



Selected Topics For Raspberry Producers In Virginia

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Recent supermarket prices may reflect strong consumer demand for fresh raspberries in the eastern United States, and this interests farmers who want to diversify or start new enterprises in Virginia. The commonwealth's nearness to large population centers should help its berries to reach retail distributors faster, and with fewer chances for mishandling, than fruit from other regions. Growth in the region's population should help to sustain relatively high prices that are needed to pay for the labor- and management-intensive procedures that produce fruit for fresh markets.

Manual harvesting is the most costly of these procedures, but it is needed to avoid injuries that would reduce quality and shorten the berry's "marketing life." Special packaging, pre-cooling, and proper postharvest handling are also needed to maintain shelflife and assure marketability. Prices vary with wholesale-market locations and with fluctuations in the quantity and quality of available fruit, so careful study is needed to identify profitable niches for berries that a particular farm may produce.

"Direct marketing" studies have shown that most customers travel fewer than 25 miles to buy Pick-Your-Own (P-Y-O) fruits. Information is not available to determine how many customers are needed to harvest an acre of raspberries, so the optimum raspberry acreage for a P-Y-O marketing region or county is also unknown. Over-saturation of local P-Y-O markets would jeopardize both new and established plantings, so producers should be cautious in estimating the quantity of new supplies that a marketing area can tolerate.

Marketing opportunities seem sufficient to justify at least moderate growth in Virginia's raspberry industry. Economic success of new enterprises will be favored by producers' decisions to use: 1) properly selected sites; 2) adapted cultivars i.e., varieties; 3) disease-free transplants; 4) efficient horticultural practices; 5) effective management of weeds, pests and diseases; 6) timely irrigation; 7) timely harvests; 8) appropriate post-harvest techniques. This implies that an "integrated crop management plan" should be derived to reflect the specific philosophy (eg., organic vs. conventional), resources and marketing circumstances under which each enterprise is created. A list of "Sources of Additional Information" (see below) is

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provided to assist producers in gaining perspectives for development of such a detailed plan. The list includes on-line crop production or enterprise budgets that can be adapted for use in this region.

Choosing cultivars and transplants for commercial raspberry enterprises:

Raspberry cultivar improvements have joined with new nursery practices, cultural systems and plant pathology advances to reduce the risks of raspberry (red, black, purple, yellow, and “blackberry-raspberry hybrid-berry”) production on small farms in the eastern United States and much of Virginia. Knowledge of virus and soil-borne fungus diseases (esp., verticillium wilt and phytophthora root-rot) and “tip-culture” propagation helps nurseries to generate clean, true-to-type transplants for higher yields and longer-lived enterprises.

Plant breeders have intensified the ever-bearing or primocane-fruiting trait in red and yellow raspberries so that fall-crop production systems now extend commercial harvests beyond the traditional summer (floricane) cropping season. All raspberries can produce flowers and fruit during spring and/or early summer on shoots that grow from over-wintered floricanes, but only certain cultivars can produce flowers and fruit during later summer and fall on primocanes (i.e., on new canes that have not undergone winter dormancy). Continued breeding efforts are likely to close the gap between floricane and primocane harvests so that field-grown raspberries will be available at Virginia farms from mid-May until mid- or late-October. Greenhouse and other “protected culture” systems have been suggested to extend both the spring and fall harvest periods or achieve year-round marketing of this crop, but additional research is needed to adapt such cultural systems for use in Virginia.

Large-sized, high quality, firm, cohesive, attractive fruit are most acceptable to consumers and large fruit size reduces raspberry harvest costs. The latter traits, as well as climatic adaptability, insect resistance, disease tolerance and fruit-rot resistance are objectives in the Cooperative Maryland/Virginia/New Jersey/Wisconsin Bramble Breeding Program that first planted seedlings at Blackstone during 1986. ‘Anne’, ‘Caroline’, ‘Lauren’, and ‘Josephine’ have been patented and are available (along with certain advanced selections) from the Program’s licensed nurseries. Local trials of cultivars from this and other breeding programs will be needed to confirm adaptability within each of the commonwealth’s diverse climatic zones,

but the following cultivars (Table 1) should be good candidates for commercial production in Virginia.

Table 1. Raspberry cultivars suggested for commercial trials in Virginia.

Fruiting type	Fruit color	Cultivar (or Selection) name
spring	red	Reveille
spring	red	Lauren
spring	red	Esta (GEL-114)
spring	red	Amos-H
spring	red	Newbergh
spring	red	Emily (JAM-1)
spring	red	Claudia (KCE-1)
spring	purple	Royalty
spring	red	Citadel
fall	red	Caroline
fall	red	Josephine
fall	yellow	Anne
fall	red	Cherokee
spring	black	Jewel
spring	black	Haut

Topography and Soil Factors in Site Selection:

Irrigation costs may be lower for sites that are adjacent to rivers, lakes or large ponds, but river-bottoms and other “low-ground” sites are frequently subject to late spring frosts and should be avoided. Additionally, sites that are gently sloping and relatively higher than surrounding topography will have better air-drainage so that heavy dews may evaporate from plants more quickly and fungus diseases may be reduced.

Internal- and surface-drainage of soil water are prime factors in the establishment of long-lived, profitable raspberry plantings. A soil’s texture and depth largely determine the rate at which excess water drains internally to the subsoil and the proportion of time during which roots are exposed to favorable aeration. Deep, medium-textured (or coarse) soils and stable water-tables are, therefore, recommended for this crop. Examples of Virginia soils that may be acceptable for raspberries are listed in Table 2.

Fine textured and shallow soils tend to experience prolonged periods of soil saturation (24 hours or longer) during cool weather in the Spring and Fall seasons. Cool, saturated soil conditions encourage certain “water mold” fungi to produce zoospores; such episodes also provide water-filled pathways (soil pores) through which spores can swim to susceptible root tissues. Thus, poor soil drainage can lead to serious

incidences of phytophthora root rot disease in raspberries and a number of other crops. Infected plants may experience rapid degeneration and become sources of inocula that can spread to other parts of the planting. Acceptable soils are those which are moderately well- to well-drained. Soils to be avoided are those which are poorly drained, shallow or rocky.

Gently sloping (2-3%) fields are desirable because water tends to flow across the soil surface and away from the site during periods of excess rainfall. Good surface drainage shortens the time during which soil moisture conditions favor *Phytophthora* zoospore production and movement, but it also increases the distance and speed of zoospore movement within the field. Thus, during pre-plant site preparations, it may be prudent to install grassy drainage swales, berms or raised-beds that segment the drainage pattern and delimit areas within which spore dispersal is likely to occur. Raised beds are recommended as means of improving aeration and soil drainage for essentially all sites on which raspberries might be planted in Virginia (Figure 1-a,b).



Figure 1-a,b. High, wide raised-beds are suggested for both raspberries and blueberries.

Table 2. Examples of soils¹ that may be acceptable, and others that may be unacceptable for raspberry production in Virginia.

Usually Acceptable		
Coastal Plains Region	Piedmont Region	Appalachian Division
Bowling	Appling fsl, sl	Bolton l
Emporia sl	Appomattox sl, l	Chagrin sil
Eunola sl	Braddock l	Clymer l
Faceville	Cecil sl	Frederick sil, l
Goldsboro fsl	Chester l, sl	Groseclose sil, l
Granville	Cullen l	Hayter l, fsl, sl
Kalmia	Davidson l	Huntington sil
Kempsville fsl, sl	Dyke l	Lodi l, fsl, sl
Marlboro	Eubanks l	Pope sl, l
Matapeake l, fsl, sil	Georgeville sl, l	Wheeling sil, l
Mattaponi sl	Glenelg l	Zion
Norfolk fsl, sl	Hiwassee l, cl	
Orangburg fsl, sl	Manassas l, sil	
Pamunkey fsl, sil	Mayodan fsl, sl	
Ruston fsl	Myersville sil, l	
Sassafras fsl, sl	Thurmont l	
State sil, l	Unison l	
Suffolk fsl, sl		
Woodstown fsl		
To be Avoided		
Coastal Plains Region	Piedmont Region	Appalachian Division
Bayboro	Bremo	Berks
Bertie	Colfax	Calvin
Bladen	Elbert	Chilhowie
Dragston	Goldston	Corydon
Elkton	Helena	Dandridge
Fallsington	Iredella	DeKalb
Galestown	Lignum	Lehew
Klej	Louisa	Litz
Lenoir	Louisburg	Montevallo
Lynchburg	Manteo	Muskingum
Othello	Orange	Teas
Pasquotank	Trego	Tumbez
Plummer	Wilkes	
Portsmouth	Worsham	
Weeksville		

¹Within certain named soil series there may be more than one textural class for the surface horizon: cl = clay loam; fsl = fine sandy loam; l = loam; sil = silt; sl =silt loam.

Irrigation is Needed for Consistent Yields and Good Fruit Size:

Supplemental irrigation seems essential for regularity of profitable raspberry yields in Virginia. The necessity of irrigation is related to climate or weather patterns, but it is intensified by this crop's need for well-drained soils. Fruit enlargement and primocane vigor are reduced by water shortages; the former increases harvest costs and the latter may reduce potential yields in the following year.

Trickle irrigation uses less water than over-head systems, allows more timely applications of water, and can be employed for delivery of soluble fertilizers. Trickle irrigation does not dampen the flowers, fruits, canes, or foliage and this helps to reduce fungus disease infections (including fruit rots).

Pre-plant Site Preparations Help to Maintain Productivity:

Perennial weed species (such as bermudagrass, bind weed, wild blackberries, Virginia creeper, cow itch, dandelion, horse nettle, nightshade, nutsedge, poison ivy, or sweet briar) may occur as inconspicuous understory plants or dormant seed populations on old pastures, hay fields or other sites. Broadleaf perennials can be especially troublesome reservoirs of certain important viruses, other diseases, and pests. *Broadleaf perennial weeds are generally difficult to eradicate from established broadleaf perennial crop plantations, so it is very important to clean up contaminated sites before raspberries are established on them.*

Raspberry producers should be aware of a connection between broadleaf weeds (or crops) and the occurrence or distribution of Tomato Ringspot Virus (TomRSV), a soil-borne disease (**Figure 2**). This systemic disease can drastically reduce plant growth, fruit development, berry integrity, yields and quality. No raspberry cultivars are immune to the TomRSV disease; nor can it be eliminated from established plants in fruit production fields. Economically significant levels of resistance or tolerance are not known among those raspberry cultivars that seem best adapted (climatically and horticulturally) for commercial production in Virginia. Thus, the producer should focus on weedy host-plants and the nematode-vectors as “weak links” against which management procedures should be applied.



Figure 2. Shock symptoms of Tomato Ringspot Virus on 'Royalty' leaves at Blackstone, Virginia.

TomRSV reproduces in cells of many broadleaf plants but not in grasses or corn (monocots), and it is vectored (carried from plant to plant) by dagger nematodes (*Xiphinema* spp). These nematodes are relatively long-lived, and mature individuals may remain infective (contaminated by TomRSV particles) long after diseased plants have been eliminated from their diets. Immature, growing nematodes, however, lose “infectivity” when they molt (i.e., when they shed their old skins).

It is important to know that TomRSV can also exist in weed (and crop) seeds that may lie dormant within the soil for extended periods of time. Further, TomRSV may be carried onto the site, at any time, in weed seeds or other propagules that are dispersed by birds, animals, humans, machines, drainage water or wind. With their perennial growth habit and highly mobile seeds, dandelions can be especially troublesome hosts of this disease (**Figure 3**). Thus, effective weed management will be essential for maintenance of raspberry productivity on affected sites.



Figure 3. Mature dandelion flower with seeds ready for dispersal by wind.

TomRSV and its vector(s) may not exist on a proposed site but the following precautions are strongly suggested:

- obtain transplants that are free of TomRSV
- eliminate potential sources of infection (i.e., broadleaf plants) from the proposed site
- use post-plant weed control to prevent new sources of infection (esp., dandelion) from developing on the site
- try to eliminate the soil-borne vectors (dagger nematodes) that can transmit TomRSV to healthy plants
- select sites whose soils have good internal and surface drainage
- manage surface run-off to retard the waterborne movement of dagger nematodes onto or within the planting.

Neat Surroundings Look Nicer and May Be More Profitable:

Short-tailed mice (meadow voles and pine voles) feed on roots and bark of *Rosaceous* plants, including bramble crop species. Persistent vole problems may occur in fields that are bordered by thick vegetation, hedgerows or neglected hay fields. Such borders may act as reservoirs from which rodents can migrate to newly established plantings. It is suggested, therefore, that adjoining habitats should be modified and vole infestations should be eliminated early in the site-preparation process.

Effective baits currently are not registered for reduction of vole populations in Virginia's raspberry plantings. Even if such products were available, pre- and post-plant site maintenance procedures should be used to make habitats less attractive to these pests. Plowing, disking, and cultivation of row-crops may kill some voles, and encourage others to leave the site during pre-plant crop rotations. Somewhat similar effects may occur where close successions of green manure crops are tilled into the soil prior to establishment of raspberry plants.

Farmers should consult with wildlife and game experts for guidance on preservation and encouragement of local predator populations (certain owls, hawks, kestrels, foxes, etc.) that feed on these rodents. Predators may be more effective where vegetation is

sparse or very low in stature so that visibility and access to prey are improved. Voles, fungus diseases, inter-plant competition and other problems seem less serious when plants are maintained in weed-free strips, and the plant-bed is kept narrow.

The probabilities of infestation and crop loss may be increased by use of cultural practices that create favorable vole habitats within established fruit plantings. Avoidance of all such practices may be impossible, since some of them achieve other, desired, and important management objectives. Knowledge of possible negative impacts may, however, allow farmers to adapt these practices so that benefits to rodent-pest populations will be minimized. Thus, permanent-sod reduces soil erosion from alleys between rows, but it must be mowed frequently so that predators can more easily detect and capture voles.

A Quick Summary of Site Preparation Tasks:

Use a systemic herbicide (such as glyphosate) or other acceptable means to kill both tops and roots of the perennials and then plow to incorporate residual organic matter with the soil. A rotation or two of small grains (or small grains and corn) should follow this operation so that time will be available to:

- remove tree or shrub roots, if any are present on the site
- incorporate lime and nutrients whose needs may be indicated by soil tests
- eliminate wild blackberries and raspberries from the site and its surroundings so that insect pest and disease hazards will be reduced
- take additional measures to exclude all broadleaf weed and crop species that may be reservoirs of important viruses and other diseases
- submit soil samples to a laboratory that is capable of determining if the site is infested with dagger nematodes (vectors of ringspot viruses), lesion nematodes, etc., then determine if pre-plant soil fumigation is needed
- manage the site's borders so that habitat is less acceptable to resident vole populations and more acceptable to predators.

Additional Sources of Information:

The Midwest Small Fruit Pest Management Handbook is available (11/13/01) at: www.ag.ohio-state.edu/~ohioline/b861/index.html

Information on the advantages of new trellising and training systems is available (11/13/01) in two Virginia Agricultural Experiment Station Bulletins (VAES Bull. 95-2 and 99-1) on the Virginia tech web site at: www.vaes.vt.edu/research/publications/index.html

North American Bramble Growers Association's newsletter is available (11/13/01) at: nabga.com/

Southeastern Small Fruit Center maintains a web site (11/13/01) at: www.smallfruits.org/

Nursery lists are maintained on-line (2/14/02) by at least two universities:
Cornell: www.hort.cornell.edu/Nursery/

NCSU: www.ces.ncsu.edu/hil/hil-210.html

Mid-West and Eastern U.S. web sites with raspberry production budgets:

Agricultural Alternatives

Penn. State Univ. and Coop. Extens. (last modified May 17, 2001)

agalternatives.aers.psu.edu/default.html

agalternatives.aers.psu.edu/crops/redraspberry/RedRaspberry.pdf

Brambles - Production Management and Marketing

Ohio State Univ., Extension Bulletin 782-99 (last modified July 6, 2001) :

ohioline.osu.edu/b782/index.html

Selected Costs and Returns Budgets for Horticultural Food Crops Production/Marketing

VCE Publication Number 438-898, (posted January 2001):

www.ext.vt.edu/pubs/vegetables/438-898/438-898.html

The 1989 *Bramble Production Guide*, NRAES-35, edited by Pritts and Handley, may be purchased through Virginia Cooperative Extension's local unit offices and the Extension Distribution Center. This item includes extensive information on all phases of raspberry production, marketing and budgeting.

The 100-page *Compendium of Raspberry and Blackberry Diseases and Insects*, edited by Michael A. Ellis et al., and published in 1991 by American Phytopathological Society Press (ISBN 0-89054-121-3) is another very important source of information for bramble producers.

Background information on numerous small fruit crops is available in the book *Small Fruit Crop Management* (ISBN 0-13-814609-8), that was sponsored by American Society for Horticultural Science and published by Prentice-Hall in 1990.

Ms. Catherine T. Belcher, Virginia Department of Agriculture, P.O. Box 1163, Richmond, VA 23218 [phone: 804-786-4046], maintains a mailing list for announcements of **Farmers Direct Marketing Association of Virginia (FDMAV)** meetings. The same office can provide information for access to **Virginia Department of Agriculture and Consumer Services (VDACS)** programs such as *Virginia Grown* (a directory of P-Y-O farms and retail farmers markets) and *Virginia's Finest* (a trademarking system). VDACS information is also available (11/13/01) on the internet at: www.vdacs.state.va.us/marketing/index.html