The Vegetable and Small Fruit Gazette

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Horticulture Department
The Pennsylvania State University

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Comments from the Editor

Elsa Sánchez, Department of Horticulture

This year we are working on making the Vegetable & Small Fruit Gazette website more user friendly. The website address is: http://hortweb.cas.psu.edu/extension/vegcrops/newsletterlist.html. Our plan is to add a search engine to help in finding articles from past issues. You'll notice key words with each article below, which are going to be used as searchable terms.

I want to thank Emelie Swackhamer for her excellent article, *Selling Your Produce to Restaurants* and look forward to Tim Elkner's article for the February issue. I also want to thank everyone who contributed articles to this issue and I want to encourage others to join us in upcoming issues.

If you have an event that you would like to advertise, please send it to me. As always, the Vegetable and Small Fruit Gazette Team encourages your feedback so that we can better serve your needs and address your concerns

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Schedule for Agent Articles

Elsa Sánchez, Department of Horticulture

January– Emelie Swackhamer	February – Tim Elkner
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July– Scott Guiser	August– Tom Butzler
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Selling Your Produce to Restaurants

Emelie Swackhamner, Horticulture Educator
Lehigh and Northampton Counties

Key words: markets, restaurants, selling, winter

Want to sell your produce to local restaurants next summer? Start now by learning about the restaurants in your community. Pennsylvania diners, chain restaurants and ethnic food restaurants use a lot of produce, but most get their supply from large-scale distributors. These establishments often use food that is already washed, chopped, and prepared, ready to cook with as little labor as possible. They need a consistent supply all year-round, and might not be very receptive to your attempts to do business with them.

Despite these obstacles, it is worth talking to the people in charge, and this is the time of year to get the conversation started. You could offer them features that the large distributors can't, like better taste and quality or homegrown marketing appeal. Do you grow products that taste better the day they are harvested, like tomatoes, strawberries or raspberries? Can you guarantee a steady supply throughout more months of the year by using high tunnels or other season-extending methods? Can you offer regular deliveries of fresh kale or herbs for garnishes? Local restaurants may like to buy any of these items from you. Also, find out if the chef could use large quantities of seasonal items. Suggest the restaurant uses your tomatoes for a 'Special' featuring sauce from locally grown tomatoes or develops a reputation for serving the freshest sweet corn on earth.

What about upscale restaurants? Many Pennsylvania growers are successfully marketing to high-end establishments. Chef Shawn Doyle, co-owner of the Savory Grille in eastern Berks County, Pennsylvania, buys produce from several local growers. His customers expect the highest quality. They are also well informed and know about recent food safety problems with imported produce. For these reasons, locally grown products have great appeal to them.

Chef Doyle appreciates when his growers contact him to let him know what is nearly ready to harvest. He changes his menu often enough to feature local produce in season. High quality, good flavor, and access to uncommon varieties are most important to him. He has been using unusual varieties of summer squash and heirloom beets and tomatoes with striking, beautiful colors.

Martine Scannavino, MS RD, LDN, an Assistant Professor at Cedar Crest College in Allentown, Pennsylvania, teaches a course called “Food Service Systems” where students learn how restaurants supply the produce that they need. She emphasizes the following points for growers who want to sell to restaurants:

- Be extremely reliable. Nothing is worse than showing up without the produce that was ordered, or not showing up at all.
- Provide consistency in your product. Chefs need to be able to count on the quality their customers demand.
- Understand how your product is being used at the restaurant. This will help you know if you can substitute something else if you need to (for example substituting cardoons for globe artichokes).
- Pay attention to food trends and grow trendy produce. Trendsetters include magazines like Food and Wine, Gourmet and Organic Gardening and people like Oprah Winfrey.
- Communicate. Make sure the restaurant can always reach you.
- Before you start, be sure to have a mutual agreement on invoicing and payment.

If you really want to be successful, learn as much as you can about the marketing and business of selling produce to restaurants, then start making connections. You still have time to choose crops to plant in 2005!

To find examples of what other growers have done to make this profitable, see:

http://www.newfarm.org/features/0802/restaurant.shtml
http://ATTRA.org/attra-pub/PDF/sellingtorestaurants.pdf

or contact your local county Cooperative Extension office for copies of the fact sheets posted at these Web sites.

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2004 Sweet Spanish Onion Variety Trial

M. D. Orzolek, Professor of Vegetable Crops
The Pennsylvania State University

Key words: onion, variety and trial

Plot size: Four rows/bed 7.5’ long x 6”apart – 60 plants/rep.

Transplanting Date: April 29, 2004

Production system: raised bed with IRT green plastic mulch and 2 rows of drip tape – high flow 0.45 gal./min./100 ft at 12 orifice spacing.

Herbicide Application: One post-emergence applications of Goal at 3.0 oz./A.

Fungicide: Two applications of Bravo at 2.5 pt./A.

Insecticide: One application of Warrior at 3.0 oz./A.

Fertility: Broadcast and incorporated 60 lbs./A-N, 60 lbs./A-P, and 120 lbs./A-K and two applications of calcium nitrate injected in the drip system for a total of 14 lbs./A N.

Harvest Date: August 18, 2003

Drying: Bulbs from individual plots were placed in potato 100 lb. Burlap bags and placed on the Horticulture Farm greenhouse benches for 7 days.

Date Graded: September 8, 2004

Design: Randomized Complete Block with 3 replications

Varieties	Seed Source	Bulb Color
1. Eagle*	American Takii	yellow
2. EM 398*	Emerald	yellow
3. EM 680* Emerald yellow	Emerald	yellow
4. EM 984* Emerald yellow	Emerald	yellow
5. Candy* Seedway yellow	Seedway	yellow
6. BGS 178	Bejo	pink
7. Exhibition	Bejo	yellow
8. Expression*	Bejo	yellow
9. Hildago*	Bejo	yellow
10. Milaga*	Bejo	yellow
11. Recorra*	Bejo	yellow
12. Sharon*	Bejo	yellow
13. Red Beauty*	Bejo	red
14. Robin	Bejo	red

*- Indicates Hybrid variety

Results:
Growing conditions in 2004 were less than ideal even for sweet Spanish onions grown on raised beds with plastic mulch and two rows of drip tape, but better than the 2003 growing season. It was fortunate to find a period of time in mid-April when the soil was dry enough to make beds and lay plastic mulch plus the drip tape. We were also fortunate in 2004 to be able to broadcast the 10-10-20 prior to making the raised beds with plastic mulch. Fourteen pounds of nitrogen was injected into the drip irrigation tape over a 7-8 week period after transplanting. Use of greenhouse grown plug plants helped to accelerate the transplanting of the onion varieties in 2004 compared to 2003. Transplanting the tray or greenhouse grown transplants was much quicker, efficient and uniform compared to the field grown transplants. While weed control was good to excellent the first 4 weeks after transplanting, continued rain resulted in significant weed populations (both grass and broadleaf weeds) in and between the onion rows. The single application of Goal and Poast significantly reduced weeds and increased harvesting efficiency.

The highest marketable onion bulb yield was obtained from Expression, EM 398, Hidalgo and Milaga compared to Candy (current sweet Spanish onion standard Table 1). The marketable yield of Eagle was slightly lower than Candy, but has a larger average bulb size and higher soluble solids level than Candy (Tables 1 and 2). Expression produced 80.5% of bulbs that were 3.0 in diameter or larger that was similar to Candy. Both Robin and Red Beauty had a higher percentage of double centers compared to BGS 178 and overall appearance of the red onion varieties was best exemplified by the variety BGS 178.

Table 1. The marketable yield of fourteen onion varieties evaluated at the Horticulture Research Farm, Rock Springs, PA – 2004.

Variety	Percent [X] Harvest	Total MKT [Y] Yield T/A	Avg. bulb.[Z] wt. lbs.	% non-MKT
Em 398	79.0	16.9	0.97	6.3
EM 680	82.0	11.2	0.77	4.1
EM 984	77.0	9.5	0.92	25.9
Sharon	81.0	11.4	0.81	5.5
Exhibition	81.0	9.8	0.97	46.5
Milaga	83.0	16.4	0.93	8.7
Candy	81.0	15.7	0.90	9.7
Eagle	77.0	15.1	0.98	10.8
Expression	74.0	18.2	1.13	6.8
Recorra	82.0	15.8	0.92	4.1
Hildago	80.0	16.7	1.03	15.3
Red Beauty	76.0	13.3	0.84	4.4
Robin	73.0	10.0	0.82	18.9

BGS 178	69.0	14.8	1.12	12.1

X – Percent of onion bulbs that were harvested from the established transplants.
Y – The total marketable yield is based on an onion population of 50,000 plants/A including jumbo and collosal bulb sizes.
Z – Average weight of bulbs in pounds based on jumbo bulb size and larger.

Table 2. The size distribution and soluble solids of fourteen onion varieties evaluated at the Horticulture Research Farm, Rock Springs, PA – 2004.

Variety	Percent bulbs 3.0 inch in diameter or larger solids	% soluble[Z]
EM 398	78.2	8.0
EM 680	36.1	9.6
EM 984	34.6	7.1
Sharon	26.2	11.4
Exhibition	45.2	6.7
Milaga	75.8	8.3
Candy	79.4	7.2
Eagle	64.1	9.5
Expression	80.5	6.4
Recorra	63.9	10.4
Hildago	73.6	6.2
Red Beauty	59.0	
Robin	40.2	
BGS 178	66.2	

Z – Soluble solids of onions was obtained by cutting a wedge from 5 onion bulbs; with wedges placed in a commercial juicer and pooled onion juice collected in a beaker. The soluble solids were measured with a digital refractometer on October 7, 2004.

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Direct Marketing Pennsylvania Grown Edamame to Professional Chefs in Metro-Philadelphia: Background

Dru Montri, Kathleen Kelley and Elsa Sánchez, Department of Horticulture

Key words: Edamame, direct marketing, chefs

This is the first of four articles in the series on direct marketing edamame to professional chefs.

Developing and implementing a successful marketing strategy is the heart of a thriving agricultural operation. This is the first article of a series that will address one marketing effort – direct marketing to professional chefs – that may provide advantages such as a steady market throughout the growing season, a larger share of the food dollar and greater product flexibility (Gibson, 1991). However, before approaching chefs, it would be beneficial to understand the attributes they value when making a purchasing decision and their main reasons for buying from local sources (see below).

Attributes Chefs Value When Making a Purchasing Decision	Leading Reasons Chefs Buy From Local Sources
• Product Quality, Taste and Freshness • Types of Production Practices Used • Consistent Quality • Adherence to Food Safety Regulations • Product Knowledge • Grower's Ability to Provide Required Quantity	• Availability of Specialty Products • Product Quality and Freshness • Positive Relationships with Growers • Customer Demand (Zumwalt and Alswager, 2003)

One of the leading reasons chefs buy from local sources is the availability of specialty crops. Specialty crops have a high cash value, grossing anywhere within the range of $4,000 to $20,000 per acre, and include crops that are especially raised for ethnic markets such as Asian vegetables (Adam et al., 1999). One such crop is edamame. Edamame, or green vegetable soybeans, are specialty cultivars of soybean that have been bred for human consumption at an immature green stage. They are the same species as agronomic soybeans but have a sweet, mild flavor and nutty texture (Miles et al., 2000). Edamame originated in China and is popular throughout Southeast Asia. The popularity of edamame in the United States is increasing due to growing interests in ethnic cuisines, an overall better understanding of preparation techniques (Adam et al., 1999) and increasing Asian-American populations (US Census Bureau, 2003). Edamame production and marketing may offer an opportunity to develop profitable niche markets.

In the fall of 2003, a consumer-research study was conducted to investigate professional chefs' preferences and demand for edamame. Chefs were selected from restaurants that represented a variety in terms of ethnic food items, type of establishment and menu selection. Twenty chefs in Metro-Philadelphia, PA, were provided with three edamame cultivars. They were supplied with one pound of shelled (beans removed from the pod) and two pounds of inshell 'Early Hakucho' and 'Green Legend' and one pound of shelled 'Kenko.'

Chefs tasted the three edamame cultivars and evaluated them for overall appeal (visual appeal, mouth feel and flavor) as a part of a sensory evaluation. They then completed a follow-up survey to aid in determining chef demand for edamame, cultivar and shelling preferences and interests in buying from local sources. They also were asked to create an original recipe using the edamame provided. Eighteen chefs completed this study. Of these chefs, 16 were male, two were female and years of experience as a chef ranged from three to 30 years.

Information collected from the sensory evaluation and follow-up survey is being used to determine if there is a demand for edamame among chefs in the Metro-Philadelphia restaurant industry. Each aspect of this study, including the sensory evaluation, the follow-up survey and the edamame recipes, will be presented in subsequent articles in this series on direct marketing edamame to professional chefs.

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The Organic Way- Organic News

Elsa Sánchez, Assistant Professor of Horticultural Systems Management

Key words: resources, organic, news

This month's Organic Way article is devoted news about the upcoming Mid-Atlantic Fruit & Vegetable Convention and some new resources available on organic production.

The program for the organic session at the Mid-Atlantic Fruit & Vegetable Convention has been set. The session will be on Tuesday, February 1, 2005 from 1:30 to 4:30 pm. Speakers and topics are listed below.

Time	Topic	Speaker
1:30	Introduction to Organic Certification	Leslie Zuck, Pennsylvania Certified Organic
2:15	Marketing Organic Produce	Chris Fullerton, Tuscorora Organic Coop
3:15	Non-Mechanical Weed Control Strategies	Dr. William Curran, Penn State University
4:00	Organic Production at Goldfinch Farm	Jon Weaver-Krieder, Goldfinch Farm

For more information on the Mid-Atlantic Fruit and Vegetable Conference, which takes place in Hershey, PA, go to http://www.pvga.org or contact Bill Troxell at (717)-694-3596 or by e-mail at pvga@pvga.org.

Dr. William Curran, professor of weed science at Penn State University, has written a fact sheet on weed management for organic growers. It's called 'Weed Management in Organic Cropping Systems' and includes strategies for preventing weeds, cultural weed management, using mulches and cover crops, mechanical weed control and herbicides. It can be accessed in a couple of ways:

to access the PDF file at the Department of Crop and Soil Sciences go to:
http://cropsoil.psu.edu/Resources/Publications.cfm
then, scroll down to Agronomy Facts, then to Number "64" in the list

OR go directly to the PDF file at:
http://pubs.cas.psu.edu/freepubs/pdfs/uc187.pdf.

Finally, since late last year, I have been constructing a website. The purpose of the website is to serve as a warehouse for articles, presentations and fact sheets on the topic of sustainable horticulture. Among other information, the website includes a section called, 'Organic Grower's Guide to Penn State'. This contains information on diagnostic services, publications, newsletters and websites available through Penn State University that have been screened and determined to be useful for organic growers. The website is currently located at http://hortweb.cas.psu.edu/dept/faculty/sanchez/sustainable_horticulture/.

Please mail or email ideas for future column topics or thoughts on organic production to Elsa Sánchez, Department of Horticulture, 102 Tyson Building, Penn State University, University Park, PA 16802 or elsa-sanchez@psu.edu.

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Strawberry Cultivars for Matted-Row Production

Kathy Demchak, Department of Horticulture

Key Words: strawberry, cultivars, matted-row

As you browse through plant catalogs, you might realize that every single cultivar described therein sounds great. In 2002, a strawberry cultivar trial was established at the PSU Horticulture Research Farm at Rock Springs, PA to evaluate some of the newer cultivars appearing on the market. Two years of yield data and three years of observations are completed. Here are some comments on the newer cultivars.

L'Amour (NYSAES-Geneva, Cornell University) is an early-mid season cultivar. No one characteristic jumped out; however, it probably would have been near the top (out of 28 cultivars and selections) for all-around good performance, with a nice size and conic shape, bright red color, well-balanced flavor, and decent (but not great) yields. It was resistant to fungal leaf diseases, and had a harvest season that was a few days longer than most.

Clancy, a mid-season berry from the same breeding program as L'Amour, didn't fare so well. Perhaps it just didn't like our environment, but it didn't fill in the rows very well, and yields were low. Color was dark (but not too dark) red, and size was good, but those two characteristics didn't make up for the low yields. It was very susceptible to fungal leaf diseases, and the berries were a bit wide for their height.

Ovation (USDA-Beltsville) gave new meaning to the term 'late season', being 4 to 5 days later than Jewel. Ovation was developed for use in plasticulture, but runnered well in this system. Plants were tall and bushy. Yields were low relative to the amount of foliage, but this is the best choice if you want to extend the season on the "back-end". Berries are conic, with an average size, medium-red color and good flavor.

Evangeline (AAFC-Nova Scotia) was a pretty little early-season berry, with good yields, beautiful conic shape, perfect caps, and deep red color, but unfortunately, the key word in all of that would be "little".

Cabot (AAFC-Nova Scotia) was the opposite of Evangeline. Berries are huge, and its king berries sported interesting features. I suppose this could be turned into a game on a pick-your-own farm. Maybe a contest for finding the berry that most resembles Richard Nixon, for example. At any rate, later berries were normally-shaped, but still very large. Color was medium red, yields were high, but berry centers are hollow. Some would suggest selling by volume, not weight. It fruited in mid-late season.

Darselect (Darbonne, France) produced mid-season, and had good flavor and a deep color, but average yields and berry size. It developed more fruit anthracnose than any other cultivar. Yields have been variable on growers' farms, and cultural difference may account for this.

Eros (HRI, U.K.) fruited mid-season, was a light red, and tended to be a bit soft and susceptible to fruit rots. Yields were variable across the field, but averaged out very high.

A sincere thanks is given to the Pennsylvania Vegetable Growers Association for funding this project.

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New Blueberry Publication from Michigan State U.

Kathy Demchak, Department of Horticulture

Key Words: blueberry, diseases, insects

"A Pocket Guide to IPM Scouting in Highbush Blueberries", compiled and edited by Annemiek Schilder, Rufus Isaacs, Eric Hanson, and Bill Cline is available. It's 128 pages long, with index card-sized pages, so it's handy to keep with you. The guide contains disease and insect scouting calendars that are based on blueberry growth stages, not dates, to make the information transferable to different areas. Calendars describe when infections begin or insects are problematic, when symptoms of diseases appear, and when controls might be needed for problems that affect blueberry growers in PA just as much as in Michigan. This is followed by 86 pages of disease and insect descriptions and pictures that show just what you should be looking for. What's really useful is that the insect pictures show the sizes of insects with a little 'ruler', which might explain why some of us can't find those little buggers. Other useful information such as pictures of natural enemies, nutrient deficiencies, herbicide damage, and environmental problems wraps it up. The cost is $14 plus $4 for handling. Go ahead - drop a hint - this could be a lovely Valentine's Day gift that remains useful for years. It can be ordered online at http://web2.msue.msu.edu/bulletins/mainsearch.cfm, then type in the keyword "blueberries" or "blueberr" (not "blueberry") to pull up all of MSU's blueberry publications. It can also be ordered from the MSU Extension Bulletin office at 517-353-6740.

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Potato Musings- Interpreting Soil Analyses

Bill Lamont, Department of Horticulture

Key words: potato, soil analysis

This is an excellent article written by Steve Johnson, Crops Specialist at the University of Maine for the December 2001 issue of “Spudlines”.

There are a number of components that make up a soil analysis, as there are a number of components that make up a soil. This article is an effort to increase the understanding of some of the component of soils and soil analyses.

Soil pH: The “potential (of) hydrogen” or pH test measures the relative acidity of the soil. The pH is only a measurement of the hydrogen and tells us that the soil is acid or alkaline but does not tell us the reason why the soil is acid or alkaline. A low pH does not necessarily mean a shortage of calcium. The pH is purely a measure of the number of hydrogen ions in the soil. Hydrogen ions are positively charged and are attracted to colloidal particles of clay or organic matter. In a balanced soil, the colloidal particles have the correct proportion of various minerals attracted to them. This allows the soil to interact correctly with its environment, giving and taking different nutrients to plant roots and microbes. When hydrogen levels become too high, the soil can no longer interact well with the living organisms around it. Trace elements such as copper, zinc, and phosphorous become “locked up” and although present, are not available to plants as nutrients.

The pH of a soil is influenced by three crucial elements: calcium, magnesium and potassium. The balance of these within any soil will determine the hydrogen level (or pH) and the relative health of the soil. Only a healthy soil, well balanced with these elements, can support a good level of microbial activity, hold air and water in its structure and allow trace elements to become available for plant use.

Some clay particles are so small that they stay suspended in water. These clay particles are negatively charges and repel each other, which is why they are held in suspension. This is called a suspended colloid. Portions of the organic matter in soils are also suspended colloids. The colloidal constituent of the soils is of great importance to pH and the availability of nutrients for plant growth. All the electrical energy of the colloid portion of the soil tells us how much potential there is in that soil to react with other nutrients.

Cation Exchange Capacity (CEC): The negative charge of soil colloids attracts positively charged cations such as calcium, magnesium and sodium. The surfaces of clay and organic matter that hold cations are the action exchange sites. The soil’s ability to react is measured as its cation exchange capacity (CEC) in milliequivalents (Meq). CEC is usually related to soil texture. For example, clay soils will have a higher CEC because they have more “surface area” than coarse, sandy soils. The more sites a soil has, the higher its cation exchange capacity (CEC), and the greater its ability to hold nutrients. In order to maintain equilibrium, the negative charges in the soil must be balance by positive charges. This means that exchange sites are always full, safely storing plant nutrients. In a nutshell, the higher CEC and organic matter, the more lime it will take to move the pH.

Base Saturation Balancing –Major Elements of Cation Exchange: Conventional soil analysis centers on phosphorous, potassium, magnesium, and pH, but does not focus on the balance of the soil. In order to have chemical equilibrium it is essential that major elements are balanced on the soil colloid exchange sites. This allows the soil to function far more efficiently than if they are out of balance. The first priority is to achieve a balance between calcium and magnesium. This will benefit nutrient availability, soil structure and ease of cultivation.

Base saturation analysis centers on the ratio of exchangeable bases making up the CEC, and is expressed on a percent basis. There are several theories on what these ratios should be. Some deal with the ratio of Ca-Mg being from 5 to 10 based on the CEC; others involve the Ca being a 7-fold multiple of the Mg and the Mg being a 2-fold multiple of the K. I prefer the following approach, which identifies ranges for the Ca, Mg, and K.

Calcium 60% to 80%
Magnesium 10% to 25%
Potassium 5% to 7%

Calcium (Ca2+): Calcium activates a number of plant growth-regulating enzyme systems, helps convert nitrate-nitrogen into forms needed for protein formation, is used in cell wall formation and normal cell division and contributes to improved disease resistance. Along with magnesium and potassium, calcium helps to neutralize organic acids, which form during cell metabolism in plants. In soil, calcium replaces hydrogen (H) ions from the surface of soil particles when lime is added to reduce soil acidity. Calcium is essential to microorganisms as they turn crop residues into organic matter, release nutrients, and improve soil aggregation and water holding capacity.
Calcium and magnesium must always be considered together and the balance between them kept correct at all times. Excess in one will cause deficiency in the other. In the soil, calcium should occupy between 60 to 80 percent of the positions on the soil colloid in terms of the exchange capacity. When this correct saturation level is achieved, calcium improves soil texture, makes phosphorous and micronutrients more available and improves the environment for microbial growth. Calcium tends to improve soil structure; therefore on a light soil structure the target for calcium would be nearer 60 percent, while on heavy clay it would be nearer to 80 percent.

Magnesium (Mg 2+): Magnesium is closely associated with calcium and therefore the two elements should be considered together. Fertilizer more readily inhibits magnesium than calcium, particularly super phosphates.

Magnesium is an essential component of the chlorophyll molecule, with each molecule containing 7 percent magnesium. Therefore magnesium is important to plants in photosynthesis. Magnesium also acts as a phosphorous carrier in plants. It is necessary for cell division and protein formation. Phosphorous uptake could not occur with out magnesium and vice versa. Magnesium is essential for phosphate metabolism, plant respiration and the activation of several enzyme systems. It should be remembered that magnesium is far more reactive that calcium in the soil. Magnesium has far more influence on soil pH than calcium. Magnesium has 1.67 times more exchange capacity than an equal amount of calcium. It should occupy between 10 percent and 25 percent of the soil's cation exchange capacity. Magnesium helps to hold the soil together and tightens it up in terms of physical structure. Deficiencies occur most often in coarse-textured, acid soils.

Magnesium availability to plants is often related to soil pH. On soils with a pH below about 5.8, excessive hydrogen and aluminum can influence Mg availability and plant uptake. At pH values about 7.4, excessive calcium may have an overriding influence on Mg uptake by plants. Sandy soils with low cation exchange capacity have a low Mg supplying power. Application of high calcium lime can aggravate a Mg deficiency by increasing plant growth and increasing the demand for Mg. High applications of ammonium and potassium may also interfere with balanced nutrition through competitive ion effects. Magnesium tightens the soil and pulls it together, making it sticky. The higher the magnesium content, the stickier the soil will be when wet, the harder when dry. In a clay soil, the target for magnesium would be 10 percent.

For soils with a cation exchange capacity (CEC) higher than about 5 milliequivalents (Meq) per 100 grams, it may be desirable to maintain the soil Ca to Mg ratio at 10 to 1. For sandy soils with a CEC of 5 Meq pr less, it may be desirable to maintain the Ca to Mg ratio at about 5 to1.

Potassium (K+): Potassium is involved in the conversion of free air-borne nutrients – carbon, hydrogen, and oxygen – into plant materials: starches, sugars, proteins, vitamins, enzymes or cellulose. Potassium is inhibited by a soil too high in iron or with a low pH. Both potassium and phosphorous benefit enormously, in the terms of availability to plants, from the decomposition of nutrients by soil microbes. Because potassium (K) is a cation, it can be measured like calcium and magnesium. Generally, K levels are 5-7 percent saturation.

Availability of Trace Elements: There are three forms in which plant nutrients can exist in soils: **unavailable, exchangeable (partly available) or soluble (readily available)**. In the *unavailable* form the nutrient element is bound in a chemical compound that renders it unavailable so it is not free to be absorbed by plants. Decomposition of the compound is required to free the element for use. For example, nitrogen or other elements bound in plant residue or soil organic matter cannot be used until the organic compounds have been decomposed by soil micro organisms, which then release the nutrients in an available form for plant use. Phosphate added in a soluble form as a fertilizer can be rendered useless to plants, as it precipitates into the high insoluble iron and aluminum phosphates. The exchangeable form is when an element is “adsorbed” (attached to the surface of a colloid particle) and available for exchange. Most colloids are negatively charged and it is the positively charged cations that are attracted to them. In addition to macro elements, calcium, magnesium, sodium, potassium and hydrogen cations also include zinc, copper, manganese and iron as trace elements. Plants can exchange cations with the colloids freely. If a colloid or plant root does, not hold elements such as potassium, in exchangeable form, they are soon washed out of the soil. When soils become too acidic, some of the exchangeable cations become unavailable to plant roots. Sulfur, nitrogen, phosphorous, molybdenum and boron form negatively charged ions called anions. These are not held to any great extent by the soil in exchangeable form. These elements are mainly present in soluble form in soil solution, or in fairly insoluble substances such as calcium sulfate or dicalcium phosphate. A main source of these elements is in organic combination with plant residues and soil organic matter. Most fertilizers are designed to provide nutrients in the most *available*, soluble form. However, if applied to soils that are imbalanced in terms of the cation exchange equilibrium, much of the product can be readily leached from the soil, only offering short-term benefit. The availability of minerals to the plant for uptake varies according to soil pH. Between 6.0 and 6.5 there is maximum availability for boron, copper, iron, manganese and zinc. However, this only holds true if, in addition to correct pH (hydrogen level), there is also the correct balance of macro elements on the cation exchange sites of the soil colloid particles. In other words, calcium, magnesium, sodium, and potassium must also be in correct balance to enable the trace elements to become available for uptake. Nitrogen, phosphate, and sulfate must also be adequate.

The basic idea is that inadequate exchangeable Ca results in poor soil structure, characterized by “tightness”, because the amount of pore space for air is less than optimal. Consequently, root health is compromised and nutrient availability and uptake reduced. A general rule often given is that the ratio of calcium (Ca) to magnesium (Mg) should be about 5-7 to 1.

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Upcoming Meetings

Elsa Sánchez, Department of Horticulture

Local

January 8-15, 2005: Pennsylvania Farm Show, Harrisburg, PA. Contact: Dr. Pete Ferretti, (814) 863-2313.

January 17, 2005: New Holland Vegetable Growers Day, New Holland, PA. Contact: Tim Elkner (717) 394-6851.

January 20, 2005: Susquehanna Regional Vegetable Meeting, Mifflinburg, PA. Contact: Jeff Mizer (570) 837-4252.

February10, 2005: Northeast Vegetable Growers Meeting, Thompson's Dairy Bar, Clarks Summit, PA. Contact: John Esslinger (570) 963-4761

February 21, 2005: Tri-County Vegetable, Small Fruit and Greenhouse Meeting, Shippensburg, PA. Contact: Steve Bogash (717) 263-9226

February 22, 2005: Schuylkill County Regional Vegetable Growers Meeting, Extension Office, Pottsville, PA. Contact: George Perry (570) 622-4225

March 3, 2005: Lehigh/Schuylkill County Potato Growers Meeting, Schnecksville Grange in Neffs PA. Contact: Bob Leiby (610) 391-9840

March 4-5, 2005. Passive Solar Greenhouse Workshop, 1522 Lefever Lane, Spring Grove, PA 17362. Contact: Steve and Carol Moore (717) 225-2489 or sandcmoore@juno.com.

March 12, 2005: North Central PA Vegetable Growers Meeting, Penns Valley Area High School. Contact: Tom Butzler (570) 726-0022. (Tentative Date).

March 15 or 16, 2005. Erie Vegetable Growers Meeting, Erie, PA. Contact: Andy Muza (814) 825-0900. (Tentative Date).

October 14-15, 2005. Passive Solar Greenhouse Workshop, 1522 Lefever Lane, Spring Grove, PA 17362. Contact: Steve and Carol Moore (717) 225-2489 or sandcmoore@juno.com.

Regional

January 11-13, 2005. Vegetable Growers Association Annual Meeting and Trade Show. Borgata Hotel in Atlantic City, NJ. Contact: Mel Henninger (732) 932 9711 Ext120

January 19-21, 2005. Ohio Fruit and Vegetable Growers Congress/Ohio Direct Marketing Conference. Toledo Sea Gate Centre, Toledo, OH. Contact: Tom Sach (614) 246-8292.

Februrary1-3, 2005. Mid-Atlantic Fruit and Vegetable Conference, Hershey, PA. Contact: Bill Troxell (717)-694-3596 or e-mail: wt.pvga@tricountyi.net

February 14-17, 2005. Empire State Fruit and Vegetable Expo, Omni Center, Syracuse, N.Y.

National

January 9-10, 2005. Wisconsin Fresh Fruit and Vegetable Conference. Holiday Inn Conference Center, Stevens Point, Wis. Contact: (920) 478-3852.

January 9-11, 2005. Potato Association of North America Winter Meeting, Hilton Marco Island, FL.

February 15-17, 2005. Wisconsin Potato and Vegetable Growers Association Annual Meeting, Holiday Inn, Stevens Point, Wis.

February 16 – 19, 2005. 2005 North American Berry Conference, Doubletree Nashville Hotel, Nashville, Tennessee
A joint conference of the North American Strawberry Growers Association and the North American Bramble Growers Association.
For More Information: http://www.nasga.org/meetings/2005/berry_conference/reg_brochure.htm

March 2-5, 2005. 2005 Chip Seminar, Adams Mark Hotel, Jacksonville, FL. Contact: (303) 873-2334.

March 5-8, 2005. National Agricultural Plastics Congress. The Francis Marion Hotel, Charleston, SC. Contact: www.plasticulture.org/conginfo2005.htm.

International

September 5-9, 2005. Potato 2005. Emmeloord, the Netherlands. Contact: www.potato2005.com.