Production of blueberries in containers

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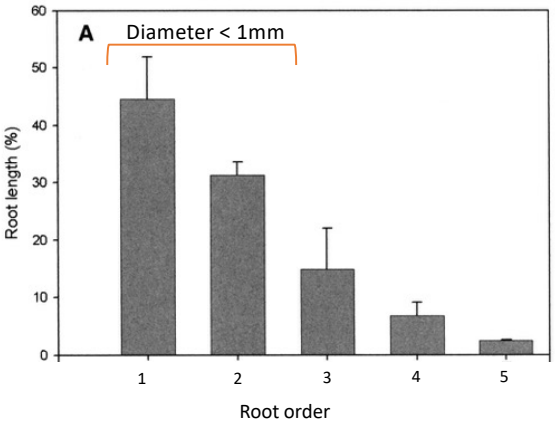
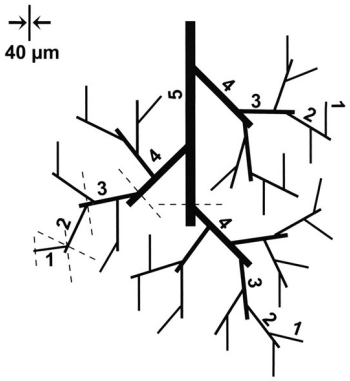
Container-based blueberry production represents the evolution of the cultivation strategy

Optimization
Intensification

Costs
Longevity

The blueberry root system is made of very fine roots



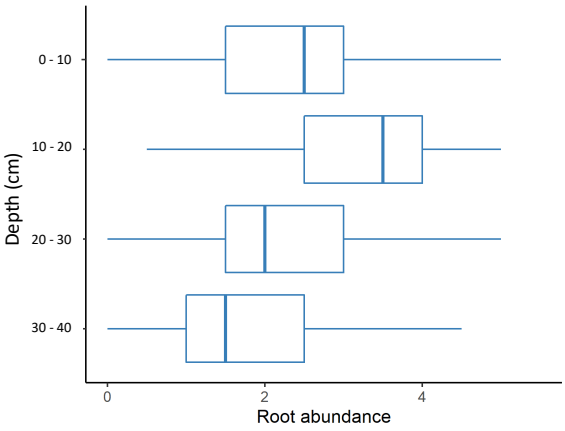


Valenzuela-Estrada et al. (2008) *Am. J. Bot.*

Fine roots cannot penetrate compacted, heavy soils

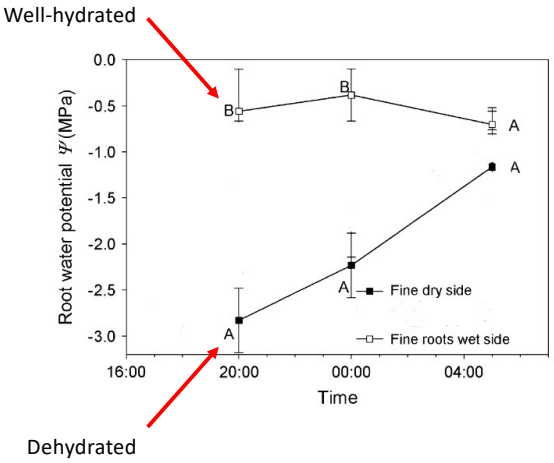
More pine bark

Less pine bark



Nunez et al. (2022) *En Prep.*

Fine roots need long nights to rehydrate



Valenzuela-Estrada et al. (2009) *J. Exp. Bot.*

Blueberry roots do not tolerate flooding

Treatment	Shoot length (cm)	No. flower buds per shoot	No. flowers per bud
Control	5.50 a	4.3 a	4.2 a
Flooded	2.30 b	1.1 b	1.4 b

Modified from Abbot (1986) HortScience

Flooding promotes disease development in blueberry roots

Treatment	Phytophthora disease rating
Control	0.90 c
Flooded 1 week	3.20 a
Flooded 2 week	2.70 ab
Flooded 4 week	2.3 b

Silva et al. (1999) HortScience

Huarhua et al. (2018) Per. J. Agr.

Blueberry roots prefer acidic soils

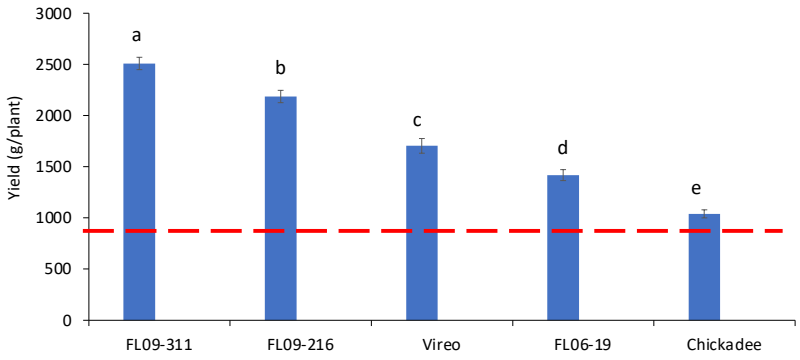
Soil pH	Root dry weight (g)	Cane dry weight (g)	Leaf dry weight (g)	Total dry weight (g)
4.5	41.09 a	67.08 a	29.91 a	138.07 a
5.3	35.69 b	46.77 b	25.02 a	107.48 b
6.0	3.13 c	3.84 c	6.50 b	13.47 c

Challenging: carbonate and bicarbonate contents

Jiang et al. (2019) *Agronomy*

Container-based systems allow is to optimize the root environment and maximize productivity

The main characteristic of container-based production systems is high vigor



Fang et al. (2023) *Scientia Hort.*

Containers larger than 40.4 L do not improve productivity

Fang et al. (2023) *Scientia Hort.*

Containers larger than 40.4 L do not improve productivity

Rapidly becoming the industry standard

No effect over 2 years

Fang et al. (2022) *In Prep.*

Container shape affects the height of the perched water table

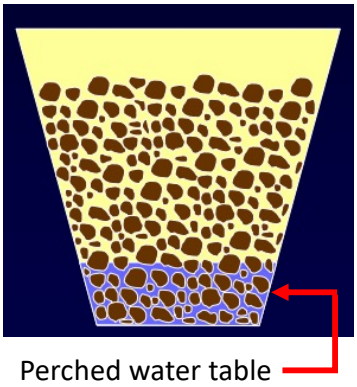


Image credits: James Altland (USDA ARS /OSU)

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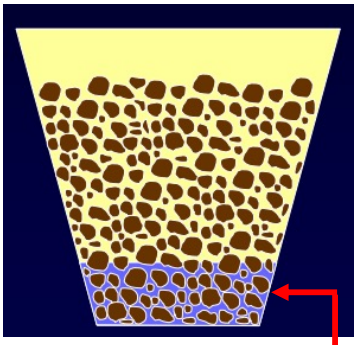
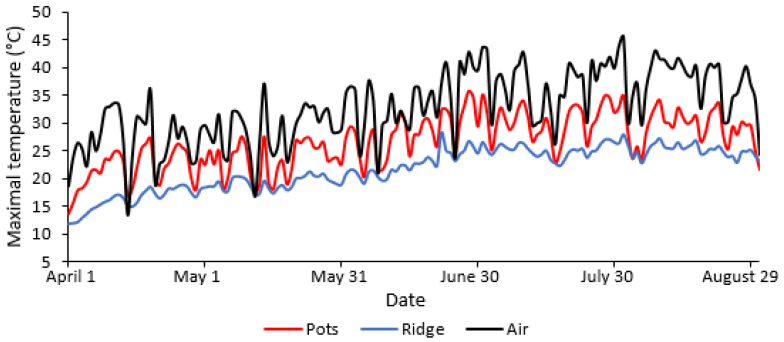


Ideal containers have many drainage holes

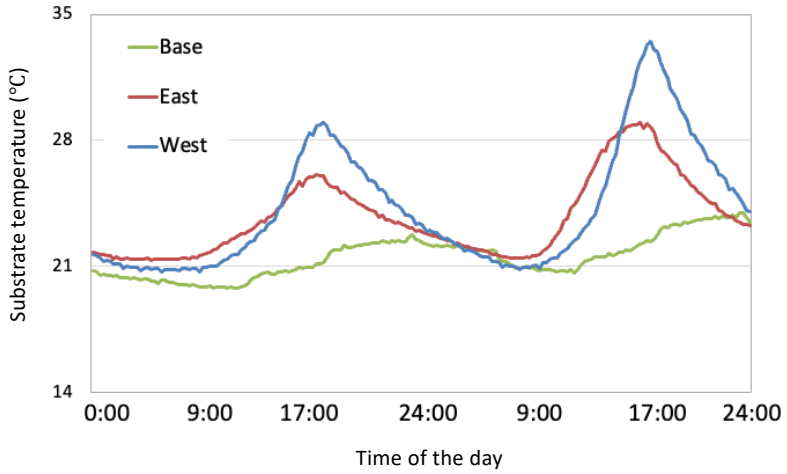
Image credits: James Altland (USDA ARS /OSU)

Substrates have wider temperature variation than soils

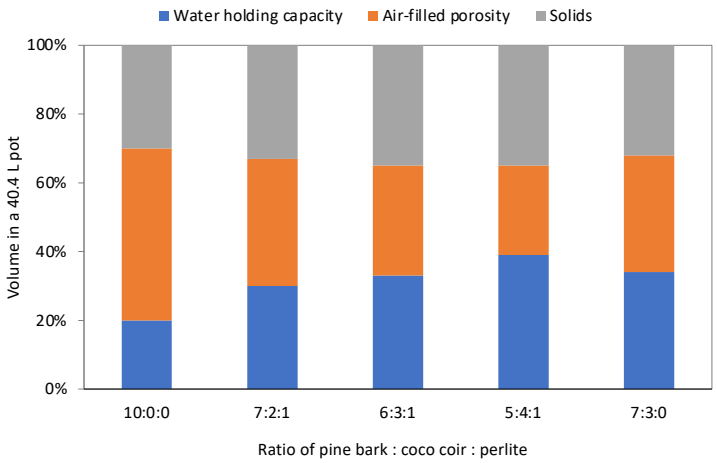


Smrke et al. (2022) *Agriculture*

Substrates do not warm up evenly



Substrate composition impacts water holding capacity and porosity



Good Performance

Water holding capacity: 20% - 39%

Porosity: 26%-50%

Fang et al. (2023) *Scientia Hort.*

Substrate composition also affects chemical characteristics

Composition	pH
90% peat : 10% perlite	4.4
90% coco : 10% perlite	6.6
90% bark : 10% perlite	5.8

Kingston et al. (2017) *HortScience*

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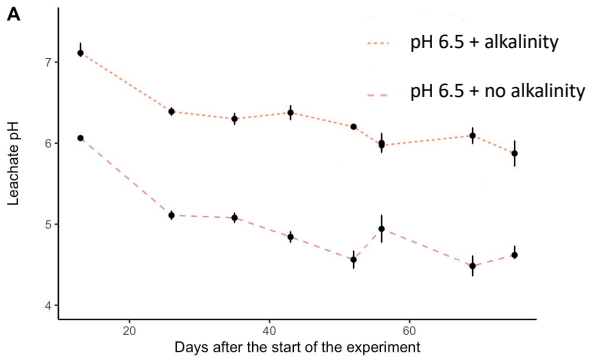
Kingston et al. (2017) *HortScience*



Schreiber and Nunez (2021) *Horticulturae*

Substrate composition also affects chemical characteristics

Target is < 2.0 dS/m

Composition	EC (dS/m)	Concentration (ppm)			
		K	Na	Ca	Mg
90% peat : 10% perlite	0.31	128	85	8,017	1,304
90% coco : 10% perlite	1.20	8,689	1,260	3,124	155
90% bark : 10% perlite	0.22	570	307	3,059	646

Target is 3:1

Kingston et al. (2017) *HortScience*

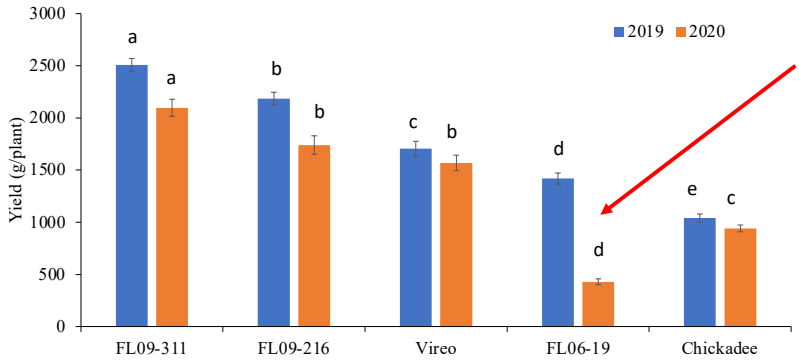
Substrate composition also affects decomposition rates

Tendency to 30

Composition	C:N
90% peat : 10% perlite	44
90% coco : 10% perlite	70
90% bark : 10% perlite	103

Kingston et al. (2017) *HortScience*

Substrate longevity is a major challenge



Up to 70% decrease due to substrate compaction

Fang et al. (2023) *Scientia Hort.*

Many questions remain

- Alternatives to coco coir
- Substrate longevity
- Machine harvest

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