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IPM ISSUES

Project Title: Adopting New IPM Methods for Cucurbit Virus Disease

Key Words: Pumpkin, insect vectors, weed management

PROPOSAL TYPE

For National Research Initiative Competitive Grants Program Proposals Only
[x] Standard Research Proposal
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Strengthening:
[ ] Career Enhancement
[ ] Equipment
[ ] Seed Grant
[ ] Standard Strengthening

For Higher Education Program Proposals Only:
Need Area: _____

Discipline: _____

This proposal will address a priority need that was expressed by the IPM Vegetable working group in 2004, 2005 and 2007; the need for greater information on IPM for virus diseases of cucurbits. Our overarching goal is to help pumpkin producers in the region adopt new IPM methods to manage virus diseases. The primary pumpkin virus diseases in the mid-Atlantic are cucumber mosaic virus (CMV), Papaya ringspot virus type W (PRSV-W), Watermelon mosaic virus (WMV), and Zucchini yellows mosaic virus (ZYMV). These diseases are spread by aphids in a non-persistent manner and therefore, these viruses are primarily introduced into pumpkins by aphid transmission from a nearby cucurbit crop or from overwintering weed reservoirs. Insecticide applications, although used, are not effective. Recently virus resistance has become available in some cucurbits, most notably squash, and the release of commercial pumpkin cultivars with virus host resistance will increase in 2008 and 2009. Prevalence of each of the four viruses in the pumpkin crop and weed hosts will be evaluated in Maryland, Delaware and southeastern Pennsylvania. The aphid vectors (including *Aphis gossypii*, a species new to the mid-Atlantic) will be monitored, enumerated and speciated. This project will develop IPM strategies that encompass management of weed hosts, aphids and host resistance. Growers will learn science-based concepts to effectively manage virus diseases in pumpkins.

IPM ISSUES

Adopting New IPM methods for Cucurbit Virus Diseases

4. PROJECT DESCRIPTION:

a. Problem, Background and Justification

This proposal will address a priority need that was expressed by the IPM Vegetable working group in 2004, 2005 and again in 2007 (http://northeastipm.org/work_vegpriority.cfm and see attached letter of support). The need for greater information on IPM for virus diseases of cucurbits. This is a collaborative effort between three states, two with populations less than 9 million (Maryland and Delaware). Our overarching goal is to help the vegetable producers in the region adopt new IPM methods to manage virus diseases.

Pumpkins are a valuable vegetable crop throughout the mid-Atlantic region. Per acre value of pumpkins can reach $3000, which is well above the average value of vegetable crop production. Because pumpkins can be planted and harvested at times of the year when other production activities are not pressing, and because a few acres of pumpkins are seen as a way to diversify farm production and stabilize income, pumpkins are grown on many farms. As a matter of fact, pumpkin acreage is thought to be under reported because often farms may have relatively small fields. Maryland has 2000 reported acres of pumpkin which represents approximately 3.8 million dollars production value, Delaware has 400 reported acres for 1.1 million dollars and Pennsylvania has 7300 reported acres for 19.3 million dollars.

There are approximately thirty virus diseases of cucurbits reported worldwide (Kyle, 1993). However, the primary pumpkin virus diseases in the mid-Atlantic are cucumber mosaic virus (CMV), Papaya ringspot virus type W (PRSV-W, which was previously called Watermelon mosaic virus 1 or WMV-1), Watermelon mosaic virus (WMV), which was formerly called WMV-2, and Zucchini yellows mosaic virus (ZYMV) (Riggs, 2003).

One of the first principles of IPM for diseases is to identify the causal agent. This is particularly difficult for virus diseases of pumpkins because the diseases cannot be identified reliably by their symptoms. The diseases may exhibit different symptoms at times, and at other times have overlapping symptoms. In addition different isolates of a virus may result in different symptoms (Davis, 1987). Mixed infections also may yield unusual symptoms, for example a mixed infection of WMV and ZYMV in Indiana in 2007 resulted in an unusual pitting symptom on fruit. Because they cannot be easily identified by symptoms, virus diseases are not easily distinguished by growers.

The four most important virus diseases of cucurbits; CMV, PRSV-W, WMV, and ZYMV, are spread by aphids in a non-persistent manner (i.e., viral particles (virions) are acquired by the aphid on its stylet and are retained in association with the stylet for short periods of time (usually hours). Therefore these viruses are primarily introduced into a crop by aphid transmission from nearby cucurbit crop or from overwintering weed reservoirs.

Some of the most efficient vectors of cucurbit viruses in New York were found to be *Aphis gossypii*, *A. pisum* and, surprisingly, *A. glycines*, the soybean aphid. Results of the NY survey demonstrate that epidemics of cucumber mosaic virus in vegetables could be associated with late-summer migrations of *A. glycines*, as well as other species. In Wisconsin widespread yield losses in vegetables were reported in late planted snap beans and cucurbits. These losses were associated with a complex of aphid transmitted viruses with cucumber mosaic and alfalfa mosaic viruses being prevalent. It was also found in the Wisconsin study that cucurbit varieties with reported tolerance or resistance to virus also were infected (Davis et al. 2003). Virus symptoms after heavy flights of soybean aphids have been detected in the Midwest and New York. Although soybean aphids do not colonize and reproduce on most vegetable crops, their host seeking behavior is ideally suited to the movement of plant viruses between crops and their huge numbers overcome individual inefficiencies as vectors. Since virus inoculation requires only seconds and thus cannot be prevented by insecticidal control of the vectors, the potential for crop damage is high. Because growers know that aphids vector viruses, they frequently apply unnecessary and ineffective insecticides. With new introductions of some virus resistant pumpkin varieties it would be important to know what cucurbit viruses are prevalent in the mid-Atlantic, which common weed species act as reservoirs for which viruses and what percentage of the most common aphid species, especially late season soybean aphids that land in pumpkin fields are vectors.

Because most cucurbit virus diseases are non-persistent in their aphid vectors, there are limited options for virus management. Insecticide applications have not been effective. Reflective mulches have been used on squash but not pumpkin, which are grown primarily on bare ground. Likewise, frequent applications of mineral oil are expensive, and deemed not reliable enough to justify the expense. Use of border or intercrops also provides a reduction in disease in some, but not all environments. (Damicone, et al. 2007.) It is likely that host plant resistance will become the key tactic in the best management program for virus diseases of pumpkin.

Previously the primary recommendation for managing cucurbit virus diseases was to plant pumpkins as far as possible from other cucurbit crops to minimize the spread of infected aphids into a pumpkin planting (Everts et al. 2007). More recently virus resistance has become available in some cucurbits, most notably squash (see appendix A) and introgression of virus host resistance into pumpkin is imminent (Kyle, 1993). Currently Magician is the only commercially recommended cultivar for the mid-Atlantic that has virus resistance. Magician is resistant only to ZYMV. However, it is expected that in the near future many, if not most, pumpkin cultivars that will be commercially available will have virus resistance. Seigers Seed Co. is releasing a virus resistant cultivar from Seminis, #7440, this year (available spring 2008); (Jamie Scholten, personal communication). Seminis Seed Co. also has several other cultivars in advanced testing. It is anticipated that they will be in commercial production in 2009. Growers are anxious to use this resistance and minimize their losses. In 2004 and 2005 the Northeast Vegetable IPM working group listed Aphid vectored viruses in cucurbits (and other crops) as a priority issue in the region. Questions about how to manage virus diseases remain one of the most frequent questions on pest management in pumpkin (Everts pers. communication).

Several surveys on virus prevalence have been conducted in other states, in the past, (Davis and Mizuki, 1987; Sammons et al. 1989). Currently we do not have a clear understanding of which

virus's are most prevalent within Maryland or Delaware or the distribution of virus. Surveys that were conducted in the past have indicated that the most prevalent cucurbit viruses vary both temporally and geographically. In South Carolina a total of 25 fields were surveyed over a two year period and WMV-2 was the most prevalent virus detected followed by CMV and PRSV-W (Sammons, 1989). In New Jersey, 20 fields sere sampled over a three year period in the mid-1980s. WMV-2 was more prevalent in one year and ZYMV was most prevalent in another year (Roberts, 1987). A small survey in 2005 in New Jersey found WMV-2 was most widespread followed by ZYMV and then PRSV (Wyenandt personal communication). However, a limited survey conducted in Maryland in 1988 found only PRSV and WMV, but not ZYMV present. Extensive surveys conducted in Wisconsin vegetable production areas in 2002 and 2003 found widespread virus incidence (German, 2003) with losses also being reported in Minnesota, Michigan, Ontario, and New York. In Michigan, vine crops were extensively damaged by virus infections in 2003 (Hausback, 2003). Losses were reported in cucumber, summer squash, winter squash, melons, and pumpkins which were diagnosed with single or multiple infections of cucumber mosaic virus, WMV and ZYMV.

Table 1. Summary of virus diseases of pumpkin of importance in the mid-Atlantic region.

Virus	**Seedborne**	**Weed hosts**[1]	**Aphid Vectors**	**Host resistance available**[2]
Cucumber Mosaic (CMV)	No (cucurbits)	Numerous	60+ spp.	S; P in development
Papaya Ringspot (PRSV-W)	no	Cucurbitaceae (*Melothria pendula* and *Mamordica* spp.)	20+ spp.	S and P in development
Watermelon Mosaic (WMV, formerly WMV-2)	no	*Trifolium* spp., *Malvaceae* spp., *Chenopodium* spp., *Amaranthus* spp.	20+ spp.	S; P in development
Zucchini Yellow Mosaic (ZYMV)	possible	Not known	Several?	S; P in development

[1]Zitter et al. 1006. Compendium of cucurbit diseases.
[2]Pumpkin=P; Squash=S

b. Objectives and Anticipated Impacts

Our overall objective is to foster the adoption of integrated pest management practices for managing pumpkin virus diseases. We will develop regional guidelines that include information on weed hosts, insect vectors and host resistance. We will develop information to assist growers in cultivar selection as resistant cultivars become available and to help them realistically evaluate the value of virus resistance within each cultivar. We will educate growers on integrated tactics that can be used with virus resistance to reduce losses to virus diseases in pumpkins. We also will provide growers with research-based information on the prevalence of soybean aphid near infected cucurbits and virus weed hosts present in the region.

Objective 1. Survey pumpkin and virus weed hosts in commercial pumpkin fields in Maryland and Delaware.

We will accomplish this objective by conducting a survey of pumpkin farms in Maryland, and Delaware and southeastern Pennsylvania and collecting symptomatic pumpkin foliage and tissue from weed species that are known hosts of CMV, PRSV-W, WMV, and ZYMV. Symptomatic weeds will be selected, however; if no symptoms are present we will select asymptomatic weeds. Tissue that is collected at each site will be assayed for presence of CMV, PRSV, WMV and ZYMV.

Objective 2. Survey and identify aphid vectors present in the region.
Insect traps will monitor the insect vectors that are present each year. Aphids will be enumerated and speciated.

Objective 3. Develop a multistate IPM publication (web-based) to educate producers on management practices for virus diseases.
We will include information on what virus are prevalent in our region in resident weed populations, vectors, and management with host resistance. We will include existing information on how viruses are spread to pumpkins from other cucurbit crops so growers do not forget this important information. The publication will coincide with the commercial release of virus resistant pumpkin cultivars (2009 and 2010).

	Anticipated Impacts
Safeguarding human health and the environment	We anticipate that our project will lead to an increase in integrated management for pumpkin virus diseases. Virus transmission by aphids occurs at infestation levels well below the economic threshold. As a result, growers frequently apply insecticides for virus management because they want to do something to manage these diseases. We will provide science-based information so that they can make effective choices. Our project will result in a reduction of unnecessary insecticide applications.
Implementation of IPM	IPM strategies that result from this project will encompass viruses, aphids and weeds. Because pumpkins are planted on many farms in the region, our project will have wide applicability. Growers will learn science-based concepts that influence the efficacy of their management choices. Some of these choices (weed management at the edges of fields) also may be applicable to other vegetable crops. Our project will result in improved pumpkin plant heath and increased grower knowledge of virus-pumpkin pathosystem.

c. Approach and Procedures

Objective 1. Survey pumpkin and virus weed hosts in commercial pumpkin fields in Maryland and Delaware.
We will identify pumpkin fields in nine counties in Maryland, all three counties in Delaware and in Lancaster County, Pennsylvania. A minimum of 10 pumpkin plants will be sampled in each field. Plants with virus disease symptoms such as mosaic, veinbanding, distortion, stunting, mottling or blistering will be collected from the fields. In the absence of obvious symptoms we will sample a transect of each field. At the time of sampling the fields, the weeds that are known

vectors of cucurbit virus's and are present at the edge or within the pumpkin field, will be sampled. Those sampling weeds will take drawings or photographs of the weed host to the field to aid in identification of the weed. We will survey 16 fields in Delaware, 26 in Maryland over the two year (8 in Delaware and 13 in Maryland in each year). Additional fields will be identified and sampled in Lancaster county. Symptomatic weeds will be selected however if no symptomatic weeds are identified, asymptomatic weeds will be sampled. Virus symptoms will be recorded according to standard protocols. GPS coordinates of each farm field location will be recorded at the time of sampling.

Pumpkin and weed leaf samples will be processed and tested for the presence of viruses using Enzyme Linked Immunosorbent Assay (ELISA) reagents purchased from Agdia, Inc., Elkhart, IN. All incubations will be at room temperature and both positive and negative controls will be included. Samples will be considered positive when absorbance values are more than three times above the negative controls. Virus assays will be performed at the University of Maryland's Plant Diagnostic lab under the direction of Dr. Karen Rane.

Objective 2. Survey and identify aphid vectors present in the region.
Fields and areas around fields will be sampled for aphid numbers and species identification using yellow pan traps that will be positioned above the plant canopy. Aphid sampling will start in mid-June and continue every two weeks through September. Aphid samples will be taken to the lab where aphids will be enumerated and speciated.

Objective 3. Develop a multistate IPM publication (web-based) to educate producers on management practices for virus diseases.
We will develop a multistate IPM publication that will be available to growers at a "teachable moment" - i.e. when they are interested in the new tool of virus-resistant pumpkin cultivars. The information generated in this project will enable growers to effectively use host resistance. Topics will include:
1) The prevalence of CMV, PRSV-W, WMV, and ZYMV, in the two years of the study. The most prevalent virus may vary by year. However, these two "snapshots" will enable growers to select appropriate cultivars.
2) The presence of virus weed hosts in the survey region. We will include images of the weed hosts to improve awareness of this source of virus infection. Because these virus diseases are spread in a non-persistent manner by aphids, reducing weed hosts in the field and increasing the weed-host free area around the crop will reduce virus infestation. Information in this publication will include weed-host identification and management guidelines.
3) The prevalence of aphid virus-vectors in the survey region. Again, this information will provide two snapshots of the presence of specific viruses in this region. We will train growers on the nonpersistent nature of aphid virus transmission and highlight that aphid management does not reduce virus outbreaks.

Timeline of activities:

May – June 2008:

Objective 1) Develop weed identification material specific to species that are pumpkin virus hosts. Hire and train summer employees in weed identification and tissue collection. Purchase materials for sampling and other activities.

Objective 2) Hire and train summer employees in aphid monitoring and collection.

July – September 2008:

Objective 1) Identify fields of interest in Maryland, Delaware and Pennsylvania. Sample weeds species and pumpkins, track field locations, record symptoms.

Objective 2) Identify fields of interest in Maryland, Delaware and Pennsylvania. Monitor and collect aphids, enumerate and speciate aphids.

October 2008 – April 2009:

Objectives 1 and 2) Hire and train prebaccalaureate student in ELISA. Conduct ELISA on tissue collected. All collaborators will confer, discuss progress and improve methodology for summer 2009. Data from year 1 will be summarized and we will compile information on resistant cultivars that will be available in the summer 2009. Outreach will be conducted at extension meetings. Purchase materials for sampling and other activities.

Objective 3) Initial work will begin on development of the IPM fact sheet, which will include the information used in outreach activities.

May – June 2009:

Objective 1) Revise weed identification material if necessary. Hire and train (if prebaccalaureate student is new) summer employees in weed identification.

Objective 2) Hire and train (if prebaccalaureate student is new) summer employees in aphid monitoring and collection.

July – September 2009:

Objective 1) Identify fields of interest in Maryland, Delaware and Pennsylvania. Sample weed species and pumpkins, track field locations, record symptoms.

Objective 2) Identify fields of interest in Maryland, Delaware and Pennsylvania. Monitor and collect aphids, enumerate and speciate aphids.

Objective 3) An article on virus management in pumpkin will be published in the University of Delaware Weekly Crop Update. http://ag.udel.edu/extension/wcu/index.htm

October 2009– April 2010:

Objectives 1 and 2) Hire and train prebaccalueaeate student in ELISA. Conduct ELISA on tissue collected. Data from year 1 and 2 will be summarized and we will compile information on resistant cultivars that will be available in the summer 2010.

Objective 3) Our results will be used to develop the IPM publication, which will include the information used in outreach activities. We will post it to our state IPM websites, and the Northeast IPM Vegetable working group website. Outreach will be conducted at extension meetings including printed material. Evaluation of the project will be conducted by questionnaires at winter extension meetings. This feedback will assist us in updating our web-based extension information.

d. Evaluation Plans

Deliverables

Information from this project will answer key questions that impede the adoption of IPM for Cucurbit Diseases. The new information generated from this project will be:

1) Knowledge about the prevalence of virus weed hosts and their level of virus infection. Extension personnel will use this information to advise growers on management practices and increase growers' awareness of weed hosts.
2) Relative prevalence of the four major virus diseases of cucurbits in the mid-Atlantic. Extension personnel need this information to advise growers on cultivar deployment as resistant pumpkin cultivars become available in 2009 and 2010.
3) We will generate new information on prevalence of the soybean aphid in pumpkin fields. This information is needed as the soybean aphid becomes more prevalent in the Northeast region.

These results will be disseminated through presentations in Maryland and Delaware, through the PI's vegetable extension programs. The next two years will be critical for developing the information to underlie the strategies for deployment of host resistance.

We will develop a fact sheet (web-based) that will include information on weed and crop hosts, insects, and virus disease. We have received a request from the Northeast Vegetable IPM working group to share this information. Our results are applicable throughout the Northeast region because we will provide information on identification of weeds and pumpkin cultivar host resistance. Even where some aspects of the pathosystem differ, our biologically-based management information will apply. Our results also will be informative for non-persistent aphid-vectored viruses in other crops.

The results of our project can be best measured by the implementation of IPM practices for virus management in pumpkins after the introduction of virus resistant pumpkins. That will occur after the completion of this project. However, we will question growers on their understanding of virus disease management during extension meetings. This will be done with questionnaires or verbally. Because our IPM publication is web-based, we will improve the content to answer questions growers have. We also will be able to update information on pumpkin cultivars that have host resistance as they become available.

e. Literature cited

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5. COOPERATION AND INSTITUTIONAL UNITS INVOLVED:

This proposal is a collaboration between the University of Maryland, The University of Delaware and The Pennsylvania State University (see letter of support). University of Maryland is the lead institution. University of Delaware and The Pennsylvania State University Cooperative Extension will participate in training personnel for weed identification and by assisting in identifying growers' fields and sampling in Pennsylvania, respectively. Outreach will be conducted through ongoing Extension meetings in each state.

This proposal is a collaboration of a vegetable pathologist (Everts), entomologist (Brust), diagnostician (Rane), weed scientist (VanGessel), and Extension horticulture specialist (Elkner). Drs. Everts, Brust, VanGessel and Elkner all have ongoing extension education programs for pumpkins. Kathryne Everts will be responsible for administration of project, coordination of activities and identification of pumpkin fields in Maryland and Delaware. Gerald Brust will be responsible for aphid trapping and identification. Dr. Brust also will assist in identification of pumpkin fields in Maryland. Karen Rane is the University of Maryland Plant Diagnostician. She will direct virus identification on pumpkins and weeds. Mark VanGessel will conduct training on weed identification of virus weed hosts (see Table 1). Dr. VanGessel is located at the University of Delaware's Research and Education Center located near Georgetown, DE. His position is Extension Specialist for Weed/Crop Management and holds the rank of Professor in the Department of Plant and Soil Sciences. He will provide training and technical materials for plant/weed identification. Dr. VanGessel has developed weed identification guides for common weed species in agronomic and commercial vegetable crops in Delaware, and resource materials for Future Farmers of America students preparing for the state agronomy competition.

Dr. VanGessel will serve as backup when identification is unclear. Tim Elkner has conducted trials on pumpkins in Pennsylvania for more than 10 years. Dr. Elkner will assist in locating growers' fields and sampling in southeastern Pennsylvania. Dr. Everts and Brust (leads), VanGessel and Elkner (participants) will develop web-based fact sheet for dissemination of results. As requested at the NE-IPM Vegetable Working Group Meeting in 2007, we will share our results with the working group to increase our impact. Drs. Everts, Brust and VanGessel will give talks as part of ongoing extension programs such as:

Pumpkin Twilight meeting (University of Maryland)
Delaware Vegetable Growers Conference
Friendly farms Vegetable Meeting (University of Maryland)
Southern Maryland Vegetable and Fruit Growers (University of Maryland)
Caroline/Dorchester Vine Crops Meeting (University of Maryland)

Plan of Work:

Dr. VanGessel is the Extension Specialist for Weed/Crop Management and holds the rank of Professor in the Department of Plant and Soil Sciences. He will provide training and technical materials for plant/weed identification. Dr. VanGessel has developed weed identification guides for common weed species in agronomic and commercial vegetable crops in Delaware, and resource materials for Future Farmers of America students preparing for the state agronomy competition.

May – June 2008:

Objective 1) Develop weed identification material specific to weed species that are pumpkin virus hosts.

July – September 2008:

Objective 1) Assist in identifying fields of interest in Delaware.

October 2008 – April 2009:

Outreach will be conducted at extension meetings.

May – June 2009:

Objective 1) Revise weed identification material if necessary.

July – September 2009:

Objective 1) Assist in identifying fields of interest in Delaware.

October 2009– April 2010:

Participate in developing weed information for IPM web-based publication on management of pumpkin virus diseases.

9. ATTACHMENTS:

APPENDIX
Virus Resistance in Pumpkin and Squash Cultivars Recommended in the mid-Atlantic Region.

	CMV	ZYMV	WMV	PRMV
Summer Squash				
Crookneck Type (yellow)				
Prelude II	X	X	X	
Straightneck Type (yellow)				
Seneca Prolific				
Lemondrop L				
XPT1832 (trial)	X	X	X	
Patriot II		X	X	
Multipik				
Fortune				
Cougar		X		X
Lioness	X	X	X	
Superpik				
Conqueror III	X	X	X	X
Goldbar				
General Patton				
Scallop Types				
Peter Pan (green)				
White Ruffles				
Sunburst (golden)				
Specialty Types				
Magda (short, light green) (trial)				
Starship (scallop shape, dark green) (trial)				
Zephyr (yellow, green blossom end) (trial)				
Zucchini Types				
Zucchini Elite				
Golden Dawn III (yellow)				
Senator				
Revenue	X	X	X	
Justice III	X	X	X	
Independence II		X	X	
Payroll				
Cashflow		X		
Lynx		X	X	X
Dividend	X	X	X	
Tigress		X	X	X
Spineless Beauty				
Seneca Zucchini				
Gold Rush (yellow)				

Pumpkins and Winter Squash

Pumpkins (less than 1 pound)
- Apprentice
- Munchkin
- Wee-B-Little

Pumpkins (less than 1 pound)
- Baby Boo

Pumpkins (1 to 5 pounds)
- Baby Pam
- Ironsides
- Baby Bear
- Touch of Autumn
- Pik A Pie
- Snackjack (edible seeds)
- Cannonball
- Iron Man

Pumpkins (5 to 10 pounds)
- Small Sugar
- Casper (White)
- Mystic Plus
- Hybrid Pam

Pumpkins (10 to 20 pounds)
- Magic Lantern
- Sorcerer
- Charisma
- Magician X
- Gold Boullion

Pumpkins (more than 20 pounds)
- Pro Gold 510
- Conestoga Giant
- Gold Boullion
- Howden Biggie
- Gladiator
- Atlantic Giant
- Prize Winner
- Aladdin
- Gold Medal

Winter Squash (Acorn Type)
- Table Ace
- Tay Belle
- Table Gold
- Table Queen
- Autumn Queen
- Royal Ace

Winter Squash (Butternut Type)
- Puritan Butternut
- Nicklow's Delight Butternut
- Bugle
- Waltham Butternut

Winter Squash (Butternut Type)
- Early Butternut
- Harris Butternut

Winter Squash (Buttercup Type)
- Sunshine (trial)
- Ambercup
- Buttercup
- Sweet Mama

Winter Squash (Delicious Type)
- Golden Delicious

Winter Squash (Hubbard Type)
- Hubbard Types
- Boston Marrow

Spaghetti Squash
- Orangetti
- Stripetti
- Vegetable Spaghetti

Processing
- Golden Delicious
- Neck Pumpkin Types
- Hercules & Other Butternut Types