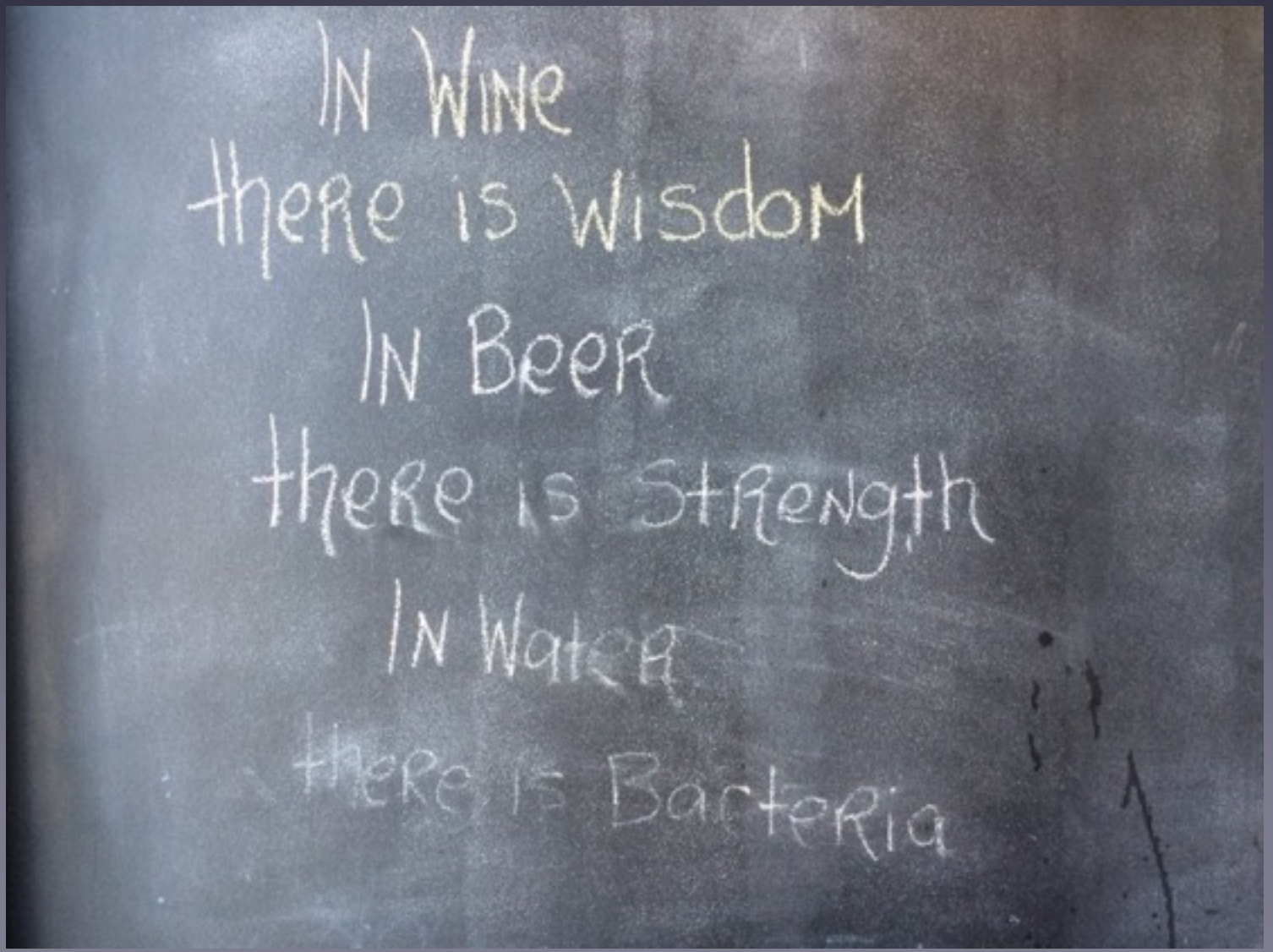
In Wine
there is Wisdom
In Beer
there is Strength
In Water
there is Barteria

Expanding your risk management toolbox - on-farm tools for water quality and pathogen monitoring

(GF2 0251 FCO-HMGA)

FCO Research Conference

February 1, 2017

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Objective:

- Develop **PRACTICAL** methods that growers can use to:
  - Track microbial water quality – **manage RISK**
  - Monitor water **treatment system performance**
  - Proactively manage water quality throughout the **whole production system**

Concerns for **Greenhouse Flower** Growers

- Plant pathogens going into production areas from fresh or **recycled** water
- Treatment system performance

Concerns for Vegetable & Herb Growers

- **Food safety** in production and processing
- **Regulations**
- Plant pathogens going back onto cropland

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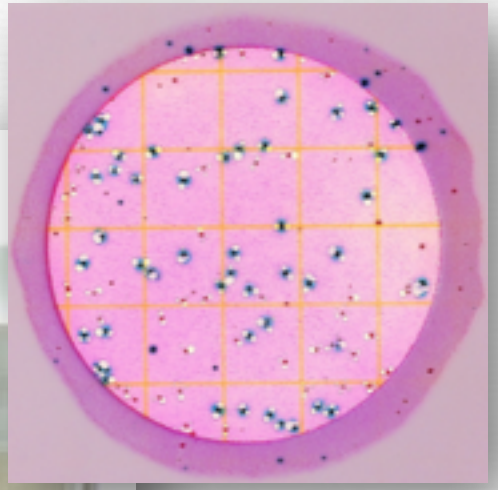
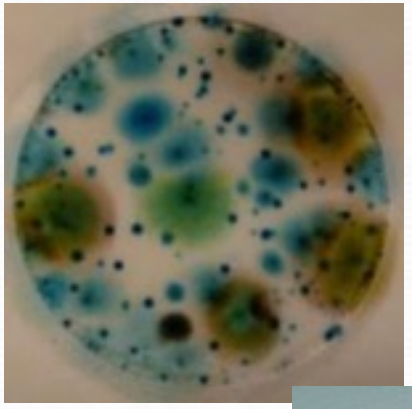


3M Petrifilms

General water quality:
Total aerobic bacteria

Tools for fungal plant pathogens

- 3M Petrifilm Yeast & Mold
- Standard plating methods
- Sani-Check dipslides
- AgDia test strips
- DNA Multiscan (UofG Lab Services)



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DNA Multiscan testing

Site code	F2
Crop	Cut mixed
System	Recirculating
Treatment	UV

Untreated recirc. water

Treated water

DNA Multiscan scores

		Leach or Runoff water - untreated					Treated				
Sample Code		F2-3	F2-3	F2-3	F2-3	F2-3	F2-4	F2-4	F2-4	F2-4	F2-4
Sample Name		Cistern 1	Cistern 1	Cistern 1	Cistern 1	Cistern 1	Cistern 2	Cistern 2	Cistern 2	Cistern 2	Cistern 2
Sampling Date		14-May-12	5-Jun-12	5-Jul-12	1-Aug-12	15-Aug-12	14-May-12	5-Jun-12	5-Jul-12	1-Aug-12	15-Aug-12
Target Organism	Botrytis cinerea	1	0	0	0	0	1	1	0	0	0
	Fusarium oxysporum	1	0	0	1	1	0	1	1	1	0
	F. solani	1	0	0	1	1	1	1	1	1	1
	Phytophthora sp.	1	0	0	1	0	2	0	0		0
	P. cactorum	0	0	0	0	0	0	0	0		0
	P. capsici	0	0	0	0	0	0				0
	P. cinnamomi	0	0	0	0	0	0				
	P. cryplogea	0	0	0	0	0	0				0
	P. drechsleri	0	0	0	0	0	0				
	P. fragariae	0	0	0	0	0	0	0			0
	P. infestans	0	0	0	0	0	0	0		0	0
	P. nicotianae	0	0	0	0	0	0	0	0	0	0
	Pythium sp.	3	1	1	1	1	4	3	1	1	0
	P. aphanidermatum	0	0	0	0	0	0	0	0	0	0
	P. dissotocum	6	1	2	3	3	6	8	1	1	0
	P. irregulere	1	0	0	0	0	0	0	0	0	0
	P. polymastum	0	0	0	0	0	0	1	0	0	0
	P. sylvaticum	0	0	0	0	0	0	0	0	0	0
	P. ultimum	1	0	0	0	0	0	0	0	0	0
	Rhizoctonia solani	0	0	0	0	0	0				
	Sclerotinia sp.	0	0	0	0	0	0				
	Thielaviopsis basicola	0	0	0	0	0	0				
	Verticillium albo-atrum	0	0	0	0	0	0				
	Verticillium dahliae	0	0	0	0	0	0				
	V. dahliae (ver longisporum)	0	0	0	0	0	0				

OOPS !

2 weeks for results

Plant pathogen removal by woodchip bioreactor – DNA Multiscan testing

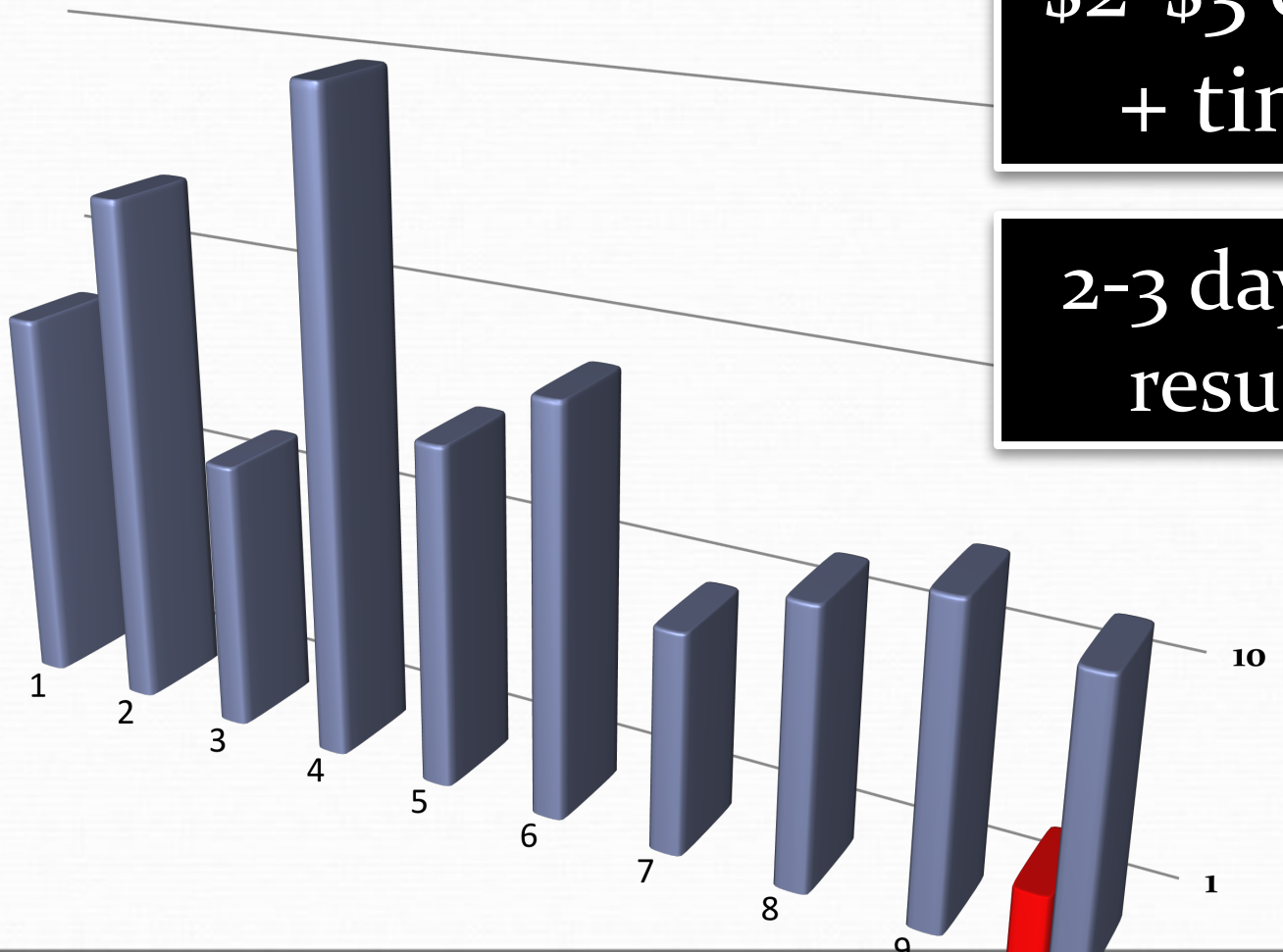
Target Organism	Untreated Sump Water							Woodchip Bioreactor Treated						
	22 May 12	5 June 12	5 July 12	1 Aug 12	15 Aug 12	12 June 13	5 Sept 13	22 May 12	5 June 12	5 July 12	1 Aug 12	15 Aug 12	12 June 13	5 Sept 13
Botrytis	2	3	1	0	1	0	0	0	0	0	0	0	0	0
Fusarium	0	1	1	1	2	1	1	0	0	0	0	0	0	1
Phytophthora	0	1	0	0	0	1	0	0	0	0	0	0	1	0
Pythium	0	5	4	5	3	10	1	0	0	0	0	0	1	0
Rhizoctonia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olpidium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sclerotinia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thielaviopsis	0	0	0	0	0	0	0							0
Verticillium	0	0	0	0	0	0	0							0

$175-$225 each

3M Petrifilm for yeast & mold

$2-$3 each + time

2-3 days to results



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Project Cooperators

Cooperator	Crops	Irrigation systems	Recirc ?	treatment
Greenhouses (7)	❑Cut ❑Potted ❑Bedding ❑Vegetable	❑Flood •floor, •trough, •Dutch tray ❑Drip ❑Overhead	YES	❑UV (5) ❑Cloth filter(7) ❑Peroxide (2) ❑Copper ❑Chlorine dioxide ❑ECA ❑Ozone ❑Woodchip Bioreactor ❑Constructed wetland
Vegetable growers/ Washers (8)	❑Carrots, beets, parsnips ❑Greens ❑Asian veg	❑Overhead irrigation ❑Wide range of washing systems	Some	Nothing to everything!

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Results -

Toolbox for Microbial water quality assessment

- **3M Petrifilms** - a measure of RISK
  - **Total yeast & mold** – risk of fungal pathogens
  - **Total aerobic plate count** (bacterial) – general water quality; risk of biofilm development in pipes and drippers
  - ***E.coli* and total coliforms** (only if food safety is a concern)

- **DNA multiscan** – identifies WHAT is there

Results -

Baseline microbial water quality data (2 years)

- **treatment system performance** and general **water management**
  - 7 greenhouse systems
  - 8 vegetable production and processing systems

- >3000 Petrifilm analyses!!

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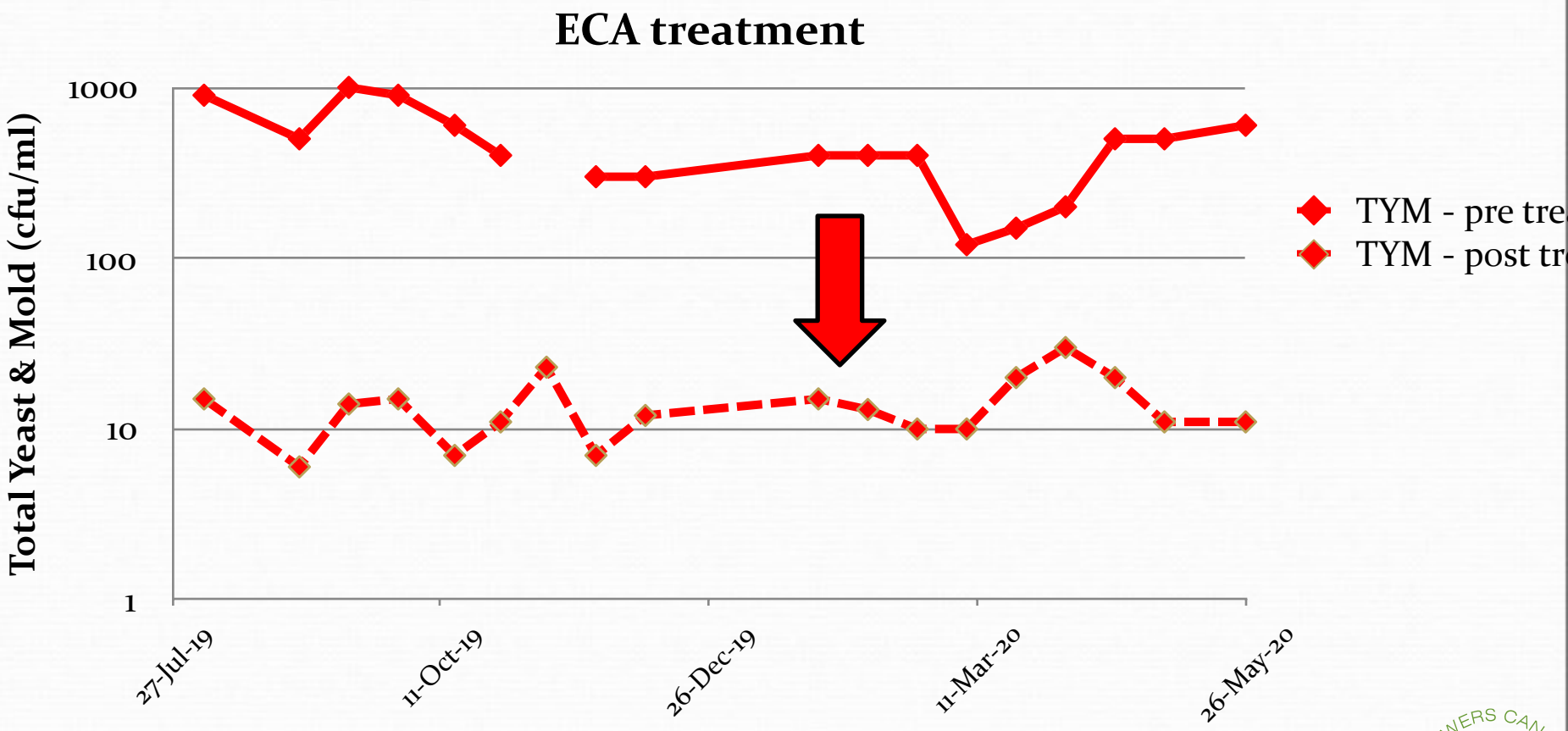
Typical results: treatment system performance



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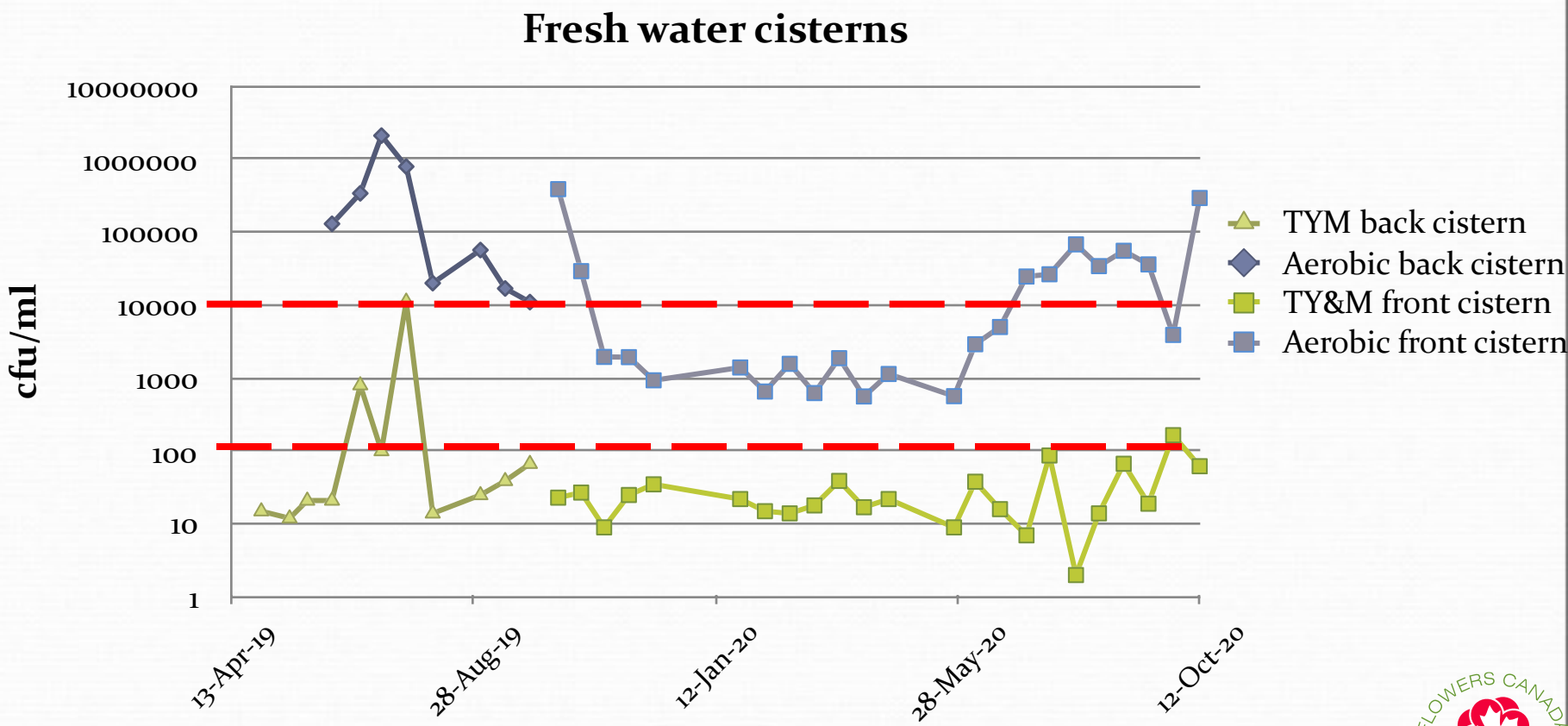
Typical results: changes over season and management



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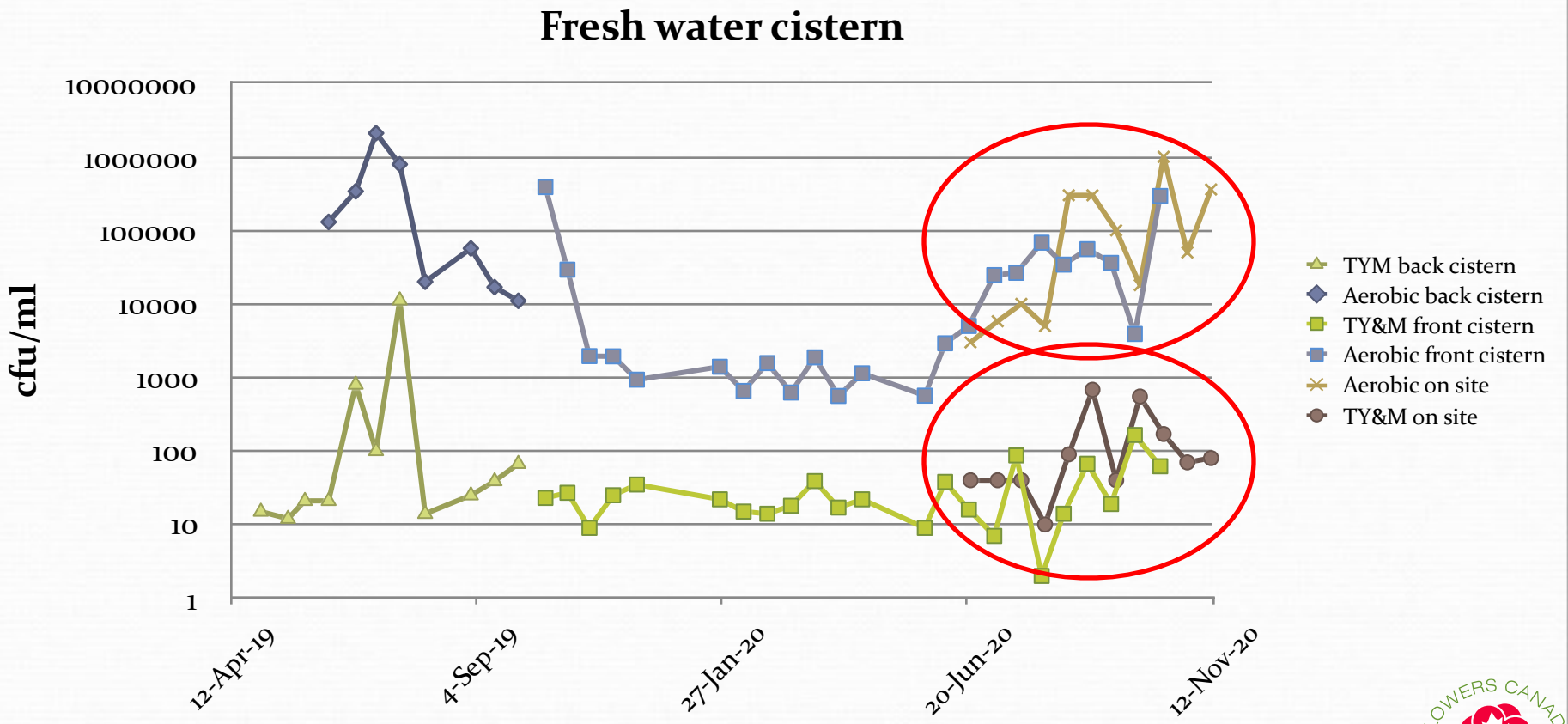
On-site comparisons



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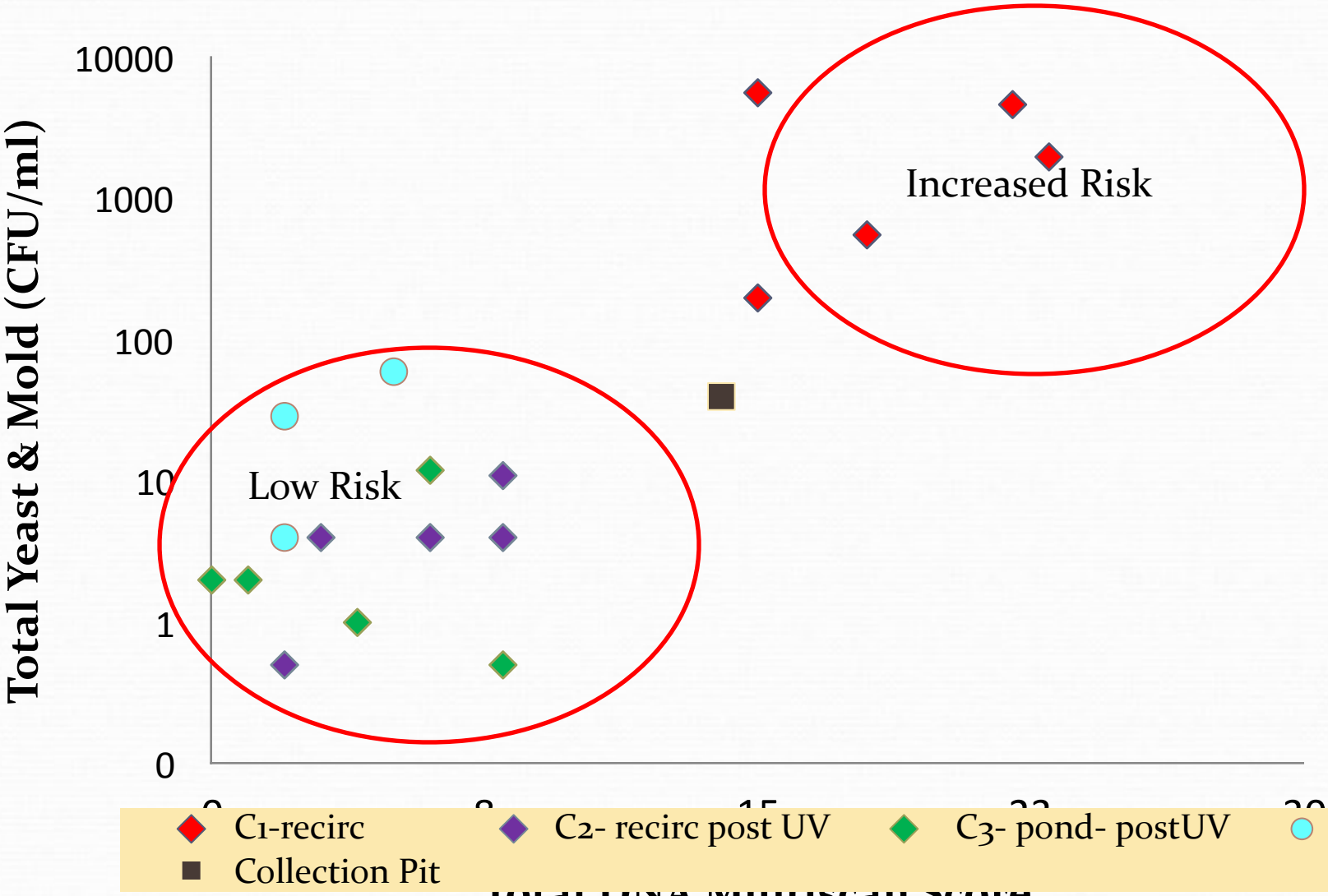
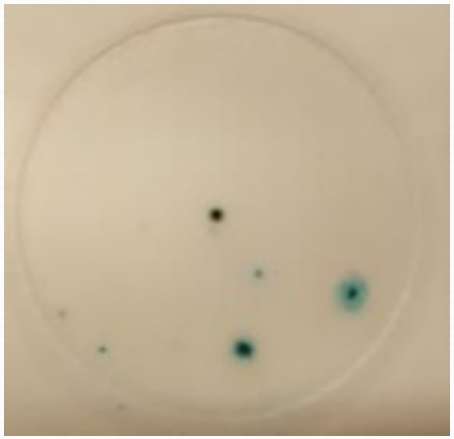
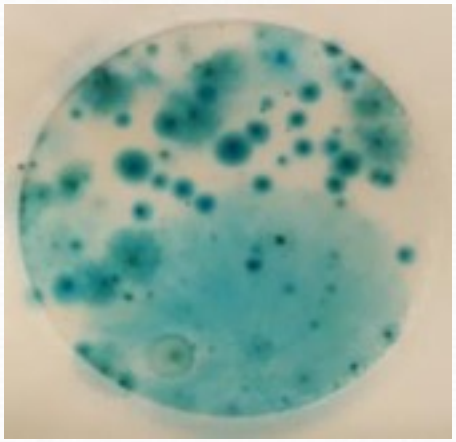
Implications for growers



RISK Determination



- Low counts
- Consistent results
- Treatment system OK
- Scouting looks OK
- Track changes in levels with water sources changes (e.g. pond vs roof)



- High counts
- Inconsistent results
- Unusual spikes in data
- Send for DNA multiscan?
- Extra scouting for issues?
- Check/maintain treatment equipment?
- Clean tanks, including feed tanks

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Equipment alternatives

OR

OR

$159 at Amazon.ca

$373 at Amazon.com

OR Room temperature for Aerobic and Y&M

Other parameters

- Test strips/meters for sanitizer residuals and other chemicals
  - **peroxide**
  - **chlorine – free & total**
  - **chlorine dioxide**

  - **pH**
  - **ammonia**
  - **nitrate**
  - **phosphate**

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Next Steps

- **Workshops** – February:
  - Niagara area
  - Holland Marsh area
- **Ordering supplies and equipment** through FCO
  - SOON please!!!!!
- **Contact us:**
  - Ann Huber, SRG; ahuber@srgresearch.ca
  - Jeanine West, FCO; jeanine@fco.ca

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Acknowledgements

- Flowers Canada (Ontario) Inc.,
- Holland Marsh Growers Association & LSGBCUF project,
- Steering Committee Members, and
- Our Growers!!

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Growing Forward 2 AAC agricultural adaptation council Ontario Canada