

Great Lakes Fruit, Vegetable & Farm Market EXPO

December 9-11, 2008

DeVo Place Convention Center, Grand Rapids, MI



Pickling Cucumber

Tuesday morning 9:00 am

Where: Gallery Overlook (upper level) Room A-B

Recertification credits: 1 (1B, PRIV CORE)

CCA Credits: PM(1.0) CM(1.0)

Moderator: Bernard Zandstra, Horticulture Dept., MSU

9:00 a.m. A Season-Long Weed Control Program for Pickling Cucumbers

- Mark Van Gessel, Plant Science Dept., Univ. of Delaware

9:20 a.m. Agricultural Trade: Opportunities and Challenges

- Brian Bursiek, Pickle Packers International, Washington, DC

9:50 a.m. Parthenocarpic Pickle Production in Europe, Asia, and the USA

- Jos Suelmann, Nunhems Seeds, Haelen, Netherlands

10:30 a.m. Developments in Downy Mildew Control in Pickling Cucumbers

- Mary Hausbeck, Plant Pathology Dept., MSU
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A Season-Long Weed Control Program for Pickling Cucumbers



Mark VanGessel
Extension Specialist
Weed / Crop Management



Delaware Pickle Crop



Topics

- Herbicides
- Weed trials
- Double-cropped pickles

Non-Chemical Controls

- Few herbicides; need an integrated approach
- NO substitute for planning and field selection
- Cultivation – very important

Cucumber Herbicides

Mostly grasses

Prefar 4E
Command 3ME
Curbit 3EC
Strategy
Alanap 2SC

Poast 1.53 EC
Select 2EC

Between rows of plastic mulch only!
Gramoxone Inteon (OLF)
POST (directed & shielded)

Broadleaf weeds

Alanap 2SC
Sanda 75DF
Aim 1.9EW
(hooded spray)



Pickle Herbicides

PRE grass	PRE brdlvs	POST grass	POST brdlvs
Prefar	Sanda	Poast	Alanap
Curbit	Command	Select	Sanda
Strategy		Aim	
Alanap	(hooded applic)		

Between rows of plastic mulch only!
Gramoxone Inteon (OLF)
POST (directed & shielded)

Alanap

- Alanap (naptalam) 2SC:
- 1 gal/A - applied PPI or PRE.
- Alanap will control a limited number of grass and broadleaf weeds (pigweed and common purslane).
- Weed control is reduced on sandy soils with less than 1% organic matter.
- Alanap is always used in combination with other herbicides (Prefar).
- Used on 0-5% acreage



Soil-applied

Prefar

- Prefar (bensulide) 4E:
- 5 to 6 pts/A - applied PPI or PRE
- Prefar will control some annual grasses (barnyardgrass, large crabgrass, fall panicum, giant foxtail, and johnsongrass seedlings) but only suppression of certain broadleaves, such as common lambsquarters, common purslane, and pigweed species.
- Excellent crop safety.
- Used on less than 5% acreage.

Prefar 4-E

Gowan

Soil-applied

Curbit

- Curbit (ethalfluralin) 3E:
- 1.5 to 2 pts/A - Preemergence application only.
- Curbit controls a number of annual grasses but only a few broadleaf weeds (pigweed and carpetweed).
- Curbit provides better weed control than Prefar, yet it has a slightly higher risk of crop injury. Curbit is seldom used with early planted pickling cucumbers due to this reason.
- Used on 90-100% acreage.

Curbit EC
Selective Herbicide for Preemergence Weed Control in Cucurbits



Soil-applied



Command

- Command (clomazone) 3ME:
- 4-8 oz./A - Preemergence application only.
- Used predominately for annual grass, velvetleaf, jimsonweed, purslane, and common lambsquarters control.
- Good crop safety (Previously there was crop injury concern with another formulation of Command).
- Used on 90-100% acreage.

FMC

Soil-applied



Strategy

- Pre-packaged mixture of clomazone and ethalfluralin (Curbit + Command)

Strategy	Curbit	Command
pts/A	oz/A	oz/A
1.5	13	4
2	17	5
3	25	8
4	34	11



Soil-applied

Sandea Sandea

- Sandea (halosulfuron) 75DF:
- 0.5 to 1 oz/A - Preemergence application only.
- Sandea provides fair to good control of common ragweed, common lambsquarters, pigweed, cocklebur, jimsonweed, smartweed, galinsoga, and yellow nutsedge. Yellow nutsedge control is better when applied as a postemergence herbicides.
- Used on 50-75% acreage.

Gowan

Soil-applied



Alanap

- Alanap (naptalam) 2SC: 2 qts/A
- Alanap will control a limited number of broadleaf weeds. Alanap provides good to fair control of pigweed and common purslane.
- Avoid use early in the season due to increase risk of crop injury.
- Used on 5% acreage.
- No carry over restrictions with this product.

POST



Alanap

- Chemtura, has voluntarily cancelled the EPA registration for Alanap herbicide on cucurbits.
- There is no time limitation for sale or use
- The product should hold up well in storage for 3 or more years if properly stored.



Sanda

- Sandea (halosulfuron) 75DF: 0.5 to 1 oz/A + NIS
- Apply 3 to 5 lf stage, prior to female flowers appear
- Sandea provides good to excellent control common ragweed, pigweed, cocklebur, smartweed, galinsoga and yellow nutsedge.
- Lambsquarters and jimsonweed control is much better when Sandea is applied preemergence.
- Carry over can be an issue.
- Differences in control between *Amaranthus* species
- RESISTANCE
- Used on 50% acreage.



POST



Poast

- Poast (sethoxydim) - 1 to 1.5 pints/A + COC
- Used exclusively for grass control. Will control annual grasses and certain perennial grasses. Use with crop oil concentrate at 1 percent solution.
- Grass control will be best when the plants are treated while actively growing.
- Used on 25% acreage.



POST



Select / SelectMax Clethodim

- Select 2EC - 6 to 8 fl oz/A + COC
- Select Max 0.97EC - 9 to 16 fl oz/A + NIS
- Will control annual grasses and certain perennial grasses, although not as effective on goosegrass as Poast.
- Used on 10% acreage.



POST

Aim

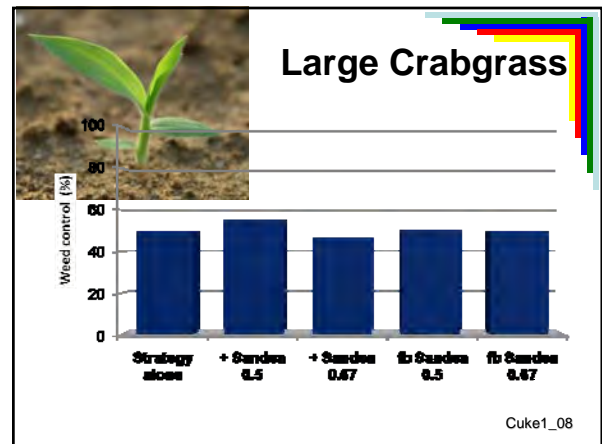
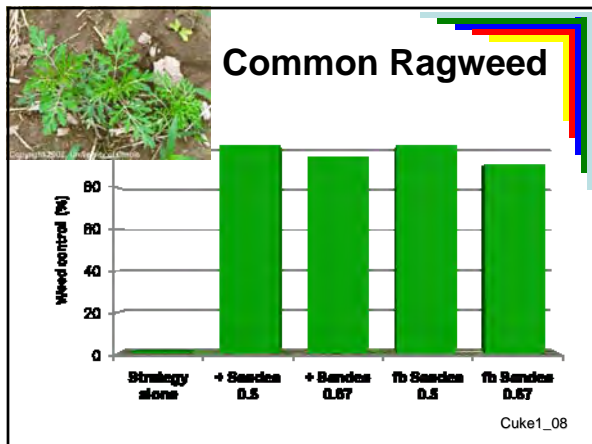
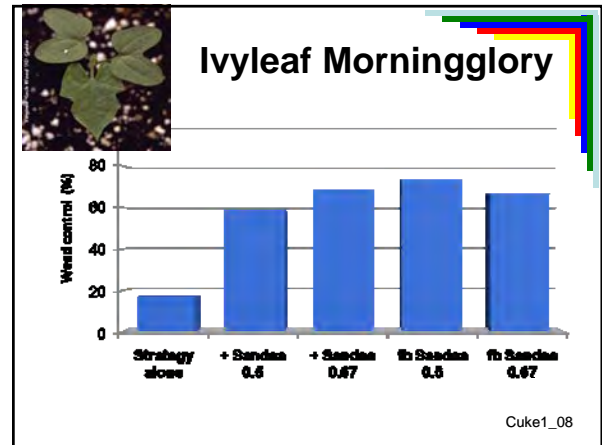
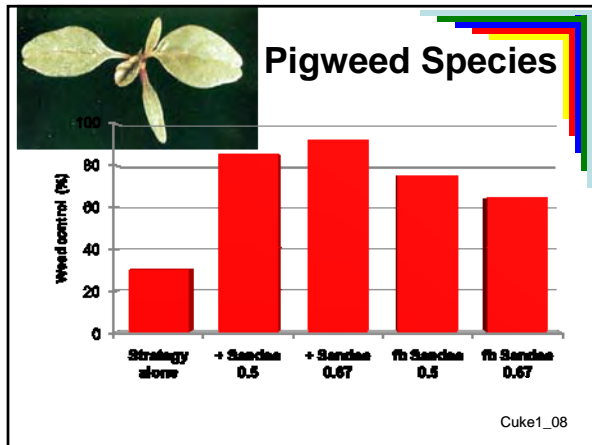
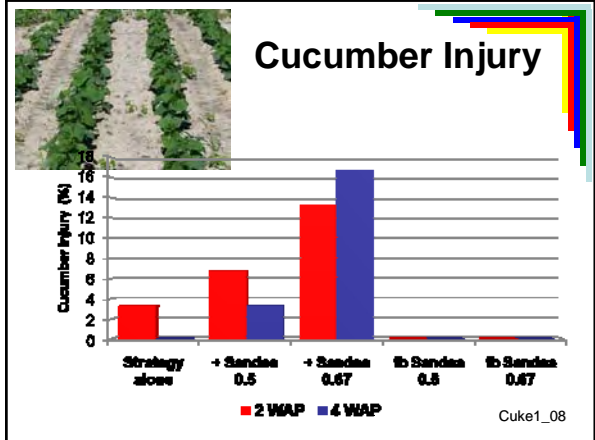
- Carfentrazone - Aim 1.9EW
- Hooded or shielded-applications
- Will severely injure vine crops
- Controls small broadleaf weeds – no grass control
- Use with crop oil concentrate



POST - shielded

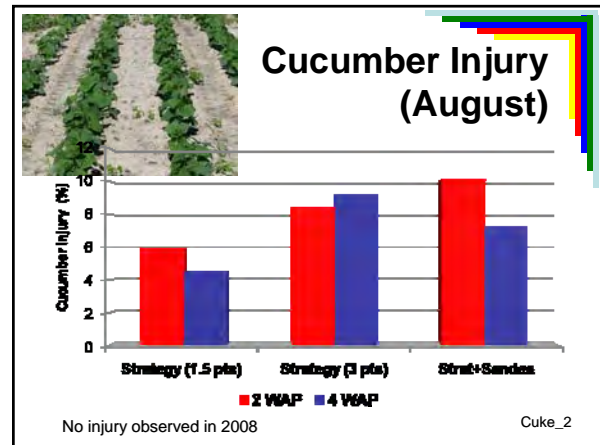
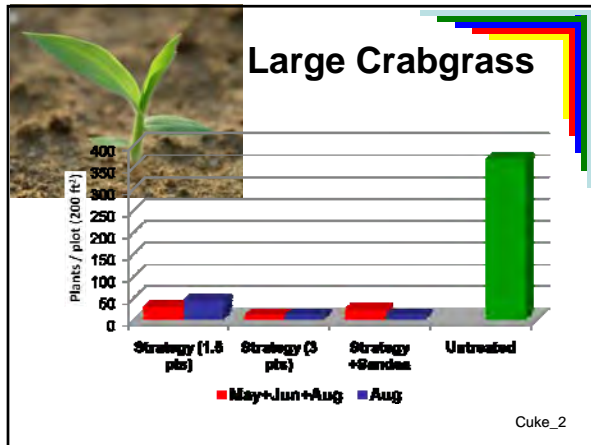
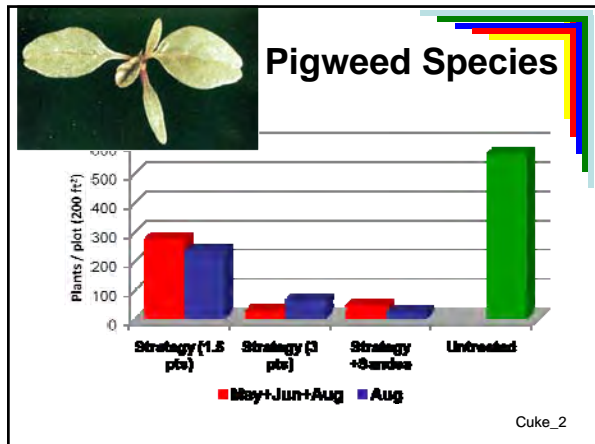
Sandea PRE or POST

- Sandea applied at 0.5 or 0.67 oz wt/A
- Applied at planting or 3 WAP
POST with NIS
- All plots received Strategy 1.5 pts at planting



Double-cropping Cucumbers

- Planting dates of May, Late June, August
- Herbicides
 - Strategy @ 1.5 pts/A
 - Strategy @ 3 pts/A
 - Strategy + Sandea @ 1.5 pts + 0.5 oz
- Applications (once or each preceding planting)
- No-tillage / Cucumbers only planted in Aug



Summary

- Sandea PRE or POST depends on species, but over many trials more effective POST
- Double-cropped cucumbers have no benefit of previous herbicide applications (no increase in crop injury)
- Herbicide are useful tools, but are not “stand alone” options for weed control in cucumbers



AGRICULTURAL TRADE

Brian Bursiek, Executive Vice President
Pickle Packers International, Inc.
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Agricultural trade throughout the world is changing. Keeping up with fluctuations in markets, new and amended regulations, and issues that affect trade is challenging. Technology and fewer trade restrictions have opened international markets for both buyers and sellers.

U.S. agricultural trade programs are designed to develop and expand commercial outlets for U.S. commodities and to provide international food assistance. Farmers in the United States produce more with the same or even fewer resources than 50 years ago. American farmers must look to foreign markets because production and production capacity is increasing faster than domestic demand.

Trade provides U.S. consumers with access to a wider variety of foods at reasonable prices, including those not produced domestically. Trade brings tropical fruits, coffee, and exotic cheeses to American consumers. Imports make fresh fruits and vegetables, such as asparagus and grapes, available at affordable prices during winter months. U.S. food processors rely on global markets for many food ingredients, such as cocoa (combined with domestic sugar and dairy products) for chocolate.

The Importance of Agricultural Trade

U.S. agriculture looks overseas to expand sales and boost incomes. Exports also generate additional economic activity that ripples through the domestic economy. According to USDA's Economic Research Service, every dollar of exports creates another \$1.48 in supporting activities to process, package, finance and ship agricultural products. This means that agricultural exports, which reached a record \$62.4 billion in 2005, will generate an additional \$92 billion in supporting business activities.

Exports also mean jobs: jobs that pay higher than average wages and are distributed across many communities and professions, both on the farm and off, in urban and rural communities. Agricultural exports currently provide employment for 836,000 Americans.

How Dependent Are Agricultural Industries on Overseas Markets?

Compared to the general economy, U.S. agriculture is twice as reliant on overseas markets. Agriculture's export reliance, measured as exports divided by farm cash receipts, ranged from 26 percent to 30 percent during the mid-1990s.

Bulk commodities have long depended on overseas markets. Nearly half of our wheat and rice crops are exported; about one-third of soybean, tobacco and cotton production is shipped overseas; and 20 percent of the corn crop is exported. High-value products, including fruits, vegetables and animal products, are increasingly dependent on overseas markets as well, and many are approaching or have already reached the same level of export dependency.

Since the mid-1980s, suppliers of high-value products have seen export sales outpace domestic sales by a wide margin. Today, for example, nearly 60 percent of U.S. cattle hides are exported, with a total export sales value of \$1.6 billion. The export dependency of the almond industry is even higher, with 67 percent of the crop shipped overseas. One-third or more of fresh table grapes, dried plums, raisins, canned sweet corn, walnuts and animal fats is exported.

Major Agricultural States Are Most Reliant on Foreign Markets

A top supplier of fruits, vegetables and tree nuts, *California's* agricultural industry, since 2003, has become more reliant on exports than the national average due to the sharp rise in the value of horticultural exports. It is the largest exporting state by a wide margin, with exports estimated at \$9.2 billion in 2004.

Washington State, with exports of \$1.9 billion in 2004, is highly reliant on export markets due to large fruit, vegetable and wheat shipments. *Texas*, with exports totaling \$3.4 billion, is the second largest exporting state.

Located in the grain and soybean belts, the *Midwest states* are generally more reliant on export markets. The most obvious examples are *Iowa, Illinois, Indiana, Kansas, Minnesota* and *Nebraska*.

Trade Agreements Expand Employment and Economic Opportunities

Export gains attributed solely to trade liberalization since 1985 are conservatively estimated by USDA's Economic Research Service at \$3.5 billion a year. Dozens of previous agreements have opened markets, reduced unfair competition, brought some discipline to sanitary and phytosanitary barriers, and introduced more effective dispute-settlement procedures in global trade.

Expanding existing market access and opening new markets under future trade agreements will significantly boost U.S. agricultural export sales. After all, 96 percent of the world's consumers live outside the United States. And many of them are in developing countries where almost all income growth is spent on food. The United States is the largest exporter of agricultural products in the world, and is a highly competitive producer of many products. And U.S. agriculture is one of the few sectors of our economy that consistently enjoys a trade surplus.

Here are some specific examples of how past trade liberalization has increased U.S. exports:

- **Uruguay Round**—The first multilateral trade round to address agriculture in a comprehensive manner, the Uruguay Round substantially addressed trade-distorting agriculture issues. It resulted in reduced export subsidies, cut excessive tariffs and opened the door for other trade facilitating measures.
- **North American Free Trade Agreement**—Implemented in January 1994, NAFTA established rules for free trade between Canada, Mexico and the United States. The agreement phases out most trade restrictions within 15 years, provides special safeguards for sensitive seasonal horticultural imports, sets country-of-origin rules, and disciplines sanitary and phytosanitary regulations. Together, our two NAFTA partners took an unprecedented \$15.3 billion in U.S. agricultural products, for the first time in 2001, exceeding our sales to Japan and the European Union (EU) combined.
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- **Looking to the Future Doha**—Priorities for future trade agreements that will benefit the U.S. food and agricultural sector include:
 - Completion of the Doha trade talks under the World Trade Organization (WTO);
 - Implementation of the Central American Free Trade (CAFTA-DR) agreement, which could expand U.S. farm exports by 1.5 billion a year;
 - A Free Trade Area of the Americas (FTAA) agreement to expand economic cooperation and opportunity in the Western Hemisphere; and
 - Other regional and bilateral trade agreements.

Trade Builds International Partnerships for Security

Trade builds transparency, counters corruption, strengthens the rule of law, and encourages economic integration – building partnerships in prosperity for the United States.

The Central America-Dominican Republic Free Trade Agreement supports freedom, democracy and economic reform in our own neighborhood. In the 1980s, Central America was characterized by civil war, chaos, dictators, and Communist insurgencies. Today, elected leaders in the region are, through CAFTA and other efforts, embracing transparency and economic reform, fighting corruption, and strengthening the rule of law.

To re-ignite economic growth and expand opportunity in the Middle East, the President proposed on May 9th, 2003, establishing a U.S.-Middle East Free Trade Area within a decade. According to the United Nations, the Middle East attracted just 0.7 percent of global foreign direct investment throughout the 1990s. Exports from the region -- over 70 percent of which are accounted for by oil and oil-related products -- grew at 1.5 percent per year over the same period, far below a global average growth rate of 6 percent. On a per capita basis, exports are significantly lower today than 20 years ago.

According to the World Bank, about 25 percent of people in the region live on less than \$2 per day. The UN reports that Arab countries have the world's lowest percentage of people who use the Internet or have access to a computer. The United States is committed to expanding trade in the region and providing economic hope for millions in the Middle East. The 9/11 Commission unanimously recommended that the United States expand trade with the Middle East as way to “encourage development, more open societies, and opportunities for people to improve the lives of their families.”¹

¹ Source: United States Department of Agriculture, Foreign Agricultural Service

PARTHENOCARPIC PICKLE PRODUCTION IN EUROPE, ASIA AND THE USA.

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Definitions

Parthenocarpy and femaleness are 2 independent characteristics but are often seen as the same thing, because mostly both characteristics are combined in a parthenocarpic variety.

Parthenocarpy means “virgin fruits”. What happens is that fruit develop, without fertilization of the ovules takes place. This characteristic can be present independent of the sex expression of the material. Most benefit of parthenocarpic material is gained if it is brought in to a 100% female background.

History.

In the early seventies from the previous century pickling cucumber growers in Europe and the US started to face new challenges. Not only labour cost went up sharply, also the availability of labour became a problem. In Europe as well as in the USA growers started looking for the possibilities of machine harvesting of pickles. Breeders tried to anticipate on this development by looking for characteristics that would improve the yield when crops were ones over harvested. Parthenocarpy was one of the characteristics that showed a lot of potential to improve yield. Fruit set does not depend on pollination anymore. Soon it was discovered that the yield did not increase sufficiently to make machine harvesting economically feasible in Europe. In the US machine harvesting developed due to a different cost structure and the availability of land, but the varieties used are not parthenocarpic.

The internal quality of the first parthenocarpic varieties was very poor, so many processors rejected parthenocarpy because of this. Since the introduction, breeders have improved the negative characteristics significantly and now more and more markets are seeing the benefits of parthenocarpy. Slowly the area where parthenocarpic varieties are grown is increasing.

Parthenocarpy

What are the points initiating more and more growers to choose a parthenocarpic variety.

-A big advantage is that no bees are needed anymore. In some countries it became difficult to find sufficient bee hives. In other countries growers just relied on naturally occurring insect to do pollination

-Bees do not like to work when the weather is bad. If pollination is required in a period of bad weather, the resulting yields of these fields is often disappointing. Parthenocarpy offers a kind of bad weather insurance.

-Incomplete pollination results in a high amount of nubs and rejects. The percentage in parthenocarpic varieties is much higher.

-To non-parthenocarpic varieties, pollinators had to be added to ensure sufficient male flowers and a sufficient pollination. Male flowers do not produce fruits. Replacing the male flowering plants by female plants increases the yield.

-It is known that pollinated fruits are growing thick faster than seedless fruits. The consequence is that the harvesting window of a parthenocarpic variety is wider resulting in harvesting a more expensive grade.

-When pollinated fruits are being used for cut product often seeds are floating in the jars, specially in the larger sizes. Parthenocarpic fruits do not have this problem, making the product looking much more appealing.

There are also a few disadvantages linked to parthenocarpy. The ones affecting growers have been solved by 30 years of breeding. The major one here is the internal quality. There are many parthenocarpic varieties available with excellent internal and brining quality. Another disadvantage will not be solved but is related to the breeding only. It is much more difficult to produce seeds on parthenocarpic materials than it is on mixed flowering materials. We have to change the sex expression to enable seed production. This is costly, labour intensive and not always easy to achieve.

Markets

Pickles are grown all over the world. The major production countries are USA, Mexico, Germany, and India. Also Eastern Europe and several Asian countries have important production areas. Each production area has its own peculiarities. The cultural practices differ, the decision makers can be grower or processor, even the way the product is being paid is largely different. Sometimes pickles are produced for the fresh market, sometimes for processing, whole fruits or cut product. In each area the balance of arguments for or against parthenocarpy can be different.

In the next table you can see where pickles are grown, what percentage is parthenocarpic and the tendency for this.

Country/area	% Parthenocarpy	Tendency
USA	1	-
Mexico	1	-
Turkey	60	↑↑↑
W Europe Outdoor	99	-
E Europe Outdoor	50	↑↑↑
Europe Indoor	100	-
Central Asia (Uzb, Kaz, etc)	10	↑↑↑
India	5	↑↑↑
Vietnam	100	-
Thailand	0	↑↑↑
China	0	-

Table 1. Pickle growing areas, parthenocarpy and tendency of parthenocarpy for the future.

Expectations for the US

Parthenocarpy itself does not give a higher yield. Most advantages can be observed if it goes together with a series of adjustment in the growing practise. The more picks can be done the more clear the advantages become.

At the moment a parthenocarpic variety in the US market has more value for multiple hand harvesting than when they are harvested by machine. If parthenocarpic varieties are introduced for the machine harvesting it should be in combination with some additional beneficial characteristics.

Finally one should keep in mind that if a variety is introduced with a yield potential that is substantially higher also fertilisation should be adjusted to that expectation.

DEVELOPMENT IN DOWNY MILDEW CONTROL IN PICKLING CUCUMBERS

Dr. Mary K. Hausbeck (517-355-4534) and B.D. Cortright
Michigan State University, Department of Plant Pathology

Pickling cucumber production in Michigan has a farm gate value of \$30.6 million with production plant receipts of \$240.7 million. These values are based on the approximately 38,000 acres of pickles harvested yielding 4.8 tons/acre and 21.9 million cases of finished product.

Michigan pickle growers have battled downy mildew, incited by the water mold, *Pseudoperonospora cubensis*, for four consecutive years. Downy mildew is well-known for causing catastrophic losses in a brief period of time. Unprotected foliage can become completely infected and appear to be frosted within 10 days of initial infection. This downy mildew pathogen is resistant to commonly used fungicides including Ridomil Gold-based products and the strobilurin fungicides (i.e. Cabrio, Quadris, and Flint). Results from our 2005-08 research identified a limited number of fungicides that are effective, but must be applied every 5-7 days when the weather favors disease.

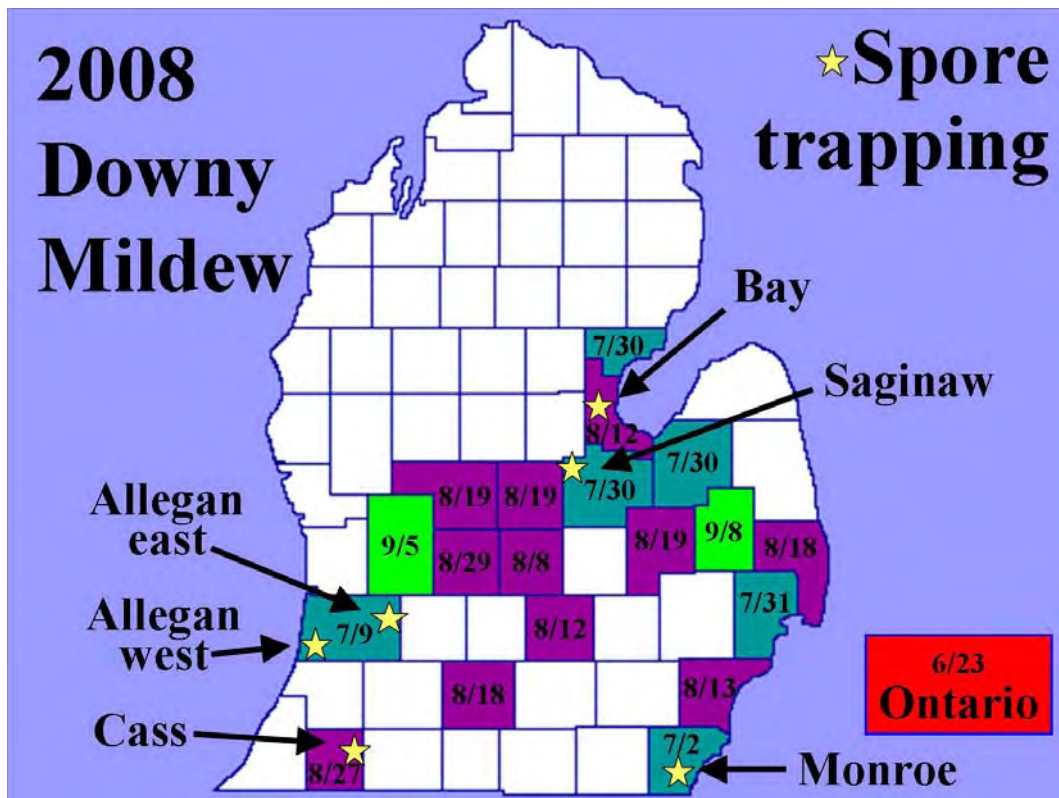


Fig. 1. Occurrence of downy mildew in the Great Lakes region. Stars designate sites of spore trapping.

Downy Mildew Spore Trapping 2008

The downy mildew reproduces via tiny, microscopic spores that act as seeds of the pathogen. Six spore traps were placed in five Michigan counties spread across the state (Fig. 1). A compound microscope is needed to have enough magnification to identify any downy mildew spores that may be present on the tapes. The spore traps helped to alert us to any influx of spores into those production regions, but were not used to time fungicide sprays. Since we did not have a trap in each field, it is possible that we could miss an isolated spore mass coming into a particular region (Fig. 2).

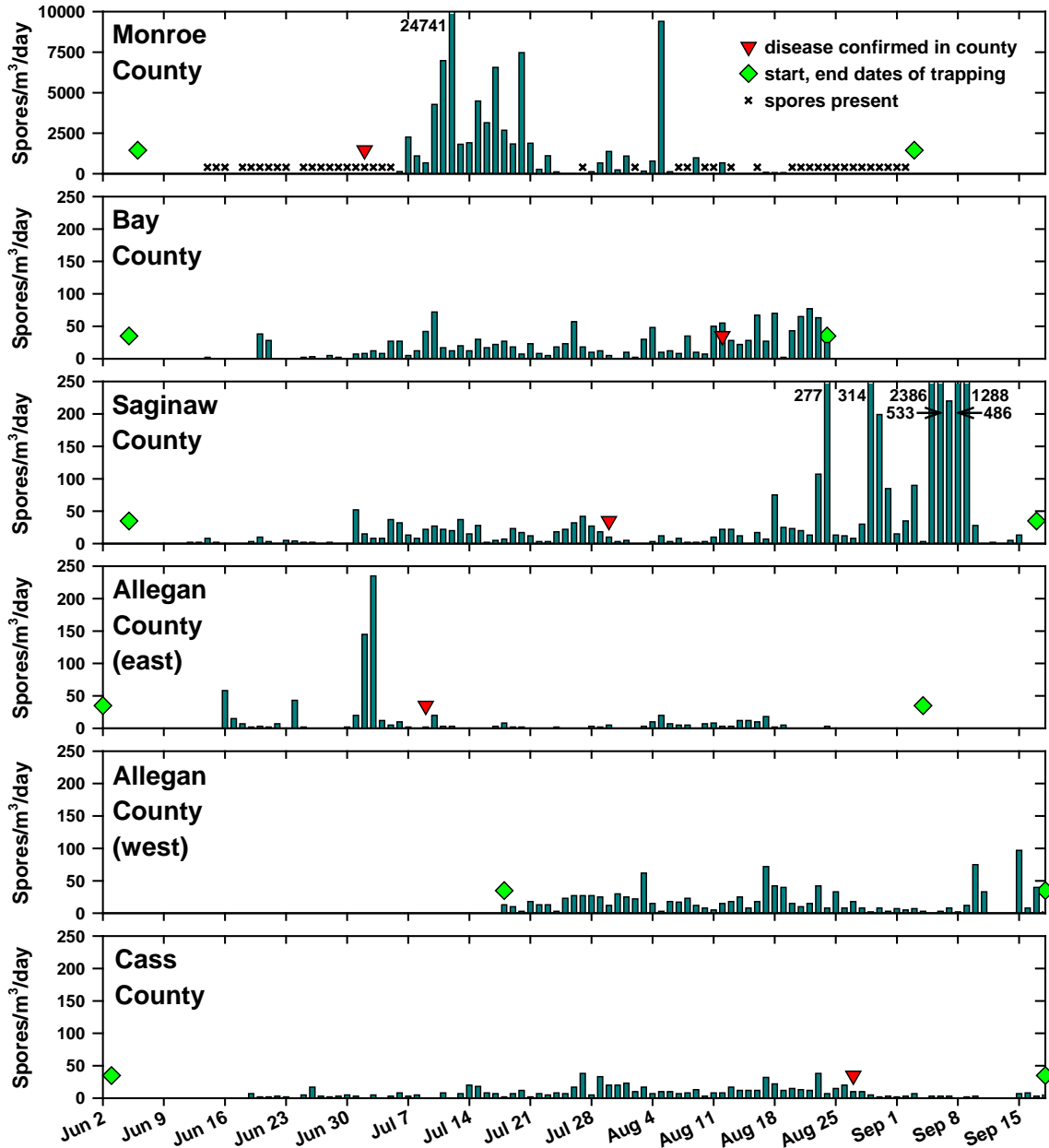


Fig. 2. Daily atmospheric spore counts for five Michigan counties.

Fungicide Trials

Chemical control must be focused on using the most effective products, alternating the products, and applying fungicides at short intervals. Results from our downy mildew research in past research trials and those from field season 2008 (Figs. 3,4) indicate that an effective spray program includes the following: Previcur Flex (propamocarb hypochloride) plus Bravo (chlorothalonil) alternated with Tanos 50DF (cymoxanil + famoxadone) plus mancozeb. Presidio is a newly registered product that is highly effective against downy mildew and against Phytophthora crown, fruit and root rot. All fungicides should be used in a tank mix with another fungicide effective against downy mildew (Table 1).

Table 1. Recommended products for managing downy mildew on pickle.

APPLIED BEFORE DISEASE (7-day intervals)	APPLIED AFTER DISEASE (5-day intervals)
<ul style="list-style-type: none"> Gavel 75WG (5 day PHI) Presidio 4FL (2 day PHI) Previcur Flex 6SC (2 day PHI) Ranman 3.6SC (0 day PHI) Tanos 50WG (3 day PHI) 	<ul style="list-style-type: none"> Presidio 4FL (2 day PHI) Previcur Flex 6SC (2 day PHI) Ranman 3.6SC (0 day PHI) Tanos 50WG (3 day PHI)
Alternate products and mix each with either: <ul style="list-style-type: none"> Dithane (mancozeb) 3 lb or Bravo (chlorothalonil) 1.5 pt 	Alternate products and mix each with either: <ul style="list-style-type: none"> Dithane (mancozeb) 3 lb or Bravo (chlorothalonil) 2 pt

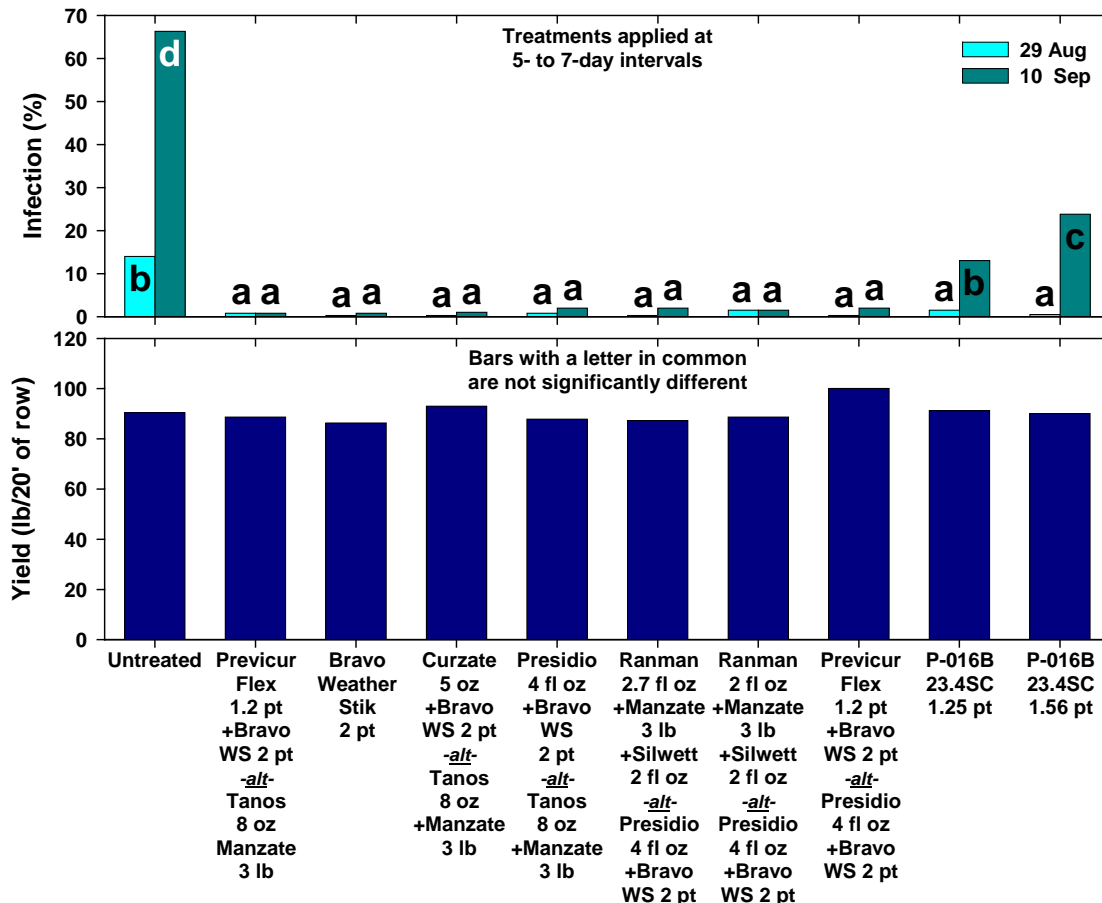


Fig. 3. Evaluation of fungicides for control of downy mildew of pickling cucumber, trial 1.

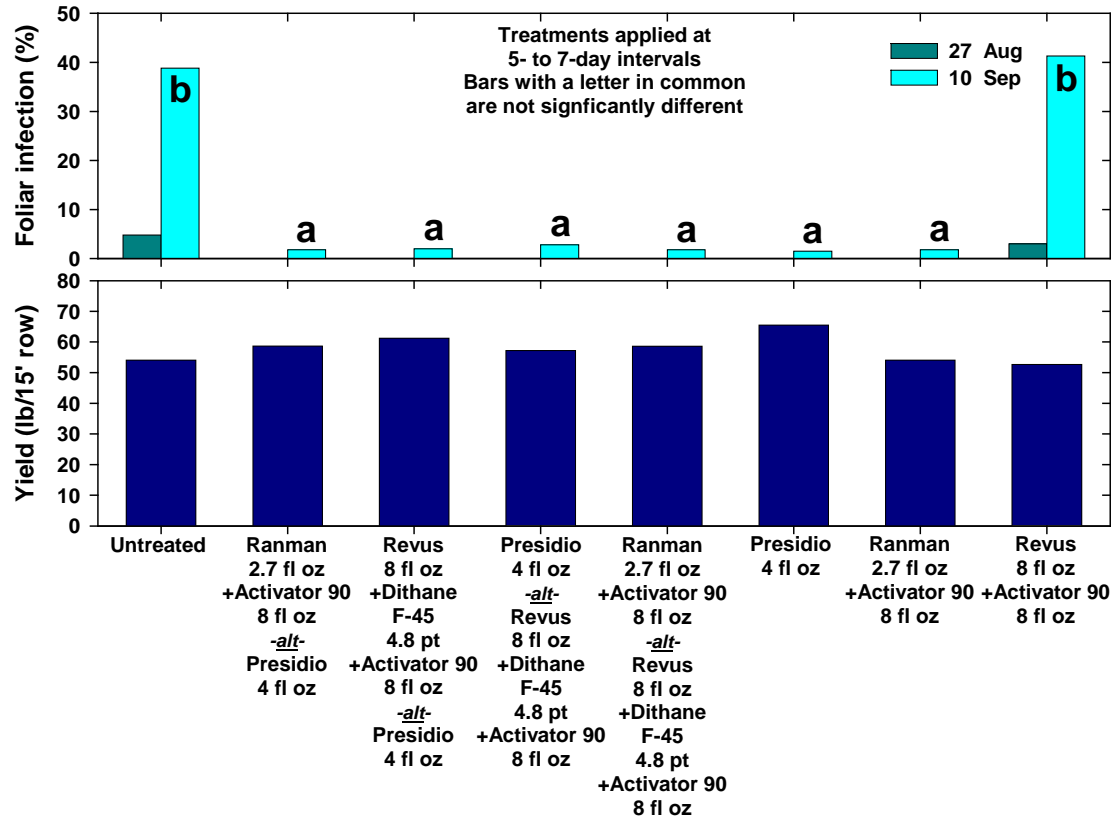


Fig. 4. Evaluation of fungicides for control of downy mildew of pickling cucumber, trial 2.

Acknowledgements

This research has been funded by the Pickle and Pepper Research Committee for MSU and the Agricultural Research Fund, Pickle Packers International Inc., Project GREEN, the Michigan Agricultural Experiment Station and the North-Central Integrated Pest Management Program.