UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

Volume 21, Number 2 March 12, 2010

This document summarizes the research and extension activities undertaken at the University of Massachusetts in 2009 on vegetables and herbs popular among the large and expanding ethnic communities in the United States.

In This Issue

Research and Extension Activities Implemented by the UMass Ethnic Crops Program in 2009

Frank Mangan, Maria Moreira, Zoraia Barros, Celina Fernandes, Renato Mateus, Fernando Finger, Amy Koenig, Rich Bonanno, Wes Autio, Mildred Alvarado, and Rob Wick

The demographics of the United States are changing rapidly as immigrant populations increase at rates not seen since the early 20th century. According to the U.S. Census Bureau, the U.S. Hispanic population was 38 million in 2003 and is expected to jump to 49 million by 2015. The Asian population was 12 million in 2003 and expected to grow to over 17 million by 2015. This dramatic increase in immigrant and ethnic populations has had a significant effect in the U.S. marketplace, including fresh fruit and vegetable markets. In 2002, Hispanics, Asian-Americans, and African-Americans represented 31% of the U.S. population, yet they accounted for 37% of all fresh produce sales in supermarkets. In 2006, Hispanics had a buying

Figure 1. Members of the UMass Ethnic Crops Team with Michael Pollan at an event on Martha's Vineyard in 2009. (From left – right: Celina Fernandes, Amy Koenig, Michael Pollan, Zoraia Barros and Renato Mateus.)

power of $798 billion. This figure is expected to reach $1.2 trillion by 2011, accounting for 9.5% of total U.S. buying power.

A majority of the recent immigrants to the United States are coming from Latin America, Asia and Africa; many of these countries are located in the tropical or sub-tropical regions. Despite this fact, the majority of the vegetable crops popular in these regions can be grown in the Northeastern U.S. For example, more than 70% of the 25,000 acres of vegetables produced in Massachusetts have their center of origin in tropical and sub-tropical climates. Examples are sweet corn (*Zea mays*), pumpkins and squash (*Cucurbita spp.*), peppers (*Capsicum spp.*), and tomatoes (*Solanum lycopersicum*). There are few vegetable crop species in the world that cannot be grown in the Northeastern U.S.

In some cases the ethnic crop may grow in our climate, but the yield will not be as high, or the quality as good, compared to other parts of the country or world with more favorable climates for the specific crop. For this and other reasons addressed below, it is always recommended to produce a small amount of a new crop initially to become familiar with all aspects of the production and marketing before producing the crop in any significant quantity.

These demographic changes and growing conditions in our state for crops popular among new immigrants create an exciting marketing opportunity for growers in Massachusetts. Researchers at the University of Massachusetts have been evaluating cultural requirements and market opportunities for vegetable crops used by the growing immigrant populations in our state and region since 1996. Research began with crops popular among Puerto Ricans and Dominicans, and has expanded subsequently into vegetable crops popular among other Latino groups, Asians, and Brazilians. Due to this research, retail sales of crops identified by this research and introduced to commercial farmers in Massachusetts have totaled over $3,000,000 since 2000. Table 1 gives a selected list of crops introduced to commercial growers by the UMass Ethnic Crops Program.

Table 1. Selected list of crops researched at UMass and produced by commercial farmers in Massachusetts for ethnic markets.

Crop Name	Latin Name	Where Popular
Abóbora japonesa	*Cucurbita maxima X C. moschata*	Brazil and Japan
Ají dulce	*Capsicum chinense*	Spanish-speaking Caribbean
Calabaza	*Cucurbita moschata*	Spanish-speaking Caribbean
Chipilín	*Crotalaria longirostrata*	Central America and Southern Mexico
Culantro	*Eryngium foetidum*	Spanish-speaking Caribbean and S.E Asia
Jiló	*Solanum gilo*	Brazil and West Africa
Okra	*Abelmoschus esculentus*	India, Latin America, Southern US
Maxixe	*Cucumis anguria*	Brazil
Taioba	*Xanthosoma sagittifolium*	Brazil and West Africa
Water spinach	*Ipomoea aquatica*	Asia

In order to meet the regional demand for crops by immigrant populations, it is critical to understand the existing supply for the specific crops and the markets that

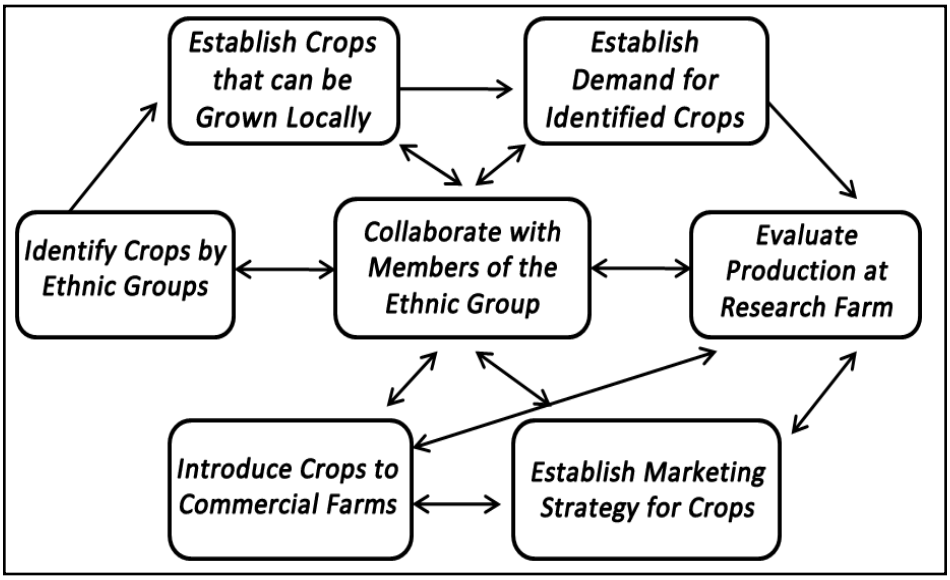

Figure 2. Graphic outline of the UMass Ethnic Crops Program.

want to carry them. There are definitely opportunities, but as is the case with any crop it is important to procceed with caution and to have detailed information on all aspects of the crop to be grown on your farm before producing it in any volume.

The UMass Ethnic Crops Program has worked closely with commercial farmers on all aspects of the distribution and marketing of these new crops. This has included the use of ethnic and traditional media. An understanding of the power of ethnic media outlets has been very important to maximize the sales of fresh products to target communities. For example, Brazilian cable TV, radio and newspapers are important means to promote locally-grown crops popular among Brazilians.

Related to this, the importance of promoting these crops in the market-place with personnel who speak Portuguese and understand the culture and cuisine of Brazil cannot be underestimated.

Figure 2 gives a graphical representation of the systematic approach used by the UMass Ethnic Crops Program for evaluating crops to be produced locally for target ethnic groups.

Chipilín (Crotalaria longirostrata)

Chipilín is a leguminous plant used as an herb in some parts of Central America and Southern Mexico. It is a perennial crop that can be grown as an annual in temperate climates such as Massachusetts. Chipilín is especially popular in El Salvador and Guatemala where it is used in soups and as an ingredient in tamales. It has a distinctive aroma and flavor that is released when cooked.

Figure 3. Chipilín before covered with row cover at the UMass Research Farm in 2009.

Research began on this crop at the UMass Research Farm in Deerfield in 2006 with seed from the Salvadoran Ministry of Agriculture (through USDA). The plant grew well in our climate, but was severely damaged by potato leaf hopper (*Empoasca fabae*) in initial trials. This insect severely damages the leaves, rendering them unmarketable. Research continued in 2007 and 2008 to evaluate cultural practices, with an emphasis on management of potato leaf hopper.

The most effective strategy for managing this insect has been the use of row cover in combination with the insecticide Pyganic (active ingredient Pyrethrin). In our work, Pyganic gives short-term management of potato leaf hopper with very little residual activity. Based on our research, the use of row cover in combination with the Pyganic has been essential to maintain season-long control of potato leaf hopper. The use of row cover will also increase the yields of chipilín by raising the temperatures under

the cover, but will also add to the production costs.

Chipilín can be direct seeded or started as transplants. Given the very small seed and the short growing season in the Northeastern US, using transplants is recommended.

Research activities in 2008 and 2009 have evaluated the optimum temperature and packing strategies for maintaining good quality of chipilín. Based on this work, it is recommended to wash chipilín after harvest in water at 55 F° or cooler to remove the field heat and then pack in polyethylene bags with some holes to allow aeration. The polyethylene bags help to maintain high humidity, which is as important as temperature to maintain high chipilín quality. Chipilín washed in cool water, packed in polyethylene bags and stored at 45 F° maintained high quality for up to ten days (Figures 5 and 6).

In 2009, the UMass Ethnic Crops Program worked with two cooperating farmers to produce and market chipilín, based on successful market work in 2008, and to continue to evaluate the market potential for this herb outside of Massachusetts. Chipilín produced in Massachusetts was sold in markets in Massachusetts and New York on a weekly basis in 2009. In addition, chipilín produced in Massachusetts was sold in one supermarket chain in Washington DC that services the large Salvadoran population in that region.

Figure 4. Transplanting three acres of chipilín at the UMass Research Farm in 2009.

Figure 5. Chipilín harvested and packed in Massachusetts at a supermarket in New York.

Figure 6. Chipilín produced at the UMass Research Farm for sale at a supermarket in New York in 2009.

Taioba (Xanthosoma sagittifolium)

Taioba is the leaf of tannia *(Xanthosoma sagittifolium)*, a species originally from the Amazon that is very similar in growth and appearance to taro (*Colocasia esculenta*) which is from Southeast Asia. The leaves are used as a leafy green in parts of Brazil and West Africa. Leaves must be cooked to eliminate calcium oxalate, an irritant; taioba is never eaten raw.

Preliminary work on taioba began at the UMass Research Farm in 2006, focusing on production techniques and evaluating the market potential. This plant, despite being from the Amazon, grows well in our climate and there is a strong market demand among Brazilians and potentially non-Brazilians.

Taioba is a perennial in Brazil, but must be grown as an annual in Massachusetts since it is extremely frost sensitive. The current production system developed by the UMass Ethnic Crops Program is to produce transplants from corms in the greenhouse and transplant them into the field after the danger of frost. Current recommendations for row spacing are one foot in the row, staggered for additional space, with rows six feet on center.

Figure 7. Taioba at the UMass Research Farm in 2009.

At the UMass Research Farm we use black plastic with drip irrigation. Taioba can tolerate shade, but should be grown in full sun in order to produce maximum yield in the Northeastern US.

Leaves can be harvested approximately 4 weeks after transplanting, depending on the size of transplants and climate, and each plant will produce a marketable leaf every 10 – 14 days in Massachusetts. It is best to cut a fully-expanded leaf when there is another leaf

Figure 8. Taioba growing at Fazenda Esperança in the town of Simonésia, Minas Gerais Brazil.

that is unfolding on the plant – it can be cut anywhere on the stem. If you do cut the only fully-expanded leaf from the plant, make sure not to damage the next leaf that is bring produced from the stem, usually about 2 inches down from the bottom of the leaf.

In the four years that this crop has been evaluated at the UMass Research Farm and on cooperating farms, the insect pests that have been encountered have not required management. Fungus gnats (*Bradysia spp.*) have been very aggressive on transplants in the greenhouse. In 2009, yields were dramatically reduced from damage caused by the fungi *Rhizoctonia solani* and Pythium spp. These diseases were on the transplants and became more aggressive when they were put in the field due to the very wet and cool weather in June.

In 2009, corms were imported from a commercial farm in Brazil (Fazenda Esperança in the town of Simonésia, Minas Gerais Brazil – Figure 8) and forced in a commercial greenhouse to produce transplants that were put into the field in early June. Research focused on cultural practices for field production, propagation techniques to produce annual transplants, and continued market analysis.

Figure 9. Taioba transplants in the greenhouse shortly before being put in the field in 2009.

Figure 10. Transplanting taioba at the UMass Research Farm in 2009.

One of the most important barriers to production of taioba in the Northeastern United States is access to inexpensive corms to be used for forcing transplants for field production. An experiment was implemented at the UMass Research Farm in 2008 and 2009 to evaluate the optimum cutting regime for taioba yield, and also its effect on corm growth. The experiment consisted of four treatments: A. Control (no leaf harvest during season); B. Harvest every week; C. Harvest every two weeks; D. Harvest every three weeks. Each plot had ten plants in 4 blocks arranged in a randomized complete block.

Plants were put out in the field on black plastic six feet on center with drip irrigation. In 2008, plants were placed every two feet in the row and one foot in the row in 2009, for a plant population of 3,600/acre in 2008 and 7,200/acre in 2009. Leaves were harvested on a weekly basis according to treatments. Leaves were counted and fresh weight was taken and recorded.

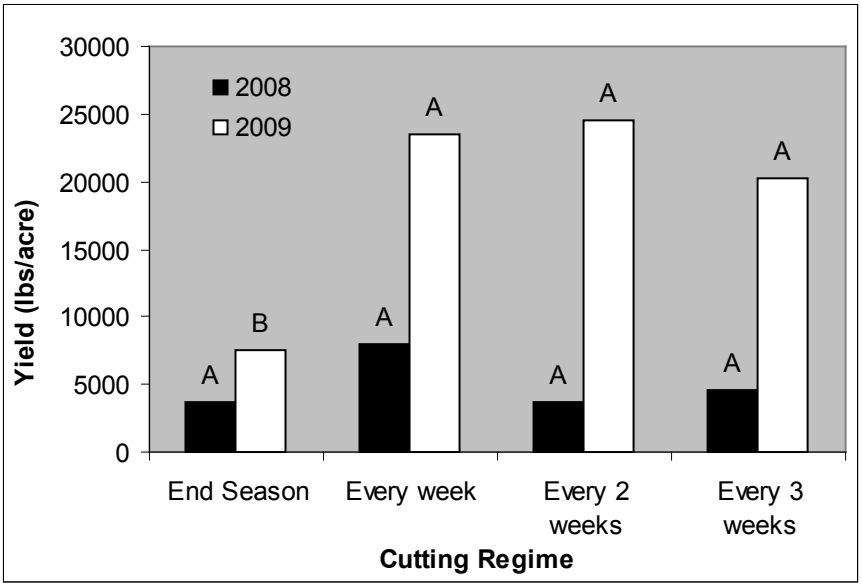

Figure 11. Yield of taioba leaves produced at the UMass Research Farm for four different cutting regimes in 2008 and 2009. (Mean values not followed by the same letter differ by Duncan's Multiple Range Test at p=0.05)

Yields were much higher on a per acre basis in 2009 since the plant population was twice as high as in 2008 (Figure 11). In 2009, harvesting the leaves every one, two and three weeks produced much higher yields compared to one harvest at the end of the season. There was no significant difference among these treatments in 2008.

In 2009, approximately 2,000 pounds of taioba were harvested at the UMass Research Farm and sold in targeted markets to evaluate market demand. The largest sales were to an ethnic supermarket chain with 14 stores in Massachusetts, Rhode Island, New Jersey and Florida. They wanted at least 300 pounds/week for their stores, which we were not able to provide due to disease issues described above. Sales were also made to a small Brazilian corner store in Framingham MA, a Brazilian jobber who supplies Brazilian markets and restaurants in the Boston area, and ethnic and non-ethnic stores on Martha's Vineyard. As with the supermarket chain, we were not able to supply all of the demand to these markets.

A preliminary experiment was initiated to evaluate the response of taioba leaves at two different storage temperatures, 35F° and 45F°, with and without polyethylene packaging. The quality of the taioba leaves deteriorated after four days at both temperatures when not

Figure 12. Taioba being grown in the UMass greenhouse to propagate corms for the following season.

packed in polyethylene bags. The leaves stored at 35F°, both in polyethylene plastic and without, displayed symptoms of chilling injury after several days; no chilling injury was observed at 45F°. Taioba leaf quality was excellent after 16 days when stored at 45F° in polyethylene.

At the end of the season in 2009, approximately 4,000 corms were dug up by hand and processed for storage. These corms will be a source of plants for 2010 field production. Each corm was inspected and those with substantial disease were discarded. If corms had sufficient healthy tissue, diseased portions were cut off. All corms were then dunked in water and then dipped in a solution with hydrogen dioxide (27% a.i) to clean pathogens on the corm surface. The corms were then brought into a greenhouse and laid out to dry. Corms larger than 150 grams were packed for storage and the smaller ones were potted up and put in a greenhouse to encourage more corm growth. Corms were packed in vermiculate and stored at 45F° and 70% humidity.

After six to eight weeks of growth in the greenhouse, the corms of the plants in the greenhouse were inspected and diseased corms were thrown out or cut as described above and packed for storage.

Maxixe (Cucumis anguria)

Maxixe is a type of cucumber that was brought to Brazil from Africa during the slave trade. This crop was grown extensively in New England in the 18th and 19th centuries, known as “West India Gherkin” since it was thought to have originated from the West Indies. It was eaten raw and also pickled for consumption in the winter.

“Maxixe do Norte” is the most popular variety of maxixe in the Northeastern states of Brazil where it is consumed boiled, fried, stewed or used fresh in salads. The fruits of maxixe, which are about the size and shape of a chicken egg, can have either supple spines or smooth skin and are pale green in color (Figure 13).

Figure 13. Graduate student Celina Fernandes with maxixe at the UMass Research Farm in 2009.

Maxixe is grown in Massachusetts using the same production practices as cucumbers. Maxixe is a frost sensitive crop, as all cucurbits, and should be seeded or transplanted after the threat of frost has passed. If starting as transplants, they should be started in the greenhouse four weeks before planting in the field. It is recommended to have at least two staggered plantings since maxixe will produce marketable fruit for only three to four weeks. The second planting should be started about four weeks after the first one to ensure season-long production. Maxixe will

start producing marketable fruit in five to six weeks (if started as transplants – later if started from seed), and if there are two plantings there should be production until late September or frost.

A focus of our work in 2009 was to evaluate different seed sources of maxixe and cultural practices at the UMass Research Farm in Deerfield Massachusetts. Five seed sources were evaluated for yield and earliness in an experiment with five replications. Figure 15 shows the total and marketable yield for the maxixe fruit for the five different seed sources. The total fruit yield was more than twice the yield of the marketable fruit for all seed sources. This was due to a relatively high percentage of diseased fruit and also fruit that turned bitter. The maxixe from the seed company Isla had the highest yield (Figure 15).

A factorial experiment was also implemented at the UMass Research Farm in order to evaluate the effects of row spacing and the use of trellis on yield, quality and earliness of maxixe fruit. There were five replications with five spacing in the row: 6, 12, 18, 24 and 30 inches. Each transplant plug had two plants, and the spacing between rows was six feet. For each row spacing, the plants were trellised using plastic fencing attached to wooden stakes, or left to grow on the ground.

Figure 14. Sliced maxixe grown at the UMass Research Farm in 2009.

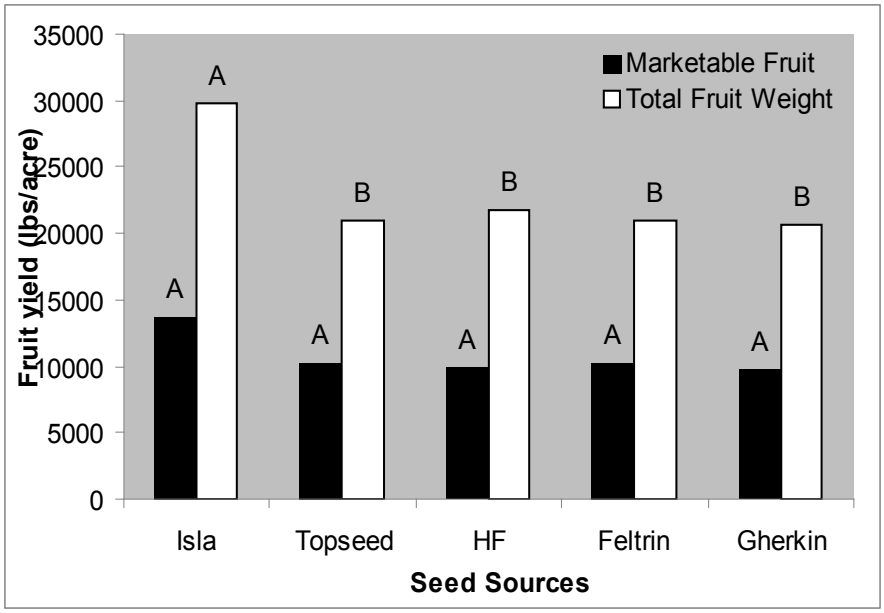

Figure 15. Total and marketable fruit yield for five sources of maxixe at the UMass Research Farm in Deerfield MA in 2009. (Mean values not followed by the same letter differ by Duncan's Multiple Range Test.)

There was no statistical difference in total and marketable yield of maxixe when trellised or left on the ground (Figure 16). The yield of total fruit and marketable fruit decreased as the plant population decreased (Figure 17). Based on this work, it is recommended to place transplants at 18 inches in the row when using rows that are six feet on center.

We also worked with four cooperating farmers in 2009, located in Lancaster,

Deerfield, Methuen and Edgartown (Martha's Vineyard), to evaluate the production and market potential for maxixe.

Maxixe produced by cooperating growers was sold in three chain stores, some smaller ethnic markets and at farmers' markets.

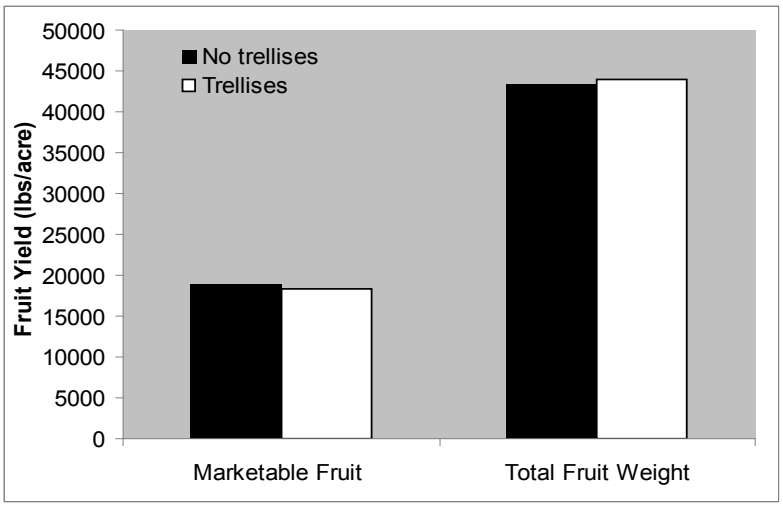

Figure 16. Total and marketable yield of maxixe fruit grown with and without trellises. (There was no statistical difference observed.)

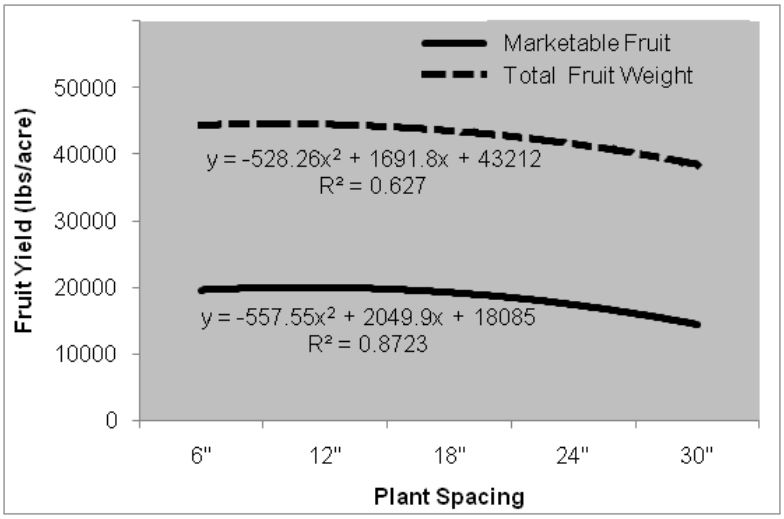

Figure 17. Total and marketable yield of maxixe fruit at five different row spacings.

Figure 18. Maxixe grown by a commercial farmer in Methuen, MA bought by a customer at a Market Basket Store in Chelsea, MA in 2009.

Okra (Abelmoschus esculentus)

Okra is a warm-season crop, called “quiabo” in Portuguese, that is very popular in many parts of Brazil, among many other countries. It is originally from India and was introduced to Brazil with the slave trade. Frango com Quiabo (chicken with okra- in portuguese) is a Brazilian dish that is especially famous in the state of Minas Gerais, the state of origin of a very high percentage of Brazilians living in the US. The most common variety in Brazil is “Santa Cruz 47”, a smooth type as opposed to the undulating type that predominates in the U.S.

Okra is frost sensitive and can be started from seed or as a transplant – it is recommended to grow from transplant in Massachusetts for early harvest. It should be grown for four to six weeks in the greenhouse before planting into the field. Flowering will occur as soon as 45 days after seeding, depending on the variety, and pods are ready for harvest four to five days after flowering. The tenderness of the pods decreases as the size of the pod increases. Most varieties will lose their tenderness, desired by the market, when they exceed three inches in length. For this reason okra plantings must be picked almost every other day.

Figure 19. Okra at the UMass Research Farm in 2009.

In 2009, research focused on evaluating varieties of okra for their performance in our climate. Seven varieties were selected for this experiment: “Annie Oakley”, “Baby Bubba”, “Cajun Delight”, “Chifre de Viado”, “Clemson Spineless”, “North and South” and “Santa Cruz 47”. Where “Clemson Spineless” is the most popular variety grown in the

Figure 20. Okra planting at Pleasant Valley Gardens in Methuen MA in 2009.

Southern US, “Cajun Delight” is perhaps the most common variety grown in the Northeastern US. “Chifre Viado” and “Santa Cruz 47” are two varieties commonly grown in Brazil.

The results showed that “Santa Cruz 47” gave the highest yield and “Cajun Delight” began producing the earliest (Date not shown). Approximately five week after transplanting, the plants began to show signs of Verticillium Wilt (*Verticillium spp.*). Verticilium, a soil-borne pathogen, is the same disease that affects eggplant. The plants began to show water-soaked lesions on the leaves (Figure 21); the disease advanced rapidly and by the end of August most plants were almost completely bare (Figure 22).

The symptoms of verticillium wilt are yellowing, wilting of leaves and dieback of branches, often one at a time or on one side of the plant. The water transporting cells in the plant become clogged with fungal hypae and the plants droop and wilt.

It is recommended to avoid the area that is infested by Verticillium with susceptible plants such as okra, eggplant, tomatoes and potatoes. The microsclerotia can survive in the soil for multiple years, so plant rotations of at least four years with non-susceptible plants are recommended.

Figure 21. Okra leaves at the UMass Research Farm with symptoms of Verticillium wilt in 2009.

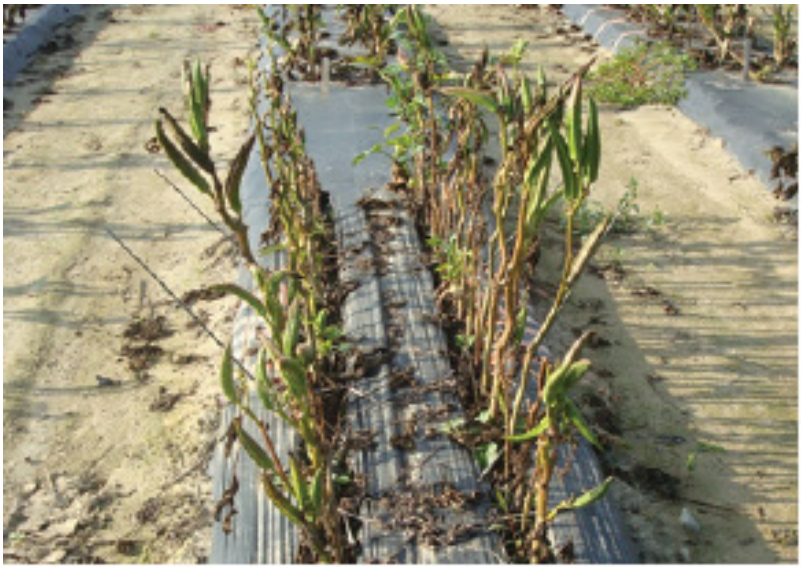

Figure 22. Advanced symptoms of Verticillium wilt on okra plants at the UMass Research Farm in 2009.

The two varieties popular Brazil, “Santa Cruz 47” and “Chifre Viado”, showed tolerance to Verticilium in the trials at the UMass Research Farm. Work in 2010 will be evaluating the mechanism for resistance in these varieties.

Okra flower.

Evaluation of a High Tunnel for Ethnic Crop Production

In early 2009, a "hoop house' was purchased from a commercial farmer in Amherst and put up at the UMass Research Farm in Deerfield MA. It was actually a car port that the farmer was using as an unheated greenhouse. The house measured 78' by 12' (936 square feet).

Before setting up the hoop house, lime was applied according to soil test results and then two rows of black plastic were laid (Figure 23). A three-year plastic was then put up. The house cost $500 and the plastic cost $350.

Small amounts of the four ethnic crops described above were put into the hoop house for evaluation. Transplants of taioba, chipilín, maxixe, and okra were put on the plastic in the hoop house on May 13, between two and three weeks before these crops were put in the field. The sides were raised on days when the temperatures in the hoop house rose above 90 F° and the sides were lowered each evening to hold in the heat.

In general, all of the crops produced marketable leaves/fruit two weeks before the same crops in the field. The hoop house seemed most appropriate for the taioba and maxixe. The taioba, as a perennial, produced leaves throughout the season. Given that the plants produce large leaves, and the high wholesale price ($4/pound), there was sufficient yield per plant to justify this crop in a hoop house. The maxixe, which also produced marketable fruit two weeks before the field production, also did well in the hoop house. One advantage to the early yield was that samples could be sent to markets for evaluation before major field production commenced. This crop also has a high wholesale price ($2/pound) which helps to justify the extra production costs of the high tunnel compared to field production.

The chipilín and okra were not as well suited to hoop house production, mainly due to the small yield from each plant (small pods with okra and small stems with chipilín). In the case of okra, it does not have as high a wholesale price ($1/pound) which also hinders its viability for high tunnel production. Chipilín has a much higher wholesale price ($4/pound), but its low production/plant is a disadvantage.

Figure 23. Putting up a hoop house at the UMass Research Farm in Deerfield in May of 2009.

Figure 24. Putting in transplants in mid May 2009.

Figure 25. Crops in the high tunnel in June of 2009.

The Introduction of Locally-Grown Brazilian Vegetables to the Island of Martha's Vineyard.

In 2008 and 2009, a collaborative project was implemented to introduce five Brazilian vegetable crops popular in Brazil to farmers, homeowners and markets on Martha's Vineyard. Three of the crops, taioba, maxixe and okra, are described above. The other two crops were abóbora japonesa (*Cucurbita maxima X C. moschata*) and jiló (*Solanum gilo*). Abóbora japonesa is one of the most popular hard squashes in Brazil and jiló is a very popular type of eggplant in Brazil.

The Island has a large Brazilian population, estimated to be as high 3,000 residents, which would be 20% of the winter population. Activities focused on making transplants of Brazilian vegetables available to Brazilians and non-Brazilians in the spring, and to work with three commercial farmers on the Island to grow the above-mentioned crops.

Figure 26. Taioba transplants being sold at an event at a Brazilian market on Martha's Vineyard on May 23, 2009.

Figure 27. Maxixe, labeled as "Brazilian Cukes" for sale at a farm stand on Martha's Vineyard in 2008.

Events were planned and advertised in the spring of 2008 and 2009 to sell transplants of taioba in 2008, and taioba, maxixe, okra, and jiló in 2009. In 2008, the event was targeted to the Brazilian population, and was advertised in the local Brazilian businesses and churches. In 2009, the event was also advertised in the non-Brazilian community. The sales of transplants at events are listed in Table 2.

Three commercial farmers on the Island were also given transplants of taioba, maxixe and abóbora japonesa to trial on their farms in 2008 and 2009. Cooperating farmers were provided with production information by UMass and were visited by UMass researchers several times during the seasons to provide technical assistance and recommendations on both production practices and market promotion.

In addition to targeting the Brazilian population on the Island, who are very familiar with these vegetables, a concerted effort was placed on promotional activities to introduce these crops to non-Brazilian markets. Many markets and restaurants are interested in offering new crops to diversify their produce line and menus. These activities were organized and implemented by a buy local organization, Island Grown Initiative (www.islandgrown.org).

Cooperating farmers were given promotional materials in English to let their customers know about these vegetables. These included nutritionally-balanced recipes produced by the UMass Nutrition Education Team. A restaurant on Martha's Vineyard, Zephrus, added dishes using taioba and maxixe to their menu and promoted them at events organized by Island Grown Initiative.

In 2009, UMass Ethnic Crops Program held several taste test events on Martha's Vineyard to promote these new Brazilian vegetables, especially taioba and maxixe. Surveys were conducted with participants in the events to gain an understanding of their interest and willingness to purchase these locally-grown vegetables.

Among the questions on the survey, participants were asked how willing they would be to purchase taioba or maxixe after tasting them at the event. Fifty-five percent of those surveyed said they would be "very willing" to purchase taioba and 52% said the same for maxixe (Figure 28). This work speaks to the opportunities to introduce these crops to non-Brazilian markets. In order to have success with these new markets, there needs to be similar promotional events in order to introduce them successfully in the market.

Work will continue in 2010 on Martha's Vineyard with Brazilian and non-Brazilian markets and cooperating growers.

Table 2. Sales of Brazilian vegetable transplants to home gardeners on Martha's Vineyard in 2008 and 2009.

	Number of transplant sales	
Crop	2008	2009
Jiló	-	144
Okra	-	216
Maxixe	-	360
Taioba	72	720
Total	72	1,440

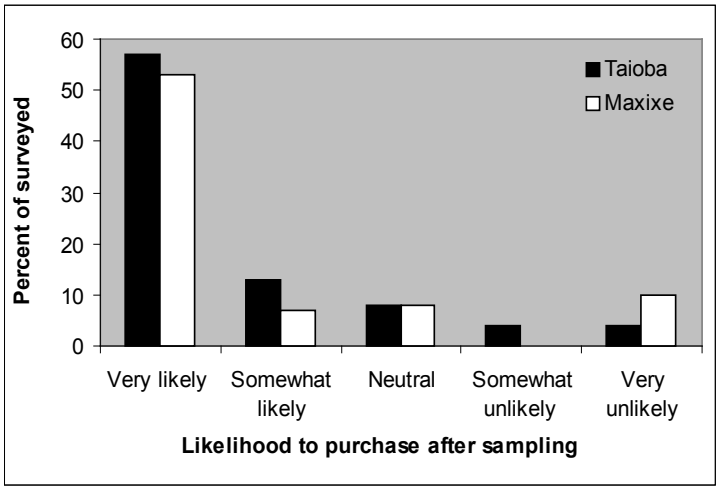

Figure 28. Likelhood to purchase taioba and maxixe after sampling dishes made wtih these vegetables at several events on Martha's Vineyard in 2009.

Figure 29. UMass graduate students at booth to promote locally-grown Brazilian vegetables at Cronigs Market on July 26, 2009.

If you would like to become a Vegetable notes sponsor, please contact Jessica Dizek at jdizek@outreach.umass.edu or 413 545 1445

Vegetable Notes. Ruth Hazzard, editor and Amanda Brown and Andrew Cavanagh, assistant editors. Vegetable Notes is published weekly from May to September and at intervals during the off-season, and includes contributions from the faculty and staff of the UMass Extension Vegetable Program, other universities and USDA agencies, growers, and private IPM consultants. Authors of articles are noted; author and photographer is R. Hazzard if none is cited.