

## 2011 PESTICIDE APPLICATION RECORD

Location of Application			Pesticide Product Used				Mixture Recipe per Product Label		Total Volume Applied  Total Volumen Aplicar	Date (M/D/Y) & Time (am/pm)		Applicator Full Name/ Pesticide License or Handler Number
Farm Name & Address; City or Township; and County of Application	Field Name  Sitio Aplicado	Acres Treated/ Tratado	Crop Treated  Cosech Tratado	Brand Name of Pesticide  Nombre del Pesticida	EPA Registration Number  Numero de Registracion EPA	Active Ingredient(s)  Ingrediente Acitvo	Amount of Pesticide Concentrate used before mixing*	Total Diluent  Candidad Usada		Date/Time Application Completed  Fecha y Hora de la Aplicacion	Date/Time of Reentry  Fecha y Hora de Reentrada	

R1

\*Aumente el pesticida concentrado usarlo antes mesclarlo

## 2011 PESTICIDE APPLICATION RECORD

New Jersey regulations require growers [private applicators] to maintain records of **all applications** of pesticides (both general and restricted use) for 3 years. All records should be recorded in writing as soon as possible, but no later than 24 hours. These records must be made available to the New Jersey Department of Environmental Protection and medical personnel (for emergencies) upon request.

Below is an example using a one-page format for keeping your records. The most current version can be found on the Rutgers Pest Management Office website at [www.pestmanagement.rutgers.edu/PAT/record\\_forms.htm](http://www.pestmanagement.rutgers.edu/PAT/record_forms.htm). You can use your own recordkeeping format as long as you include all of the information required by State regulations (NJAC 7:30-8.8 Records). If you don't include it as part of your application record, keep a separate list of handlers working under the private applicator's supervision.

The crop/field designation must be specific. *For example-* assign a number to each field, or the parts of a field planted to different crops, or the parts of a field planted to the same crop in a different growth stage. Then use this number on the application record for each application to that specific location. For all pesticides having a reentry time, enter the date and the hour that the application was completed.

Location of Application				Pesticide Product Used			Mixture Recipe per Product Label		Total Volume Applied Total Volumen Aplicar	Date (M/D/Y) & Time (am/pm)		Applicator Full Name/ Pesticide License or Handler Number
Farm Name & Address; City or Township; and County of Application	Field Name Sitio Aplicado	Acres Treated/ Tratado	Crop Treated Cosech Tratado	Brand Name of Pesticide Nombre del Pesticida	EPA Registration Number Numero de Registracion EPA	Active Ingredient(s) Ingrediente Acitvo	Amount of Pesticide Concentrate used before mixing*	Total Diluent Candidad Usada		Date/Time Application Completed Fecha y Hora de la Aplicacion	Date/Time of Reentry Fecha y Hora de Reentrada	
XYZ Farm 1234 Farm Road; Agriville; Cumberland County	G-11	8	Tomatoes	Vydate L	352-372	Oxamyl	12 qts.	400 gal	200 gal	6/15/10- 9:30 a.m.	6/17/10- 9:30 a.m.	John Smith C080569

## PESTICIDE REGISTRATION NUMBERS

Use the space below to list the pesticides that you use and their EPA registration numbers. These numbers are printed on the label.

Pesticide*	EPA Registration No.*	Active Ingredient*	Formulation
<i>Example:</i> Rally	62719-410	myclobutanil 40%	40 WSP

\* In New Jersey, a form listing all pesticides stored on site must be sent each year to your local Fire Department with an explanatory cover letter. It must include a description or diagram of the exact location of the storage area. See [www.pestmanagement.rutgers.edu/PAT/record\\_forms.htm](http://www.pestmanagement.rutgers.edu/PAT/record_forms.htm) for template

# VEGETABLE SEED SIZES

**Table R-1. Vegetable Seed Sizes<sup>1</sup>**

Crop	Seeds/Unit Weight	Crop	Seeds/Unit Weight
Asparagus	13,000-20,000/lb	Mustard	15,000-17,000/oz
Beans: baby lima	1,150-1,450/lb	Okra	450-550/oz
fordhook	440-550/lb	Onions: bulb	105,000-144,000/lb
snap	1,600-2,200/lb	bunching	180,000-200,000/lb
Beets	24,000-26,000/lb	Parsnips	7,500-12,000/oz
Broccoli	8,500-9,000/oz	Parsley	240,000-288,000/lb
Brussels sprouts	8,500-9,000/oz	Peas	1,440-2,580/lb
Cabbage	8,500-9,000/oz	Peppers	4,000-4,700/oz
Carrots	300,000-400,000/lb	Pumpkins	1,900-3,200/lb
Cauliflower	8,900-10,000/oz	Radishes	40,000-50,000/lb
Celery	60,000-72,000/oz	Rutabaga	150,000-192,000/lb
Collards	7,500-8,500/oz	Spinach	25,000-50,000/lb
Cucumbers	15,000-16,000/lb	Squash: summer	3,500-4,800/lb
Eggplants	6,000-6,500/oz	winter	1,600-4,000/lb
Endive, escarole	22,000-26,000/oz	Sweet corn: normal, sugary enhanced	1,800-2,500/lb
Kale	7,500-8,900/oz	Super sweet (Sh)	3,000-5,000/lb
Leeks	170,000-180,000/lb	Tomatoes: fresh	10,000-11,400/oz
Lettuce: head	20,000-25,000/oz	processing	160,000-190,000/lb
leaf	25,000-31,000/oz	Watermelons: small seed	8,000-10,400/lb
Muskmelons	16,000-19,000/lb	large seed	3,200-4,800/lb

<sup>1</sup>Use this table to estimate your seed requirements. Varieties and seed lots can differ in seed size. Check with your seed supplier and the label on the container for more precise information.

# PLANT SPACINGS AND POPULATIONS

**Table R-2. Population of Plants per Acre at Several Between-Row and In-Row Spacings**

Inches between Rows	Inches Apart in Row												
	2	4	6	8	10	12	14	16	18	24	30	36	48
7	448,046	224,023	149,349	112,011	89,609	74,674	64,006						
12	261,360	130,680	87,120	65,340	52,272	43,560	37,337	32,670	29,040	21,780	17,424	14,520	10,890
18	174,240	87,120	58,080	43,560	34,848	29,040	24,891	21,780	19,360	14,520	11,616	9,680	7,260
21	149,349	74,674	49,783	37,337	29,870	24,891	21,336	18,669	16,594	12,446	9,957	8,297	6,223
24	130,680	65,340	43,560	32,670	26,136	21,780	18,669	16,335	14,520	10,890	8,712	7,260	5,445
30	104,544	52,272	34,848	26,136	20,909	17,424	14,935	13,068	11,616	8,712	6,970	5,808	4,356
36 (3 ft)	87,120	43,560	29,040	21,780	17,424	14,520	12,446	10,890	9,680	7,260	5,808	4,840	3,630
42 (3½ ft)	74,674	37,337	24,891	18,669	14,934	12,446	10,668	9,334	8,297	6,223	4,978	4,149	3,111
48 (4 ft)	65,340	32,670	21,780	16,335	13,068	10,890	9,334	8,167	7,260	5,445	4,356	3,630	2,722
60 (5 ft)			17,424	13,068	10,454	8,712	7,467	6,534	5,808	4,356	3,485	2,904	2,178
72 (6 ft)			14,520	10,890	8,712	7,260	6,223	5,445	4,840	3,630	2,904	2,420	1,815
84 (7 ft)			12,446	9,334	7,467	6,223	5,334	4,667	4,149	3,111	2,489	2,074	1,556
96 (8 ft)			10,890	8,167	6,534	5,445	4,667	4,084	3,630	2,722	2,178	1,815	1,361

## USEFUL WEBSITES

The following is a list of websites that may be of interest and value to vegetable growers. Growers should carefully evaluate the source and accuracy of the information. Cooperative Extension DOES NOT confirm the accuracy of information at these websites. No endorsement of the information found at these websites is implied and no lack of endorsement is implied for sites not listed.

<b>AGRICULTURAL SEARCH ENGINES</b>	
<a href="http://cris.csrees.usda.gov">cris.csrees.usda.gov</a>	USDA Agricultural Search Engine
<a href="http://www.produceoasis.com/">www.produceoasis.com/</a>	About produce--recipes, nutrition, etc.
<a href="http://www.agricultureinformation.com">www.agricultureinformation.com</a>	Agricultural Search Engine
<a href="http://www.agfind.com/">www.agfind.com/</a>	Agricultural Search Engine
<b>VEGETABLE PRODUCTION</b>	
<a href="http://njaes.rutgers.edu/pubs/">njaes.rutgers.edu/pubs/</a>	2009 Commercial Vegetable Production Rec.
<a href="http://aesop.rutgers.edu/~horteng">aesop.rutgers.edu/~horteng</a>	Horticultural Engineering
<a href="http://ag.udel.edu/extension/vegprogram/index.htm">ag.udel.edu/extension/vegprogram/index.htm</a>	Delaware Extension Vegetable Program
<a href="http://vric.ucdavis.edu/">vric.ucdavis.edu/</a>	California Vegetable Crops Information
<a href="http://postharvest.ucdavis.edu/Pubs/publications.shtml">postharvest.ucdavis.edu/Pubs/publications.shtml</a>	UC Davis Postharvest Handling of Perishables
<a href="http://edis.ifas.ufl.edu/topic_commercial_vegetable_production">edis.ifas.ufl.edu/topic_commercial_vegetable_production</a>	Florida Commercial Veg. Information
<a href="http://weedid.aces.uiuc.edu">weedid.aces.uiuc.edu</a>	Univ. of Illinois Weed Identification
<a href="http://www.ces.ncsu.edu/hil/veg-index.html">www.ces.ncsu.edu/hil/veg-index.html</a>	North Carolina Vegetable Information
<a href="http://aggie-horticulture.tamu.edu/vegetable/vegetable.html">aggie-horticulture.tamu.edu/vegetable/vegetable.html</a>	Texas Vegetable Information
<a href="http://msucare.com/index.html">msucare.com/index.html</a>	Mississippi Vegetable Information
<a href="http://plasticulture.psu.edu/?q=node/2">plasticulture.psu.edu/?q=node/2</a>	Penn State Extension Page
<a href="http://plasticulture.cas.psu.edu">plasticulture.cas.psu.edu</a>	Penn State Center for Plasticulture
<a href="http://www.ppath.cas.psu.edu/EXTENSION/VEGDIS/Identification.html">www.ppath.cas.psu.edu/EXTENSION/VEGDIS/Identification.html</a>	Penn State Disease Management Publication
<a href="http://www.msue.msu.edu/iac/vegevege.html">www.msue.msu.edu/iac/vegevege.html</a>	Michigan Vegetable Site List
<a href="http://www.hort.cornell.edu/extension/commercial/vegetables/index.html">www.hort.cornell.edu/extension/commercial/vegetables/index.html</a>	Cornell Vegetable Information
<a href="http://oregonstate.edu/dept/hort/">oregonstate.edu/dept/hort/</a>	Oregon Vegetable Information
<a href="http://ag.arizona.edu/hydroponictomatoes/">ag.arizona.edu/hydroponictomatoes/</a>	Growing Hydroponic Tomatoes
<a href="http://www.ag.ohio-state.edu/~vegnet/">www.ag.ohio-state.edu/~vegnet/</a>	Ohio Veg Net
<a href="http://www.umassvegetable.org/">www.umassvegetable.org/</a>	Univ. of Mass. Veg. Information
<a href="http://www.pollinator.com/">www.pollinator.com/</a>	The Pollination Home Page
<a href="http://www.ext.vt.edu/">www.ext.vt.edu/</a>	Virginia Cooperative Extension Information
<a href="http://www.xerces.org/pollinator-conservation">www.xerces.org/pollinator-conservation</a>	Pollinator Conservation
<a href="http://ohioline.osu.edu/cv-fact/pdf/1003.pdf">ohioline.osu.edu/cv-fact/pdf/1003.pdf</a>	Ohio State Pumpkin Pollinator Fact Sheet
<a href="http://www.ppws.vt.edu/weedindex.htm">www.ppws.vt.edu/weedindex.htm</a>	Virginia Tech Weed ID
<a href="http://www.ca.uky.edu/agc/pubs/id/id36/id36.htm">www.ca.uky.edu/agc/pubs/id/id36/id36.htm</a>	Kentucky Vegetable Growers Guide
<a href="http://www.mda.state.md.us/resource_conservation/nutrient_management/index.php">www.mda.state.md.us/resource_conservation/nutrient_management/index.php</a>	Maryland Nutrient Manager
<a href="http://entweb.clemson.edu/pesticide/saftyed/pstident.htm">entweb.clemson.edu/pesticide/saftyed/pstident.htm</a>	Multi-university Resource Insect Pest ID
<b>SUSTAINABLE/ALTERNATIVE CROP PRODUCTION</b>	
<a href="http://www.ibiblio.org/farming-connection">www.ibiblio.org/farming-connection</a>	Sustainable Farming
<a href="http://www.sarep.ucdavis.edu">www.sarep.ucdavis.edu</a>	California Sustainable Ag Program
<a href="http://www.sfc.ucdavis.edu">www.sfc.ucdavis.edu</a>	California Small Farm Center
<a href="http://www.hort.purdue.edu/newcrop">www.hort.purdue.edu/newcrop</a>	Purdue's New Crop Information
<a href="http://www.ams.usda.gov/nop/indexIE.htm">www.ams.usda.gov/nop/indexIE.htm</a>	USDA National Organic Program
<a href="http://www.nal.usda.gov/afsic/">www.nal.usda.gov/afsic/</a>	Alternative Farm Systems Inform. Ctr.

Continued

## USEFUL WEBSITES (continued)

### SUSTAINABLE/ALTERNATIVE CROP PRODUCTION (continued)

<a href="http://attra.ncat.org/horticultural.html">attra.ncat.org/horticultural.html</a>	ATTRA horticulture series
<a href="http://www.sare.org">www.sare.org</a>	Sustainable Agriculture Network
<a href="http://www.kerrcenter.com/">www.kerrcenter.com/</a>	The Kerr Center for Sustainable Agr.

### INTEGRATED PEST MANAGEMENT (IPM)

<a href="http://www.omri.org">www.omri.org</a>	Approved organic nutrients and sources
<a href="http://njaes.rutgers.edu/weeds">njaes.rutgers.edu/weeds</a>	New Jersey Weed Photos
<a href="http://www.nysaes.cornell.edu/recommends/">www.nysaes.cornell.edu/recommends/</a>	Cornell Vegetable IPM
<a href="http://www.pestmanagement.rutgers.edu/IPM/Vegetable/index.htm">www.pestmanagement.rutgers.edu/IPM/Vegetable/index.htm</a>	Corn earworm and corn borer flights
<a href="http://www.ipm.ucdavis.edu">www.ipm.ucdavis.edu</a>	California IPM
<a href="http://www.hort.uconn.edu/ipm/ipmveg.htm">www.hort.uconn.edu/ipm/ipmveg.htm</a>	U Connecticut Vegetable IPM for growers
<a href="http://www.vegedge.umn.edu/MNFruit&amp;VegNews/mnindex.htm">www.vegedge.umn.edu/MNFruit&amp;VegNews/mnindex.htm</a>	Minnesota IPM Newsletter
<a href="http://www.nysipm.cornell.edu/">www.nysipm.cornell.edu/</a>	New York Vegetable IPM
<a href="http://www.ipmnet.org/cicp/vegetable/vegindex.htm">www.ipmnet.org/cicp/vegetable/vegindex.htm</a>	Database of IPM Resources (DIR)
<a href="http://www.nysaes.cornell.edu/ent/biocontrol/">www.nysaes.cornell.edu/ent/biocontrol/</a>	Biocontrol NY
<a href="http://ag.udel.edu/extension/IPM/index.html">ag.udel.edu/extension/IPM/index.html</a>	Delaware IPM
<a href="http://www.mdipm.umd.edu/">www.mdipm.umd.edu/</a>	University of Maryland IPM
<a href="http://www.ces.ncsu.edu/depts/pp/cucurbit">www.ces.ncsu.edu/depts/pp/cucurbit</a>	Cucurbit Downy Mildew Forecasting
<a href="http://www.pestwatch.psu.edu">www.pestwatch.psu.edu</a>	Sweet Corn Pest Maps (U.S.)

### PESTICIDE NEWS AND INFORMATION

<a href="http://www.ace.orst.edu/info/nptn/">www.ace.orst.edu/info/nptn/</a>	Natl. Pesticides Information Center
<a href="http://www.cdms.net/manuf/manuf.asp">www.cdms.net/manuf/manuf.asp</a>	Pesticide Labels & MSDS sheets
<a href="http://www.pested.unl.edu/softrec.htm">www.pested.unl.edu/softrec.htm</a>	Pesticide Education Resources Univ. of Neb
<a href="http://www.greenbook.net/">www.greenbook.net/</a>	C&P Press Greenbook.net
<a href="http://www.ipmcenters.org/">www.ipmcenters.org/</a>	Office of Pest Management Prog. USDA
<a href="http://www.iraac-online.org">www.iraac-online.org</a>	Insecticide Resistance Action Committee
<a href="http://www.epa.gov/pesticides/">www.epa.gov/pesticides/</a>	US EPA Office of Pesticide Programs
<a href="http://www.nj.gov/dep/enforcement/pcp/index.htm">www.nj.gov/dep/enforcement/pcp/index.htm</a>	NJDEP Pesticide Control & Local Prog.
<a href="http://maarec.psu.edu/pdfs/WilliamsWinfree_NativeBees2009_1.pdf">maarec.psu.edu/pdfs/WilliamsWinfree_NativeBees2009_1.pdf</a>	Native Bee Benefits

### NEWSLETTERS

<a href="http://njaes.rutgers.edu/pubs/plantandpestadvisory/">njaes.rutgers.edu/pubs/plantandpestadvisory/</a>	NJ Plant & Pest Advisory Newsletter
<a href="http://agdev.anr.udel.edu/weeklycropupdate/">agdev.anr.udel.edu/weeklycropupdate/</a>	University of Delaware Weekly Crop Update
<a href="http://www.ag.ohio-state.edu/~vegnet/">www.ag.ohio-state.edu/~vegnet/</a>	Ohio Weekly Newsletter
<a href="http://www.ipm.uiuc.edu/ifvn/index.html">www.ipm.uiuc.edu/ifvn/index.html</a>	Illinois Weekly Newsletter
<a href="http://www.ag.arizona.edu/crops/vegetables/vegetables.html">www.ag.arizona.edu/crops/vegetables/vegetables.html</a>	SW Arizona Vegetable Pest Reports

### MARKETING

<a href="http://www.ams.usda.gov/marketnews.htm">www.ams.usda.gov/marketnews.htm</a>	USDA Agr.Mkt.Service Reports
<a href="http://www.farmersmarketonline.com/marketwa.htm">www.farmersmarketonline.com/marketwa.htm</a>	Terminal Market Prices for U.S. Crops
<a href="http://www.fas.usda.gov/commodities.asp">www.fas.usda.gov/commodities.asp</a>	Terminal Mkt.Prices around the World
<a href="http://www.sfproduce.org/home.html">www.sfproduce.org/home.html</a>	San Francisco Wholesale Mkt.Listings
<a href="http://www.nass.usda.gov/">www.nass.usda.gov/</a>	USDA Nat'l Agr. Statistics Service
<a href="http://www.ams.usda.gov/directmarketing/">www.ams.usda.gov/directmarketing/</a>	USDA's Direct Marketing Information
<a href="http://www.lwebblvd.com/coosemans/default.htm">www.lwebblvd.com/coosemans/default.htm</a>	Coosemans Worldwide-Spec. Produce
<a href="http://www.pafarm.com/">www.pafarm.com/</a>	PA Farm Market Association
<a href="http://www.todaymarket.com/">www.todaymarket.com/</a>	Today's Market Prices
<a href="http://www.worldcrops.org">www.worldcrops.org</a>	Ethnic vegetable production & marketing

continued

## USEFUL WEBSITES (continued)

<b>FARM MANAGEMENT</b>	
<a href="http://www.pma.com/">www.pma.com/</a>	Produce Marketing Association
<a href="http://www.aesop.rutgers.edu/~farmmgmt/">www.aesop.rutgers.edu/~farmmgmt/</a>	Farm Management
<a href="http://www.ers.usda.gov/">www.ers.usda.gov/</a>	USDA Economic Research Service
<a href="http://www.farminfo.org/">www.farminfo.org/</a>	The Small Farm Resource
<a href="http://dda.delaware.gov/plantind/forms/publications/FarmManagementforNativeBees-AGuideforDelaware.pdf">dda.delaware.gov/plantind/forms/publications/FarmManagementforNativeBees-AGuideforDelaware.pdf</a>	Farm Management for Native Bees
<b>WILDLIFE MANAGEMENT</b>	
<a href="http://www.berrymaninstitute.org/">www.berrymaninstitute.org/</a>	The Jack H. Berryman Institute
<a href="http://wildlifecontrol.info/newdm/Pages/default.aspx">wildlifecontrol.info/newdm/Pages/default.aspx</a>	The Northeast Wildlife Damage Management Research and Outreach Cooperative
<a href="http://liberty.state.nj.us/agriculture/conventions/2006/wildliferes.html">liberty.state.nj.us/agriculture/conventions/2006/wildliferes.html</a>	NJ Dept of Ag Wildlife and Agriculture Resolution
<a href="http://www.sdgifp.info/SDDigest/MarchApril/AnimalDamageControl.html">www.sdgifp.info/SDDigest/MarchApril/AnimalDamageControl.html</a>	Animal Damage Control – A Part of Wildlife Management Report
<a href="http://icwdm.org/handbook/index.asp">icwdm.org/handbook/index.asp</a>	Internet Center for Wildlife Damage Management
<a href="http://www.dem.ri.gov/topics/erp/nahems_wildlife_management.pdf">www.dem.ri.gov/topics/erp/nahems_wildlife_management.pdf</a>	USDA National Animal Health Emergency Management System Guidelines
<b>EDUCATION</b>	
<a href="http://njaes.rutgers.edu">njaes.rutgers.edu</a>	Rutgers NJ Agricultural Experiment Station
<a href="http://www.cpe.rutgers.edu">www.cpe.rutgers.edu</a>	NJAES Office of Continuing Profess. Ed.
<b>GOVERNMENT AGENCIES RELATED TO AGRICULTURE</b>	
<a href="http://www.usda.gov/">www.usda.gov/</a>	US Department of Agriculture
<a href="http://www.nalusda.gov/">www.nalusda.gov/</a>	National Agricultural Library
<a href="http://www.fsa.usda.gov/pas/default.asp">www.fsa.usda.gov/pas/default.asp</a>	USDA, Farm Service Agency
<a href="http://dda.delaware.gov">dda.delaware.gov</a>	Delaware Department of Agriculture
<a href="http://www.state.nj.us/agriculture/">www.state.nj.us/agriculture/</a>	NJ Department of Agriculture
<a href="http://www.mda.state.md.us">www.mda.state.md.us</a>	Maryland Department of Agriculture
<a href="http://www.agriculture.state.pa.us">www.agriculture.state.pa.us</a>	Pennsylvania Department of Agriculture
<a href="http://www.vdacs.virginia.gov">www.vdacs.virginia.gov</a>	Virginia Department of Agriculture
<a href="http://www.rma.usda.gov/">www.rma.usda.gov/</a>	Risk Management Agency USDA
<a href="http://www.pcpnj.org">www.pcpnj.org</a>	NJ Pesticide Control Program
<b>TRADE PUBLICATIONS</b>	
<a href="http://www.americanfarm.com/">www.americanfarm.com/</a>	American Farm Publications
<a href="http://www.meistermedia.com/">www.meistermedia.com/</a>	American Vegetable Grower
<a href="http://www.vegetablegrowersnews.com">www.vegetablegrowersnews.com</a>	The Vegetable Grower News
<a href="http://www.agriculture.com/">www.agriculture.com/</a>	Agriculture Online
<a href="http://www.growermagazine.com/">www.growermagazine.com/</a>	The Grower Magazine
<b>WEATHER</b>	
<a href="http://www.nws.noaa.gov/">www.nws.noaa.gov/</a>	National Weather Service
<a href="http://climate.rutgers.edu/stateclim/">climate.rutgers.edu/stateclim/</a>	NJ State Climatologist
<a href="http://www.deos.udel.edu/index.html">www.deos.udel.edu/index.html</a>	Delaware Environmental Observing System
<a href="http://www.usna.usda.gov/Hardzone/">www.usna.usda.gov/Hardzone/</a>	Natl. Arboretum--Hardiness Zone Map
<a href="http://www.state.nj.us/dep/watersupply/precip.htm">www.state.nj.us/dep/watersupply/precip.htm</a>	NJDEP Hydrologic Information
<b>FOOD SAFETY</b>	
<a href="http://ecommons.library.cornell.edu/handle/1813/2209">ecommons.library.cornell.edu/handle/1813/2209</a>	Growers Guide to Food Safety
<a href="http://www.foodsafety.gov">www.foodsafety.gov</a>	National Food Safety Programs

## PUBLICATION RESOURCES

The following publications are suggested for agents, growers, agriculture-industry representatives, and others who desire more detailed information on specific crops or production practices.

### General Texts and Handbooks

- Holcomb, E.J., editor. 1994. *Bedding Plants IV*. 516 pages. Fourth edition. Pennsylvania Flower Growers, Ball Publishing Co., P.O. Box 9, Batavia, IL 60510-0009. A manual on the culture of bedding plants as a greenhouse crop.
- Uva, Richard H., Joseph C. Neal and Joseph M. DiTomaso, 1997; *Weeds of the Northeast*; 416 pages, Cornell University Press, 750 Cascadilla St., Ithaca, NY 14851. Comprehensive handbook for identifying 299 common and economically important weeds. 46 color photos and 118 drawings.
- Maynard, D.N., and George Hochmuth. 2006. *Knott's Handbook for Vegetable Growers*. 582 pages. Fourth edition, John Wiley & Sons, Inc., 605 Third Ave., New York, NY 10158. A practical handbook on commercial vegetable production.
- Meister, R.T., editor. July issue. *Annual Buyer's Guide: American Vegetable Grower*. Meister Publishing Co., 37841 Euclid Ave., Willoughby, OH 44094.
- Phillips, Roger, and Martyn Rix. 1993. *The Random House Book of Vegetables*. Random House Publishers, New York, NY. Illustrations and photographs of 650 vegetables with some production information included.
- Pierce, Lincoln C. 1987. *Vegetables: Characteristics, Production, and Marketing*. 433 pages. First edition, John Wiley & Sons, Inc., 605 Third Ave., New York, NY 10158. A good technical textbook for temperate vegetables.
- Plucknett, D.L. and H.B. Sprague. 1989. *Detecting Mineral Nutrient Deficiencies in Tropical and Temperate Crops*. Westview Tropical Agriculture Series No. 7, Westview Press, Boulder, CO 80302.
- Scaife, A. and M. Turner. 1984. *Diagnosis of Mineral Disorders in Plants. Volume 2: Vegetables*. Chemical Publishing Co., New York, NY 10000.
- Shepersky, K. 1984. *The Rain Bird Landscape Drip Irrigation Design Manual*. Rain Bird Sprinkler Mfg. Corp., Glendora, CA 91740.
- Sherf, A.F., and A.A. MacNab. 1986. *Vegetable Diseases and Their Control*. 728 pages. Second edition. John Wiley & Sons, Inc., 605 3rd Ave., New York, NY 10158. Information on diagnosis, disease cycles, and control; includes over 400 diseases and over 200 illustrations.
- Swiader, John M., George W. Ware, and J.P. McCollum. 1992. *Producing Vegetable Crops*. Fourth Edition. Interstate publishers, Inc., 510 N. Vermillion Street, PO Box 50, Danville, IL 61834.
- Anonymous. 1990. *Western Fertilizer Handbook*, Interstate Publishers, Inc., Danville, IL, 279 pp.
- Anonymous. 2007. *Crop Protection Handbook*, Meister Media, Inc., Willoughby, OH, 828 pp.
- Barenklau, K. E. 2001. *Agricultural Safety*, Lewis Publishers, Boca Raton, FL, 135 pp.
- Brase, T. A. 2005. *Precision Agriculture*, Thomson Delmar Learning, Clifton Park, NY, 224 pp.
- Cloyd, R. A., Nixon, P. L., and Pataky, N. R. 2004. *IPM For Gardeners*, Timber Press, Portland, OR, 204 pp.
- Decoteau, D. R. 2000. *Vegetable Crops*, Prentice-Hall, Upper Saddle River, NJ, 464 pp.
- Jones, J. Benton Jr. 2005. *Hydroponics: A Practical Guide for the Soilless Grower*, CRC Press, Boca Raton, FL, 423 pp.
- McElhatton, A. and Marshall, R. J. 2007. *Food Safety – A Practical and Case Study Approach*, Springer, New York, NY, 311 pp.
- McKinlay, R. G. 1992. *Vegetable Crop Pests*, CRC Press, Inc., Boca Raton, FL, 406 pp.
- Monaco, T. J., Weller, S. C., and Ashton, F. M. 2002. *Weed Science: Principles and Practices, 4<sup>th</sup> Edition*, John Wiley & Sons, New York, NY, 669 pp.
- Naylor, R. E. 2002. *Weed Management Handbook, 9<sup>th</sup> Edition*, Blackwell Publishers, Oxford, UK, 423 pp.
- Rechcigl, N. A. and Rechcigl, J. E. 1997. *Environmentally Safe Approaches to Crop Disease Control*, CRC Lewis, Boca Raton, FL, 386 pp.
- Rubatzky, V. E. and Yamaguchi, M. 1997. *World Vegetables: Principles, Production, and Nutritive Values*, Chapman and Hall, New York, NY, 843 pp.
- Singh, H. P., Batish, D. R., and Kohli, R. K. 2005. *Handbook of Sustainable Weed Management*, Food Prod. Press, New York, NY, 892 pp.
- Snowdon, A. L. 1990. *Color Atlas of Post-Harvest Diseases and Disorders Vol. 2: Vegetables*, CRC Press, Inc., Boca Raton, FL, 416 pp.
- Van Emden, H. F. and Service, M. W. 2004. *Pest and Vector Control*, Cambridge University Press, Cambridge, UK, 349 pp.

### Publications from Universities, USDA, Societies, and Commercial Companies

*Compendium of Bean Diseases, Compendium of Beet Diseases and Insects, Compendium of Corn Diseases, Compendium of Pea Diseases, Compendium of Potato Diseases, Compendium of Sweet Potato Diseases, Compendium of Tomato Diseases*. Available from APS Press, The American Phytopathological Society, 3340 Pilot Knob Road, St. Paul, MN 55121.

Hardenburg, R.E., A.E. Watada, and C.Y. Wong. 1995. *The Commercial Storage of Fruits, Vegetables, and Florist and Nursery Stocks*. 136 pages. USDA Agricultural Handbook No.66 (revised).

Kader, Adel A., et al. 1985. *Postharvest Technology of Horticultural Crops*. 192 pages. Special Publication 3311. Univ. of CA, 6701 San Pablo Ave, Oakland, CA 94608-1239.

*Integrated Pest Management for Cole Crops and Lettuce*. 1992. Publication of the Div. of Agric. and Natural Resources. Univ. of CA, 6701 San Pablo Ave., Oakland, CA 94608-1239.

MacNab, A.A., A.F. Sherf, and J.K. Springer. 1983. *Identifying Diseases of Vegetables*. 62 pages. Order from Publications Distribution Center, Penn State University, 112 Agricultural Administ. Building, University Park, PA 16802. Color photos and description of common vegetable diseases. (\$8)

# PUBLICATION RESOURCES

## Publications from Universities, USDA, Societies, and Commercial Companies (continued)

McGregor, S.E. (continuously updated). *Insect Pollination of Cultivated Crop Plants*. USDA Agricultural Handbook 496. 411 pages. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

*Specialty and Minor Crops Handbook*. 1991. Publication 3346. Publication Div. of Agric. and Natural Resources. Univ. of CA, 6701 San Pablo Ave., Oakland, CA 94608-1239.

Stephens, J.M. 1989. *Manual of Minor Vegetables*. 123 pages. Florida Cooperative Extension Service, Univ. of FL, Gainesville, FL 32611.

*Weeds of the North Central States* (Bulletin 7). 303 pages. Illustrated book that lists and describes most of the weeds found in New Jersey. Available from the University of Illinois, Champaign, IL 61820.

Grubinger, Vernon P. 1999 *Sustainable Vegetable Production from Start-Up to Market*. 280 pages. Guide for those who are considering beginning a vegetable production business. The Natural Resource, Agriculture, and Engineering Service. Contact NRAES by phone (607) 255-7654 or [www.nraes.org](http://www.nraes.org).

Zitter, Thomas A., Hopkins, Donald L., and Thomas, Claude E. 1996. *Compendium of Cucurbit Diseases*, American Phytopathological Society, 140 pp. [www.shopapress.org/42074.html](http://www.shopapress.org/42074.html)

**Table R-3. Frequently Used Weights and Measures and Approximate Metric Equivalent**

Liquid			Dry				
Pint	Liters	Gallons	Liters	Ounces	Grams	Pounds	Kilograms
0.5	0.24	1	3.8	0.25	7.1	1	0.5
1.0	0.47	2	7.6	0.50	14.2	2	0.9
1.5	0.71	3	11.4	0.75	21.3	3	1.4
2.0	0.95	4	15.1	1.0	28.4	4	1.8
2.5	1.18	5	18.9	2.0	56.7	5	2.3
3.0	1.42	6	22.7	3.0	85.0	6	2.7
3.5	1.65	7	26.5	4.0	113.4	7	3.2
4.0	1.90	8	30.3	5.0	141.7	8	3.6
4.5	2.13	9	34.1	10.0	283.5	9	4.1
5.0	2.37	10	37.9	16.0	453.6	10	4.5

### Length and Area

1 acre = 0.405 hectares	1 inch = 2.54 centimeters
1 square mile = 2.39 square kilometers	1 foot = 30.3 centimeters
1 square yard = 0.836 square meters	1 yard = 0.914 meters
1 square foot = 0.0929 square meters	1 mile = 1.61 kilometers
1 square inch = 6.45 square centimeters	

# PLANT GROWING MIX

**Making a Plant-Growing Mix.** Many pre-mixed growing media products are available commercially (see below). A good, lightweight, disease-free, plant-growing material can also be made from a mixture of peat and vermiculite. The main advantage of making one's own mix is uniform and consistent composition, but it can also be less costly than commercial products. Formulas for a very simple mix are given in Table R-4, but a preferred formulation is shown in Table R-5. If plants are to be grown in mix longer than 8 weeks, use the formula in Table R-5.

**Table R-4. Simple Plant-Growing Mix**

Materials	Cubic Yard	
	(22 Bushels)	2 Bushels
Shredded sphagnum peat moss	11 bu	1 bu (10 gal)
No. 2, 3, or 4 domestic or African vermiculite <sup>1</sup> or horticultural grade (dust-screened)	11 bu	1 bu (10 gal)
Pulverized limestone use <i>dolomitic</i> lime for mixes made with <i>domestic</i> vermiculite	10 lb	1 lb (1¼ cups)
<i>or</i> use <i>calcitic</i> lime mixes made with <i>African</i> vermiculite	6 lb	9 oz (¾ cup)
Superphosphate (20% P <sub>2</sub> O <sub>5</sub> ) or Triple superphosphate (46% P <sub>2</sub> O <sub>5</sub> )	2½ lb	4 oz (½ cup)
Fertilizer (5-10-10)	5 lb	8 oz (1 cup)

<sup>1</sup> Vermiculite should be pea-sized and relatively free of fines and dust. Final mix should have a pH of 6.0-6.5.

**Notes.** Good results for growing lettuce and cabbage transplants have been obtained by diluting this mix with an equal part of sand.

This mix will only get the seedlings up. Supplemental fertilizing will be needed to grow plants to transplant size. About 3 weeks after seeding, begin liquid fertilizing the plants with a soluble fertilizer, such as a 20-20-20, at the rate of 2-3 teaspoons per gallon of water. This rate should be applied at least weekly. More frequent applications may be desirable.

**Table R-5. Preferred Plant-Growing Mix**

Materials	Cubic Yard	
	(22 Bushels)	2 Bushels
Shredded sphagnum peat moss	11 bu	1 bu (10 gal)
No. 2, 3, or 4 domestic vermiculite <sup>1</sup> or horticultural grade (dust-screened) <i>or</i> African vermiculite <sup>1</sup>	11 bu	1 bu (10 gal)
Pulverized limestone use <i>dolomitic</i> lime for mixes made with <i>domestic</i> vermiculite	10 lb	1 lb (1¼ cups)
<i>or</i> use <i>calcitic</i> lime mixes made with <i>African</i> vermiculite	6 lb	9 oz (¾ cup)
Superphosphate (20% P <sub>2</sub> O <sub>5</sub> ) or Triple superphosphate (46% P <sub>2</sub> O <sub>5</sub> )	2½ lb	4 oz (½ cup)
Sulfate or muriate of potash (50%-60% K <sub>2</sub> O)	½ lb	1 oz (2 tbs)
Osmocote <sup>2</sup> (18-6-12)		
Tomatoes	4 lb	6 oz (¾ cup)
Eggplants	8 lb	12 oz (1½ cups)
Peppers	8 lb	12 oz (1½ cups)
Micronutrient mix	Use according to mfr.'s recommendations	
Wetting agent (such as Aqua-Gro granular)	1½ pt	1 oz (4 tbs)

<sup>1</sup> Vermiculite should be approximately pea-sized and relatively free of fines and dust. Final mix should have a pH of 6.0-6.5.

<sup>2</sup> Osmocote is a slow-release fertilizer. Use a formula that will release nutrients over a period of 8 to 9 months. Therefore, mixes should be made just prior to seeding. Plants grown in mixes containing Osmocote must be carefully watered and the temperature carefully controlled prior to field planting. Reduced rates are suggested to control plant height when using small cells.

Regardless of which formula is chosen, unless good mixing procedures are used, the results will be less than optimal. For best mixing, use a horizontal-type paddle mixer that folds or blends the components, such as lime and fertilizer, evenly throughout the mix. With tilted or other types of mixers, the components tend to segregate or separate out, resulting in erratic performance of the mix.

Good procedures to follow when preparing a mix are:

1. Use a respirator to prevent inhalation of dust when mixing peat, vermiculite and additives.
2. For small quantities of mix preparation--1 cubic yard or less--place 4 to 5 inches of vermiculite in the bottom of a 5-gallon pail. Add all the additives (lime, fertilizer, micronutrient, etc.) to the vermiculite in the pail and mix thoroughly.
3. Fluff the recommended amount of peat. Start mixer and begin blending the peat.
4. While blending, add water according to the dampness of the peat. You will need approximately 1 gallon of water per bushel of peat in the mix.
5. While blending, slowly pour the additives, which you have already mixed thoroughly with a small amount of vermiculite, into the mixer and blend for 3 to 5 minutes.
6. Add the recommended amount of vermiculite after the other ingredients and blend for 1 minute or less, depending on the consistency of the vermiculite. It should be mixed thoroughly without breaking down. Soon after mixing, use the mix for growing your plants. It is not a good practice to stockpile the mix in large piles for long periods of time.
7. Read all labels of the ingredients used, and heed all warnings that may be marked on the labels or bags.

# Appendix A

## Methods to measure honeybee colony size and strength

Colony strength can be assessed in several ways.

1. **Inspect hives.** This method is the most time-consuming, but also the most accurate. Colonies used for springtime pollination should have at least:
  - a laying queen
  - one and one-half or two stories (hive bodies or boxes)
  - four to six frames of brood
  - enough adult bees to cover six to eight frames

These are minimum requirements; stronger colonies with larger populations make superior pollination units and may command a higher price. As these stronger colonies are opened, bees will “boil out” or cover the tops of the frames. When smoked, however, the bees move down onto the frames and may not cover the frame tops. In this case, the frames themselves should be covered with bees. Note that there will be some variability in the quality of the colonies you rent. As a general rule, a group of colonies where 10 percent fall below the minimum standard is acceptable if 10 percent are also above the minimum standard. Also, for a variety of reasons, some colonies may become queenless for a time; however, if these colonies meet all the other minimum requirements they still will be effective pollination units.

You can request hives to be inspected. In Pennsylvania, The Pennsylvania Department of Agriculture Apiary Inspection Service runs a hive evaluation program for colonies used for pollination. Requests may be made by either the grower or the beekeeper and should be arranged through the state apiarist at the PDA Bureau of Plant Industry, 2301 North Cameron Street, Harrisburg, PA 17110; telephone 717-772-5225. Requests should be made as early as possible to facilitate scheduling. If an evaluation is requested by the grower, the beekeeper will be informed that a request has been made. Colonies are inspected to determine the colony size (number of supers), the presence of a laying queen, the number of frames of brood and adult bees, and the presence of disease and parasites. At least 10 percent of the colonies in an apiary, or a minimum of five colonies, are selected at random for inspection. Inspected colonies are identified by sticker. If selected colonies are banded or stapled, these are not refastened by the inspector. A copy of the evaluation report is given to both the grower and the beekeeper.

2. **Assess traffic at hive entrance.** This method is less time-consuming but also less accurate. On a warm (70 to 80°F), calm day between 11 AM and 3 PM, bee traffic at hive entrances should be heavy. During a one-minute observation period, strong colonies should have 50 to 100 or more bees arriving and leaving the hive. Bees also should be seen arriving with pollen pellets on their back legs. In weak colonies, less than 40 bees will be seen arriving and leaving per minute. Colonies that are being used for summer pollination should have heavier traffic at the hive entrance.

Another crude way to assess colony strength is to observe entrances when temperatures are cool (between 55 and 60°F). In strong colonies, flights will be observed when temperatures are between 55 and 60°F, but in weaker colonies bees rarely fly when temperatures are below 60°F. Honeybees very rarely fly when the temperature is below 55°F.

3. **Assess bee density on the crop.** This method allows you to assess the contribution of feral or other honeybee colonies in the area in addition to rented bees. If you are using rented colonies, however, this method tells you little about the quality of the bees. We suggest that if you use this technique and find that the number of bees on the crop is low, you then use options (1) or (2) to assess colony strength before renting additional bees.

### ***Additional information***

The publications listed below are available on the MAAREC Web site at [MAAREC.cas.psu.edu](http://MAAREC.cas.psu.edu).

- *Beekeeping Basics*
- *Beekeeping Topics: Sources of Bees for Pollination in Pennsylvania, Bees and Insecticides, Pollination Contracts, Basic Biology and Management of the Japanese Hornfaced Bee*

### **Sources of pollination rentals**

For an up-to-date list of beekeepers with colonies for rent (*Sources of Bees for Pollination in Pennsylvania*), visit

**MAAREC.psu.edu** or your county extension office or the Penn State Department of Entomology at 814-865-1896.

U.S. distributors of “Fruit Boost” that was recommended in the Pollination for attracting bees section are located in the Pacific Northwest. For more information, contact Phero Tech, Inc., 7572 Progress Way, RR 5, Delta, British Columbia, Canada V4G 1E9; phone: 604-940-9944; fax: 604-940-9433.

Other sources of information for bee guides in your area see the websites listed below:

[www.state.nj.us/agriculture/divisions/pi](http://www.state.nj.us/agriculture/divisions/pi)

[dda.delaware.gov/publications/plant\\_industries/Bee%20Guide\\_07.pdf](http://dda.delaware.gov/publications/plant_industries/Bee%20Guide_07.pdf)

[anr.ext.wvu.edu/bees](http://anr.ext.wvu.edu/bees)

[www.virginiafruit.ento.vt.edu/VAFS-bees.html](http://www.virginiafruit.ento.vt.edu/VAFS-bees.html)

[www.attra.org/attra-pub/beekeeping.html](http://www.attra.org/attra-pub/beekeeping.html)

---

## NOTES

---

---

## NOTES

---

# **Delaware Extension Agents and Specialists**

## **County Agents**

New Castle County: Anna Stoops - 302/831-2506  
Kent County: 302/730-4000  
Sussex County: Tracy Wootten and Cory Whaley  
302/856-7303

## **Specialists at Newark**

Robert P. Mulrooney, Plant Pathologist - 302/831-4865  
Joanne Whalen, Entomology/IPM - 302/831-1303

## **Specialists at Georgetown**

Mark VanGessel, Weed Specialist – 302/856-7303  
Emmalea Ernest, Extension Associate: Vegetable Crops – 302/856-7303  
Gordon Johnson, Fruit and Vegetable Crops Specialist – 302/856-7303

## **Plant Diagnostic Clinic**

The Delaware Nematode Assay Service accepts samples for plant-parasitic nematode assay and identification. To ensure proper collection and handling of samples submitted for nematode analysis, refer to the Plant Diagnostic Clinic "Nematode Assay Information Sheet". This form must accompany each sample submitted for laboratory analysis. This form is available at county Delaware Cooperative Extension offices or the website below. The charge for a nematode assay is \$10.00/ sample and checks should be made payable to the "University of Delaware".

Send or take the samples directly to the Plant Diagnostic Clinic, Room 151, Plant and Soil Sciences Dept, Townsend Hall, University of Delaware, Newark, DE 19716, or to any of the three county Extension offices. Phone: 302-831-1390, FAX: 302-831-0605, Web: <http://ag.udel.edu/extension/pdc/index.htm>

## **Delaware Poison Control Center\***

Poison Information Center 302/655-3389  
Wilmington Medical Center--Delaware Division  
502 West 14 Street  
Wilmington, DE 19899

---

\* When telephoning a hospital concerning poisoning, ask for the Poison Control Center

---

### **For Information on Certification of Pesticide Applicators, Call:**

Delaware Department of Agriculture .....800/282-8685

### **For Help with a Pesticide Spill or Emergency, Call:**

Delaware Department of Agriculture .....800/282-8685

Chemtrec .....800/424-9300

EPA/RCRA Hotline .....800/424-9346

National Pesticide Hotline .....800/858-7378

### **For Help in Case of Pesticide Poisoning, Call:**

National Pesticide Hotline .....800/858-7378