



Blueberry Breeding @UF 2018 FBGA update

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October 30 2018. Ocala, FL.

www.blueberrybreeding.com



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Blueberry Breeding & Genomics Lab

PROFESSOR Dr. PATRICIO MUÑOZ

2016 global production growth predictions



Production doubled (US), tripled (EU) and quadrupled (APAC) since 2008

Brazelton et al 2017 IBO

Top 10 global production highbush blueberry

	Th	iousand i	metric to	ons produ	iced by c	ountry				
		2012			2014			2016		
000 Metric Tons	FR	PR	Total	FR	PR	Total	FR	PR	Total	
United States	125.4	87.2	212.6	145.4	103.7	249.1	133.1	123.5	256.6	
Chile	70.1	29.9	100.0	74.0	27.3	101.3	91.4	33.9	125.3	
Canada (BC)	22.7	29.5	52.2	27.2	41.7	69.0	22.7	49.9	72.6	
Spain	9.8	0.1	9.8	19.6	0.1	19.7	28.0	2.0	30.0	
China	8.2	3.2	11.3	16.0	4.0	20.0	20.0	8.0	28.0	
Argentina	14.2	6.4	20.6	12.6	2.9	15.4	14.9	3.0	17.9	
Poland	10.1	1.5	11.7	14.0	1.5	15.5	15.0	1.0	16.0	
Peru	0.1	0.0	0.1	2.0	0.0	2.1	15.4	0.4	15.8	
Mexico	5.6	0.1	5.6	10.4	0.1	10.5	16.5	0.6	17.1	
Morocco	2.2	0.0	2.2	6.4	0.2	6.7	11.4	0.3	11.7	
Top 10 Total	268.3	157.9	426.2	327.7	181.5	509.2	368.4	222.6	591.0	

- USA ~40% of global production, but utilized a 68% globally

- Big changes in the Southern Highbush countries expected

Brazelton et al 2017 IBO

Monthly Global Production and Florida

Total Global Production



- Florida window

UF Blueberry Breeding Program Test Sites



UF Blueberry Breeding Program Test Sites



Early stage selections in Central-South Florida

UF Blueberry Breeding Program Test Sites



A variety trial with all cultivars – Dormex and Evergreen

UF IFAS

UF Blueberry Breeding

Wish list for new cultivars:

Late flowering but short bloom to ripe Early season yield Fruit quality (flavor, texture, size, scar, firmness, etc.) Machine harvest Disease resistance Pest resistance High fruit Set Strong root systems Stable performance across production systems

Average Historical Harvesting Cost % per Flat



How breeding can help our stakeholders:

- Cultivars that decrease cost of production/establishment
- Cultivars that increase yield (i.e. less disease, high yield)

Machine Harvest

 Producers can machine harve and market the product fresh decreasing labor costs and increasing profit margins.

 Strategically the program will continue developing cultivars with the right:
<u>firmness</u>,
detachment strength,
stem length, and
bush architecture
<u>Concentrated ripening</u>
ideal for machine harvest!!

Fruit Firmness/Crunchiness

Relevant for all stakeholders:

- Machine harvest cheaper (Brazelton, 2016)
- Distributors Postharvest quality, less likely to mold (Mehra et al., 2013)
- Retailers Longer shelf life (Padley, 2005)
- Consumers More enjoyable texture (Saftner et al, 2008)



Francesco Cappai, PhD student



Review

Molecular and Genetic Bases of Fruit Firmness Variation in Blueberry—A Review





Consumers surveys have indicated the single most applicate fruit quality of blueberries was flavor (Gilbert, et al., 2013)



Blueberry Flavor/Aroma



Flavor criteria Aroma (volatiles) Acid (citric acid) Sugar (fructose, glucose & sucrose)



Sugar and acid: easy to measure Volatiles: enhance sensory experience





Lorenzo Bizzio, PhD student

Timothy Johnson, PhD student

Haley Sater, PhD student

Root Length Ideal substrate and Roots water economy nutrient Secondary Roots fixation power deal air substrate economy heat budget Root Angle



Fang Yang, PhD student





Boodt et al., 1971

Substrate Production?

3 factors:

5 substrates

	substrate 1	substrate 2	substrate 3	substrate 4	substrate 5
fine pine bark	50%	60%	70%	70%	100%
Coconut coir	40%	30%	20%	30%	0%
perlite	10%	10%	10%	0%	0%

Pot sizes: 10 gal, and 15 gal – same diameter

Selections/cultivars: 'Chickadee', 'Vireo', '06-19', '09-311', '09-216'



'FL 09-216' Bushy

'FL 09-311' semi-upright

'FL 06-19' upright

Effect of architecture on yield, pot temperature, and weed management

Can we select seedlings with "better" root systems?

-avgdiameter,-lengthbytips;+max depth;





+ avgdiameter,+ lengthbytips;-max depth;

Wild species

- Blueberry belongs to the genus Vaccinium
- The genus includes ≈400 species worldwide



Vaccinium corymbosum



Vaccinium vitis-idaea



Vaccinium angustifolium



Vaccinium macrocarpon



Vaccinium oxycoccos



Vaccinium ashei



Vaccinium stamineum



Vaccinium myrtillus

http://www.dlc.fi/~marian1/gourmet/i_berry.htm

Introgressed wild species in SHB

- V. darrowii
- V. ashei (V. virgatum)
- Florida needed:
 - Good quality fruit with low chilling requirements
 - Disease pressure resistant varieties for Florida
 - Early berries with good size and flavor



Blueberry relative species in Florida

	Diploid	Tetraploid	Hexaploid	
Species in <i>Vaccinium</i> present in Florida	V. fuscatum	V. fuscatum	V. virgatum	
	V. darrowii V. arboreum V. stamineum	V. myrsinites		
	V. elliottii	I		

New PhD student working in pollination

Rationale: Fruit set is one of the main constrains for yield. Pollination is one of the main components for fruit set!

Collaboration with Dr. Rachel Mallinger

Focus: developing protocols to measure "pollination traits" that we could select for to enhance fruit set.

PostDoc working in blueberry diseases

Rationale: Diseases decrease significantly the yield potential of blueberry cultivars

Collaboration with Dr. Phil Harmon

Focus: Stem blight, Xyllela, Stem Algae, and Ralstonia.

- I) Developing protocols
- 2) Test advanced selections
- 3) Screen early selections

PhD student working in blueberry Gall Midge

Rationale: Gall midge decrease significantly the yield potential of blueberry cultivars

Collaboration with Dr. Oscar Liburd

Focus: Developing protocols to measure gall midge susceptibility. Then using the protocols to select and breed for gall midge resistance

SWD next step with Dr. Liburd

Planning: New Master student working with Dormex

Rationale: Dormex could be a great benefit for production, but could decimate the crop if not applying properly

Collaboration with Dr. Jeffrey Williamson

Focus: Determine the recommendations for Dormex application before cultivars are released

Blueberry Breeding Lab



Thanks to our collaborators!



Visit us at www.blueberrybreeding.com



QUESTIONS??