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Berry Crops (Blueberry) Extension and Research
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Ph.D. Horticultural Science, Pennsylvania State University, 1999
M.S. Horticultural Science, Pennsylvania State University, 1995
B.S. Plant Physiology, Northwest University, P.R.C., 1986

PROFESSIONAL EXPERIENCE

Position	Institution	Dates
Associate Professor	North Willamette Research and Extension Center, OSU	7/2006 - present
Assistant Professor	North Willamette Research and Extension Center, OSU	3/01- 6/2006
Postdoctoral Associate	Boyce Thompson Institute for Plant Research, Cornell University, Ithaca, NY	3/99-2/2001
Graduate Research and Teaching Assistant	Pennsylvania State University, Department of Horticulture	2/93-2/99
Researcher	Shaanxi Fruit Crops Research Center, P.R. China	12/91-1/93
Visiting Scientist	USDA - ARS, Appalachian Fruit Research Station, Kearneysville, WV	4/90-11/91
Researcher	Shaanxi Fruit Crops Research Center, P. R. China	7/86-3/90

EXTENSION PROGRAM

Needs assessment

Taking advantage of activities such as farm visits (more than 400), field surveys (3 large industry surveys), and regular grower meetings (more than 80) to identify and evaluate the extension and research needs for the Oregon blueberry industry on a continuing basis.

Program delivery

1. Blueberry industry field survey (August, 2001): In cooperation with several USDA-ARS scientists, more than 60 commercial blueberry fields were sampled in the North Willamette

Valley to collect information on cultural practices, nematodes, phytophthora root rot, ericoid mycorrhizae, and blueberry scorch virus.
2. Blueberry meetings organized: 7
3. Website development and management: Webmaster, Editor, and Associate editor for http://berrygrape.oregonstate.edu; Webmaster for http://www.nwsmallfruits.org
4. Oregon Blueberry Newsletter: 19 issues with more than 30 original articles/notes related to blueberry production.
5. Presentations: more than 60 as listed below by each subject area

Subject area	Presentations	Invited presentations		
		out state	in state	international
General blueberry production systems	5	2	3	
Irrigation management	2	2	1	1
Grafted blueberries	1			
Post harvest berry quality	1			
Organic fertilizers for blueberry production	2			
Organic matter and soil pH management	5	3	2	1
Plant growth regulator- CPPU for blueberries	2	1		
Nitrogen nutrition and ericoid mycorrhizae	5	2	2	1
Pest management	3	1	3	
Marketing berry crops (mainly blueberries)	2	2	2	5
Berry Grape Information Network website			1	

RESEARCH PROGRAM

The following research projects have been supported by more than $350,000 extramural funding since 2001.

Biology and control of blueberry gall midge (BGM) (2004-present)

The presence of blueberry gall midge, *Dasineura oxycoccana* Johnson (Diptera: Cecidomyiidae) in all commercial blueberry fields sampled in Oregon and SW Washington (more than 30 fields) was confirmed. The characteristics of BGM infestation was observed and described. A complete life cycle of this new pest was established. Chemical control trials are underway in collaborations with WSU.

Develop grafted blueberries-blueberry tree project (2005-present)

Several potential blueberry rootstocks were evaluated by grafting various blueberry cultivars. The goal is to develop blueberry trees for mechanical harvesting of fresh quality berries.

The use of plant growth regulators in highbush blueberry production (2002-present)

Prestige, a new plant growth regulator (also known as CPPU) has been registered for use in grape and kiwifruit production. Its effect on fruit quality and yield has not been studied on highbush blueberries. Since 2002, we have found that CPPU application increased berry size in 'Elliott' blueberry except in 2005 growing season, while it had no effect on berry Brix, color, and firmness.

Evaluate the effect of organic fertilizers on highbush blueberry production (2005-2007)

A fish waste-based and protein-based organic fertilizer blends were evaluated for field highbush blueberry production. The rate and timing of the organic fertilizer were determined with various plant growth parameters measured.

Develop a water usage model for highbush blueberries (04-06)

The blueberry field survey found that few blueberry growers have reliable methods for irrigation scheduling. In collaborative efforts, we used TDR technology to determine the actual plant water use and crop coefficients of mature blueberries (Bluejay, Bluecrop, and Jersey). We found that on average, 26' of water is used during the growing season by mature plants. The crop coefficients for these blueberry cultivars were obtained for the first time in the northwest.

Effect of mulch and pre-plant amendment on soil N availability in highbush blueberries (2002-2004)

Because the decomposition of organic matters uses soil nitrogen, it is currently unknown how much additional nitrogen should be applied to compensate for the 'loss' of fertilizer nitrogen to decomposition in blueberry production systems. Our study found that the aged sawdust tied up more fertilizer N than the fresh sawdust. As a result, we are now able to calculate that one acre of blueberry field with an aged sawdust (C/N ratio <200) mulch row 3" deep and 2' wide ties up about 80 lb fertilizer N per season, while a same amount of fresh sawdust mulch ties up 25 lb fertilizer N. It was found that two nitrogen application rates (150 kg/ha vs. 50 kg/ha) had an equal affect on the C/N ratio of both sawdust types when they are incorporated as soil amendments.

Evaluate the post-harvest quality of newly released blueberry cultivars (2003-2005)

A FirmTech II firmness tester was used to compare storage quality of three new blueberry cultivars. I found that three newly released blueberry cultivars have the same or better keeping quality compared to the current blueberry cultivars.

The role of ericoid mycorrhizae in blueberry production systems (2002-2004)

The influence of nitrogen application, cultivar, early cropping, and spacing on EM colonization in highbush blueberries were studied for the first time in the northwest. We

found that high nitrogen rates reduce EM colonization, while early cropping and spacing had little effect on colonization. There was a seasonal trend in EM colonization which follows the seasonal trend of root carbohydrate concentrations; indicating EM colonization is regulated in part by root carbohydrate levels.

PUBLICATIONS

Extension

Yang, W.Q., J. Pscheidt, G. Fisher, and J. DeFrancesco. 2006-2002. Blueberry pest management guide for the Willamette Valley. Oregon State University Extension Publication. EM8538. **Updated annually** (my involvement began in fall 2001).

John Hart, Bernadine Strik, Linda White, and Wei Yang. 2006. Nutrient management for blueberries in Oregon. Oregon State University Extension Publication. EM8918.

Yang, W.Q. 2005. Blueberry gall midge-a new pest in the northwest: identification, life cycle, and plant injury. Oregon State University Extension Publication. EM 8889.

Eleveld, B., B. Strik, K. DeVries, and W.Q. Yang. 2005. Blueberry economics. The costs of establishing and producing blueberries in the Willamette Valley. EM 8526. 41 pp.

Yang, W.Q. Incorrect soil pH for blueberries. 2003 PNW Plant Disease Management Handbook. Pp.108.

Book Chapters

Yang, W.Q. Blueberries in the Northwest. 2005. In: Blueberries – For Growers, Gardeners, and Promoters. Editors: Norman F. Childers and Paul M. Lyrene. Dr. Norman F. Childers Horticultural Publications. Gainesville, FL. Pp. 206-208.

Li, Y., W.Q. Yang, Z. Zhang, and W. Lin. Blueberries in China. 2005. In: Blueberries – For growers, Gardeners, and Promoters. Editors: Norman F. Childers and Paul M. Lyrene. Dr. Norman F. Childers Horticultural Publications. Gainesville, FL. Pp. 243-247.

Non-Refereed

Yang, W.Q. 2006. New information on nitrogen use when sawdust is used for blueberry production. Proceedings of Oregon Horticultural Society annual meeting.

Yang, W.Q. and T. Peerbolt. 2006. Biology and control of blueberry gall midge. Proceedings of the 7th Annual Small Fruit Grower's Workshop, WSU Vancouver campus.

Handell Larco, Wei Yang, and Bernadine Strik. 2006. Evaluation of two organic fertilizer blends for blueberry production. Proceedings of North American Blueberry Research & Extension Workers Conference. *(plus oral presentation)*

Yang, W.Q. 2005. Blueberry gall midge—an emerging new pest? Proceedings of the Oregon Horticultural Society online at http://www.oregonhorticulturalsociety.org. Portland, OR. January 2005.

Yang, W.Q., M. Tien, and B.L. Goulart. 2005. Characterization of extracellular proteases produced by four ericoid mycorrhizal fungi in pure culture and in symbiotic states. Acta Horticulturae. (In press)

Kaufman, D., W. Q. Yang, G. Fisher, and J. Kowalski. 2004. Evaluation of Surround kaolin clay particle film as a tool for integrated control of selected pests in strawberries. Proceedings of the Oregon Horticultural Society online at http://www.oregonhorticulturalsociety.org. Portland, OR. January 2004.

Yang, W.Q. 2004. CPPU application delayed maturity of 'Elliott' highbush blueberries in Oregon. Proceedings of the 6th Annual Small Fruit Grower's Workshop, WSU Vancouver campus.

Kaufman, D., W.Q. Yang, G. Fisher, and J. Kowalski. 2004. Evaluation of Surround kaolin clay particle film as a management tool for root weevils in strawberries. Proceedings of the 63rd Annual Pacific Northwest Insect Management Conference. Pp. 12-14.

Eleveld, B., B. Strik, K. DeVries, and W.Q. Yang. 2004. The costs of establishing and producing blueberries in Oregon's Willamette Valley. Proc. Great Lakes Fruit, Vegetable & Farm Market EXPO, Grand Rapids, Michigan, Dec. 7-9

Bernadine Strik and Wei Yang (editors). 2004. Proceedings of Blueberry Production Course – For new and experienced growers and other industry members. Salem, OR. 132 pages.

Wei Yang and David Bryla. 2004. Irrigation system design considerations and challenges. In: Proceedings of Blueberry Production Course. Pp. 69-73.

Bernadine Strik and Wei Yang. 2004. Planting design – Plant spacing, trellising, and mulching options. In: Proceedings of Blueberry Production Course. Pp. 66-67.

Bernadine Strik, John Hart, Pilar Banados, and Wei Yang. 2004. Fertilization – What we now know and what we still need to learn. In: Proceedings of Blueberry Production Course. Pp. 83-91.

Bart Eleveld, Bernadine Strik, Karen Vries, and Wei Yang. 2004. Blueberry economics – Cost of establishing and producing blueberries in the Willamette Valley. In: Proceedings of Blueberry Production Course. Pp. 15-27.

Yang, W.Q. and B. Strik. 2003. How does nitrogen application affect ericoid mycorrhizae in blueberry production? Proceedings of the 5th Annual Small Fruit Grower's Workshop, WSU Vancouver campus.

Yang, W.Q. 2003. Strawberry and raspberry production and market in China. Proceedings of the Oregon Horticultural Society. Portland, OR. January 2003. 94:124-126.

Yang, W.Q. 2003. Blueberry production and market in China. Proceedings of the Oregon Horticultural Society. Portland, OR. January 2003. 94:119-123.

Yang, W.Q. 2002. China berry trip. Berry Works News. Fall 2002.

Yang, W.Q. 2002. The importance of organic mulch in highbush blueberry production systems. Proceedings of the 4th Annual Small Fruit Grower's Workshop, WSU Vancouver campus.

Yang, W.Q. 2002. 2002. Oregon blueberry industry survey—cultural practices. Proceedings of the Oregon Horticultural Society. Portland, OR. January 2002. 93:113-115.

Scagel, C. and W.Q. Yang. 2002. Cultural variation and mycorrhizal status of blueberry plants in NW Oregon commercial production fields. Proceedings of the Oregon Horticultural Society. Portland, OR. January 2002. 93:115-123.

Scagel, C., W.Q. Yang, J. Pinkerton, R. Linderman, and R. Martin. 2002. 2001 Oregon blueberry survey to growers. A 40-page USDA-NWREC publication.

Yang, W.Q. 12/24/2002. China has Oregon berry concerned. Statesman Journal newspaper.

Goulart, B.L., K. Demchak and W.Q. Yang. 1998. Highbush blueberry root systems: cultural management effects on root system development and mycorrhizal infection intensity. 8th North Amer. Blueberry Res. Ext. Workers Con. NC State. May, 1998.

Goulart, B.L., K. Demchak and W.Q. Yang. 1996. Effect of cultural practices on field grown 'Bluecrop' highbush blueberries, with emphasis on mycorrhizal infection levels. Acta Horticulturae. 46:271-278.

Stevens, C.M., B.L. Goulart, Y. Dalpe, J.F. Hancock, K. Demchak and W.Q. Yang. 1996. The presence, isolation, and characterization of ericoid mycorrhizal symbionts in 2 native and 2 commercial Vaccinium populations in central Pennsylvania. Acta Horticulturae. 46:411-420.

Goulart, B.L., K. Demchak and W.Q. Yang. 1995. Blueberry mulch, amendments, and nitrogen levels studied. Pennsylvania Vegetable Growers News 18(7):12-15.

Goulart, B.L., K. Demchak and W.Q. Yang. 1994. Bramble cultivar trials underway at Penn State. Pennsylvania Vegetable Growers News. 17(12):11-14.

Yang, W.Q. 1993. Computer applications in agriculture science. Northwest Horticulture. P.R. China. 10:51-52.

Yang, W.Q. 1991. The method of determining the water use of fruit trees. Northwest Horticulture. P.R. China. 4:32-34.

Refereed

Li, Y., W.Q. Yang, Z. Zhang, and W. Lin. Blueberry research, production, and market in China. Small Fruits Review (Accepted).

Yang, W.Q. and Q. Gao. 2005. Raspberry production and markets in China. Small Fruits Review. 4(4):32-36.

Scagel, C. and W.Q. Yang. 2005. Cultural variation and mycorrhizal status of blueberry plants in NW Oregon commercial production fields. International Journal of Fruit Science. 5:85-111.

Yang, W.Q., R. Murthy, P. King, and M.A. Topa. 2002. Diurnal changes in gas exchange and carbon partitioning in needles of fast- and slow-growing families of loblolly pine (*Pinus taeda*). Tree Phys. 22:489-498

Yang, W.Q., B.L. Goulart, K. Demchak and Y. Li. 2002. Interactive effects of mycorrhizal inoculation and organic amendment on nitrogen acquisition and growth of highbush blueberries. J. Amer. Soc. Hort. Sci. 127:742-748

Yang, W.Q. and B.L. Goulart. 2000. Effect of mycorrhizal infection on short-term aluminum uptake and root cation exchange capacity (CEC) of highbush blueberry plantlets. HortScience 35:1083-1086.

Yang, W.Q., B.L. Goulart and K. Demchak. 1998. Mycorrhizal infection and plant growth of highbush blueberry in fumigated soil following soil amendment and inoculation with mycorrhizal fungi. HortScience. 33:1136-1137.

Yang, W.Q. and B.L. Goulart. 1997. Aluminum and phosphorus interactions in mycorrhizal and nonmycorrhizal highbush blueberry plantlets. J. Amer. Soc. Hort. Sci. 122:24-30.

Yang, W.Q., B.L. Goulart and K. Demchak. 1996. The effect of aluminum and media on the growth of mycorrhizal and nonmycorrhizal highbush blueberry plantlets. Plant and Soil. 183:301-308.

Goulart, B.L., W.Q. Yang and K. Demchak. 1995. Development of an inoculation system for studying mycorrhizal effects in highbush blueberry. J. Small Fruit Vitic. 3:193-201.

Goulart, B.L., K. Demchak and W.Q. Yang. 1995. Organic matter and nitrogen level effects on mycorrhizal infection in 'Bluecrop' highbush blueberry plants. J. Small Fruit Vitic. 3:151-164.

Yang, W.Q. and D.M. Glenn. 1994. Interactions between vegetative and floral buds in apple and peach. HortScience 29:310-312.

Abstracts (# With conference proceedings)

#Yang, W.Q. and T. Peerbolt. 2006. An in-depth study of the biology and life cycle of blueberry gall midge. Proceedings of the Northwest Center for Small Fruit Research 2006 Conference. *(plus oral presentation)*

#Yang, W.Q. 2006. Using grafted blueberries to improve mechanical harvesting for fresh market quality berries. Proceedings of the Northwest Center for Small Fruit Research 2006 Conference. *(plus oral presentation)*

Yang, W.Q. and T. Peerbolt. 2005. Blueberry gall midge – A new pest in the northwest. Water, Wildlife & Pesticides in the West Symposium. Portland, OR. *(plus poster presentation)*

Yang, W.Q., D. Bryla, and B. Strik. 2005. Plant water use differs among three mature highbush blueberry cultivars. HortScience. 40:873. *(plus oral presentation)*

#Yang, W.Q. and T. Peerbolt. 2005. Evaluation of northwest incidence & lifecycle of blueberry gall midge *Dasineura oxycoccana* Johnson in blueberries. Proceedings of the Northwest Center for Small Fruit Research 2005 Conference. *(plus oral presentation)*

Yang, W.Q. 2004. Effect of sawdust age and nitrogen application on the decomposition rates of two types sawdust used for blueberry production. HortScience. 39:873. *(plus oral presentation)*

#Yang, W.Q. 2004. Effect of sawdust mulch and pre-plant amendment on soil nitrogen availability in highbush blueberry. Proceedings of the Northwest Center for Small Fruit Research 2004 Conference. *(plus oral presentation)*

Yang, W.Q. 2003. CPPU application delayed maturity of 'Elliott' highbush blueberry in Oregon. HortScience. 38:687. *(plus oral presentation)*

Yang, W.Q. 2003. The new online tools for extension education in small fruits. HortScience. 38:696. *(plus poster presentation)*

#Yang, W.Q., D. Bryla, and B. Strik. 2003. Develop a seasonal water usage model in highbush blueberries**.** Proceedings of the Northwest Center for Small Fruit Research 2003 Conference. *(plus oral presentation)*

#Yang, W.Q. 2002. Sawdust mulch and amendment affect soil nitrogen availability in highbush blueberry. Proceedings of the Northwest Center for Small Fruit Research 2002 Conference. *(plus oral presentation)*

Yang, W.Q., R.P. Phillips, A. Dunbar-Wallis, and M.A. Topa. 2001. Seasonal ^{15}N acquisition and allocation in slow- and fast-growing loblolly pine (*Pinus taeda* L.). HortScience. 36:546

Phillips, R.P., W.Q. Yang, and M.A. Topa. 2001. Differences between rhizosphere and bulk soil in a nutrient-poor loblolly pine (*Pinus taeda* L.) plantation. Ecological Society of America Annual Meeting, Madison, Wisconsin.

Yang, W.Q., R.P. Phillips, A. Dunbar-Wallis, and M.A. Topa. 2001. Seasonal nitrogen acquisition and allocation patterns in slow- and fast-growing loblolly pine (*Pinus taeda* L.). Ecological Society of America Annual Meeting, Madison, Wisconsin.

Yang, W.Q., Amy, D. W. and Topa, M.A. 2000. Fine root turnover and mycorrhizal morphotypes in loblolly pine. Ecological Society of America Annual Meeting, Snowbird, UT.

Topa, M.A., W.Q. Yang, S.K. Paul, and R.P. Phillips. 2000. Carbon acquisition and partitioning strategies of slow- and fast-growing families of loblolly pine. Ecological Society of America Annual Meeting, Snowbird, UT.

Yang, W.Q., A. Dunbar-Wallis, and M.A. Topa. 2000. Fine root production and mycorrhizal morphotypes in loblolly pine. HortScience. 35:424

Yang, W. Q., B.L. Goulart and K. Demchak. 1998. Assessing organic nitrogen acquisition of ericoid mycorrhizae in highbush blueberry (*Vaccinium corymbosum* L.) plants by using an ^{15}N tracer. HortScience. 33:467.

Yang, W. Q., B.L. Goulart and K. Demchak. 1998. Nitrogen acquisition efficiency of ericoid mycorrhizae in highbush blueberry (*Vaccinium corymbosum* L.) plants. HortScience. 33:467.

Goulart, B.L., K. Demchak and W.Q. Yang. 1998. Effect of preplant amendment, mulch, and nitrogen level on highbush blueberry root growth and mycorrhizal infection intensity. HortScience. 33:529.

Yang, W. Q., B.L. Goulart and K. Demchak. 1997. The effect of aluminum and media on the growth of mycorrhizal and nonmycorrhizal highbush blueberry plantlets. HortScience. 32:486-487.

Yang, W. Q. and B.L. Goulart, and K. Demchak. 1996 Aluminum and phosphorus interactions in mycorrhizal and nonmycorrhizal highbush blueberry plantlets. HortScience. 31:627.

Goulart, B.L., K. Demchak, and W.Q. Yang. 1996. The effect of varying cultural practice on the location of mycorrhizal infection within the rhizosphere of highbush blueberry plants. HortScience. 31:614.

Goulart, B.L., K. Demchak, W.Q. Yang. 1996. Interactive effects of cultural practices on mycorrhizal infection intensity level in field grown 'Bluecrop' highbush blueberry. ICOM. 1:54. UC Berkeley, USA.

Stevens, C.M., B.L. Goulart, Yolande Dalpe, J.F. Hancock, K. Demchak and W.Q. Yang. 1996. The presence, isolation and characterization of ericoid mycorrhizal symbionts in 2 native and 2 commercial vaccinium populations in central Pennsylvania. ICOM. 1:113. UC Berkeley, USA.

Yang, W.Q. and B.L. Goulart. 1995. Aluminium uptake and root cation exchange capacity (CEC) in mycorrhizal and nonmycorrhizal blueberry (*Vaccinium corymbosum* L.) plant. HortScience 30:784.

Goulart, B.L., K. Demchak, W.Q. Yang, C.M. Stevens, and Y. Dalpe. 1995. Development of an inoculation protocol for ericoid mycorrhizae. HortScience 30:881.

Stevens, C.M., B.L. Goulart, Y. Dalpe, J.F. Hancock, K.Demchak and W.Q. Yang. 1995. Survey and fungal symbiont characterization of ericoid mycorrhizae in four Vaccinium populations of Centre County, Pennsylvania. Ecological Society of America Annual Meeting.

Yang, W.Q. and D.M. Glenn. 1992. Osmotic potential is related to sink strength in vegetative and floral buds of apple and peach. HortScience 27:613.

Glenn, D. M., W. V. Welker, C. Cavin and W. Q. Yang. 1991. Interaction between peach and tall fescue roots. HortScience 26:727.

PROFESSIONAL AFFILIATIONS

1995-present	American Society for Horticultural Science (ASHS)
2004-present	International Society for Horticultural Science (ISHS)
2002-present	Member of the Oregon Horticultural Society

2001-presnet	Member of the Northwest Center for Small Fruit Research
2005, 2004, 2001	OSU Extension Association

AWARDS

- OSU Extension Association Newer Faculty Award, 2004
- ASHS student travel grants, 1998, 1997, and 1995
- Visiting fellowship at USDA-ARS, Appalachian Fruit Research Station awarded by the UNDP and FAO of the United Nations. 4/1990-11/1991