

Guidelines for Greenhouse Raspberry Production

UMass Extension and the Massachusetts Department of Food and Agriculture

While more commonly practiced in parts of Holland and Belgium, greenhouse raspberry production is relatively new to North America. Research conducted at Cornell University by Dr. Marvin Pritts has confirmed that this production system can be profitable in the Northeast United States. This Guide outlines the basic steps needed to implement this system. For more extensive publications on the background of this system, see the resource list at the end of this publication.

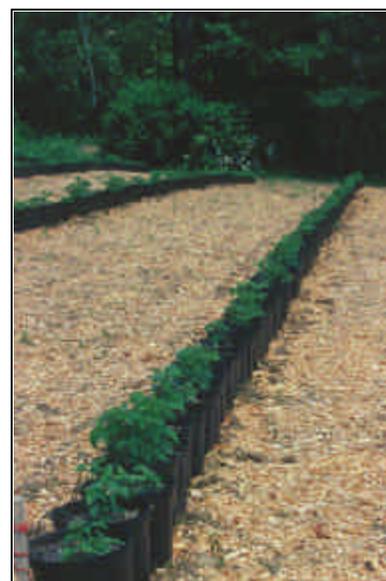
Greenhouse Raspberry Production Summary: Greenhouse raspberry production is a system of growing floricanic fruiting raspberries in containers that can be moved into a greenhouse after the plants' chilling requirement has been met (around 800 – 1000 hrs @ < 45°F). This is usually accomplished by the middle of December under outdoor conditions in New England. Once moved indoors, they will break dormancy and begin to grow. They will flower in about 6 weeks and produce ripe fruit in about 10 weeks from the time they are moved indoors. They do not require supplemental light and can be kept at cool temperatures (55°F at night and 65°F during the day). Pollination is accomplished with the use of commercially available bumble bees which are introduced once the plants begin to flower. Irrigation and fertilizer applications are delivered with drip irrigation. This reduces the incidence of fruit rots or cane/foliar diseases because plant surfaces are kept dry. Air circulation is important and is accomplished using gable end fans and several ceiling mounted fans. Most insect pests of raspberries are dormant at this time of year so that insect pest control measures are rarely required. Once exception is spider mites which are easily controlled using released mite predators and/or ultrafine oil applications. Powdery mildew can occur late in the growth cycle but can also be controlled using ultra fine oil applications. Market prices for fresh raspberries are high with the only competition coming from off shore (e.g., Mexico and Chile). Returns per square foot of greenhouse space have been found to be as high as many floriculture crops (e.g., geraniums, etc.).

Greenhouse Raspberry Production Steps :

Year I: Summer - Fall

In early spring, plant bare root transplants or tissue culture plugs of 'Tulameen' summer red raspberries in 3-gallon pots using a standard potting mix or equal parts sand : peat : perlite : vermiculite.

- ☑ Line out pots outdoors and install drip irrigation using individual pot drippers to deliver water and fertilizer to each pot.
 - rows of pots should be spaced 8' apart to allow good light penetration to the lower leaves.
- ☑ Provide support stakes (e.g., 5' bamboo) for each pot.
 - secure primocanes to these stakes using horticultural twist-ties or plant clips as they grow.
- ☑ Provide additional support by driving 5' angle iron garden stakes at 20' intervals on each side of the row of pots and running non-degradable twine at two heights (24" and 48") along both sides of the rows.
- ☑ Fertilize once a week with a complete soluble fertilizer solution containing 100 ppm N.
 - suggested solution consists of 2.46 g/gal 5-11-26 (Peter's Hydrosol®), 0.26 g/gal ammonium nitrate, and 1.23 g/gal calcium nitrate - providing 88 ppm N as NO₃-N and 12 ppm as NH₄-N.



- ☑ Scout for and control any insect or disease outbreaks or infestations.
- ☑ Once leaves drop (October), rows of pots can be moved together and protected with hay bales against freezing temperatures.
 - *Roots are more sensitive to cold temperatures than canes, so temperatures around 10°F can kill the plants.*
- ☑ In late-December plants can be moved into the greenhouse and allowed to break dormancy.

Year I: Fruiting



- ☑ Place plants pot-to-pot with approximately 5.5 ft. between the rows.
 - *Double rows can be used with a 5.5 ft. on-center spacing but might create a canopy that is too dense and promotes cane and leaf diseases such as Botrytis cane blight or powdery mildew.*
- ☑ Continue the irrigation/fertigation regimen delivering a complete fertilizer with 100 ppm N once a week.
- ☑ Bamboo support stakes should remain in the pots and the outer support trellis should be reconstructed in the greenhouse.
- ☑ After a few days, an application of Ultrafine Horticultural oil will suppress early outbreaks of spider mites.
- ☑ Provide ample air circulation with ceiling and/or floor mounted fans.
- ☑ Temperatures are maintained at 65 – 70°F during the day and can be as low as 50 – 55°F at night.

disease infections and problems with pollination during bloom. So, nighttime temperatures may need to be higher and additional ventilation provided.

- ☑ Maintain relative humidity at 65% – 75%.
 - *Low humidity (< 50%) can reduce pollen germination, and high humidity (> 90% can cause pollen to be “sticky”. Both these conditions can lead to misshapen fruit due to poor pollination.*
- ☑ Scout foliage weekly for two-spotted spider mites and/or European red mites. If/when found, release predators *Phytoseiulus persimilis* and *Neoseiulus fallacis* at rates recommended by supplier. Repeat the release in two weeks. Further releases may not be needed.
- ☑ Six weeks from the time the plants move indoors, bloom will begin. Be prepared to move bumble bees in for pollination by contacting your supplier in advance to insure bees will be available and can be shipped on time.



- ☑ Once flowering has begun, the nutrient solution should be diluted to deliver 50 ppm N once a week.
- ☑ 1st year plants will generally produce between 2-4 half pints of marketable raspberries each.



- ☑ During fruiting, remove all but 4 of the newly emerging primocanes so that they do not interfere unduly with harvest and air circulation.

– *When the new primocanes (which will produce next year's crop) reach about 3.5 ft. pinch the top 4" off to halt their growth for the remainder of harvest.*



- ☑ After harvest, carefully remove all the old fruiting canes and reuse the bamboo stakes to support the new primocanes.
- ☑ Repot plants into 5 gallon pots with the same type of potting soil and move outdoors for the summer.

Year II: summer – fall

- ☑ Re-establish the outdoor rows and drip irrigation/fertigation system as in Year I.
- ☑ When the primocanes reach 6 ft., tip again to slow the growth.
- ☑ Continue to apply fertilizer once a week with a complete fertilizer containing 100 ppm N.
- ☑ Scout and control any insect pests or disease infestations as needed.
- ☑ Protect roots as in Year I from very cold temperatures from October to December.
- ☑ Move plants into the greenhouse in late December to begin the fruiting cycle again.



Year II: Fruiting

- ☑ Pots of 2nd year plants should be placed in single rows and spaced 1.5 ft. apart on center with 5.5 ft. between rows. These plants will need a little more room than when they were smaller.
- ☑ Apply Ultra fine Horticultural oil after a few days in the greenhouse to suppress spider mite infestations.
- ☑ Continue to deliver irrigation and fertilizer to the plants with N at 100 ppm.
- ☑ Scout foliage for spider mite outbreaks as in Year I.
- ☑ Provide bumble bees at bloom as in Year I.
- ☑ Select the 4 largest primocanes in each pot and pinch at 3 ft., removing all other primocanes.
- ☑ 2nd year plants will yield 8-11 half pints of fruit each.

This cycle can be repeated for a third year before the plants begin to decline.

Resources

Greenhouse and Irrigation Supplies:

W. H. Milikowski, Inc., 75 Chestnut Hill – Rte. 190, Stafford Springs, CT 06076 (800-368-9464 or 800-243-7170)

Stearns Irrigation, Inc. 42 Cranberry Highway West Wareham, MA 02576-1505 (508) 295-2223

Charles W. Harris Co., Inc. 451 Old Somerset Ave. North Dighton, MA 02764 (888-928-3731) Or (508) 824-5607

Bumblebee Vendors:

Koppert Biological Systems, Inc., 28465 Beverly Rd., Romulus, MI 48174 (800-928-8827)

BioBest Canada Ltd. 2020 Merse Road #3, RR 4, Township of Mersea, Leamington, Ontario N8H 3V7, Canada 303-661-9546 or Fax: 303-661-9543

Insect and Mite Predator Vendors:

IPM Laboratories, P.O.Box 300, Locke, NY 13092 [315-497-2063]

The Green Spot, 93 Priest Rd., Nottingham, NH 03290 [603-942-8925]

Biotactics Inc., 20780 Warren Road, Perris, California 92570. Phone (909) 943-2819, FAX (909) 943-8080, E-mail sales@benemite.com
www.benemite.com.

For more information on greenhouse raspberry production, visit the website:

<http://www.hort.cornell.edu/department/faculty/pritts/greenhouse/Frontpage.htm>

For more information on a grower who has used this production method, visit the website:

<http://www.state.ma.us/dfa> and look under the Agro-Environmental Technology Funding Program

or

<http://www.umass.edu/fruitadvisor/> and look under 'Factsheets'