 50% of that of untreated plots (Table 2). The most effective treatment on controlling Phytophthora foliar and fruit infection was spray application of Ridomil Gold MZ. Additional studies are needed to determine the effectiveness of the new experimental fungicide for control of Phytophthora foliar blight and fruit rot of cucurbits.

There was no downy mildew infection of the plants. Powdery mildew severity of leaves ranged form 1 to 4.74%. Fruit yield was the highest in the plots sprayed with Ridomil Gold MZ and the lowest in the unsprayed plots.

Table 1. Fungicide application schedule in processing pumpkin plots in Illinois in 2008

Treatment	Seed planted (19 May)	Dates fungicides applied						
		9 July	16 July	23 July	30 July	6 Aug	13 Aug	20 Aug
Untreated check	—	—	—	—	—	—	—	—
Ridomil Gold MZ *alt* BAS	—	RGM*	BAS	BAS	BAS	BAS	BAS	RGM
Ridomil Gold MZ *alt* BAS	—	RGM	BAS	BAS	BAS	BAS	BAS	RGM
Ridomil Gold MZ *alt* BAS + Induce	—	RGM	BAS + IND	BAS + IND	BAS + IND	BAS + IND	BAS + IND	RGM
Ridomil Gold MZ *alt* BAS + Silwet	—	RGM	BAS + SIL	BAS + SIL	BAS + SIL	BAS + SIL	BAS + SIL	RGM
Ridomil Gold MZ *alt* BAS + Penetrator	—	RGM	BAS + PEN	BAS + PEN	BAS + PEN	BAS + PEN	BAS + PEN	RGM
Ridomil Gold MZ	—	RGM	RGM	RGM	RGM	RGM	—	—
Ridomil Gold MZ *alt* Revus	—	RGM	REV	REV	REV	REV	REV	RGM

* BAS = BAS 65100F; IND = Induce; PEN = Penetrator Plus; REV = Revus 2.09SC; RGM = Ridomil Gold MZ 65WP; SIL = Silwet L-77 AG.

Table 2. Incidence of Phytophthora blight on vines and fruit and yield in processing pumpkin plots following applications of the fungicides in Illinois in 2008

Treatment, rate/A (application)[w]	Phytophthora blight			Powdery mildew severity (%) (24 Aug)[x]	Marketable yield/plot	
	Infected vines (%) (28 July)	Infected vines (%) (5 Sep)	Infected fruit (%) (5 Sep)		Fruit number	Fruit weight (lb)
Untreated check[y]	31.0 a[z]	38.0 a	62.30 a	1.00 b	12.00 c	168.8 b
Ridomil Gold MZ 65WP, 2 lb (1,7) *alt* BAS 65100F, 10.96 fl oz (2-6)	11.0 ab	27.0 ab	31.12 ab	4.74 a	26.25 bc	436.0 ab
Ridomil Gold MZ 65WP, 2 lb (1,7) *alt* BAS 65100F, 13.70 fl oz (2-6)	16.0 ab	19.0 ab	30.05 ab	2.35 b	23.25 bc	413.3 ab
Ridomil Gold MZ 65WP, 2 lb (1,7) *alt* BAS 65100F, 13.70 fl oz + Induce, 0.25% (V/V) (2-6)	7.0 b	20.0 ab	17.18 b	2.04 b	37.75 ab	559.3 a
Ridomil Gold MZ 65WP, 2 lb (1,7) *alt* BAS 65100F, 13.70 fl oz + Silwet L-77, 0.05% (V/V) (2-6)	12.0 ab	24.0 ab	23.75 b	1.82 b	33.75 ab	540.0 a
Ridomil Gold MZ 65WP, 2 lb (1,7) *alt* BAS 65100F, 13.70 fl oz + Penetrator Plus, 0.25% (V/V) (2-6)	5.0 b	14.0 ab	15.65 b	2.17 b	32.75 ab	513.8 ab
Ridomil Gold MZ 65WP, 2 lb (1-5)	0.0 b	4.0 b	4.73 b	7.74 b	43.50 a	687.0 a
Ridomil Gold MZ 65WP, 2 lb (1,7) *alt* Revus 2.09SC, 8 fl oz (2-6)	14.0 ab	18.0 ab	30.88 ab	1.91 b	26.50 bc	420.0 ab
LSD (P=0.05)	***20.1***	***25.4***	***37.04***	***2.28***	***16.47***	***332.4***

[w] Application time: 1 = 9 July, 2 = 16 July, 3 = 23 July, 4 = 30 July, 5 = 6 August, 6 = 13 Aug, and 7 = 20 August.

[y] Percentage of leaf area affected 11 days prior to harvest.

[y] Seeds for all plots, including check plots, were treated with Apron XL LS (0.64 fl oz/100 lb seed) prior to sowing seeds.

[z] Values within each column with a letter in common are not significantly different (*P*=0.05) from each other according to Fisher's protected LSD test.

Efficacy of selected Fungicides for Control of Phytophthora Blight (*Phytophthora capsici*) in Processing Pumpkin in Illinois, 2008

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Summary

This study was conducted to evaluate efficacy of selected fungicides for control of Phytophthora blight (*Phytophthora capsici*) of processing pumpkins. No seedling damping-off was observed in the plots. Until 26 August, low incidence of vine and fruit infection in the plots was recorded. Due to heavy rain falls during the period between 26 August and 15 September, rapid infection of vines and fruits occurred. Lower percentages of fruit infection were recorded in the plots received weekly application of fungicides. The lowest percentage of fruits infected was recorded in the plots sprayed with Revus plus Kocide-3000 plus Activator 90 alternated with Tanos plus Kocide-3000. There was no downy mildew infection of the plants. Powdery mildew severity of leaves ranged form 16.64 to 32.05%. Fruit yield was the highest in the plots sprayed with Revus plus Kocide-3000 plus Activator-90 alternated with Ridomil Gold Copper with eight applications of fungicides.

Introduction

More than 90% of commercial processing pumpkins produced in the United States are grown and processed in Illinois. Phytophthora blight, caused by *Phytophthora capsici*, is one of the most serious threats to production of processing pumpkins and other cucurbits, causing up to 100% crop losses. This study was conducted to evaluate efficacy of selected fungicides for control of Phytophthora blight of processing pumpkin.

Materials and Methods

A trial was conducted in an irrigated field near Pekin, IL, to evaluate the efficacy of selected fungicides to control Phytophthora blight of processing pumpkin, caused by *Phytophthora capsici*. The field was naturally infested with *P. capsici*. Soil was chisel-plowed on 22 October 2007, and was deep plowed on 3 May 2008. Fertilizers (60 lb phosphorus, 200 lb potassium, and 140 lb anhydrous ammonium per acre) were broadcast and incorporated into soil in 24 October 2007.

Seeds of processing pumpkin cultivar Dickinson were slurry-treated with Apron XL LS (0.64 fl oz/100 lb seed) and planted on 7 May. Seeds were sown 18-in. apart in single-row plots, 20 ft long. The plots were spaced 35 ft apart in a randomized complete block design with four replications. Command 3ME herbicide (1.33 pt) and Dual Magnum (1.0 pt) in 25 gallons of water per acre) was applied over the entire field on 3 May. During the season, weeds were controlled by cultivating and hand weeding. Spray-applications of fungicides began 2 July and

continued until 20 Aug at 7-day intervals. Fungicides were applied with a backpack sprayer using 50 gal of water per acre.

Average monthly high and low temperatures (°F) were 67/48, 82/62, 83/64, 81/60, and 78/59, during 7-31 May, June, July, August, and 1-15 September. Recorded precipitation in the field was 4 days (2.10 in.) during 7-31 May, 7 Days (4.95 in.) in June, 6 Days (5.70 in.) in July, 7 days (5.10 in.) in August, and 9 days (6.20 in.) during 1-16 September. The field was irrigated 1 day (0.3 in.) in July.

Plants were examined biweekly for Phytophthora damping-off, foliar blight, and fruit rot from 21 May to 16 Sep. Disease incidence and severity were assessed by examining all seedlings, 40 leaves in four spots (10 leaves per spot), 20 vines in four spots (five vines per spot), and all fruit in each plot. Severity of downy mildew and powdery mildew on leaves (i.e., percentage of total leaf area affected) was assessed by examining 40 leaves in four spots (10 leaves per spot) in each plot on 15 September. Plots were harvested on 16 September and the fruit yields were measured. The data were analyzed using GLM procedures of SAS.

Results and Discussion

No seedling damping-off was observed in the plots. Also, there was not a measurable Phytophthora leaf infection in the plots. The first vine infection was observed on 28 July, and the first fruit infection was observed on 11 August. Until 26 August, low incidence of vine and fruit infection in the plots was recorded. During the period of 26 August and 15 September, heavy rain falls resulted in rapid infection of vines and fruits (Table 2). Since the last spray-application of the fungicides was on 20 August, the residues of the fungicides left on/in the plants were not effective in protecting foliage and fruits against infection with *P. capsici*. Lower percentages of fruit infection were recorded in the plots received weekly application of fungicides. The lowest percentage of fruits infected with *P. capsici* was recorded in the plots received eight spray-applications of Revus plus Kocide-3000 plus Activator 90 alternated with Tanos plus Kocide-3000.

There was no downy mildew infection of the plants. Powdery mildew severity of leaves ranged form 16.64 to 32.05%. Fruit yield was the highest in the plots sprayed with Revus plus Kocide-3000 plus Activator-90 alternated with Ridomil Gold Copper.

Table 1. Fungicide application schedule in processing pumpkin plots in Illinois in 2008

Treatment	Seed planted (7 May)	Dates fungicides applied							
		2 July	9 July	16 July	23 July	30 July	6 Aug)	13 Aug	20 Aug
Untreated check	—	—	—	—	—	—	—	—	—
Revus 2.09SC + Activator-90 + Kocide-3000 46.1DF *alt* Ridomil Gold Copper 65WP	—	RE + A90 + KO[z]	RGC	RE + A90 + KO	RGC	RE + A90 + KO	RGC	—	—
Revus 2.09SC + Activator-90 + Kocide-3000 46.1DF *alt* Ridomil Gold Copper 65WP	—	RE + A90 + KO	RGC	RE + A90 + KO	RGC	RE + A90 + KO	RGC	—	—
Revus 2.09SC + Activator-90 + Kocide-3000 46.1DF *alt* Ridomil Gold Copper 65WP	—	RE + A90 + KO	RE + A90 + KO	RGC	RE + A90 + KO	RE + A90 + KO	RGC	—	—
Revus 2.09SC + Activator-90 + Kocide-3000 46.1DF *alt* Ridomil Gold Copper 65WP	—	RE + A90 + KO	—	RGC	—	RE + A90 + KO	—	—	—
Revus 2.09SC + Activator-90 + Kocide-3000 46.1DF *alt* Tanos 50DWG + Kocide-3000 46.1DF	—	RE + A90 + KO	TA + KO	RE + A90 + KO	TA + KO	RE + A90 + KO	TA + KO	—	—
Tanos 50DWG + Kocide-3000 46.1DF *alt* Forum 4.16SC + Kocide-3000 46.1DF	—	TA + KO	FO + KO	TA + KO	FO + KO	TA + KO	FO + KO	TA + KO	FO + KO
Revus 2.09SC + Activator-90 + Kocide-3000 46.1DF *alt* Ridomil Gold Copper 65WP	—	RE + A90 + KO	RGC	RE + A90 + KO	RGC	RE + A90 + KO	RGC	RE + A90 + KO	RGC
Forum 4.16SC + Cuprofix Ultra 40DF *alt* Tanos 50DWG + Kocide-3000 46.1DF	—	FO + CU	TA + CU	FO + CU	TA + CU	FO + CU	TA + CU	FO + CU	TA + CU
Ranman 400F + Kocide-3000 46.1DF + SIL = Silwet L-77 *alt* Tanos 50DWG + Kocide-3000 46.1DF	—	RA + KO + SIL	TA + KO	RA + KO + SIL	TA + KO	RA + KO + SIL	TA + KO	RA + KO + SIL	TA + KO
Presidio 4SC + Gavel 75DF Gold 480SL, *alt* Tanos 50DWG + Bravo Weather Stik 6F	—	PR+ GA	TA+ BWS	PR+ GA	TA+ BWS	PR+ GA	—	—	—
Presidio 4SC + Gavel 75DF Gold 480SL, *alt* Tanos 50DWG + Bravo Weather Stik 6F	—	PR+ GA	TA+ BWS	PR+ GA	TA+ BWS	PR+ GA	—	—	—

[z] A90=Activator-90; AP=Apron XL LS; BWS=Bravo Weather Stik 6F; CU=Cuprofix Ultra 40DF; FO=Forum 4.16SC; GA=Gavel 75DF; KO=Kocide-3000 46.1DF; PF=Previcur Flex 6F; PR=Presidio 4SC; RA=Ranman 400F; RE=Revus 2.09SC; RG=Ridomil Gold 480SL; RGC=Ridomil Gold Copper 65WP; SIL = Silwet L-77; TA=Tanos 50DWG.

Table 2. Incidence of Phytophthora blight on vines and fruit, powdery mildews on leaves, and yield in processing pumpkin plots following applications of the fungicides in Illinois in 2008

Treatment, rate/A (application)[w]	Phytophthora blight			Powdery mildew severity (%) (15 Sep)[x]	Marketable yield/plot	
	Infected vines (%) (25 Aug)	Infected vines (%) (15 Sep)	Infected fruit(%) (15 Sep)		Fruit number	Fruit weight (lb)
Untreated check[y]	4.00 ab[z]	43.00 ab	39.75 a	32.05 a	17.25 a	414.8 a
Revus 2.09SC, 8 fl oz + Activator-90, 0.125% + Kocide-3000 46.1DF, 1.5 lb (1,3,5) *alt* Ridomil Gold Copper 65WP, 2 lb (2,4,6)	0.00 b	25.00 abc	19.70 bcd	20.79 a	20.75 a	517.3 a
Revus 2.09SC, 8 fl oz + Activator-90, 0.125% + Kocide-3000 46.1DF, 0.75 lb (1,3,5) *alt* Ridomil Gold Copper 65WP, 2 lb (2,4,6)	1.00 ab	39.00 abc	20.65 bcd	25.32 a	21.50 a	542.8 a
Revus 2.09SC, 8 fl oz + Activator-90, 0.125% + Kocide-3000 46.1DF, 1.5 lb (1,2,4,5) *alt* Ridomil Gold Copper 65WP, 2 lb (3,6)	1.00 ab	23.00 bc	15.47 cd	30.56 a	25.25 a	636.3 a
Revus 2.09SC, 8 fl oz + Activator-90 0.125%+ Kocide-3000 46.1DF, 1.5 lb (1,5) *alt* Ridomil Gold Copper 65WP, 2 lb (3)	5.00 ab	31.00 abc	41.75 a	21.45 a	17.25 a	413.3 a
Revus 2.09SC, 8 fl oz + Activator-90, 0.125% + Kocide-3000 46.1DF, 1.5 lb (1,3,5) *alt* Tanos 50DWG, 10 oz + Kocide-3000 46.1DF, 1.5 lb (2,4,6)	0.00 b	21.00 c	8.22 d	25.14 a	23.75 a	605.5 a
Tanos 50DWG, 10 oz + Kocide-3000 46.1DF, 2 lb (1,3,5,7) *alt* Forum 4.16SC, 6 fl oz + Kocide-3000 46.1DF, 1.5 lb (2,4,6,8)	7.00 a	30.00 abc	17.47 bcd	20.70 a	24.00 a	622.5 a
Revus 2.09SC, 8 fl oz + Activator-90, 0.125% + Kocide-3000 46.1DF, 1.5 lb (1,3,5,7) *alt* Ridomil Gold Copper 65WP, 2 lb (2,4,6,8)	1.00 ab	23.00 bc	15.35 cd	16.64 a	26.75 a	691.8 a
Forum 4.16SC, 6 fl oz + Cuprofix Ultra 40DF, 1.5 lb (1,3,5,7) *alt* Tanos 50DWG, 10 oz + Kocide-3000 46.1DF, 1.5 lb (2,4,6,8)	4.00 ab	34.50 abc	18.97 bcd	24.90 a	21.75 a	505.5 a
Ranman 400F, 2.75 fl oz + Kocide-3000 46.1DF, 1.5 lb + SIL = Silwet L-77, 2 fl oz (1,3,5,7) *alt* Tanos 50DWG, 10 oz + Kocide-3000 46.1DF, 1.5 lb (2,4,6,8)	3.00 ab	24.00 abc	17.12 bcd	21.19 a	22.25 a	559.8 a
Presidio 4SC, 3 fl oz +Gavel 75DF, 1.5 lb (1,3,5) *alt* Tanos 50DWG, 10 oz + Bravo Weather Stik 6F, 1 pt (2,4)	2.00 ab	41.00 abc	27.00 abc	18.49 a	19.25 a	483.5 a
Presidio 4SC, 4 fl oz +Gavel 75DF, 1.5 lb (1,3,5) *alt* Tanos 50DWG, 10 oz + Bravo Weather Stik 6F, 1 pt (2,4)	3.00 ab	45.00 a	32.25 ab	24.76 a	16.50 a	400.0 a
LSD (P=0.05)	***6.64***	***21.94***	***16.30***	***15.60***	***12.07***	***312.9***

[w] Application time: 1= 2 July; 2= 9 July; 3= 16 July; 4= 23 July; 5= 30 July; 6= 6 August, 7= 13 August; and 7= 20 August.

[x] Percentage of leaf area affected 1 days prior to harvest.
[y] Seeds for all plots, including check plots, were treated with Apron XL LS (0.64 fl oz/100 lb seed) prior to sowing seeds.
[z] Values within each column with a letter in common are not significantly different (P=0.05) from each other according to Fisher's protected LSD test.

WINTER RODUCTION OF SALAD GREEN SPECIES UNDER HIGH TUNNEL AND AN ADDITIONAL LAYER OF INTERNAL ROW COVER

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1. ABSTRACT

Two polyethylene high tunnels with three replications of three internal row cover treatments Ken-Bar 0.5 mil clear slitted polyethylene row cover (SP), Grow-Guard UV GG-40 (40 gram m²) floating row cover fabric (FR) with 60% light transmission, and no cover (NC) were tested for winter production of cold-hardy salad greens. Four species were tested during two consecutive winters season including: arugula (*Eruca vesicaria* L.) Cav. subsp. *sativa* Mill.) Thell.), sylvetta or wild arugula (*Diplotaxis tenuifolia* (L.) DC.), mizuna (Brassica rapa L. subsp. nipposinica L.H. Bailey)., and an Asian salad green 'Tokyo Bekana' (*Brassica rapa* L. subsp. *chinensis* L.). FR had significantly warmer low air temperatures than the other cover treatments during the winter of 2006-2007. FR had a two year average of 10.7 ºC and 6.1 º C higher temperatures compared to the outside for low air and soil temperature, respectively. In 2007 and 2008 respectively, FR had 0.6 and 0.7 kg/m² more mass than NC. Bekana, arugula, and mizuna, had the highest and most uniform yields across both years.

FR and SP had warmer low soil temperatures than the NC treatment in the winter of 2007-2008. There was also a significant cover effect for cumulative yield. The FR treatment displayed higher cumulative yields than NC in 2007-2008. In 2006-2007 the FR and SP treatments had higher cumulative yields than the NC treatment. The species bekana, arugula, and mizuna, had the highest and most uniform yields in both years.

2. INTRODUCTION

High tunnels are unheated or passively solar heated non-permanent greenhouses. In vegetable production, they are normally used to protect spring plantings of warm season crops, such as tomatoes and cucumbers, from late frosts and freezes, as well as extend harvest into the fall in mid-latitude temperate climates (Lamont, 2005). In addition to extending the harvest season, these structures also provide a barrier from pests and other fluctuating environmental conditions including: excessive rain, wind, hail, and extreme temperatures (Rader et al., 2006). This protection translates into increased profits for growers who can harvest fresh vegetables and fruits when the outside low temperature is not conducive to plant growth. Most high tunnel research has focused on warm season crops and the extension of spring and fall growing seasons (Jett, 2004; Lamont, 2005; Both et al., 2007). However, the colder months of late fall through winter might be sufficiently moderated by high tunnels to allow for production and harvest of certain cold hardy salad greens. The protected microclimate created from the combination of row covers within high tunnels and the use of cold hardy crops are the keys to the success of winter high tunnel vegetable production (Coleman, 1998).

Row covers and high tunnels, used separately, have demonstrated increases in yield, plant biomass, and leaf area index in Chinese cabbage [*Brassica rapa* L. (Pekinensis Group)], lettuce (*Lactuca sativa* L.), tomato (*Lycopersicon esculentum* L.), and spinach (*Spinacia oleracea* L.). (Both et al., 2007; Gimenez et al., 2002; Moreno et al., 2002; Rader et al., 2006). Since row covers and high tunnels separately create beneficial microclimates and increase yield, then their combination might allow cold hardy crops to survive otherwise unsuitable low winter temperatures. This study was initiated to determine the benefits an additional layer of internal

row cover material would create inside high tunnel structures during winter production of cold hardy salad green crops.

3. MATERIALS AND METHODS

Two 6.1 x 14.6 meter high tunnels were constructed at the Department of Natural Resources and Environmental Sciences Pomology Research Farm in Urbana, IL, 40°N latitude. The tunnels were covered with one layer of Klein K-50 6 mil UV-resistant four year polyethylene greenhouse film, with approximately 87% light transmission (Nelson, 1998). Inside the tunnels, three in ground beds extending the length of the tunnel (14.6 meters) were established with a width of 91.4 cm. Each 14.6 meter long bed was divided into three 4.9 meter sections that made up the whole plots to which the row cover treatments were assigned. Within the high tunnels, the three row cover treatments were: Ken-Bar 0.5 mil clear slitted polyethylene row cover (SP), Grow-Guard UV GG-(40 gram per square meter) floating row cover fabric (FR) with 60% light transmission, and no cover (NC). Three replications of each row cover were randomly assigned to the divided beds in both tunnels.. The covers were supported with 9 gauge wires, bent to a half-circle, spaced at 1.22 meter intervals at approximately 45.7 cm above the crop canopy. The experimental design for these beds was a completely randomized design with a split plot arrangement.

A 70% rye / 30% vetch cover crop mix was seeded at 3lb/100m² in April 2006 and plowed under one month prior to the 21 September, 2006 planting. Seeds of four salad green species were obtained from Johnny's Selected Seeds (Winslow, Maine) including: arugula (*Eruca vesicaria* (L.) Cav. subsp. *sativa* (Mill.) Thell.) sylvetta or wild arugula (*Diplotaxis tenuifolia* (L.) DC.), mizuna (Brassica rapa L. subsp. nipposinica (L.H. Bailey), and an Asian salad green 'Tokyo Bekana' (*Brassica rapa* L. subsp. *chinensis* (L.)). All four species were

assigned randomly to each sub-plot within each whole plot cover. The sub-plots were 0.6 meters in length and 91.4 cm wide. The between-row spacing was 15 cm creating six evenly spaced rows across the width of the bed. Seeds of each species were planted with a "Pin-Point Precision Seeder" from Johnny's Selected Seeds with a less than 0.6 cm in-row spacing.

All samples were harvested approximately 40 to 50 days after planting, or when they reached marketable size (Gent, 2002). A random 0.1 m² sample of salad green tissue was harvested from each sub-plot, packed in ice to remove field heat, and immediately transported to the laboratory. Tissue was weighed to determine fresh weight, which was used to estimate yield in kilograms per m^2. The species in the sub-plots were harvested with scissors above the apical growth point to facilitate re-growth for multiple harvests. Two marketable harvests were obtained from each sub-plot. The separate harvest weights were combined for cumulative yield. More harvests were collected but were not of marketable quality and therefore were not considered in the cumulative yield parameter. The harvests took place from early November 2006 to early March 2007. The results were expressed as least square means (lsmeans) of the cumulative yields. The data was analyzed in Proc Mixed (SAS, Cary, NC) and the lsmean comparisons were adjusted according to Tukey $\alpha=0.05$. Factors in the linear model were R = replicate, C = cover treatment (whole plot), and V = variety (subplot): $\gamma=\mu+R+C+e_1+V+CV+e_2$

The experiment was repeated again during the winter of 2007-2008. The only cultural difference from the first year experiment was the addition of a one cubic meter of organic compost obtained from the Landscape Recycling Center (Urbana, IL) applied equally to the whole plots and incorporated with a tiller. This was done due to the time constraints involved in the establishment and incorporation of another cover crop. The planting date for the second year

was delayed by one week to 28 September, 2007 due to high soil temperatures within the high tunnel.

Watch Dog 100 2K button loggers (Spectrum Technologies, Plainfield, IL) were used to collect low air and soil temperatures within the high tunnels and cover treatments for two consecutive years (winter 2006-07 and winter 2007-08) from November to March. Low air temperatures were measured close to the height of the growing crops, suspended 5 cm above the soil. The low soil temperature was measured at a depth of 10 cm. Two data loggers were used to record one replicate of air temperature and soil temperature outside the tunnel, at the same positions as in the high tunnels. Photosynthetically active radiation (PAR) was measured with a handheld quantum meter (Apogee Instruments, Logan, UT), at solar noon, at random intervals throughout the production cycle. Three outside replications and three replications of each inner treatment were collected for PAR. The data for the environmental parameters were analyzed in a split-plot completely randomized design with an adjustment for repeated measures by month. The results were expressed as least square means (lsmeans) of the monthly temperatures. The data was analyzed in Proc Mixed (SAS, Cary, NC) and the lsmean comparisons were adjusted according to Tukey α=0.05. Factors in the linear model were R = replicate, C = cover (whole plot), and M = month (subplot): $\gamma=\mu+R+C+e_1+M+CM+e_2$

5. RESULTS/DISCUSSION

The fixed effect of cover on low air and soil temperatures varied in both years as illustrated in Table 1. There was significant interaction for low soil temperature during the winter 2006-2007 and for low air temperature during the winter 2007-2008. For clarity, the environmental parameters with interactions are not represented with figures here.

Low air temperature was significantly moderated by the FR treatment compared to the other covers. The least square mean low air temperature experienced within the FR treatment over all months was -4 ºC during the winter of 2006-2007. This temperature is within the range of survivability for most cold hardy salad crops used in winter production (Biernbaum, 2006). The average outside low air temperature during this same time span was -14.7 ºC. This 10.7 ºC difference in low air temperature is greater than a 2.3 ºC difference in low temperature, between the outside and within heat curtains placed inside a high tunnel found by Both et al. (2007). Rader et al, (2006) reported a 5.8 ºC temperature difference between high tunnel (with no internal cover) and outside air, during a severe frost in November 2005.

Low soil temperature within all three cover treatments never dropped below freezing in either year. Whereas the outside low soil temperature was below freezing in both years. The 6 ºC difference between the low soil temperature within FR and outside during the winter 2007-2008 is similar to the findings of Both et al. (2007) who found a 7.2 ºC warmer low soil temperature, within a heat curtain, compared to outside low soil temperature . Rader et al. (2006) reported a 3.5 ºC warmer low soil temperature inside a high tunnel (with no internal cover) compared to the outside low soil temperature during an early fall freeze. In addition, the soil temperature never dropped below freezing.

In both years, FR and the other cover treatments reduced PAR, an obvious observation because any additional cover inside a high tunnel is going to further reduce the light intercepted by the salad greens. The percentage reduction for each of the FR and NC treatments compared to the outside PAR levels in year one was 55% and 27%, respectively. For year two, the difference was 49% and 22%. A 29% and 22% reduction with and without a heat curtain placed inside a high tunnel was reported, respectively by Both et al., (2007). It should be noted

that the heat curtain in Both et al. (2007) had a 85% light transmission, where the FR treatment in this study only had 60% light transmisson.

The significant increase in yield experienced in FR compared to the NC treatment in this study confirms earlier findings by several sources Moreno et al. (2002), Gimenez et al. (2002), Both et al. (2007), and Rader et al. (2006). Even though some of these studies were carried out using different crops, seasons, and design; they all exhibited large or slight increases in yield with some form of cultural protection either with high tunnels and/or row covers. The data here suggests that integration of high tunnels with an internal cover will increase yields compared to no additional cover within the tunnels, even during a winter production cycle. The significantly lower PAR within the FR treatment does not seem to have limited plant growth compared to the NC treatment. Light saturation occurs between 400-500 μmol m^{-2} s^{-1} for most C3 plants (Hopkins et al., 2004). FR had PAR average levels of 594.7 and 466.4 μmol m^{-2} s^{-1} for years one and two, which is within and above the 400-500 μmol m^{-2} s^{-1} ranges described above. This observation infers that temperature is more important in regulating survival and growth than light in winter at this latitude (40ºN) (Gimenez et al., 2002).

Yield for species showed variation between different years. However, some similar trends were noted. Sylvetta exhibited the lowest yields in both years: 0.22 and 0.7 kg/m² for years one and two respectively. In year one, all species had different yields ranked from highest to lowest: bekana, arugula, mizuna, and sylvetta. In year two there was no difference between bekana, arugula, and mizuna with respective yields of: 1.2, 1.1, and 1.3 kg/m². These results are similar to brassica yields of 1.2 kg/ m² reported by Blomgren et al. (2007). However, the *Brassica* yield data presented here is for two harvests and Blomgren et al. (2007) is for one

harvest. Variation in soil fertility and cultural practices such as between row spacing may account for this difference.

6. CONCLUSIONS

The floating row cover treatment (FR) was the best option for an internal cover in winter high tunnel production of salad greens. The temperature parameters were significantly moderated to levels conducive to cold hardy crop survival and growth even during the marginal production months of November through March. The observed variation in environmental parameters within SP suggests it is very inconsistent in moderating temperatures within a high tunnel. FR was significantly greater or equal to SP in all the parameters presented. In addition, SP was difficult to manage due to heavy condensation loads. Also, SP only comes in two meter widths that can cover only a single bed. The FR comes in larger widths that could be used to cover entire quadrants of several rows within a high tunnel. This may be a more effective management strategy for ventilating the high air temperatures that can occur in the tunnels even during the winter months. Overall, the data shows significant improvement in the growing environment and yield of all the salad green species grown under a high tunnel, when combined with an internal row cover layer in a winter production system.

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Table 1. Proc mixed of fixed Effects for Cover and Month

Winter 2006-2007	Low Air Temperature		Low Soil Temperature	
	F Value	P value	F Value	P value
Cover	16.22	0.0065	6.64	0.0570
Month	134	0.0086	269.38	<0.0001
cover x month	6.97	0.2825	5.24	0.0036
Winter 2007-2008	Low Air Temperature		Low Soil Temperature	
	F Value	P value	F Value	P value
cover	7.83	0.0288	30.57	0.0087
month	55.09	<0.001	12.71	<0.0001
cover x month	2.55	0.0424	0.68	0.7063

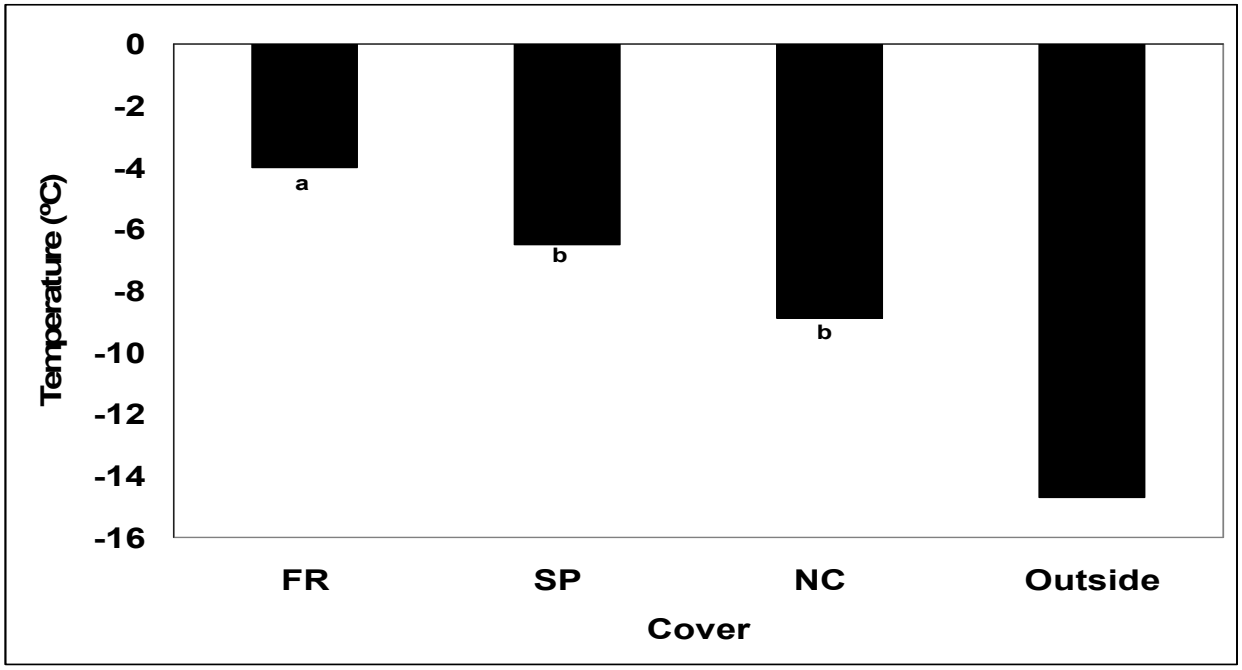


Figure 1. Low Air Temperature Under Cover Treatments within High Tunnel Compared to Outside During Winter 2006-2007. FR=Floating Row Cover; SP=Slitted Plastic Cover; NC=No Cover. Letters denote significant differences at *p*=0.05. Outside=average over all months

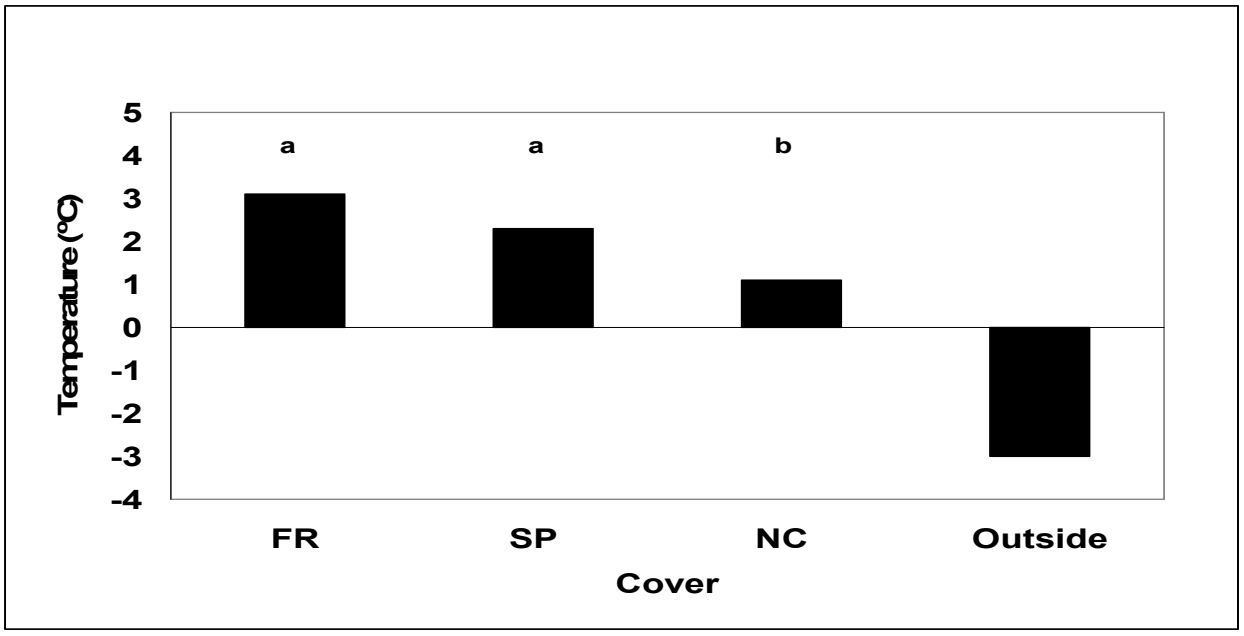


Figure 2. Low Soil Temperature Under Cover Treatments within High Tunnel Compared to Outside During Winter 2007-2008. FR=Floating Row Cover; SP=Slitted PlasticCover; NC=No Cover. Letters denote significant differences at *p*=0.05 Outside=average over all months.

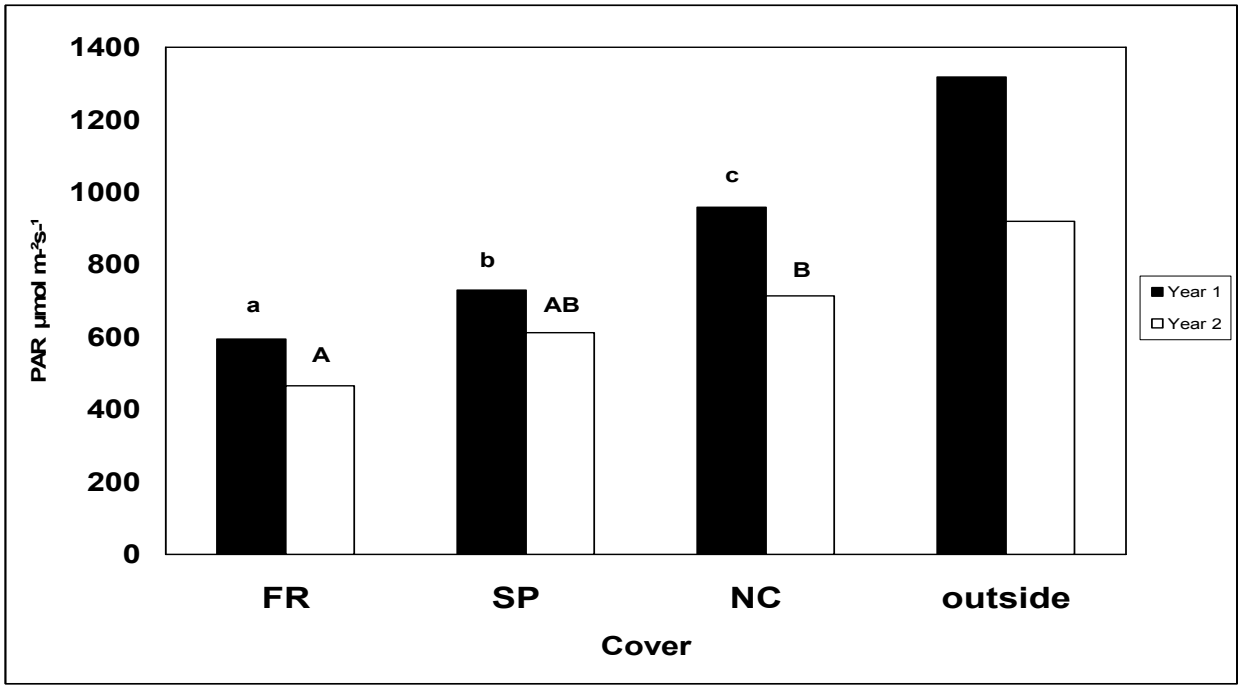


Figure 3. Photosynthetically Active Radiation (PAR) Under Cover Treatments within High Tunnel Compared to Outside During Winter 2006-2007 and 2007-2008. FR=Floating Row Cover; SP=Slitted PlasticCover; NC=No Cover. Letters denote significant differences at *p*=0.05. Outside=average over all months.

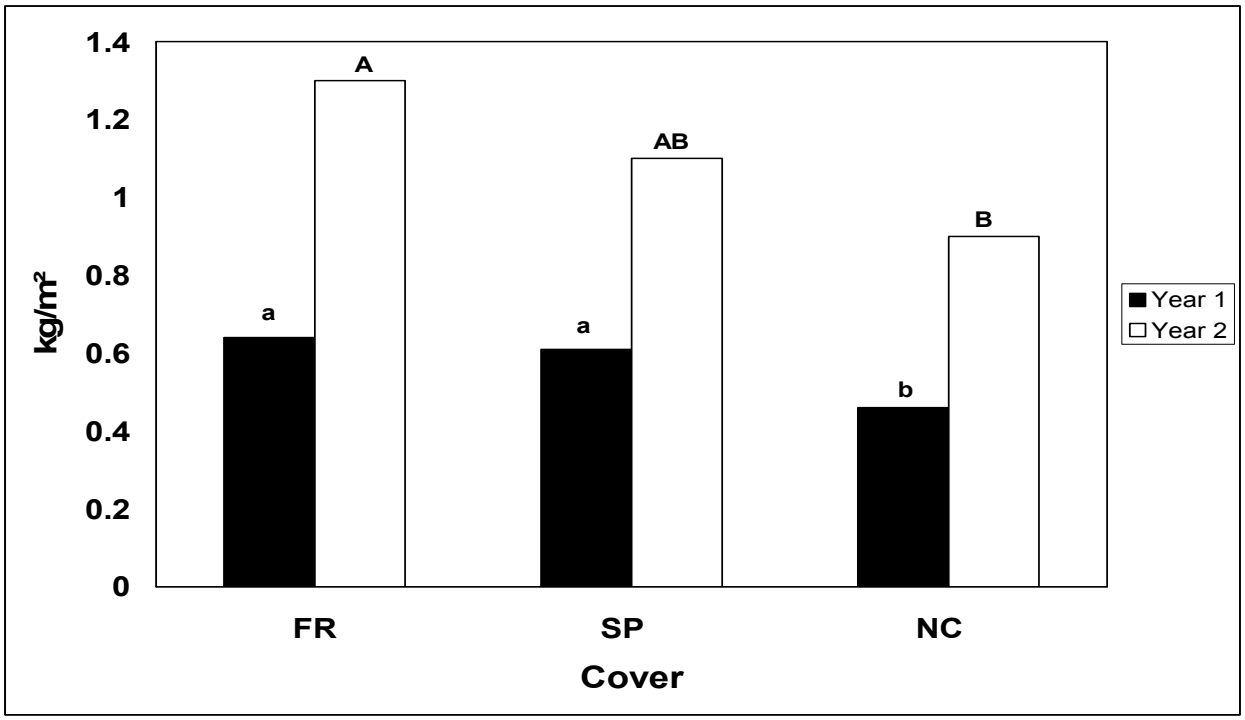


Figure 4. Cumulative Yield Under Cover Treatments within High Tunnel for 2006-2007 and 2007-2008. FR=Floating Row Cover; SP=Slitted PlasticCover; NC=No Cover. Letters denote significant differences at p =0.05.

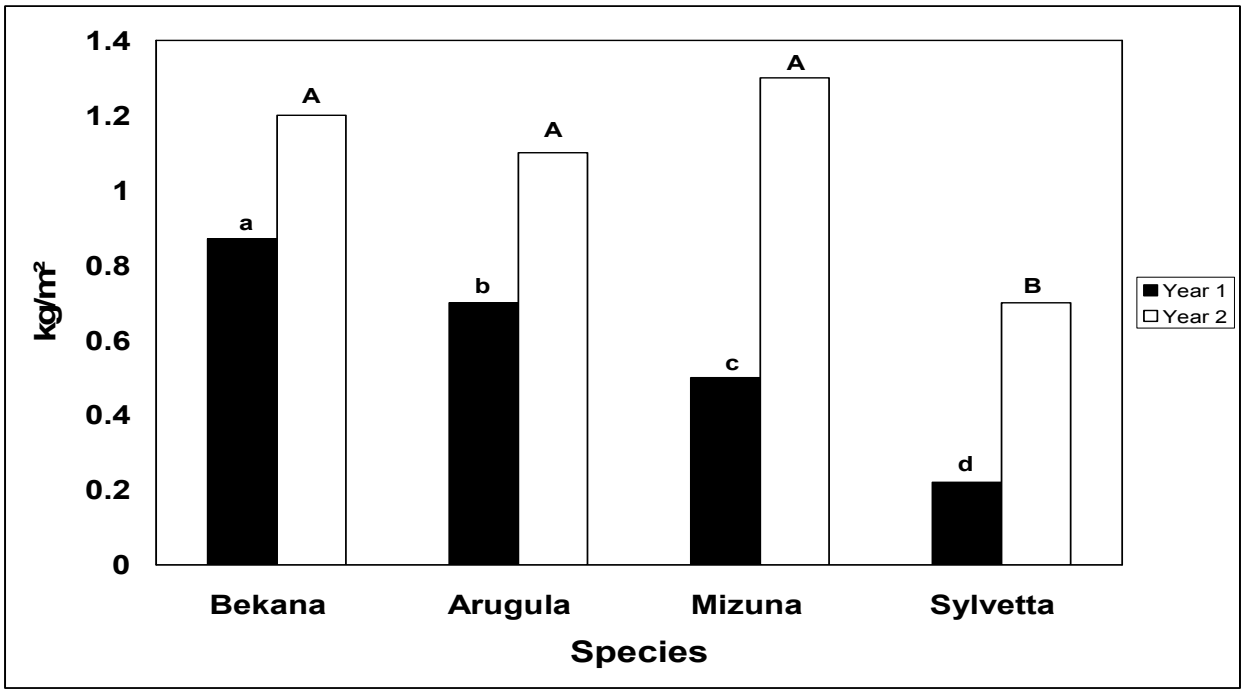


Figure 5.
Cumulative Yield per Species Under Cover Treatments within High Tunnel for 2006-2007 and 2007-2008. Letters denote significant differences at p=0.05.

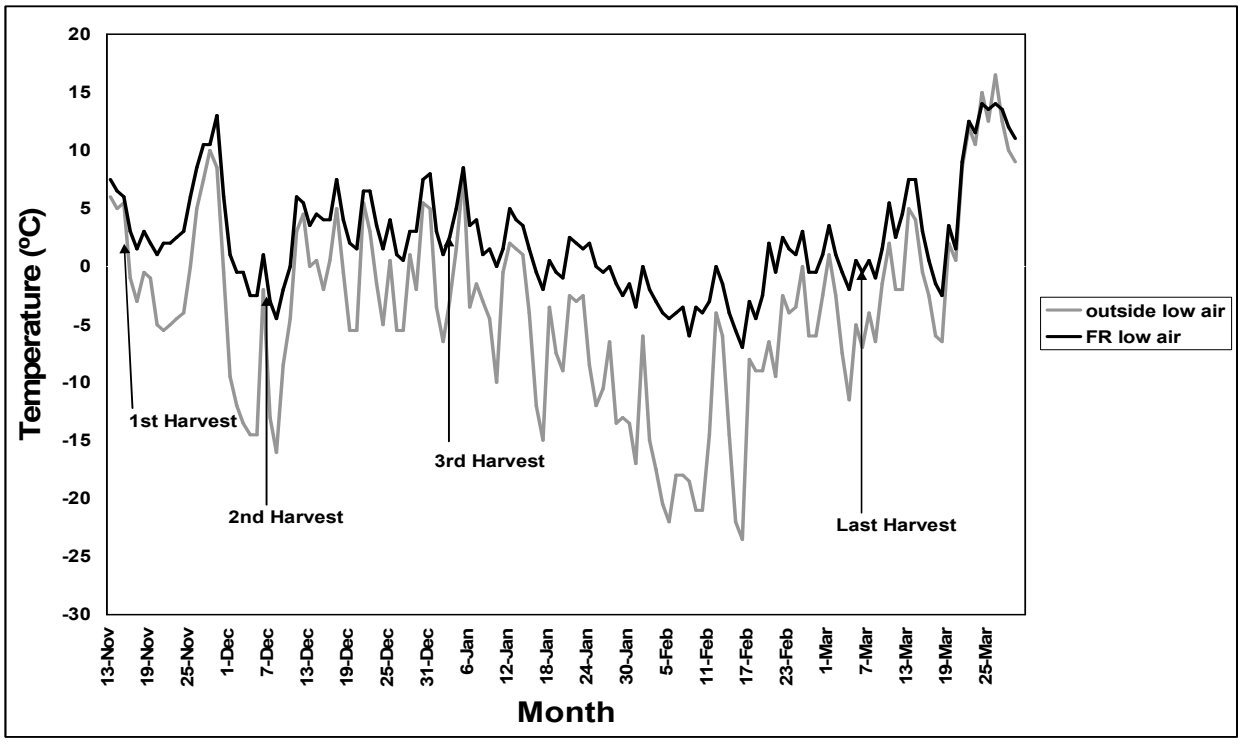


Figure 6.
Low Air Temperature of Floating Row Cover Fabric (FR) Compared to Outside Low Air Temperature 2006-2007

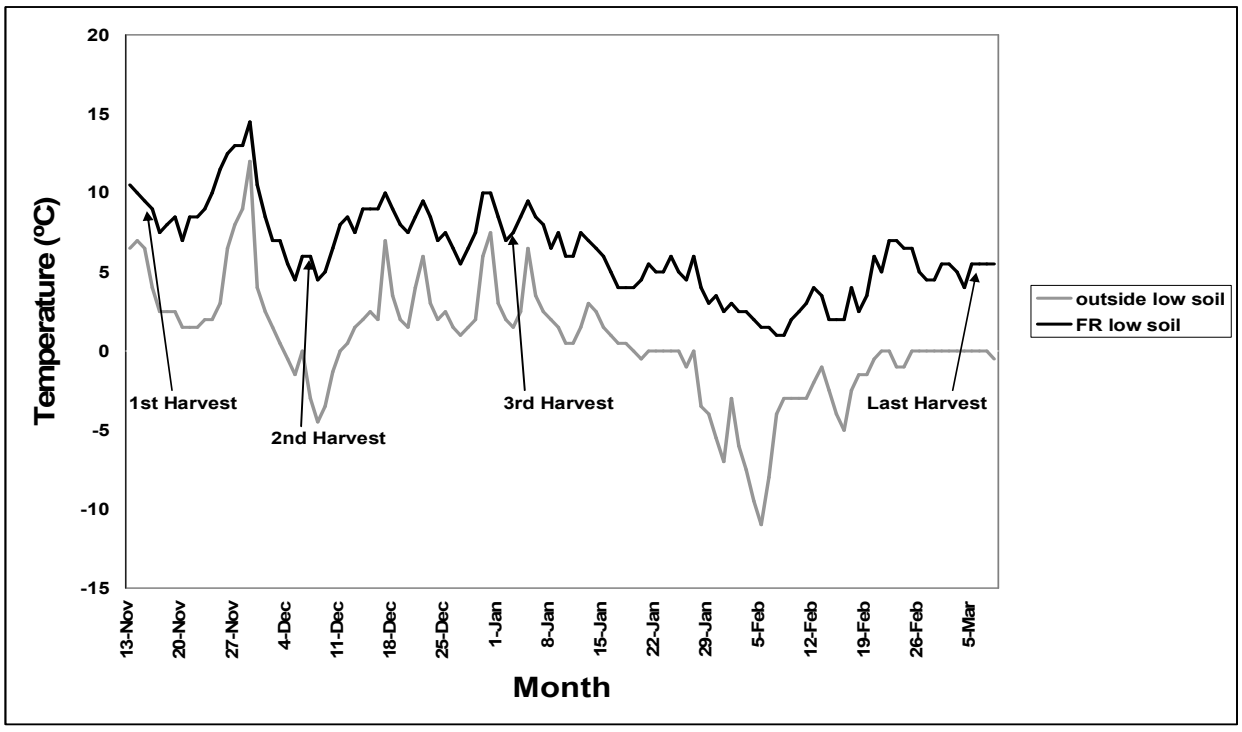


Figure 7.
Low Soil Temperature of Floating Row Cover Fabric (FR) Compared to Outside Low Soil Temperature 2006-2007

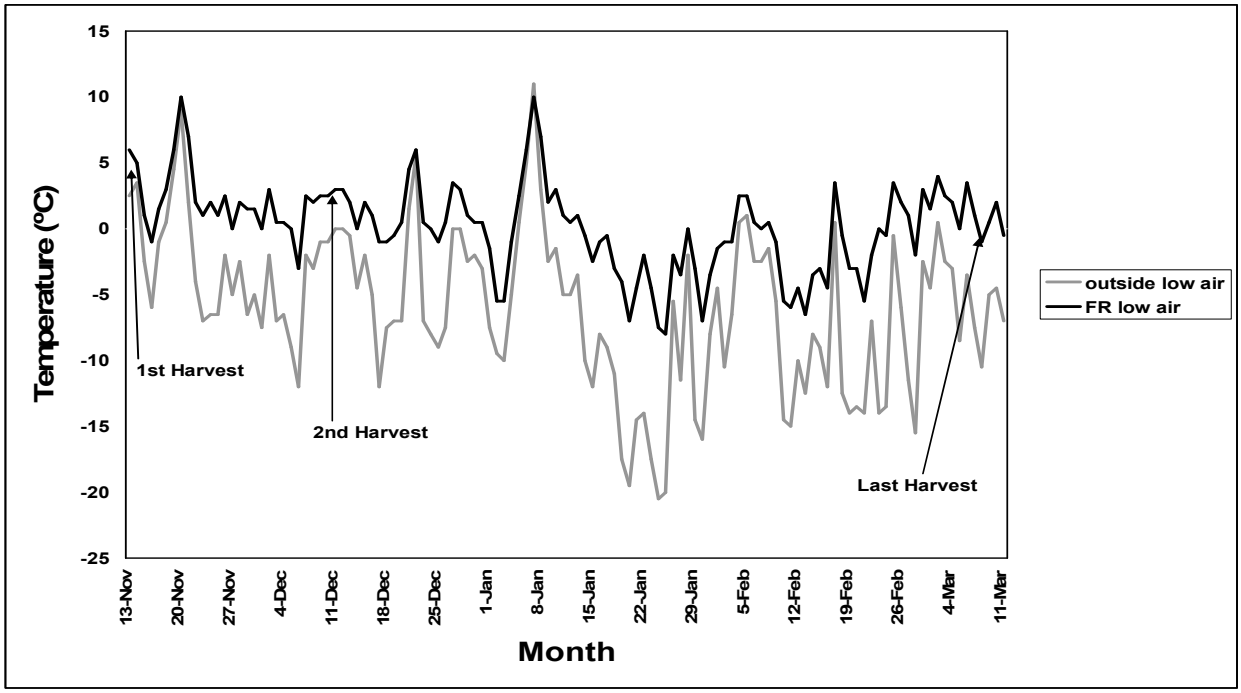


Figure 8.
Low Air Temperature of Floating Row Cover Fabric (FR) Compared to Outside Air Soil Temperature 2007-2008

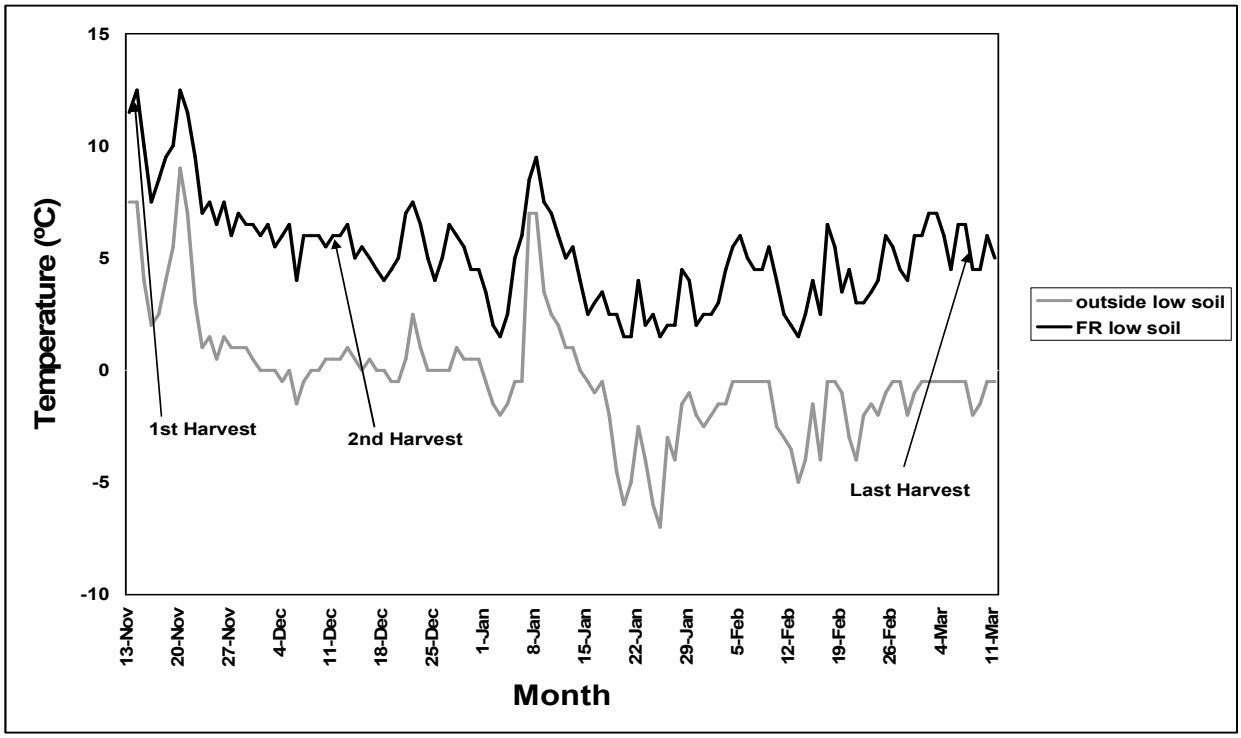


Figure 9.
Low Soil Temperature of Floating Row Cover Fabric (FR) Compared to Outside Low Soil Temperature 2006-2007

Evaluation of Herbicide Combinations for Pumpkins

John Masiunas, Joel Gehrig, Kyle Rak, and Abram Bicksler

Introduction

Pumpkin weed management has traditional relied on preemergent applications of Strategy (a prepackaged mixture of ethalfluralin and clomazone) and Sandea (halosulfuron). Strategy does not adequate control *Amaranthus* species (waterhemps and pigweeds). Sandea controls *Amaranthus* species but development of herbicide resistant weed biotypes is a problem. Sandea inhibits the enzyme acetolactate synthetase (ALS) which is involved in amino acid synthesis in plants. Waterhemp species have developed resistance to ALS-inhibiting herbicides including Sandea and are becoming difficult to control in many Illinois pumpkin fields.

Dual Magnum (s-metolachlor) was labeled in 2007 for use in pumpkin production. It will control *Amaranthus* species and nightshade. Development of weed resistance to s-metolachlor and related herbicides has not been a problem. Dual Magnum is labeled for use in pumpkins at 1.0 to 1.33 lb/ acre, which may not be adequate for season-long weed management. Combining Dual Magnum with other herbicides may lengthen the weed management and control weeds not suppressed by Dual Magnum alone.

Reflex (fomesafen) is a diphenyl ether herbicide primarily used postemergence for broadleaf weed control in legume crops. Reflex does have soil residual activity although less than a related herbicide Goal (oxyflurofen). Reflex will suppress *Amaranthus* and nightshade. In previous research we found that Reflex lacks adequate safety to be used postemergence over pumpkins. We evaluated Reflex preemergence after pumpkin planting but before emergence and post-directed, between pumpkin rows after crop emergence but before vining. Reflex was compared to Aim (carfentrazone) a herbicide labeled for use between pumpkin rows. We wanted to expand the range of herbicides labeled for pumpkin and gain more experience with Dual Magbum.

Materials and Methods

The objective of our research was to determine the efficacy and pumpkin safety for combinations of Strategy, Sandea, Reflex, Aim, Outlook, and Dual Magnum. The treatments were: 1) untreated, weedy control; 2) Strategy at 1.575 lb /acre (PRE); 3) Strategy at 1.05 lb /acre and Sandea at 0.063 lb /acre (PRE); 4) Strategy at 1.575 lb /acre and Sandea at 0.063 lb /acre (PRE); 5) Strategy at 1.575 lb /acre and Reflex at 0.25 lb /acre (PRE); 6) Strategy at 1.575 lb /acre (PRE) followed by Aim at 0.031 lb /acre (DPOST); 7) Outlook at 0.75 lb /acre (PRE); 8) Dual Magnum at 1.27 lb /acre (PRE); 9) Dual Magnum at 1.91 lb /acre (PRE); 10) Dual Magnum at 1.27 lb /acre and Reflex at 0.25 lb /acre (PRE); 11) Dual Magnum at 1.27 lb /acre and Reflex at 0.50 lb /acre (PRE); 12) Dual Magnum at 1.27 lb /acre and Sandea at 0.063 lb /acre (PRE); 13) Dual Magnum at 1.27 lb /acre and Strategy at 1.575 lb /acre (PRE); 14) Dual Magnum at 1.27 lb /acre (PRE) followed by Aim at 0.031 lb /acre (DPOST); and 15) Dual Magnum at 1.27 lb /acre (PRE) followed by Reflex at 0.25 lb /acre and 1% Crop Oil Concentrate (DPOST).

The experiment was a randomized complete block design with three replications. The plots were 30' by 10' and consisted of two rows of Magic Lantern variety Jack o'lantern pumpkins. The pumpkins were planted at a rate of 2 lb/acre with 60" between rows. On the afternoon of July 16, the pumpkins were planted. On the morning of July 17, the PRE herbicide treatments were applied directly to each plot with a CO_2 pressurized backpack sprayer delivering 28 gallons/acre at 40 psi. The DPOST herbicide treatments were applied on August 8 in a manner to minimize herbicide contact with the emerged pumpkins.

On July 24, we counted the number of emerged plants per ten feet of row for both of the two rows in each plot. On July 30, we rated weed control and pumpkin damage. Weed control was rated on a scale of 0 (no weed control) to 100 (complete control – no weeds in the plot). Pumpkin damage was also rated on a scale of 0 (no damage to the pumpkins) to 100 (all pumpkin plants dead). Weed control and pumpkin damage were rated on August 8 and 15. On October 30, we counted the number of marketable pumpkins (ripe), the number of potentially marketable pumpkins (green), and the number of cull pumpkins (damaged). For those plots with marketable pumpkins, we weighed up to five pumpkins (kg) from each plot. We used this weight data to extrapolate out the total marketable weight of pumpkins in each plot.

Results and Discussion

Wet weather and poor emergence caused us to reestablish the pumpkin herbicide experiment in mid-July. Pumpkin plants rapidly emerged with the warm temperature in mid-July. Approximately one week after planting, the number of emerged pumpkin plants per ten foot of row (pumpkin stand) varied between herbicide treatments. Pumpkin stand was greater in the control (no herbicide), Strategy (low rate), and Outlook treatments than in the Strategy + Reflex, Dual Magnum alone at 1.27 lb/acre, Dual Magnum + Reflex (at 0.5 lb/acre), and Dual Magnum + Strategy. Reflex especially at the high rate injured pumpkin plants. Dual Magnum at 1.27 lb/acre alone or with Strategy had week emergence within one week of planting that might have reduced pumpkin stand.

Pumpkin injury was dependent on the time of rating and the herbicide treatment. On July 30 before application of postemergence directed herbicides, Dual Magnum + Reflex (at 0.50 lb/acre) caused more pumpkin injury than any other treatment. Using a lower rate of Reflex (0.25 lb/acre) with Strategy or Dual Magnum did not cause more injury than Strategy or Dual Magnum alone. Compared to the control, Strategy (low rate) + Sandea, Outlook, and Dual Magnum at either rate did not injure pumpkins. On August 8, pumpkin injury was rated after applying the postemergence directed applications. Compared to untreated control, Strategy alone, Strategy (higher rate) + Sandea, and Outlook did not injure pumpkin plants. Compared to Outlook alone, the pumpkin plants were injured from Dual Magnum + Reflex (0.5 lb/acre), Dual Magnum + Strategy, and Dual Magnum + Aim. Aim caused contact burn on pumpkin leaves soon after application (Figure 1). On August 15 there was some minor foliar damage from wet weather and foliar diseases on all treatments. Compared to control Strategy alone, all Strategy + Sandea treatments, Outlook, Dual Magnum both rates, Dual Magnum + Reflex (low rate), Dual Magnum + Sandea did not injure pumpkin plants. Compared to Strategy alone or with Sandea and Dual Magnum (at 1.91 lb/acre), the high rate of Reflex applied pre injured pumpkins. Also directed

postemergence applications of Aim caused pumpkin leaf burn and stunted plants. Our DPost spray was not done with a shielded sprayer and illustrates the importance of not allowing Aim to contact crop plants.

The late planting of pumpkins prevented full fruit development and reduced yield. The number of pumpkin fruit and fruit size were generally related to weed control. Better the weed control the greater the marketable (orange color) pumpkin fruit. There were no ripe pumpkins in control due to weed competition. Weed completion delayed pumpkin ripening but total pumpkins produced in the control treatment were not reduced. The number of ripe pumpkins in the Strategy (low rate) + Sandea, Strategy / Aim, Outlook, Dual Magnum (high rate), and Dual Magnm with Aim or Reflex were not different than the number in the control. The total number of fruit was reduced in the Dual Magnum + Reflex (at 0.5 lb/ acre) treatment because of early plant injury reducing fruit load. The largest size fruit was in Dual Magnum and Outlook treatments.

Weed control was dependent on time of rating and herbicide treatment. The July 30 rating was before the directed postemergence treatments. All herbicide treatments were better than then the weedy control. Compared to the Strategy treatment alone, the Strategy (high rate) + Sandea treatment provided better weed control. Reducing Strategy rate even when combined with Sandea resulted in poorer weed control than using high rate of Strategy. Dual Magnum + Reflex (high rate) had better weed control than Dual with a low rate of Reflex. On August 8, weed control in treatments combining Sandea and Strategy did not provide any better weed control than treatments with Strategy alone. The heavy rainfall likely depleted Sandea in the upper soil levels where weeds emerge. The best weed control was in the Dual Magnum with Reflex (0.5 lb/acre), Dual Magnum + Sandea, and Dual Magnum + Strategy treatments. By the August 15 rating, the pumpkin canopy closed, improving weed control in most treatments. The DPost treatments with either Aim or Reflex and the Dual Magnum + Reflex (at 0.5 lb/ acre) preemergent treatment provided 90% or greater weed control. The combination of either Strategy / Aim or Dual Magnum/ Aim might provide season-long weed control for nightshade and ALS-resistant waterhemp species.

Table 1. Emergence data from the pumpkin plots (taken July 24).

Herbicide Treatment	Rate	Timing	# plants emerged/10 ft. of row
	lb ai/A		
1. Control	--	--	12.2 ab
2. Strategy*	1.2 + 0.375	PRE	10.0 abc
3. Strategy + Sandea	(0.8 + 0.25) + 0.063	PRE	9.0 cdef
4. Strategy + Sandea	(1.2 + 0.375) + 0.063	PRE	9.5 bcde
5. Strategy + Reflex	(1.2 + 0.375) + 0.25	PRE	6.8 def
6. Strategy/ Aim	(1.2 + 0.375)/ 0.031	PRE/ DPOST	9.5 bcde
7. Outlook	0.75	PRE	13.0 a
8. Dual Magnum	1.27	PRE	6.7 ef
9. Dual Magnum	1.91	PRE	8.2 cdef
10. Dual Magnum + Reflex	1.27 + 0.25	PRE	8.2 cdef
11. Dual Magnum + Reflex	1.27 + 0.50	PRE	6.0 f
12. Dual Magnum + Sandea	1.27 + 0.063	PRE	9.0 cdef
13. Dual Magnum + Strategy	1.27 + (1.2 + 0.375)	PRE	6.7 ef
14. Dual Magnum/ Aim	1.27/ 0.031	PRE/ DPOST	7.5 cdef
15. Dual Magnum/ Reflex**	1.27/ 0.25	PRE/ DPOST	9.8 bcd

* ethalfluralin + clomazone
** 1% Crop Oil Concentrate

Table 2. Weed rating and pumpkin damage.

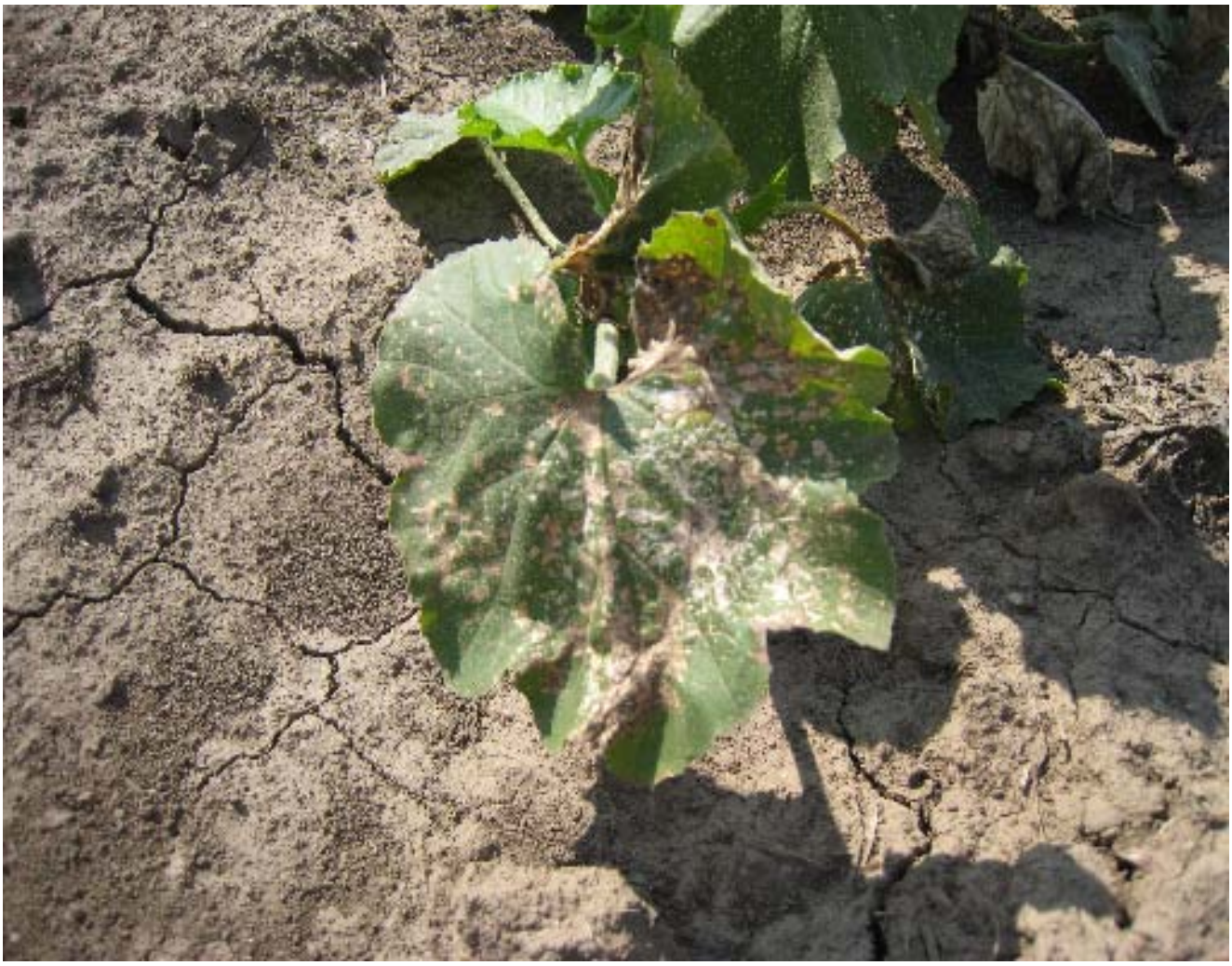
Herbicide Treatment	Rate	Timing	Pumpkin damage			Weed Control		
			July 30	Aug 8	Aug 15	July 30	Aug 8	Aug 15
	lb ai/A		---------%---------			----------%----------		
1. Control	--	--	0	0	12	0	0	20
2. Strategy*	1.2 + 0.375	PRE	17	17	20	47	58	60
3. Strategy + Sandea	(0.8 + 0.25) + 0.063	PRE	10	20	17	55	60	77
4. Strategy + Sandea	(1.2 + 0.375) + 0.063	PRE	20	15	15	83	67	82
5. Strategy + Reflex	(1.2 + 0.375) + 0.25	PRE	7	23	30	67	77	83
6. Strategy/ Aim	(1.2 + 0.375)/ 0.031	PRE/ DPOST	13	22	43	67	68	90
7. Outlook	0.75	PRE	10	13	12	52	72	82
8. Dual Magnum	1.27	PRE	3	22	28	38	65	77
9. Dual Magnum	1.91	PRE	7	20	18	53	72	80
10. Dual Magnum + Reflex	1.27 + 0.25	PRE	17	22	28	63	58	83
11. Dual Magnum + Reflex	1.27 + 0.50	PRE	33	33	45	83	87	90
12. Dual Magnum + Sandea	1.27 + 0.063	PRE	18	28	28	65	80	83
13. Dual Magnum + Strategy	1.27 + (1.2 + 0.375)	PRE	13	33	38	47	85	83
14. Dual Magnum/ Aim	1.27/ 0.031	PRE/ DPOST	10	33	47	48	72	95
15. Dual Magnum/ Reflex**	1.27/ 0.25	PRE/ DPOST	7	25	35	37	72	92
		LSD (5%) =	11	18	22	19	17	20

* ethalfluralin + clomazone
** 1% Crop Oil Concentrate

Table 3. Pumpkin harvest data from October 30.

Herbicide Treatment	Rate	Timing	Marketable Pumpkins	Potentially Marketable	Cull	Total Pumpkins	Marketable Fruit Weight
	lb ai/A		---------- number/ plot ----------				kg/ fruit
1. Control	--	--	0	24.7	3.3	28.0	0
2. Strategy*	1.2 + 0.375	PRE	1.0	26.7	2.0	29.7	2.1
3. Strategy + Sandea	(0.8 + 0.25) + 0.063	PRE	0.7	23.7	2.7	27.0	5.01
4. Strategy + Sandea	(1.2 + 0.375) + 0.063	PRE	1.0	20.3	3.3	24.7	2.29
5. Strategy + Reflex	(1.2 + 0.375) + 0.25	PRE	2.0	20.3	1.3	23.7	5.49
6. Strategy/ Aim	(1.2 + 0.375)/ 0.031	PRE/ DPOST	0.3	21.3	1.7	23.3	2.83
7. Outlook	0.75	PRE	0.3	21.0	4.3	25.7	6.5
8. Dual Magnum	1.27	PRE	2.3	24.0	2.0	28.3	6.02
9. Dual Magnum	1.91	PRE	0.7	21.7	1.7	24.0	2.31
10. Dual Magnum + Reflex	1.27 + 0.25	PRE	1.0	21.7	1.7	24.3	3.48
11. Dual Magnum + Reflex	1.27 + 0.50	PRE	2.3	13.3	1.3	17.0	3.93
12. Dual Magnum + Sandea	1.27 + 0.063	PRE	1.0	22.7	3.3	27.0	2.62
13. Dual Magnum + Strategy	1.27 + (1.2 + 0.375)	PRE	2.7	21.3	1.7	25.7	3.95
14. Dual Magnum/ Aim	1.27/ 0.031	PRE/ DPOST	0.3	20.3	2.0	22.7	2.63
15. Dual Magnum/ Reflex**	1.27/ 0.25	PRE/ DPOST	0.3	21.0	1.3	22.7	2.67
		LSD (5%) =	0.7	5.2	NS	8.3	3.24

* ethalfluralin + clomazone
** 1% Crop Oil Concentrate



Pumpkin damage in one of the plots treated with a DPOST application of Aim.

One of the plots treated with Dual Magnum (PRE) / Aim (DPOST).

Weed growth in one of the control plots.

Evaluation of Herbicide Combinations for Snap Beans

John Masiunas, Joel Gehrig, Kyle Rak, and Abram Bicksler

Introduction

Weed control in snap beans relies on a preemergent primarily grass herbicide (i.e. Treflan, Prowl, Dual Magnum) and a primarily broadleaf active herbicide (i.e. Pursuit,Raptor, Sandea) that inhibits the enzyme, acetolactate synthetase (ALS) which is involved in amino acid synthesis in plants. Broadleaf herbicides can be applied either preemergence or postemergence (POST) depending on farmer preference, cost, weed species, and cropping systems. Waterhemp species have developed resistance to ALS-inhibiting herbicides and are becoming difficult to control.
268-3662

Our research evaluated Treflan (trifluralin) or Dual Magnum (s-metolachlor) as a base of our herbicide program. Treflan is a dinitroanaline herbicide that has been long registered on snap beans. Treflan must be incorporated immediately after application for activation and to avoid loss from volatization. Treflan controls common grasses such as barnyardgrass, crabgrass, foxtail, panicum, and shattercane. It also will control small seeded broadleaf weeds including pigweed, common lambsquarters, and common purslane. Treflan can lack consistency if not properly incorporated and some grasses have developed resistance to the herbicide. Dual Magnum is a chloracetamide herbicide that can be applied PRE or PPI. It will control barnyardgrass, foxtails, crabgrass, crabgrass, goosegrass, *Amaranthus* species (pigweed and water hemp), galinsoga, and nightshade. Development of weed resistance to s-metolachlor and related herbicides has not been a problem. Combining Treflan or Dual Magnum with other herbicides may lengthen the period of weed management and control weeds not suppressed by Treflan or Dual Magnum alone.

Reflex (fomesafen) and Blazer (aciflurofen) are diphenyl ether herbicides primarily used POST for broadleaf weed control in legume crops. Blazer is not registered in snap bean but was included POST to compare against Reflex (POST) for crop injury. Reflex has recently been labeled for snap beans after previously being used under a Section 18, Special Exemption. Reflex will control puncturevine and eastern black nightshade. Other weeds that POST Reflex (at 0.375 lb/acre) will control include morningglory (2 to 4 leaves), redroot pigweed (up to 6 leaves), amaranth (2 to 4 leaves), common purslane (up to 6 inches diameter), and smartweed (up to 4 leaves). A disadvantage of Reflex is that it can only be applied every other growing season and the rotation restriction for most vegetable crops is 18 months. Although, Reflex is commonly used POST, it is now being evaluated for soil application before crop and weed emergence. PRE applications of Reflex (at 0.25 lb/ acre) will control galsinoga, common lambsquarters, nightshade, common purslane, and pigweed. PRE or PPI applications of Reflex were compared for their activity.

Sandea (halosulfuron), Pursuit (imazethapyr) and Raptor (imazamox) are ALS-inhibiting herbicides registered for use on snap beans. Sandea is labeled on a wide range of vegetable crops for both PRE and POST applications. On snap beans, Sandea can be used PRE

after planting but before soil cracking and POST after the 3-4 trifoliate leaf stage but before flowering. Sandea can injure snap bean. POST are better than PRE applications for control of giant ragweed, yellow nutsedge, pokeweed, and prickly sida. Pursuit is labeled in Illinois and Minnesota for use PRE either incorporated within a week before planting or within 1 day after planting. PRE applications of Pursuit will control galinsoga, nightshade, pigweed, smartweed, and foxtail. Velvetleaf, common lambsquarters, and jimsonweed are all controlled better by PPI than PRE (surface) applications. Raptor POST can be applied to snap beans with at least 1 trifoliate leaf but before flowering. Raptor can be applied with Basagran to reduce potential injury. Raptor POST will control up to 3 inch nightshade, pigweed, common lambsquarter, morningglory, common purslane, smartweed, barnyardgrass, foxtail, shattercane, crabgrass, and yellow nutsedge.

Materials and Methods

The objective of our research was to determine the efficacy and snap bean safety for combinations of herbicides. The treatments were: 1) untreated, weedy control; 2) Treflan at 0.50 lb /acre and Pursuit at 0.23 lb /acre preplant incorporated (PPI); 3) Treflan at 0.50 lb /acre (PPI) followed by Sandea 0.083 lb /acre (PRE); 4) Treflan at 0.50 lb /acre and Reflex at 0.25 lb /acre (PPI); 5) Treflan at 0.50 lb /acre (PPI) followed by Reflex at 0.25 lb /acre (PRE); 6) Dual Magnum at 1.27 lb /acre and Pursuit at 0.23 lb /acre (PPI); 7) Dual Magnum at 1.27 lb /acre and Reflex at 0.25 /acre (PPI); 8) Dual Magnum at 1.27 lb /acre and Pursuit at 0.23 lb /acre (PRE); 9) Dual Magnum at 1.27 lb /acre and Reflex at 0.25 /acre (PRE); 10) Dual Magnum at 1.27 lb /acre and Sandea at 0.083 lb /acre (PRE); 11) Dual Magnum at 1.27 lb /acre (PRE) followed by Reflex at 0.25 lb /acre and 1% COC (POST); 12) Dual Magnum at 1.27 lb /acre (PRE) followed by Reflex at 0.375 lb /acre and 1% COC (POST); 13) Dual Magnum at 1.27 lb /acre (PRE) followed by Raptor at 0.031 lb /acre and 1% COC (POST); 14) Dual Magnum at 1.27 lb /acre (PRE) followed by Raptor at 0.031 lb /acre and Basagran at 0.44 lb /acre and 1% COC (POST); and 15) Dual Magnum at 1.27 lb /acre (PRE) followed by Blazer at 0.25 lb /acre and 0.25% NIS (POST).

The experiment was a randomized complete block design with four replications. The plots were 20 by 10 ft and consisted of four rows of 'Branco' snap beans. The beans were planted at a rate of 90 lb/acre with 30" between rows. On the morning of July 18, PPI herbicide treatments were applied directly over each plot with a CO_2 pressurized hand-held backpack sprayer delivering 28 gallons/acre at 40 psi. These treatments were incorporated with a disc and field cultivator immediately after application. Snap beans were planted on July 18 after the application and incorporation of PPI herbicides. The PRE herbicide treatments were applied on July 22. The POST herbicide treatments were applied on August 12.

On July 28, we counted the number of emerged snap bean plants per five feet of two of the four rows in each plot. We then averaged the emergence counts of the two rows together. On August 5, we rated weed control and bean damage. Weed control was rated on a scale of 0 (no weed control) to 100 (complete control – no weeds in the plot). Bean damage was also rated on a scale of 0 (no damage to the beans) to 100 (complete destruction – death). We took weed control ratings and bean damage ratings on August 12 and 19. By the August 19 rating, the field was quite dry resulting in the control plots appearing to have bean and weed damage. In October, we harvested the snap beans. We randomly marked off 10 feet of one row of beans and

picked every mature bean on each plant. These beans were then weighed. Replication one was harvested on October 1. Replication two was harvested on October 2. Replication three was harvested on October 7. And, replication four was harvested on October 9.

Results and Discussion

Table 1 present snap bean stand, damage, and yield. Herbicide treatment did not impact stand on July 28 or yield in early October. On July 28 and August 12, before POST herbicides were applied, herbicides combinations (Treflan or Dual Magnum) with Pursuit applied PPI and PRE injured the pumpkin plants. Soil applications of Reflex caused minimal snap bean injury. Sandea PRE with Dual Magnum but not PRE after Treflan injured the snap beans. On August 19, 1 week after POST applications, Blazer burned the snap bean leaves (Figure 1) while Reflex just caused slight ($\leq$ 20% injury). Basagran did not further safen Raptor.

On August 5, weed control was poorer with PPI than PRE applications of Reflex. The incorporation likely diluted the amount of Reflex available for weed control. None of the other herbicide treatments differed in weed control. Dual Magnum alne in the Reflex and Raptor POST treatments controlled weeds as well as Treflan or Dual Magnum treatments combined with Sandea, Pursuit, or Reflex (PRE). In other snap bean experiments we have observed good initial weed control with Dual Magnum.

On August 12 and 19, some of the best weed control was in either Treflan or Dual Magnum combined with Pursuit PRE. The POST treatments with Reflex, Raptor, or Blazer improved weed control compared to Reflex applied PPI (with either Treflan or Dual Magnum).

Table 1. Weed rating and bean damage of snap bean plots.

Herbicide Treatment	Rate	Timing	July 28	August 5		August 12		August 19		Oct 9
			Bean stand	Weed Control	Bean Damage	Weed Control	Bean Damage	Weed Control	Bean Damage	Yield
	lb ai/A		#/5ft	----------%----------						Mg/ha
1. Control	--	--	14	0	0	0	6	15	6	2.53
2. Treflan + Pursuit	0.50 + 0.23	PPI	13	98	22	95	23	93	17	3.52
3. Treflan/ Sandea	0.50 / 0.083	PPI/ PRE	15	88	5	73	16	79	14	3.38
4. Treflan + Reflex	0.50 + 0.25	PPI	14	58	6	53	18	65	14	3.35
5. Treflan/ Reflex	0.50 / 0.25	PPI/ PRE	15	100	11	79	13	81	9	3.68
6. Dual Magnum + Pursuit	1.27 + 0.23	PPI	11	98	20	85	30	84	25	2.18
7. Dual Magnum + Reflex	1.27 + 0.25	PPI	12	39	11	58	30	64	21	3.00
8. Dual Magnum + Pursuit	1.27 + 0.23	PRE	15	99	20	91	15	91	10	3.61
9. Dual Magnum + Reflex	1.27 + 0.25	PRE	11	100	16	79	24	74	21	3.33
10. Dual Magnum + Sandea	1.27 + 0.083	PRE	11	94	24	88	29	88	24	3.61
11. Dual Magnum/ Reflex*	1.27/ 0.25	PRE/ POST	15	96	15	79	16	93	20	3.19
12. Dual Magnum/ Reflex*	1.27/ 0.375	PRE/ POST	11	96	18	75	16	94	19	3.38
13. Dual Magnum/ Raptor*	1.27/ 0.031	PRE/ POST	14	98	11	81	13	93	14	3.96
14. Dual Magnum/ Raptor + Basagran*	1.27/ 0.031 + 0.44	PRE/ POST	12	94	20	75	25	93	28	3.03
15. Dual Magnum/ Blazer**	1.27/ 0.25	PRE/ POST	12	91	19	69	24	95	54	2.46
		LSD (p = 0.05) =	NS	21	14	18	20	24	16	NS

* 1% COC
**0.25% NIS

Figure 1. Bean damage on August 19 from treatment with Dual Magnum (PRE)/Blazer (POST).

Figure 2. A plot treated with Dual Magnum (PRE)/Raptor (POST).

Canada Thistle Management With Summer Annual Cover Crops and Mowing

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Canada thistle (*Cirsium arvense*) is a vigorous, competitive perennial weed that is difficult to control in both conventional and organic farming systems. This study was conducted to examine the effects of summer annual cover crops and defoliation on Canada thistle suppression and to identify mechanisms of control. In 2006-2008 field experiments conduced on two existing thistle populations, the effects of cover cropping and mowing on Canada thistle suppression were investigated. Whole plot treatments were fallow, buckwheat, sudangrass-cowpea mixture (MIX), and sudangrass with mowing frequencies (0 to 2 times) as subplots. MIX and sudangrass produced more standing biomass, greater regrowth, and more surface mulch following mowing than the buckwheat. Sudangrass and MIX reduced Canada thistle shoot density and biomass. Mowing was more effective in suppressing Canada thistle shoot density and biomass on the site with greater initial density. A sudangrass or MIX cover crop alone or combined with mowing could reduce survival of Canada thistle in sustainable or organic farming systems.

Greenhouse experiments conducted in 2007-2008 examined the mechanisms causing Canada thistle defoliation and sudangrass cover crop control of Canada thistle. Multiple defoliations reduced Canada thistle shoot and root mass, root-to-shoot ratio, number of shoots, and final height compared to no defoliation. Canada thistle root mass was positively correlated with Canada thistle shoot mass and number. The combination of sudangrass interference, defoliation, and surface mulch provided the greatest Canada thistle suppression compared to

thistles subjected to only defoliation, only interference, or the combination of interference and defoliation. Sudangrass allelopathy did not suppress Canada thistle root or shoot mass, but thistle allelopathy appears to have suppressed Sudangrass root-to-shoot ratio. Sudangrass cover crop interference, environmental modifications from a sudangrass surface mulch, and less Canada thistle photosynthesis from defoliation can work in unison to suppress Canada thistle and reduce long-term fitness. All mechanisms are believed to have decreased photosynthetic capacity and thistle root systems, suppressing Canada thistle plant growth and potential for spread. Additionally, we found that Canada thistle shoot mass and numbers may serve as an aboveground proxy for root mass and overall plant health, enabling managers to quantify the effectiveness of control strategies.

Additionally, field studies were conducted on populations of USDA landrace and commercial sorghum accessions to evaluate growth habits, morphological traits, regrowth potential, and suitability for cover cropping and biofuel applications. Canonical variates in Canonical Discriminant Analysis (CDA) indicated that the traits of unmowed tiller number, regrowth tiller number, and regrowth biomass were the most significant in discriminating between accessions. The accessions clustered into three subgroups. Three multi-stemmed accessions with an ability to regrow clustered away from the bulk of the USDA sorghums in CDA and scatterplots. Multi-stemmed accessions may be useful for breeding improved summer annual cover crops that are tall, produce copious amounts of biomass, and rapidly regrow after defoliation; although propensity to lodging and poor germination will need to be addressed. Additionally, several landrace sorghum accessions in the USDA germplasm collection may be useful for breeding biofuel, due to great height and biomass production, although it will be necessary to select for improved regrowth and greater tiller production.

Best Sustainable Management Practices for Perennial Weeds

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Perennial weeds are especially challenging for sustainable and organic farmers who are unable or unwilling to use synthetic herbicides. Recent research has identified techniques that hold promise in helping farmers with this problem. Our objectives were to increase farmer knowledge of when to control perennial weeds and what are the most efficacious strategies. Secondly, we wanted to use on-farm, participatory learning methods to provide farmers with the skills to integrate strategies to suppress perennial weeds. Fact sheets were developed on identifying and managing Canada thistle (*Cirsium arvense*) and quackgrass (*Agropyron repens*). These, along with additional resources were distributed to participating farmers and posted on the University of Illinois organic agriculture website (http://asap.sustainability.uiuc.edu/org-ag).

With our farmer advisory team, a participatory research mini-grant program was developed to encourage farmer – researcher co-learning on effective management of perennial weeds. In 2008, twenty farmers applied for the mini-grant program and eight farmers were chosen to participate. Participating farmers were sent a resource packet, and contacted to discuss in detail their operations and perennial weed problems. Each farm was then visited by the project coordinator, sometimes accompanied by a farmer advisor. Together, the participating farmer and project coordinator devised an integrated management plan that included practices such as timed tillage, mowing, and short-season, annual cover crops, for perennial weeds present on the farm. A follow-up phone conversation with the participating farmers revealed that four of the eight were able to follow through with the plan and report results of their efforts.

The information and results from farmer participation in 2008 was captured and posted in report format on the organic website. Pictures are included. Reports of farmers' first-hand attempts at integrated perennial weed control are available at http://asap.sustainability.uiuc.edu/org-ag.

Cover Crops for Sustainable Pumpkin Production in Northern Illinois in 2008

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Introduction

Cover crops are crops grown to benefit the soil, other crops or both but not intended for harvest or economic sale. Cover crops can improve soil fertility as source of organic matter, control soil erosion, conserve soil moisture during dry periods, control weeds, and break life cycle of some diseases. Grain rye (*Secale cereale*) is a winter hardy cover crop that is well adapted to most climatic conditions in North America. The rye accumulate a lot of biomass in spring which forms a good mulch for weed control, have allelopathic properties to some weeds, and the residues last longer on soil surface creating a barrier between pumpkin fruit and the soil.

In northern Illinois, pumpkin (mostly Jack O'Lantern types) is grown on bare ground and weeds controlled by pre-emergence and post-emergence herbicides before pumpkin vines cover the space between the rows. Weeds that escaped are controlled by hand hoeing. Pumpkin fruit lying on bare ground tend to be dirty and need to be cleaned before marketing and most of the fruits tend to rot. Cover crop mulch smother the weeds, and forms a barrier between soil and fruit so that the fruits are clean at harvesting time leading to fewer incidences of fruit rot both in the field and in storage.

The goal of this study is to develop a sustainable pumpkin production system using different seeding rates of grain rye cover crop, and nitrogen fertilizer application rates for optimal pumpkin yield. The specific objectives of this study are: (1) To develop a rye cover crop management system that ensures adequate high residue mulch that can control troublesome weeds such as black night shade, red root pigweed, and lambsquarters. (2) To assess the effects of strip-tillage system using rye cover crop on nitrogen fertilizer application rates, and soil moisture content on pumpkin yield. (3) To study the effects of strip-tillage system with rye mulch between pumpkin rows on pumpkin foliar and fruit diseases, and on pumpkin fruit cleanliness at harvest.

Materials and Methods

The experiment was carried out at St. Charles Horticulture Research Center, St. Charles, IL between October 3, 2007 and October 10, 2008. The field has been on corn and soybean production for over seven years and the previous crop was corn. Grain rye, *Secale cereale* was

seeded on October 3, 2007 at the rates of 90, and 120 pounds (lbs) per acre on 6-ft wide strips and 5-ft wide bare ground left between the strips. Rye height and number of rye stems per 12 square feet area was assessed between May 5 and 18, 2008. On May 23, 2008, rye plants at a height of about 4-ft tall (at flowering stage before pollination) was killed by rolling with a tractor drawn "cultimulcher" to form mulch. The bare ground between the rolled areas was tilled on June 13, 2008 using a rototiller.

Three main plot treatments comprised of rye at seeding rates of 90, and 120 lbs per acre, and bare ground as control were replicated four times. Each main plot was divided into four sub-plots. Urea fertilizer grade 46-0-0 (Cooperative Plus, Burlington, WI) was applied on June 16, 2008 in a band and incorporated into the soil on the bare strips between the cover crop rows and on 5-ft wide strips on control plots. In two sub-plots, nitrogen fertilizer was applied at the rate of 45 pounds N per acre and in the other two sub-plots at the rate of 90 pounds N per acre. On June 19, 2008 pumpkin varieties 'Magic Lantern' and 'Howden' seeds were planted using a "Jab Planter". Each sub-plot was 40-ft long and pumpkin variety 'Howden' was direct seeded on 15-ft row and 'Magic Lantern' in another 15-ft long with a 10-ft alley way between the two varieties. The pumpkin seeds were planted 3-ft apart within the row (five plants of each variety per plot). The plots were 20-ft apart and were replicated four times. Immediately after plant emergence, two sets of tensiometers (Irrometer Company, Riverside, CA) were installed at 12 and 18 inches depths respectively to monitor soil moisture status. The readings were taken weekly during the growing season.

Weed control in bare ground (Control) plots was achieved by using Strategy® herbicide (Ethalfluralin and Clomazone, United Agricultural Products - Platte Chemical Company, Greeley, Colorado) that was applied pre-emergence at the rate of 6 pints per acre. Sandea® herbicide (Halosulfuron-methyl, Gowan Company, Yuma, Arizona) was applied pre-emergence at the rate of ½-fluid ounce per acre to control red root pigweed and other weeds. Weed control on strip tilled plots was done by applying same rates of herbicides mentioned above on the bare strips between rye mulch. Weeds that emerged on mulched areas were hand hoed once. Insect pest and disease control was carried out based on the recommendations in the Midwest Vegetable Production Guide for Commercial Growers.

Above ground weed biomass samples was taken between the rows covered with rye mulch on August 11, 2008 (about 6 weeks after emergence).The emerged weeds such as lambsquarters, pigweed, velvet leaf, black night shade, grass and others were sampled using a 1-square foot quadrat. The plants within the quadrat were cut, sorted out, labeled, and put in paper bags and dried until a constant weight is achieved. Plant tissue nitrogen status was monitored using Cardy Sap Meter (Spectrum Technologies, Inc Plainfield, IL) on August 18, 2008 and September 3, 2008 (at seven and nine weeks after emergence of pumpkin seedlings respectively). The samples were taken according to instructions in the Cardy Sap Meter manual. Mature (orange) pumpkin fruits harvested on October 9 and 10, 2008 were counted, and weighed. In each plot, the number of fruits with surfaces covered with soil was recorded. The fruits with spots that may be due to bacterial or fungal infection were also counted. The rotten pumpkin fruits in each treatment were recorded as well. The data was analyzed using SAS PROC GLM (SAS software Version 8e, SAS Institute Cary, NC).

Results and Discussion

1) Effects of different seeding rates of rye on growth and number of rye stems per 12 square feet area in 2008

Rye plant height above ground was measured with a 36-inch ruler. Rye growth was very rapid within the month of May with average heights of 17 inches on May 5 to over 40 inches prior to rolling on May 23 (Table 1). Rye seeded at the rates of 120 lbs per acre had denser stand with 2800 stems per 12 square feet area than in plots where rye was seeded at 90 lbs per acre with 2300 stems per 12 square feet area but there was no significant difference on May 15 and 19 sampling dates (Table 1). Rye was rolled with cultimulcher at flowering stage before heading when plants were about 4 ft tall.

2) Effects of rye mulch from rye seeded at different rates on weed count and biomass

The emergence of weeds depended on the weed seed population on site, and thickness of rye mulch. Weeds started emerging in the rolled area early but some common weeds such as red root pigweed and black nightshade were very few on the mulched areas. The field was previously under corn and soybean rotation that might have led to reduction in seed bank of red root pigweed and black nightshade. There was no significant difference in dry weights of lambsquarter, Canada thistle, *Conyza canadensis*, velvet leaf, and grass between the mulched areas in plots where rye was seeded at the rates of 120 lbs and 90 lbs per acre respectively (Table 2). Weeds in mulched areas were hand hoed once. The tilled strips in plots with rye mulch were hand weeded once by pulling out a few weeds before the pumpkins vine out. The control plots were cultivated once to control weeds that were not killed by pre-emergence herbicides before pumpkins vines cover space between the rows.

3) Effects of strip tilled plots (rye seeded at different rates) on pumpkin yield

There was significantly higher fruit number and weight in strip-tilled plots than in control plots. 'Magic Lantern' variety had higher fruit number and weight per acre than 'Howden' variety. There was no significant difference in fruit number, and weight between treatments where rye was seeded at 90 and 120 lbs per acre. There was no significant difference in fruit number, and weight between plots where nitrogen fertilizer was applied at the rates of 45 and 90 lbs N per acre. The average weight per fruit of mature 'Howden' fruits (24 lbs per fruit) in Control plots was significantly higher than in strip-tilled plots where rye was seeded at 90 lbs per acre (20 lbs per fruit). The average weight of mature 'Magic Lantern' fruits (22 lbs per fruit) in Control plots was significantly higher than in strip-tilled plots (19 lbs per fruit). Nitrogen fertilizer application rates did not affect average weight per fruit in both varieties (Table 4).

4) Effects of strip tilled plots (rye seeded at different rates) on soil moisture content during the growing season

The soil moisture content monitoring was carried out when plants were at three-leaf stage using tensiometers with 0 indicating the soil moisture status as very wet and 100 very dry. The average

soil moisture tension between 12 and 18 depths was not significantly different in all treatments in July and the rainfall recorded up to July 24 was about 4 inches. As the plants vine out and cover larger areas, during the first week of August (August 5, 2008), the strip tilled plots with soil moisture tension over 35 tend to be drier compared to the Control plots with soil moisture tensions of about 20. Between August 5 and 29, 2008 it was very dry at St. Charles, IL as the amount of rainfall recorded during this period is only 2 inches including the rainfall recorded between July 24 and August 5. This led to significantly drier soil in strip-tilled plots than in Control plots up to August 18. The dry spell continued to the end of August, and the Control plots become drier but there was no significant difference in soil moisture tension between Control and strip-tilled plots. During the month of September, it was very dry at the beginning of the month with soil moisture tensions above 74 in all treatments by September, 2. The trend changed after more than 2 inches of rainfall was recorded between September 2 and 5, 2008 that lowered the soil moisture tension to below 20 in all treatments. The rainfalls that were recorded between September 5 and 12 led to increase in soil moisture content. The 7.11 inches heavy down pour that occurred on September 13, 2008 led to flooding in parts of the farm but the trial was not affected as it was on a higher ground. The heavy rainfall led to significantly lower soil moisture tension in Control plots than in strip-tilled plots. By the time (at the beginning of October) pumpkin fruits are ready for harvest; the ground was significantly drier in strip tilled plots than in Control plots. During the same period, plots where rye was seeded at the rate of 120 lbs per acres were significantly drier than plots where rye was seeded at the rate of 90 lbs per acre (Table 5). Generally rye seeding rates did not significantly affect the soil moisture tension when the pumpkin fruit was sizing between August 20 and September 12. The soil moisture tension was significantly higher in strip-tilled than in Control plots when the pumpkin was putting in a lot of foliage between August 5 and 18. Towards the end of the season Control plots tend to be moister than strip-tilled plots, and this may promote disease development if there is a lot of moisture in the soil particularly fruit rots on pumpkin fruits lying on bare ground.

5) Effects of strip-tillage (rye seeded at different rates) compared to bare ground on powdery mildew, diseases that cause spots on pumpkin fruits, and fruit rots

The average percentage of leaf surfaces covered with powdery mildew lesions was assessed and the average percentage of the upper and lower leaf surfaces covered with powdery mildew on September 9 and 24, 2008 was higher in 'Howden' than in 'Magic Lantern' varieties.

On September 9, 2008 'Howden' leaves had significantly higher lesions covering 57% of the leaves in Control plots than in strip-tilled plots (less than 30%) and higher in plots where nitrogen fertilizer was applied at the rates of 45 lbs N per acre than in plots with 90 lbs N per acre. A similar trend was observed on September 24, 2008 with lowest incidences in plots where rye was seeded at the rate of 90 lbs per acre. On the same assessment date, higher incidence of powdery mildew was observed in plots where nitrogen fertilizer was applied at the rate of 90 lbs N per acre compared to 45 lbs N per acre. Powdery mildew development on the leaves based on the area under powdery mildew curve was significantly higher in Control plots than in strip-tilled plots and the nitrogen fertilizer application rates did not affect powdery mildew development between the two assessment periods (Table 6). 'Magic Lantern' leaves on September 9, 2008 had significantly higher lesions covering 25% of the leaves in Control plots than in strip-tilled plots (less than 15%) and higher in plots where nitrogen fertilizer was applied at the rate of 90 lbs N per acre than in plots with 45 lbs N per acre. A similar trend was observed on September 24, 2008 with lower incidences in plots where rye was seeded at the rate of 90 lbs per acre. Nitrogen

fertilizer application rates did not affect powdery mildew incidence on 'Magic Lantern' leaves on September 24, 2008. Powdery mildew development on the leaves based on the area under powdery mildew curve was significantly higher in Control plots than in strip-tilled plots and the nitrogen fertilizer application rates did not affect powdery mildew development in this variety between the two assessment periods (Table 6). Generally 'Howden' is more susceptible to powdery mildew than 'Magic Lantern' and plots with rye mulch had 50% less powdery mildew incidence in both varieties compared to Control plots.

The fruits were also assessed for any spots on the fruit (bacterial spot infection or any other condition that can predispose the fruit to rot). The percentage of 'Howden' fruits from Control plots (37%) with spots was significantly higher than fruits (14-15%) with spots from strip-tilled plots. The nitrogen fertilizer application rates did not significantly affect the percentage of 'Howden' fruits with spots. The percentage of 'Magic Lantern' fruits in Control plots with spots was significantly higher (over 27%) than in strip-tilled plots (below 17%). 'Magic Lantern' fruit from plots where nitrogen fertilizer was applied at the rate of 90 lbs N per acre had more fruits (22%) with spots than fruits from plots with 45 lbs N per acre (14%). Pumpkin fruit rots were higher in Control plots than in strip tilled plots at harvest. In Control plots, the incidence was over 20% in 'Howden' which was significantly higher than in strip-tilled plots of 2%. In Control plots, the incidence was less than 9% in 'Magic Lantern' but not significantly different from strip-tilled with less than 2%. The nitrogen fertilizer application rates per acre did not significantly affect fruit rot in both varieties but higher incidences in 'Howden' (90 lbs N – 12%; 45 lbs N – 6%) variety than in 'Magic Lantern' (90 lbs N – 6%; 45 lbs N – 1%) variety (Table 7).

6) Effects of nitrogen fertilizer application rates on petiole sap nitrate and pumpkin yield

Petiole sap nitrate was analyzed at seven weeks after emergence (7 WAE) and at nine weeks after emergence (9 WAE) on fully expanded mature leaves using Cardy Sap Meter (Spectrum Technologies Plainfield, IL). At seven weeks after emergence, pumpkin plants in control plots had seven times higher petiole sap nitrate than in strip-tilled plots, and 'Magic Lantern' variety had significantly higher petiole sap nitrate in plots where nitrogen fertilizer was applied at the rate of 90 lbs N per acre (213 ppm) than in plots where nitrogen was applied at 45 lbs N per acre (150 ppm). A similar trend was observed nine weeks after emergence with higher in control than in strip-tilled plots for both varieties with the highest variation between control and strip-tilled plots in 'Howden' than in 'Magic Lantern'. There was no significant difference between plots where nitrogen fertilizer was applied at the rates of 45 and 90 lbs N per acre at nine weeks after emergence in both varieties (Table 3).

7) Effects of strip-tillage, and nitrogen fertilizer application rates on cleanliness (less fruit surface covered with soil) of pumpkin fruits

Clean pumpkin fruit is a very important quality characteristic in pumpkin production, as the growers will spend less time cleaning the fruits. Pumpkin fruits lying on rye mulch tend have less incidence of fruit rot. Pumpkin fruits were assessed for cleanliness by ranking the fruit surface area covered with soil (30% or more surface covered with soil is graded as dirty). There was significantly higher percentage of dirty fruits (over 60%) in control plots than (below 17%)

in strip tilled plots in both varieties. There was no significant difference in percentage of dirty fruits between plots with rye mulch. The nitrogen fertilizer application rates did not affect fruit cleanliness in both varieties (Table 7).

Summary

Rye seeding rates of 90 and 120 lbs per acre did not affect rye height at heading and higher seeding rates led to higher rye stems per unit area that produced thicker residue mulch when rye was killed. Rye cover utilizes water for growth in May before pumpkin is planted but does not affect soil moisture status in the strip-tilled areas after they have been killed to form mulch. Killing rye cover crop can be accomplished by rolling or using herbicides. Weed emergence was more suppressed by thicker rye mulch but it is still very important to control weeds before seeds develop to reduce weed seed bank in the soil. Higher or lower weed seed bank in a farm or in some spots in the farm can affect weed emergence on rye mulch. It is very important to control weeds that emerge on the mulch early in the season before pumpkin vines cover the mulch around mid to late July. Weed management in combination with crop rotation is a very important factor in strip till pumpkin production. Pumpkin grown on bare ground had higher petiole nitrate sap than pumpkin grown in strip tillage and nitrogen fertilizer application rates did not affect petiole sap nitrate which may suggest that strip-tillage may require additional application of nitrogen fertilizer but not so much.

Based on the results from this trial, there was significantly higher pumpkin yield in strip tilled plots than in conventional plots where pumpkin is grown on bare ground. The pumpkin fruits from Control plots were larger than from strip-till plots by 1-4 lbs (‘Howden’) and 3 lbs (‘Magic Lantern’) but more fruits from strip-tilled plots makes up for the smaller size. Pumpkin fruit lying on bare ground tend covered with soil, had more bacterial or fungal disease spots, and higher incidences of fruit rots compared to pumpkin fruit lying on rye mulch. Field drainage is very important in ensuring that water does not remain stagnant in the field for a long period of time but more fruit rots occur when pumpkin is grown on bare ground than in strip tillage system.

Table 1. Average above ground rye cover crop height and stems per 12 square feet area in 2008

	Treatment	Sampling dates May 5	May 15	May 19
Height above ground (inches):	Rye 90	17.3[a]	33.8[a]	44.5[a]
	Rye 120	17.0[a]	33.2[a]	43.0[a]
No. of stems per 12 ft^2 area:	Rye 90	2356[b]	3882[a]	3882[a]
	Rye 120	2859[a]	4248[a]	4248[a]

Numbers followed by the same superscripts are not significantly different at p= 0.05

Table 2. Weed counts and dry weights (LBS) per 12 square feet area on August 11, 2008

	Weed count and dry weight per 12 square feet area			
	Rye 90		Rye 12	
Weeds	Counts	Dry Weight	Counts	Dry Weight
Redroot pigweed	--	--	--	--
Black nightshade	--	--	--	--
Lambsquarter	2.3[a]	0.19[a]	1.1[a]	0.10[a]
Conyza canadensis	0.9[a]	0.03[a]	0.5[a]	0.02[a]
Velvetleaf	0.2[a]	0.00[a]	0.0[a]	0.00[a]
Canada thistle	0.5[a]	0.01[a]	0.7[a]	0.04[a]
Grass	--	0.20[a]	--	0.40[a]

Numbers followed by the same superscripts are not significantly different at p= 0.05

Table 3.The effects of strip tillage, plastic mulch and nitrogen fertilizer application rates on petiole sap N-nitrate at seven and nine weeks after emergence (WAE) in 2008.

Treatments	N Rates/ac	'Howden'		'Magic Lantern'	
		Nitrate-N in parts per million (PPM)			
		7WAE	9WAE	7WAE	9WAE
Control		299[a]	1465[a]	310[a]	1850[a]
Rye 90		42[b]	40[b]	110[b]	108[b]
Rye 120		23[b]	35[b]	124[b]	361[b]
	45 LB N	107[a]	547[a]	150[b]	719[a]
	90 LB N	136[a]	480[a]	213[a]	827[a]

Numbers followed by the same superscripts are not significantly different at p= 0.05

Table 4. The effects of strip tillage and nitrogen fertilizer application rates on pumpkin fruit number, weight, and weight per fruit in 2008.

	Treatments	N rates/ac	'Howden'	'Magic Lantern'
			Number per acre	
Number of fruits:	Control		1407[b]	1746[b]
	Rye 90		1951[a]	2450[a]
	Rye 120		1838[ab]	2609[a]
		45 LB N	1777[a]	2314[a]
		90 LB N	1686[a]	2223[a]
			Tons per acre	
Weight of fruits:	Control		16.6[b]	19.3[b]
	Rye 90		19.8[ab]	22.4[ab]
	Rye 120		21.7[a]	24.2[a]
		45 LB N	19.6[a]	22.5[a]
		90 LB N	19.1[a]	21.4[a]
			Average weight (LBS/fruit)	
Fruit size:	Control		24[a]	22[a]
	Rye 90		20[b]	19[b]
	Rye 120		23[a]	19[b]
		45 LB N	22[a]	20[a]
		90 LB N	23[a]	20[a]

Numbers followed by the same superscripts are not significantly different at p= 0.05

Table 5. The effects of strip tillage on average soil moisture tension (kPa) between 12 and 18-inches depths during the growing season (from July 15 to October 6, 2008).

Reading Dates/Time	Rainfall[a] (inches)	Average Soil Moisture Tension[b] (kPa) by Treatment		
		Control	Rye 90	Rye 120
07/15/08 (10:10 AM)	1.97	9.8[a]	7.3[a]	7.0[a]
07/18/08 (10:40 AM)	0.00	10.4[a]	8.4[a]	9.9[a]
07/24/08 (05:10 PM)	1.22	10.8[a]	8.5[a]	11.0[a]
08/05/08 (12:04 PM)	1.48	20.5[b]	38.0[a]	35.3[a]
08/08/08 (01:38 PM)	0.00	18.0[b]	56.3[a]	49.5[a]
08/11/08 (10:35 AM)	0.43	19.5[b]	64.4[a]	54.3[a]
08/13/08 (12:35 PM)	0.00	22.8[b]	57.0[a]	56.8[a]
08/18/08 (10:05 AM)	0.00	41.6[b]	63.0[a]	63.5[a]
08/20/08 (11:20 AM)	0.00	49.6[a]	64.4[a]	59.4[a]
08/22/08 (09:28 AM)	0.00	62.4[a]	77.8[a]	69.8[a]
08/25/08 (10:00 AM)	0.00	66.3[a]	78.8[a]	73.4[a]
08/29/08 (09:40 AM)	0.18	71.0[a]	79.8[a]	76.4[a]
09/02/08 (09:45 AM)	0.00	74.3[a]	81.9[a]	78.0[a]
09/05/08 (10:55 AM)	2.63	20.9[a]	15.8[a]	11.3[a]
09/09/08 (02:34 PM)	1.15	14.3[a]	7.0[a]	7.5[a]
09/12/08 (08:56 AM)	0.61	9.3[a]	10.5[a]	10.0[a]
09/23/08 (10:20 AM)	8.51	10.0[b]	11.1[ab]	12.5[a]
10/02/08 (10:20 AM)	0.54	12.1[c]	15.9[b]	21.1[a]
10/06/08 (12:40 PM)	0.05	13.3[c]	18.0[b]	22.6[a]

Numbers followed by the same superscripts are not significantly different at p= 0.05

[a] – The data is from Illinois Water Survey for St. Charles station. The amount of rainfall recorded before the reading date such as for 07/15/08 (the amount recorded from 7/1-7/15/08) and for the other reading dates is rainfall recorded after the previous reading date. Heavy rainfall of 7.11 inches was recorded on 9/13/08. Total rainfall between July 1 and October 6, 2008 was 18.77 inches.

[b] – Soil moisture tension was measured using Irrometer Tensiometers (0-100 kPa scale) with 0 (very wet) and 100 (very dry).

Table 6. The effects of strip tillage and nitrogen fertilizer application rates on powdery mildew incidence (assessed as area under powdery mildew curve –AUPMC[a]) on pumpkin leaves in 2008.

	Treatments	N rates/acre	'Howden'	'Magic Lantern'
			09/09/08	
Part of leaf covered (%):	Control		57[a]	25[a]
	Rye 90		28[b]	10[b]
	Rye 120		20[b]	14[b]
		45 LB N	40[a]	14[b]
		90 LB N	30[b]	19[a]
			09/24/08	
Part of leaf covered (%):	Control		84[a]	66[a]
	Rye 90		34[c]	17[b]
	Rye 120		44[b]	20[b]
		45 LB N	50[b]	35[a]
		90 LB N	58[a]	34[a]
			AUPMC	
Disease progress (AUPMC):	Control		1058[a]	684[a]
	Rye 90		463[b]	202[b]
	Rye 120		476[b]	255[b]
		45 LB N	674[a]	365[a]
		90 LB N	657[a]	396[a]

Numbers followed by the same superscripts are not significantly different at p= 0.05

[a] - AUPMC – calculated as the sum of average of the percent of the sampled leaves infected on 09/09 and 09/24 divided the difference in time (days). Give an indication of disease progress after the first assessment both on the lower and upper side of the leaves.

Table 7. The effects of strip tillage and nitrogen fertilizer application rates on percent dirty fruits, fruit rots and bacterial spot incidence on pumpkin fruits in 2008.

	Treatments	N rates/ac	'Howden'	'Magic Lantern'
Dirty Fruits (%):	Control		62[a]	64[a]
	Rye 90		16[b]	16[b]
	Rye 120		16[b]	17[b]
		45 LB N	30[a]	33[a]
		90 LB N	33[a]	32[a]
Spots on fruits (%):	Control		37[a]	27[a]
	Rye 90		14[b]	10[b]
	Rye 120		15[b]	17[b]
		45 LB N	19[a]	14[b]
		90 LB N	25[a]	22[a]
Fruit rots (%):	Control		22[a]	8.8[a]
	Rye 90		2[b]	1.8[a]
	Rye 120		2[b]	0.9[a]
		45 LB N	6[a]	1.2[a]
		90 LB N	12[a]	6.4[a]

Numbers followed by the same superscripts are not significantly different at p= 0.05

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Disclaimer

Any opinions, findings, and conclusions or recommendations expressed in this presentation are those of the author and do not necessarily reflect the views of the Illinois Department of Agriculture

Effects of colored plastic mulches on muskmelon growth and yield in 2008

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Introduction

Muskmelon production starts in early June when the ground has warmed up in northern Illinois. Some grower's plant muskmelons on bare ground but majority use black plastic mulch. Black plastic mulch warms up the soil in early spring, conserves the moisture, and control weeds. The objective of this experiment is to compare the effects of colored plastic mulches on muskmelon growth and yield.

Materials and methods

The experiment was conduct at St. Charles Horticulture Research Center St. Charles, IL. Ten treatments namely –Black smooth, Red, Black embossed, Blue, Olive, Yellow, Clear, White, Reflective (white-on-black) plastic mulches and Control (bare ground) were replicated four times in a complete randomized block design. Each plot consists of six muskmelon plants in a 15-ft long row. The seeds of muskmelon variety 'Athena' hybrid were started in a greenhouse on April 28, 2008 using Jiffy Mix # 901 (Jiffy Products of America Inc Batavia, IL), and the seedlings were transplanted on May 23, 2008 on plastic mulch/bare ground rows 8-ft apart, and within row spacing of 2½ ft apart. After transplanting Admire® 2F (Imidacloprid – 21.4% active ingredient) insecticide was applied around the root zone of each seedling at the rate of 24 ounces per acre to control cucumber beetles. In each plot, a vigorously growing muskmelon seedling was flagged, and the cumulative vine length measured between June 23 and July 28, 2008. Most fruit set was observed on July 14, 2008. The data was analyzed using SAS POC GLM procedure.

Results and Discussion

Plants grown in Blue and Clear plastic mulch treatments had longer vines than plants grown in other treatments on June 23, 2008. The cumulative vine lengths in Yellow, Blue, and Red plastic mulch treatments were longer than in other treatments on June 30, 2008. On July 7, it followed a similar trend with cumulative vine lengths longer in Blue, Yellow, and Clear plastic mulch treatments. Muskmelons grown on Control (bare ground) had shorter vines. Seven days later, on July 14, it followed a similar trend with cumulative vine lengths longer in Clear, and Blue plastic mulch treatments. On July 28, plants grown on Blue plastic mulch treatment had longer vines but not significantly different from plants in Clear, Olive, and Red plastic mulch treatments.

Due to too many cucumber beetles flying in late July to early August, there was an outbreak of bacterial wilt that led to vine death so we had only three harvests. Higher muskmelon fruit numbers and weights were recorded in Clear, Yellow and Blue plastic mulch treatments, and lower fruit numbers and weights in Control treatment on August 19, 2008. During the second harvest on August 25, 2008, Reflective, and Blue plastic mulch treatments had higher fruit numbers and weights than other treatments. During the third harvest on September 2, 2008, Red plastic mulch treatment had higher fruit numbers and weights but not significantly different from Clear, Blue, and Control treatments.

The cumulative fruit number and weight for the three harvests was higher in Blue plastic mulch treatment. There were significantly larger fruits with higher average weight of each fruit in Olive, Yellow, and Blue plastic mulch treatments. Some growers in northern Illinois still grow muskmelons on bare ground, when plastic mulch treatments are compared to Control (bare ground) treatment, the following treatments were superior in descending order – Blue, Red, Clear, Reflective, Yellow, White, Olive, and Black smooth. Many growers in northern Illinois use Black embossed plastic mulch in muskmelon production and when compared with other plastic mulches, the following treatments had higher muskmelon fruit yield in descending order - Blue, Red, Clear, Reflective, Yellow, White, Olive, and Black smooth.

In conclusion, higher muskmelon fruit yield in plastic mulch treatments than in Control treatment except in Black embossed treatment. Muskmelon fruit numbers in Blue, Red, Clear, Reflective, Yellow, White, Olive, and Black smooth plastic mulch treatments were higher than in black embossed plastic mulch treatment by 1700, 1560, 1560, 1220, 680, 540, and 270 fruits per acre respectively. Generally the price of Blue, Olive, Red and Reflective plastic mulches is about 15% higher than black embossed plastic mulches while the price of Black smooth and Clear plastic mulches is almost the same as the price of Black embossed plastic mulch. Blue plastic mulch tends to out perform other plastic mulches in pumpkin yield. It is very important for the growers to calculate the potential differences in muskmelon fruit yields between Blue plastic mulch and Black embossed plastic mulch in addition to muskmelon fruit prices in wholesale or retail markets in order to determine whether it is profitable to use Blue or other colored plastic mulches in muskmelon production.

Table 1. Mean muskmelon vine lengths (inches) per plot (8 plants per plot, Significance level, α = 0.05) between June23 and July 28, 2008

Treatment	Mean vine length (inches) per plot				
	23 June	30 June	7 July	14 July	28 July
Black Embossed	12.5^{c}	23.0^{cd}	36.3^{cde}	54.0^{c}	65.0^{bcd}
Black Smooth	12.0^{c}	21.8^{de}	32.0^{e}	46.8^{de}	61.0^{de}
Control	10.0^{d}	18.8^{e}	27.5^{f}	41.0^{e}	56.3^{e}
Clear	18.8^{a}	28.3^{ab}	42.5^{a}	61.5^{a}	70.3^{abc}
Yellow	16.8^{b}	31.0^{a}	42.5^{a}	52.5^{cd}	64.3^{cd}
Blue	19.0^{a}	30.8^{a}	43.0^{a}	61.0^{ab}	74.0^{a}
Red	16.5^{b}	29.3^{a}	40.8^{ab}	57.0^{abc}	68.0^{abcd}
Olive	15.5^{b}	27.8^{ab}	40.3^{abc}	58.8^{abc}	72.3^{ab}
White Smooth	16.0^{b}	25.5^{bc}	37.5^{bcd}	55.3^{abc}	66.5^{bcd}
Reflective	15.5^{b}	23.3^{cd}	35.8^{de}	54.8^{bc}	64.5^{cd}

Means with the same superscripts are not significantly different p=0.05

Table 2. Mean muskmelon fruit number and weight in tons per acre from Aug. 19 to Sept 2, 2008 (three harvests).

Treatment	Mean fruit number ('00) and weight (Tons) per acre								
	19 Aug		25 Aug		2 Sept		Total		Fruit
	No.	Wt	No.	Wt	No.	Wt	No.	Wt	wt (lb)
Black Embossed	3.4^{b}	0.8^{b}	4.1^{abc}	1.1^{ab}	3.4^{b}	1.0^{b}	10.9^{c}	2.9^{b}	4.3^{b}
Black Smooth	5.4^{ab}	1.3^{ab}	4.1^{abc}	1.0^{ab}	4.1^{b}	1.0^{b}	13.6^{bc}	3.4^{b}	5.4^{ab}
Control	2.7^{b}	0.7^{b}	2.0^{c}	0.5^{b}	8.2^{ab}	2.1^{ab}	12.9^{bc}	3.2^{b}	5.6^{ab}
Clear	10.2^{a}	2.4^{a}	6.1^{abc}	1.5^{ab}	10.2^{ab}	2.4^{ab}	26.5^{ab}	6.2^{ab}	5.4^{ab}
Yellow	9.5^{a}	2.5^{a}	2.7^{bc}	1.0^{ab}	5.4^{b}	1.6^{ab}	17.7^{abc}	5.1^{ab}	6.2^{a}
Blue	8.8^{a}	2.2^{a}	9.5^{ab}	2.7^{a}	9.5^{ab}	2.6^{ab}	27.9^{a}	7.5^{a}	5.9^{a}
Red	5.4^{ab}	1.2^{ab}	6.1^{abc}	1.5^{ab}	15.0^{a}	3.5^{a}	26.5^{ab}	6.3^{ab}	5.3^{ab}
Olive	6.1^{ab}	1.8^{ab}	4.8^{abc}	1.5^{ab}	4.1^{b}	1.1^{b}	15.0^{abc}	4.3^{ab}	6.3^{a}
White Smooth	6.1^{ab}	1.6^{ab}	5.5^{abc}	1.3^{ab}	4.8^{b}	0.9^{b}	16.3^{abc}	3.7^{b}	5.4^{ab}
Reflective	6.1^{ab}	1.3^{ab}	10.9^{a}	2.8^{a}	6.1^{b}	1.8^{ab}	23.1^{abc}	5.9^{ab}	5.7^{ab}

Means with the same superscripts are not significantly different at p=0.05

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Effects of colored plastic mulches on bell pepper growth and yield in 2008

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Introduction

In northern Illinois, bell pepper is commonly grown in ground covered with black embossed plastic mulch with drip irrigation. However, there are a few growers who still grow bell pepper on bare ground, and weeds that emerge between the rows are controlled by cultivation. High soil temperatures under black plastic mulch particularly when it is too hot in summer had been shown to affect pepper root growth that may eventually lead to reduction in pepper yield.
The objective of this study is to assess the effects of colored plastic mulches on growth and yield of bell peppers. The effects of Black embossed plastic mulch on pepper growth and yield was compared to the effects of other colored plastic mulches.

Materials and methods

The experiment was conducted at St. Charles Horticulture Research Center. Pepper variety 'Aristotle' seedlings were transplanted on June 18, 2008 in ten treatments - Black embossed, Black smooth, Red, Blue, Olive, White, Reflective (white-on-black), Yellow, Clear plastic mulches and Control (bare ground) treatments. The treatments were replicated four times in complete randomized block design. There were five pepper plants in each 10-ft row plots. Plastic mulch and bare ground rows were 6-ft a part from the center of the rows, the beds were 3-ft wide and single rows of pepper seedlings were planted 2-ft apart within the row. Mature pepper fruits were harvested from each plot on August 29, September 11 & 23, and October 11, 2008. The fruits were graded according to the USDA standards into Fancy and US No.1, counted, and weighed. The fancy fruits were 3½ inches long, and 3 inches wide, and US No.1 fruits were of 2½ inches long and 2½ inches wide. The ratio of Fancy to US No.1 fruits during the first harvest, and for the four harvest combined were reported. The data was analyzed using SAS PROC GLM procedure.

Results and Discussion

Plants growing on bare ground were much shorter than plants growing on ground covered with plastic mulches. There were taller plants in Reflective, Red, and Black embossed plastic mulch on June 23 and 30, 2008 sampling dates. Plants in White, Blue, and Clear plastic mulches were taller on July 28, 2008. Plants in all plastic mulch treatments were taller than in Control treatments on July 7, 24, and August 5, 2008. At flowering time on July 14, plants in Olive treatment were taller but not significantly different in heights from plants in Red, Blue, White, and Reflective (white-on-black) plastic mulch treatments. In summary plant height varied among different treatments but plants in Reflective, Blue, Clear, and White plastic mulch treatments tend to be taller than in other treatments (Table 1).

Plants grown on ground covered with White plastic mulch had higher fancy fruit number and weight than plants grown in Control (bare ground) and ground covered with other plastic mulches. There were higher US No.1 fruit number and weight from plants grown in ground covered with Reflective plastic mulches but not significantly different from plants in ground covered with Yellow, Red, and Blue plastic mulches. The total marketable yield (fancy and US No.1 fruit number and weight combined) was higher in White, Yellow, Reflective, Blue, and Olive plastic mulch treatments. Plants from Clear and Black embossed plastic mulches and Control (bare ground) plots had the lowest marketable yield. The average weight for each fruit was higher in Blue, Yellow, Clear, and Reflective plastic mulch treatments. Fruits harvested from plants grown in ground covered with White plastic mulch had a higher ratio of Fancy to US No.1 fruits than in other treatments during the first harvest and for all the harvests (Table 2).

In comparison with peppers grown on Control (bare ground), the following treatments had higher total marketable fruit weights in descending order – Yellow, White, Reflective, Blue, Olive, Olive, Black smooth, Red, and Black embossed. Since most commercial vegetable growers in northern Illinois grow peppers in Black embossed plastic mulch, the total marketable yields from Yellow, White, Reflective, Blue, Olive, Black smooth, and Red plastic mulches were higher by 2.7, 1.7, 1.5, 1.5, 0.8, 0.3, and 0.2 tons per acre respectively. The prices of many of the above plastic mulches is about 10-15% higher than the price of Black embossed plastic mulch but the price of White plastic mulch is almost the same as the price of Black embossed plastic mulch. The difference in yield between the above plastic mulches and Black embossed plastic mulch, and wholesale or retail price of bell pepper fruits can be used to determine the profitability of using Reflective, Blue, Yellow, and White plastic mulches in bell pepper production in northern Illinois. Some weeds that may grow underneath White plastic mulch can be controlled by applying recommended pre-emergence herbicides before the plastic mulch is laid. In addition to the low cost and increase in yield, there is a very high potential for use of Reflective and White plastic mulches in pepper production as they can cool soil in summer and reflects light into pepper canopy thereby promoting higher growth rate.

Table 1. Mean pepper, 'Aristotle' height (inches) per plot (5 plants per plot) between June 23 and August 5, 2008.

Treatment	Mean height (inches) per plot						
	6/23	6/30	7/07	7/14	7/24	7/28	8/05
Black Embossed	5.0^{b}	6.3^{ab}	8.1^{a}	9.8^{b}	14.0^{a}	15.8^{b}	19.3^{a}
Black Smooth	5.0^{b}	6.0^{abc}	8.0^{a}	10.0^{ab}	14.5^{a}	16.3^{ab}	19.5^{a}
Control	4.3^{c}	4.9^{d}	6.1^{b}	8.0^{c}	11.3^{b}	14.0^{c}	17.3^{b}
Clear	5.0^{b}	5.9^{abc}	8.1^{a}	10.3^{ab}	14.3^{a}	16.8^{a}	19.8^{a}
Yellow	5.0^{b}	5.8^{bc}	8.0^{a}	10.3^{ab}	13.8^{a}	16.5^{ab}	19.8^{a}
Blue	5.0^{b}	5.6^{c}	8.4^{a}	10.5^{ab}	14.5^{a}	16.8^{a}	20.3^{a}
Red	5.3^{ab}	6.4^{a}	8.3^{a}	10.5^{ab}	13.8^{a}	16.3^{ab}	19.3^{a}
Olive	5.0^{b}	5.9^{abc}	8.0^{a}	10.8^{a}	13.8^{a}	16.5^{ab}	19.8^{a}
White	5.0^{b}	5.8^{bc}	8.0^{a}	10.3^{ab}	14.0^{a}	16.8^{a}	20.0^{a}
Reflective	5.5^{a}	6.3^{ab}	8.1^{a}	10.1^{ab}	14.3^{a}	16.3^{ab}	20.5^{a}

Means with the same superscripts are not significantly different at p=0.05
Reflective = White-on-black; Control = Bare ground

Table 2. Mean pepper, 'Aristotle' fruit number & weight per acre, average fruit weight (grams), and ratio of fancy to US No.1 fruits between August 29 and October 11, 2008.

Treatment	Mean fruit number ('000) and weight (Tons) per acre; * Fruit weight (grams), and fancy to US No1 ratio								
	Fancy		US No.1		Total		Fruit	Fancy: No1 ratios	
	No.	Wt	No.	Wt	No.	Wt	wt (grams)	w	y
Black Embossed	17.6^{bc}	4.8^{cd}	8.5^{abc}	1.8^{bcd}	26.1^{bc}	6.6^{cd}	230^{bc}	1.25^{bc}	2.20^{b}
Blue	19.7^{bc}	6.0^{abc}	8.8^{abc}	2.1^{abcd}	28.5^{abc}	8.1^{abc}	261^{a}	2.23^{bc}	2.53^{b}
Red	15.7^{c}	4.3^{d}	11.2^{ab}	2.5^{abc}	26.8^{bc}	6.8^{bcd}	231^{bc}	0.68^{c}	1.45^{b}
Olive	19.6^{bc}	5.7^{abc}	8.3^{bc}	1.7^{bcd}	27.9^{abc}	7.4^{bcd}	240^{abc}	3.40^{bc}	2.53^{b}
Reflective	17.3^{bc}	5.2^{bcd}	12.8^{a}	2.9^{a}	30.1^{ab}	8.1^{abc}	248^{abc}	0.92^{bc}	1.53^{b}
White	28.0^{a}	7.0^{a}	5.2^{c}	1.4^{d}	33.2^{a}	8.3^{ab}	227^{c}	8.50^{a}	6.68^{a}
Yellow	21.6^{b}	6.5^{ab}	11.4^{ab}	2.7^{ab}	33.1^{a}	9.3^{a}	254^{ab}	1.13^{bc}	2.08^{b}
Black Smooth	18.8^{bc}	5.3^{bcd}	7.2^{bc}	1.6^{cd}	26.0^{bc}	6.9^{bcd}	243^{abc}	1.79^{bc}	2.89^{b}
Clear	15.9^{c}	4.7^{cd}	7.1^{bc}	1.7^{bcd}	23.0^{c}	6.4^{d}	251^{abc}	2.67^{bc}	2.75^{b}
Control	17.6^{bc}	4.8^{cd}	8.0^{bc}	1.7^{bcd}	25.6^{c}	6.5^{d}	230^{bc}	3.71^{b}	2.50^{b}
LSD (0.05)	4.7	1.3	4.5	1.1	5.8	1.5	25	2.92	2.30

Means with the same superscripts are not significantly different at p=0.05

* - Grams (g) – Measure of weight in Metric system, 1 pound = 453.6 grams

- Treatments: Reflect = Reflective plastic mulch (white-on-black); Control = Bare ground

^{w} – First harvest; ^{y} – All (four) harvests combined

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Effects of colored plastic mulches on tomato growth and yield in 2008

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Introduction

Tomato production starts in late May when the ground has warmed up in northern Illinois. Tomatoes are usually grown on ground covered with black plastic mulch. Black plastic mulch warms up the soil in early spring, conserves moisture, and controls weeds. In combination with drip irrigation, soluble fertilizers can also be applied at the same time. The objective of this experiment is to compare the effects of colored plastic mulches on tomato growth and yield.

Materials and methods

The experiment was conducted at St. Charles Horticulture Research Center St. Charles, IL. There was no irrigation. The experiment was laid out in a complete randomized block design with ten treatments namely – Control (bare ground), Black smooth, Red, Black embossed, Blue, Olive, Yellow, Clear, White, and Reflective (white-on-black). The treatments were replicated four times. Each plot consists of 10-ft row with five tomato plants. The seeds of 'Sunchief' tomato variety were started in a greenhouse on April 22, 2008 at St. Charles Horticulture Research Center, St. Charles, IL using Jiffy Mix # 901 (Jiffy products of America Inc Batavia, IL), and transplanted on June 3, 2008 on plastic mulch/bare ground rows 6-ft a part, and within row spacing of 2-ft a part. In each plot, a vigorously growing tomato seedling was flagged, and cumulative height above the ground measured between June 23, and July 14, 2008. Tomato fruits from the plots were harvested, graded into marketable and unmarketable, counted, and weighed. Plant height and yield data were analyzed using SAS PROC GLM procedure.

Results and Discussion

On June 23, 2008 there was no significant difference in plant height between all the treatments. On June 30, 2008 when the plants started flowering, Reflective and White plastic mulch treatments had taller plants, and shorter plants in Control (bare ground) plots. Seven days later on July 7, 2008 Reflective (white-on-black), White, Olive, and Clear plastic mulches had taller plants than other treatments with shorter plants in Control (bare ground) treatment. On July 14, 2008 there was no significant difference in plant heights between all the treatments (Table 1).

During the first harvest on August 5, 2008 the marketable tomato fruit yield was higher in Clear, Olive, and Yellow plastic mulch treatment than in Black embossed and Control treatments. A different trend occurred during the second harvest on August 22, 2008 with higher yields in Reflective and lower yields in Olive, Red, Black smooth, Clear, Black embossed, Blue, and Control treatments. On August 26, 2008 harvest, Olive treatment had higher yields and lower

yields in White and Control treatments. The highest yield was recorded during the September 10, 2008 harvest, plants grown on ground covered with Reflective plastic mulch had higher yield than in other treatments with the lowest yield from plants in Yellow plastic mulch plots.
The cumulative marketable yield was higher in Reflective, and Clear plastic mulch treatment and lower in Control treatment. Marketable fruits from Blue plastic mulch plots were larger, each fruit weighing about 11 ounces as compared to fruits from Black smooth plastic mulch plots weighing less than 8.7 ounce (Table 2).

The highest number and weight of unmarketable fruits was recorded on September 10 harvest in Red, and Clear plastic mulch plots, and the lowest in Control plots. The cumulative unmarketable yield followed the same trend as in the September 10 harvest with the highest yield in Red, and Clear plastic mulch plots. The unmarketable fruits from Blue plastic mulch plots were larger (weighing about 6 ounces) than fruits from other treatments (Table 3). The combined yield (marketable and unmarketable fruits) was higher in Reflective, Clear, Red, White, Olive, and Blue plastic mulch plots and lower in Control, Black embossed, and Black smooth plots.

In comparison with Control (bare ground), all the treatments performed well with Reflective plastic mulch plots with the highest and Yellow plastic mulch plots with the lowest marketable tomato fruit number and weight per acre. In comparison with Black embossed plastic mulch, all the treatments performed well except Yellow plastic mulch. The marketable fruit weight in tons per acre was higher in Reflective (2.31), Clear (1.83), Olive (1.24), Red (0.78), White (0.72), Blue (0.48), and Black smooth (0.25) plots than in Black embossed plastic mulch plots.

In conclusion, Reflective, Clear, Red, Olive, and White plastic mulches had higher marketable tomato yield but their prices are higher than Black embossed plastic mulch. The growers need to consider wholesale or retail tomato prices, and differences in yields to determine whether it is profitable to use any type of colored plastic mulch in tomato production.

Table 1. Mean tomato height (inches) per plot (5 plants per plot) between June 23 and July 14, 2008

Treatment	Mean height (inches) per plot			
	23 June	30 June	7 July	14 July
Black Embossed	16.0[a]	19.3[bc]	24.5[ab]	25.0[a]
Black Smooth	16.8[a]	19.3[bc]	24.5[ab]	25.8[a]
Control	16.0[a]	17.8[c]	21.8[c]	22.5[b]
Clear	17.0[a]	20.5[ab]	25.0[a]	26.0[a]
Yellow	17.0[a]	20.5[ab]	24.0[ab]	26.0[a]
Blue	17.3[a]	20.5[ab]	24.3[ab]	25.8[a]
Red	16.8[a]	20.5[ab]	23.0[bc]	25.8[a]
Olive	16.5[a]	19.5[abc]	24.8[a]	26.0[a]
White Smooth	16.3[a]	21.5[a]	24.8[a]	26.0[a]
Reflective	16.8[a]	21.5[a]	25.0[a]	26.3[a]

Means with the same superscripts are not significantly different at p=0.05

Table 2. Mean tomato marketable yield - fruit number (thousands/acre) and weight (tons/acre) from August 5 to September 10, 2008.

Treatment	5 Aug		22 Aug		26 Aug		10 Sept		Total		Fruit
	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	wt (oz)
Black Embossed	0.5^{c}	0.16^{c}	1.6^{cd}	0.40^{cd}	4.1^{abcd}	1.17^{abcd}	8.3^{cd}	3.00^{cde}	14.5^{d}	4.74^{d}	10.5^{ab}
Black Smooth	1.2^{abc}	0.45^{abc}	1.9^{cd}	0.50^{cd}	3.9^{bcd}	0.98^{cd}	11.4^{ab}	3.06^{cde}	18.4^{bc}	4.99^{cd}	8.7^{d}
Control	0.7^{bc}	0.24^{bc}	0.9^{d}	0.21^{d}	1.4^{e}	0.39^{e}	7.9^{d}	2.56^{de}	10.9^{e}	3.33^{e}	9.7^{c}
Clear	1.6^{a}	0.63^{a}	1.7^{cd}	0.44^{cd}	5.0^{ab}	1.44^{abc}	11.7^{ab}	4.06^{ab}	20.1^{ab}	6.57^{ab}	10.6^{ab}
Yellow	1.6^{a}	0.61^{a}	2.4^{abc}	0.66^{abc}	4.1^{abcd}	1.26^{abcd}	7.0^{d}	2.11^{e}	15.1^{d}	4.64^{d}	9.9^{bc}
Blue	1.5^{ab}	0.54^{ab}	1.5^{cd}	0.38^{cd}	4.5^{abc}	1.49^{ab}	7.9^{d}	2.81^{cde}	15.4^{cd}	5.22^{cd}	10.8^{a}
Red	1.0^{abc}	0.38^{abc}	1.9^{cd}	0.50^{cd}	3.4^{cd}	0.93^{d}	12.4^{ab}	3.71^{abc}	18.7^{b}	5.52^{bcd}	9.4^{cd}
Olive	1.7^{a}	0.62^{a}	2.1^{bc}	0.53^{bc}	5.5^{a}	1.61^{a}	11.0^{bc}	3.22^{bcd}	20.0^{ab}	5.98^{abc}	9.5^{c}
White Smooth	1.4^{ab}	0.55^{ab}	3.2^{ab}	0.81^{ab}	3.0^{d}	0.81^{de}	11.0^{bc}	3.29^{bcd}	18.4^{bc}	5.46^{cd}	9.5^{cd}
Reflective	0.9^{abc}	0.37^{abc}	3.4^{a}	0.93^{a}	4.1^{abcd}	1.09^{bcd}	14.0^{a}	4.66^{a}	22.3^{a}	7.05^{a}	10.1^{abc}

Means with the same superscripts are not significantly different at p=0.05

Table 3. Mean tomato unmarketable and total yield - fruit number and weight in tons/acre from August 5 to September 10, 2008

Treatment	Mean fruit number ('000) and weight (Tons) per acre												
	5 Aug		22 Aug		26 Aug		10 Sept		Total		Fruit	Total Yield	
	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	wt (oz)	No.	Wt
Black Embossed	0.3^{c}	0.08^{b}	2.4^{cde}	0.43^{bcd}	4.2^{bcd}	0.61^{bcd}	14.6^{abc}	2.58^{ab}	21.5^{d}	3.70^{bc}	5.48^{abc}	36.1^{d}	8.44^{d}
Black Smooth	1.0^{abc}	0.25^{ab}	4.1^{abc}	0.76^{ab}	3.4^{cd}	0.49^{cd}	14.2^{abc}	1.96^{bc}	22.7^{cd}	3.46^{c}	4.88^{cd}	41.1^{bcd}	8.45^{d}
Control	1.3^{ab}	0.33^{a}	0.5^{e}	0.09^{d}	1.2^{d}	0.18^{d}	8.6^{c}	1.25^{c}	11.7^{e}	1.85^{d}	4.78^{d}	22.6^{e}	5.24^{e}
Clear	0.7^{abc}	0.20^{ab}	2.1^{de}	0.36^{cd}	6.6^{abc}	1.20^{a}	20.8^{a}	3.49^{a}	30.3^{abcd}	5.26^{a}	5.58^{ab}	50.3^{ab}	11.84^{a}
Yellow	1.2^{abc}	0.35^{a}	4.6^{ab}	0.78^{ab}	7.0^{ab}	1.14^{a}	13.2^{bc}	1.97^{bc}	26.0^{abcd}	4.24^{abc}	5.18^{abcd}	41.7^{bcd}	8.88^{cd}
Blue	1.6^{a}	0.35^{a}	2.8^{bcd}	0.42^{bcd}	3.8^{bcd}	0.75^{abc}	15.3^{abc}	2.64^{ab}	23.5^{bcd}	4.16^{abc}	5.68^{a}	38.9^{cd}	9.38^{bcd}
Red	0.8^{abc}	0.18^{ab}	4.0^{abcd}	0.75^{ab}	6.1^{abc}	0.95^{abc}	21.5^{a}	3.55^{a}	32.4^{ab}	5.43^{a}	5.35^{abcd}	51.1^{a}	10.95^{ab}
Olive	0.9^{abc}	0.21^{ab}	2.6^{bcd}	0.48^{bc}	5.4^{abc}	0.98^{abc}	18.8^{ab}	2.69^{ab}	27.8^{abcd}	4.35^{abc}	5.05^{bcd}	47.8^{abc}	10.33^{abcd}
White Smooth	0.5^{bc}	0.14^{ab}	5.7^{a}	0.97^{a}	8.2^{a}	1.10^{ab}	19.4^{ab}	2.82^{ab}	33.8^{a}	5.04^{ab}	4.78^{d}	52.3^{a}	10.50^{abc}
Reflective	0.8^{abc}	0.21^{ab}	3.8^{abcd}	0.61^{bc}	6.7^{abc}	1.00^{ab}	19.4^{ab}	3.17^{ab}	30.7^{abc}	4.99^{ab}	5.23^{abcd}	53.1^{a}	12.05^{a}

Means with the same superscripts are not significantly different at p=0.05

Insecticide Evaluations in Apples in Illinois, 2008

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The effectiveness of selected insecticides was evaluated in small plot trials in 2008 at the University of Illinois Pomology Farm near Urbana, Illinois, and at the University of Illinois Dixon Springs Agricultural Center near Simpson, Illinois. Six insecticides or insecticide programs (Tables 1 and 2) that included registered and experimental insecticides were evaluated in comparison with an untreated check at both locations. In addition, five insecticides or treatment programs that included products approved by OMRI (Organic Materials Review Institute) were evaluated in an organic block of apples at Dixon Springs (see Table 3). Very light pest pressure at both locations resulted in few new findings on the effectiveness of the products tested in these trials.

Methods

Urbana:

Seven treatments (including the untreated check) with 4 single-tree replications per treatment were assigned to 28 'Gala' trees in a randomized complete block design. Sprays were applied in 2,275 ml water per tree from backpack sprayer operating at 40 psi, with insecticide concentrations based on the calculation that a single tree at this site represented 0.005 acre. This spray volume was equivalent to120 gal/acre. Applications began at petal fall on May 9, 2008. Subsequent sprays were applied according to the schedule summarized in Table 1.

TABLE 1. INSECTICIDES, RATES, AND APPLICATION DATES FOR APPLES, UNIVERSITY OF ILLINOIS POMOLOGY FARM, URBANA, IL, 2008.

Application Dates:	Treatments: Products and Rates per Acre						
	1	2	3	4	5	6	7
May 9	Untreated	Avaunt 30WG; 6 oz	Rimon 0.83EC; 20 fl oz	Avaunt 30WG; 6 oz	DPXHGW86 (100 g a.i./l SE); 0.088 lb	Delegate 25WG; 7 oz	Belt 4SC; 5 fl oz + 0.25% MSO (v/v)
May 26	Untreated	Rimon 0.83EC; 20 fl oz + Altacor 35SG; 3 oz	Assail 30SG; 7 oz	Altacor 35SG; 3 oz	DPXHGW86 (100 g a.i./l SE); 0.088 lb	Delegate 25WG; 7 oz	Belt 4SC; 5 fl oz + 0.25% MSO (v/v)
June 10	Untreated	--	Assail 30SG; 7 oz	Altacor 35SG; 3 oz	DPXHGW86 (100 g a.i./l SE); 0.088 lb	Delegate 25WG; 7 oz	Belt 4SC; 5 fl oz + 0.25% MSO (v/v)
June 22	Untreated	Rimon 0.83EC; 20 fl oz + Altacor 35SG; 3 oz	Assail 30SG; 7 oz	Altacor 35SG; 3 oz	DPXHGW86 (100 g a.i./l SE); 0.088 lb	Delegate 25WG; 7 oz	Belt 4SC; 5 fl oz + 0.25% MSO (v/v)
July 6	Untreated	--	--	Assail 30SG; 7 oz	DPXHGW86 (100 g a.i./l SE); 0.088 lb	Delegate 25WG; 7 oz	Belt 4SC; 5 fl oz + 0.25% MSO (v/v)
July 28	Untreated	Rimon 0.83EC; 20 fl oz + Altacor 35SG; 3 oz	Rimon 0.83EC; 20 fl oz	Rimon 0.83EC; 20 fl oz + Assail 30SG; 7 oz	DPXHGW86 (100 g a.i./l SE); 0.088 lb	Delegate 25WG; 7 oz	Belt 4SC; 5 fl oz + 0.25% MSO (v/v)
Aug 11	Untreated	--	Assail 30SG; 7 oz	--	DPXHGW86 (100 g a.i./l SE); 0.088 lb	Delegate 25WG; 7 oz	Belt 4SC; 5 fl oz + 0.25% MSO (v/v)Belt 5 fl oz

Midseason fruit damage was assessed on July 21 by examining up to 100 apples per treatment and recording the number that exhibited damage from stink bug or plant bug feeding, plum curculio oviposition, leafroller feeding, and stings or tunnels from Lepidopteran larvae (primarily codling moth). Each tree was also rated for Japanese beetle and potato leafhopper damage (0 = none; 1 = light; 2 = moderate; 3 = severe). Harvest damage was assessed by picking and examining up to 100 fruits per tree August 28-31. Fruits were examined for damage characteristic of stink bug or plant bug feeding, plum curculio oviposition, plum curculio adult feeding, leafroller feeding, and codling moth tunneling.

Dixon Springs, Conventional Insecticides:

Seven treatments (including the untreated check) with 4 single-tree replications per treatment were assigned to 28 'Enterprise' and 'Goldrush' trees in a randomized complete block design. Sprays were applied with a hand-held wand from a 25-gallon tank mounted in a John Deere Gator. The sprayer was equipped with a 12-volt Sure Flow pump and operated at 40 psi. Each tree was sprayed for 60 seconds and received approximately 2.1 quarts of spray mix. This spray volume is equivalent to approximately 130 gallons/acre. Applications began at petal fall on May 1, 2008. Subsequent sprays were applied according to the schedule summarized in Table 2.

TABLE 2. INSECTICIDES, RATES, AND APPLICATION DATES FOR APPLES, IPM BLOCK, UNIVERSITY OF ILLINOIS DIXON SPRINGS AGRICULTURAL CENTER, SIMPSON, IL, 2008.

Application Dates:	Treatments: Products and Rates per Acre						
	1	2	3	4	5	6	7
May 1	Untreated	Assail 30SG; 7 oz	Rimon 0.83EC; 20 fl oz	Avaunt 30WG; 6 oz	Avaunt 30WG; 6 oz	Delegate 25WG; 7 oz	Belt 4SC; 5 fl oz + 0.25% MSO (v/v)
May 19	Untreated	Assail 30SG; 7 oz	Rimon 0.83EC; 20 fl oz	Rimon 0.83EC; 20 fl oz	DPXHGW86 (100 g a.i./l SE); 0.088 lb	Delegate 25WG; 7 oz	Belt 4SC; 5 fl oz + 0.25% MSO (v/v)
June 9	Untreated	Rimon 0.83EC; 20 fl oz	--	--	DPXHGW86 (100 g a.i./l SE); 0.088 lb	Delegate 25WG; 7 oz	Belt 4SC; 5 fl oz + 0.25% MSO (v/v)
June 24	Untreated	--	Assail 30SG; 7 oz	Altacor 35SG; 3 oz	DPXHGW86 (100 g a.i./l SE); 0.088 lb	Delegate 25WG; 7 oz	Belt 4SC; 5 fl oz + 0.25% MSO (v/v)
July 8	Untreated	Assail 30SG; 7 oz	Assail 30SG; 7 oz	Altacor 35SG; 3 oz	DPXHGW86 (100 g a.i./l SE); 0.088 lb	Delegate 25WG; 7 oz	Belt 4SC; 5 fl oz + 0.25% MSO (v/v)
July 24	Untreated	Assail 30SG; 7 oz	Assail 30SG; 7 oz	Altacor 35SG; 3 oz	DPXHGW86 (100 g a.i./l SE); 0.088 lb	Delegate 25WG; 7 oz	Belt 4SC; 5 fl oz + 0.25% MSO (v/v)
Aug 6	Untreated	Imidan 70W; 3 lb	Danitol 2.4EC ; 21 fl oz	Assail 30SG; 7 oz	Avaunt 30WG; 6 oz	Delegate 25WG; 7 oz	Belt 4SC; 5 fl oz + 0.25% MSO (v/v)
Aug 22	Untreated	Imidan 70W; 3 lb	Danitol 2.4EC; 21 fl oz	Assail 30SG; 7 oz	Avaunt 30WG; 6 oz	Delegate 25WG; 7 oz	Belt 4SC; 5 fl oz + 0.25% MSO (v/v)

Fruit damage was assessed on 27 July by examining up to 100 apples per treatment and recording the number that exhibited damage from stink bug or plant bug feeding, plum curculio oviposition, leafroller feeding, and stings or tunnels characteristic of Lepidopteran larvae. Each tree was also rated for Japanese beetle and potato leafhopper damage as noted above for the Urbana trial. Harvest damage was assessed by picking and examining up to 100 fruits per tree September 13. Fruits were examined for damage characteristic of stink bug or plant bug feeding, early season plum curculio oviposition, plum curculio adult feeding, leafroller feeding, and internal tunneling.

Dixon Springs, OMRI-approved Insecticides:

Six treatments (including the untreated check) with 4 single-tree replications per treatment were assigned to 24 'Liberty' and 'Golden Delicious' trees in a randomized complete block design. All treatments except Surround were applied with a hand-held wand from a 25-gallon tank mounted in a John Deere Gator as described above. Surround was applied with a Jacto 100-gallon air blast sprayer in 100 gallons of water per acre. Applications began at petal fall on May 1. Subsequent sprays were applied according to the schedule summarized in Table 3.

TABLE 3. INSECTICIDES, RATES, AND APPLICATION DATES FOR APPLES, ORGANIC BLOCK, UNIVERSITY OF ILLINOIS DIXON SPRINGS AGRICULTURAL CENTER, SIMPSON, IL, 2008.

Application Dates:	Treatments: Products and Rates per Acre					
	1	2	3	4	5	6
May 1	Untreated	Surround; 25 lb	Pyganic 1.4EC; 32 fl oz	EcoTec AG; 32 fl oz	CedarCide; 32 fl oz	Surround; 25 lb + Pyganic 1.4EC; 32 fl oz
May 8		Surround; 25 lb	Pyganic 1.4EC; 32 fl oz	EcoTec AG; 32 fl oz	CedarCide; 32 fl oz	Surround; 25 lb + Pyganic 1.4EC; 32 fl oz
May 19	Untreated	Surround; 25 lb	Pyganic 1.4EC; 32 fl oz	EcoTec AG; 32 fl oz	CedarCide; 32 fl oz	Surround; 25 lb + Pyganic 1.4EC; 32 fl oz
June 5	Untreated	Surround; 25 lb	Pyganic 1.4EC; 32 fl oz	EcoTec AG; 32 fl oz	CedarCide; 32 fl oz	Entrust 80W; 3 oz + Pyganic 1.4EC; 32 fl oz
June 24	Untreated	Surround; 25 lb	Pyganic 1.4EC; 32 fl oz	EcoTec AG; 32 fl oz	CedarCide; 32 fl oz	Entrust 80W; 3 oz +Pyganic 1.4EC; 32 fl oz
July 8	Untreated	Surround; 25 lb	Pyganic 1.4EC; 32 fl oz	EcoTec AG; 32 fl oz	CedarCide; 32 fl oz	Pyganic 1.4EC; 32 fl oz
July 24	Untreated	Surround; 25 lb	Pyganic 1.4EC; 32 fl oz	EcoTec AG; 32 fl oz	CedarCide; 32 fl oz	Pyganic 1.4EC; 32 fl oz
Aug 6	Untreated	Surround; 25 lb + Pyganic 1.4EC; 32 fl oz	Pyganic 1.4EC; 32 fl oz	EcoTec AG; 32 fl oz	CedarCide; 32 fl oz	Dipel DF; 2 lb
Aug 22	Untreated	Surround; 25 lb + Entrust 80W; 3 oz	Pyganic 1.4EC; 32 fl oz	EcoTec AG; 32 fl oz	CedarCide; 32 fl oz	Dipel 2F; 2 lb

Fruit damage was assessed on July 23 by examining up 100 apples per treatment and recording the same information listed above for the IPM block at this location. Harvest damage was assessed by picking and examining up to 100 fruits per tree September 13.

Results and Discussion

Urbana:

Insect pressure was very light at the Urbana orchard site in 2008. This may have resulted in part from an extended period of very wet spring weather. The midseason assessment of fruit injury on July 21 revealed codling moth tunneling in less than 1 percent of fruits in the untreated check. Potato leafhopper and Japanese beetle damage ratings were light in the untreated check as well. Japanese beetle damage was greatest in the Delegate treatment (damage ratings of 2.5 for two of four trees). Although light damage in the untreated check prevented most conclusions about the effectiveness of candidate insecticides against this insect, it is clear that (as expected) Delegate does not provide significant control of Japanese beetle.

At harvest, 3.3 percent of the apples from the untreated trees were damaged by tunneling characteristic of codling moth. All of the six insecticide regimes (treatments 2-7) effectively prevented codling moth damage (0 percent injured fruit) under the light pressure observed in 2008. For all other pests, occurrence and damage were too low to allow assessments of control.

Dixon Springs, Conventional Insecticides:

Insect pressure at Dixon Springs also was very light in 2008. Reduced populations of direct pests such as codling moth, oriental fruit moth, and plum curculio most likely resulted from the complete loss of the 2007 crop following the 2007 "Easter Freeze" and therefore an absence of food for fruit-inhabiting insects. The July 27 midseason evaluation of fruits on trees revealed no evidence of tunneling injury in any treatments, including the untreated check. Japanese beetle and potato leafhopper injury ratings were 1.4 and 0.5 for the untreated check – too low to allow treatments to result in significant differences in damage.

At this southern Illinois location, plum curculio produces a partial second generation of larvae in fruit. In one of the four untreated trees, 29 percent of the harvested fruit showed internal tunneling characteristic of plum curculio infestation, and plum curculio larvae were found in a portion of these fruits. Because plum curculio injury occurred in only one of the four single-tree replications, differences in occurrence among treatments were not statistically significant, but damage occurred in zero to less than 1 percent of the fruit in all the insecticide regimes (treatments 2-7). In midseason and harvest samples, fruits were identified as "significantly infested" by San Jose scale if more than 5 scales were evident on a single fruit. On July 27 and September 13, respectively, 5 and 12 percent of the fruits in the untreated trees were infested by San Jose scale. Although fewer fruits from treated trees were infested, differences were not statistically significant because of variation in infestation levels among replicates.

Dixon Springs, OMRI-approved Insecticides:

July 23 midseason assessments of Japanese beetle damage resulted in an average damage rating of 2.0 in the untreated check in the organic block. None of the OMRI-approved insecticides used in this trial significantly reduced Japanese beetle damage (ratings ranged from 1.8 to 2.5). Roughly 2 percent of the fruits harvested from this block showed tunneling characteristic of late season plum curculio infestation; differences among treatments were not significant at $P = 0.05$.

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Evaluations of Conventional and OMRI-approved Insecticides for Control of Corn Earworm in Sweet Corn, 2008

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Pyrethroid insecticides have been the most effective compounds for corn earworm (CEW) control in sweet corn since the introduction of permethrin in the 1980s. Among the most effective pyrethroids currently labeled on sweet corn for earworm control are bifenthrin (Capture and generic products), lambda-cyhalothrin (Warrior and generic products), and zeta cypermethrin (Mustang Max). Other pyrethroids include permethrin, cyfluthrin (Baythroid), and a mixture of bifenthrin and zeta cypermethrin sold under the trade name Hero. Corn earworm resistance to pyrethroid insecticides has limited their effectiveness in some locations in recent years, and continued assessments of insecticides with different chemical structures and modes of action is needed to provide alternatives for resistance management. Additionally, the use of pyrethroid insecticides is not allowed in certified organic production, and assessments of products approved for use by OMRI (the Organic Materials Review Institute) is needed to supply information to organic growers. To address these needs we completed evaluations of organic and conventional insecticides at two locations in Illinois in 2008.

At the University of Illinois Dixon Springs Agricultural Center near Simpson in southern Illinois we assessed the effectiveness of the OMRI-approved products Entrust (spinosad), EcoTec AG (an insecticidal oil that contains rosemary oil and mint oil), CedarCide (a cedar oil), and a combination of Pyganic (natural pyrethrins) plus Dipel (*Bacillus thuringiensis*). For comparison, treatments at this site also included a transgenic Bt sweet corn hybrid, BC0805. The BC0805 plots (two separate treatments) were either left unsprayed or treated with Warrior on a 6-day interval. The experimental design and description of these plots is provided below.

At the University of Illinois Integrated Pest Management Research Farm near Urbana we evaluated several conventional and experimental insecticides, including pyrethroid products currently considered to be standards for corn earworm control. Individual products are listed in Table 2. Pyrethroids used in this plot included Warrior, Bifenture (a generic bifenthrin), Mustang Max, Baythroid, and Hero. Coragen (chlorantraniliprole) and Belt (flubendiamide) represent a different group of chemical structures and modes of action (in Group 28 in the Insecticide Resistance Action Committee mode of action classification). Voliam Express is a pre-mix of Coragen and Warrior. Radiant is a synthetic spinosyn somewhat similar to Entrust and SpinTor. Lannate is carbamate.

Experimental Design and Methods

The experimental design for each plot was a randomized complete block with four replications. Harvest data were taken from only three replications at the Dixon Springs site. Plot size for each treatment was 4 rows x 30 feet; only the center two rows of each plot were treated. To assess insect infestation and injury, 15 randomly selected ears were picked from the center two rows of each 4-row plot in harvest samples at Dixon Springs; 25 ears were harvested from each plot at Urbana. The number and size (small, medium, and large) of CEW, European corn borer (ECB) and fall armyworm (FAW) larvae were recorded for each ear, as were the number of sap beetle adults and larvae. We also recorded the number of damaged kernels per ear (tip and side). Data were analyzed in 2-way ANOVAs with $P = 0.05$, using Microsoft Excel.

Plot details and methods for each trial were as follows:

Dixon Springs:

- Planting date: 13 June, 2008; harvest date: 13 August, 2008.
- Hybrid: 'BC0805' for treatments 7 and 8; 'Providence' for all other treatments (see Table 1). BC 0805 is a Bt hybrid; Providence is its near-isoline.
- Insecticide application dates: 28 and 31 July and 03, 06, and 09 August. In treatment 8, Warrior was applied only on 28 July and 03 and 09 August.
- Insecticide application methods: Applications were made from a CO_2-powered backpack sprayer that delivered approximately 60 gallons of water per acre using 4 drop nozzles per row (XRTES Jet 11004 VS)

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Urbana:

- Planting date: 19 June, 2008; harvest date: 29 August, 2008.
- Hybrid: BC 0805 for treatments 19 and 20; Providence for all other treatments (see Table 2). BC 0805 is a Bt hybrid; Providence is its near-isoline.
- Insecticide application dates: 11, 14, 17, 20, 22, and 25 August. In treatments 5, 12, 13, and 20, sprays differed according to date or spray intervals differed from the standard schedule (see details in Table 2).
- Insecticide application methods: Applications were made using a John Deere Hi-Cycle sprayer that delivered approximately 30 gallons of water per acre through one overhead nozzle and 2 drop nozzles per row (TXVS6 Conejet nozzles).

Results and Discussion

Dixon Springs:

Moderate population pressure resulted in 0.68 medium to large CEW larvae per ear in the untreated check (Table 1). Entrust, Entrust plus EcoTec AG, Cedarcide, BC0805, and BC 0805 plus Warrior significantly reduced infestations of medium-to-large larvae at harvest, although Cedarcide was not as effective as the treatments that included Entrust. EcoTec AG alone did not significantly reduce numbers of medium to large larvae in harvest samples, and the combination of Entrust plus EcoTec AG was not significantly more effective than Entrust alone. As expected, the number of small CEW in the BC0805 treatment was higher than in other treatments – small larvae survive for a few days even after they feed on Bt kernels, and there were no large larvae these in these ears to cannibalize them. Overall, it is significant that Entrust, an OMRI-approved product, performed very well under moderate pressure. There were too few ECB, FAW, and sap beetles to allow evaluation of their control in this trial.

Urbana:

Population pressures at Urbana were light to moderate for CEW and too low to allow evaluation of ECB, FAW, or sap beetle control. In the untreated check, there were 0.33 medium to large CEW larvae per ear (Table 2) at harvest. All treatments significantly reduced the number of damaged kernels on ear tips and the number of medium to large CEW larvae in ears at harvest. Under light pressure, the pyrethroids performed better than they have in any recent trials at this location.

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Table 1. Corn earworm (CEW) larvae and ear damage, means of 3 replications, Dixon Springs, IL, 13 August, 2008.

	Damaged kernels per ear tip	% control, tip damage	Damaged kernels per ear, side entry	Small CEW larvae per ear	Medium CEW larvae per ear	Large CEW larvae per ear	Percent control of M-L larvae
1. Untreated Check	15.2a	--	2.7a	0.1a	0.44a	0.24ab	--
2. Entrust 80W; 2 oz/A	1.9 d	88	0 c	0 a	0.04 b	0.02 c	91
3. EcoTec AG; 3 pints/A	10.4 c	32	1.5 b	0 a	0.24ab	0.24ab	29
4. Entrust 80W; 2 oz/A + EcoTec AG; 3 pints/A	1.9 d	88	0 c	0 a	0.02 b	0 c	97
5. CedarCide; 3 pints/A	11.0 bc	28	0 c	0.1a	0.18 b	0.13 bc	54
6. Pyganic 1.5EC; 18 fl oz/A + Dipel DF; 2 lbs/A	14.9ab	--	0.4 c	0 a	0.47a	0.29a	--
7. BC 0805, no insecticides	2.6 d	83	0 c	0.3 b	0.11 b	0 c	84
8. BC 0805 + Warrior 1ME; 3.8 fl oz/A in sprays 1, 3, and 5	1.0 d	93	0 c	0.1a	0.04 b	0 c	94

Within columns, means followed by the same letter do not differ significantly from each other at $P = 0.05$.

Table 2. Corn earworm (CEW) larvae and ear damage, means of 4 replications, Urbana, IL, 29 August, 2008.

Treatment	Damaged kernels per ear tip	Small CEW larvae per ear	Medium CEW larvae per ear	Large CEW larvae per ear	% Control of M-L CEW larvae
1. Untreated check	6.4a	0.20a	0.24a	0.09a	--
2. Bifenture 2EC; 2.5 fl oz/A	0.6 bc	0.02 b	0.03 bc	0.00 b	91
3. Warrior 1ME; 3.84 fl oz/A	0.2 c	0.00 b	0.01 bc	0.02 b	91
4. Warrior 1ME; 3.84 fl oz/A (sprays 1-4)	0.3 c	0.01 b	0.01 bc	0.00 b	97
5. Bifenture 2EC; 6.4 fl oz/A (sprays 1-2); Warrior 1ME 3.8 fl oz/A (sprays 3-4)	0.1 c	0.00 b	0.01 bc	0.00 b	97
6. Mustang Max 0.8EC; 3.0 fl oz/A	0.6 bc	0.04 b	0.03 bc	0.01 b	88
7. Baythroid XL 1EC; 2.2 fl oz/A	1.8 b	0.03 b	0.07 b	0.00 b	79
8. Hero 1.24EC; 8 fl oz/A	0.7 bc	0.01 b	0.02 bc	0.00 b	94
9. Voliam Express 1.25ZC; 7 fl oz/A	0.3 c	0.01 b	0.03 bc	0.00 b	91
10. Coragen 1.67SC; 5 fl oz/A + 0.5% MSO (v/v)	0.5 bc	0.00 b	0.06 bc	0.00 b	82
11. Coragen 1.67SC; 5 fl oz/A	1.1 bc	0.01 b	0.03 bc	0.00 b	91
12. Coragen 1.67SC; 5 fl oz/A + 0.5% MSO (v/v) (sprays 1, 3 and 5)	0.6 c	0.02 b	0.06 bc	0.00 b	82
13. Coragen 1.67SC; 5 fl oz/A + 0.5% MSO (v/v) (sprays 1-3); Warrior 1ME; 3.84 fl oz/A (sprays 4-7)	0.3 c	0.03 b	0.01 bc	0.00 b	97
14. Coragen 1.67SC; 3.5 fl oz/A + 0.5% MSO (v/v)	0.4 c	0.00 b	0.02 bc	0.01 b	91
15. Belt 4SC; 3.0 fl oz/A	1.3 bc	0.02 b	0.03 bc	0.01 b	88
16. Lannate 2.4SL; 1.5 pint/A	0.5 bc	0.04 b	0.02 bc	0.00 b	94
17. Radiant 1SC; 3 fl oz/A	0.7 bc	0.02 b	0.02 bc	0.00 b	94
18. Radiant 1SC; 6 fl oz/A	0.8 bc	0.04 b	0.05 bc	0.02 b	79
19. BC 0805; no insecticides	1.0 bc	0.18a	0.05 bc	0.00 b	85
20. BC 0805 + Coragen 1.67SC; 5 fl oz/A + 0.5% MSO (v/v) (sprays 1, 3 and 5)	0.4 c	0.06 b	0.00 c	0.00 b	100

Within columns, means followed by the same letter do not differ significantly from each other at $P = 0.05$.