



AgrInnovation Program Stream B

2017-18 Annual Performance Report

Optimal fertilizer application rates in container nursery crop production

Name of Recipient: Canadian Ornamental Horticulture Alliance	
Project Title: Canadian Ornamental Horticulture Research and Innovation Cluster	
Project Number: AIP-CL20	Period Covered by Report: 2017-04-01 to 2018-01-31
Activity #: COHA 08 Name of Activity: Optimal fertilizer application rates in container nursery crop production	Principal Investigator: Dr. Youbin Zheng, Vineland Research and Innovation Centre (VRIC) and University of Guelph

Innovation Items	Results Achieved	Provide a description (2-3 paragraphs) for each item produced and describe its importance to the target group or sector. Explain any variance between results achieved and targets. Use plain language.
# of new/improved practices	1	A comprehensive fertilization guide for Canadian container nursery crop productions was developed in this project. The new/improved practices outlined in the guide will help growers to enhance their productivities and minimize environmental impact. The guide provides recommendations on the optimal fertilizer application rates for different nursery species.

Information Items	Results Achieved	Provide the complete citation for each item. Please see Annex A for examples.
# of peer reviewed publications	1	Debora Bowser, 2017, "Fertilization and Irrigation Considerations for Container-grown Nursery Crop Production". University of Guelph, MSc Thesis, Retrieved from: https://atrium.lib.uoguelph.ca/xmlui/bitstream/handle/10214/10347/Bowser_Debora_201704_Msc.pdf?sequence=1
# of information items	4	<ol style="list-style-type: none"> 1. Hillary MacDougall and Dr. Youbin Zheng, "Controlled Release Fertilizer Trial at Willowbrook Nursery", Pages 1-5, Technical Transfer Summary, 2017/10/12. 2. Hillary MacDougall and Dr. Youbin Zheng, "Controlled Release Fertilizer Trial at Blue Sky Nursery", Pages 1-8, Technical Transfer Summary. 2017/10/27. 3. Hillary MacDougall and Dr. Youbin Zheng, "Controlled-Release Fertilizer Trial at J.C. Bakker Nurseries (2016-2017)", Pages 1-8 pages, Technical Transfer Summary, 2017/11/15. 4. Hillary MacDougall and Dr. Youbin Zheng, "Controlled-Release Fertilizer Trial at Maple Leaf Nurseries (2016-2017)", Pages 1-9, Technical Transfer Summary,



		2017/11/30.
# of information events	9	<ol style="list-style-type: none"> 1. Youbin Zheng, "Willowbrook Nurseries Results" Industry Meeting, Fenwick, Ontario, 2017/05/17. 2. Youbin Zheng, "Blue Sky Nurseries Results" Industry Meeting, Beamsville, Ontario, 2017/06/09. 3. Youbin Zheng, "Maple Leaf Nurseries Results" Industry Meeting, Vineland, Ontario, 2017/06/13. 4. Youbin Zheng, "Bakkers Nurseries Results" Industry Meeting, St. Catharines, Ontario, 2017/06/29. 5. Youbin Zheng, "Willowbrook Nurseries Results and Future Applications" Industry Meeting, Fenwick, Ontario, 2017/09/27. 6. Youbin Zheng, "Blue Sky Nurseries Results and Future Applications" Industry Meeting, Beamsville, Ontario, 2017/09/27. 7. Youbin Zheng, "Current nutrient management practices and technologies used in North American greenhouse and nursery industries" Greensys 2017 - International Symposium on New Technologies for Environment Control, Energy-Saving and Crop Production in Greenhouse and Plant Factory, Beijing, China, 2017/08/20 8. Youbin Zheng, "Fertilisation is one of the most effective tools in container plant production", European Mineral Fertiliser Summit, Amsterdam, Netherlands, . 2017/12/6 9. Youbin Zheng, "Optimal fertilizer application rates in container nursery crop production", Cluster 2 Webinar, Guelph, ON, 2018/02/14.
		Provide the # of attendees
# of individuals attending information events	190	<ol style="list-style-type: none"> 1. 3 2. 3 3. 2 4. 3 5. 5 6. 4 7. 100 8. 50 9. 20
		Provide the # of attendees who intended to adopt new information or technology
# of individuals attending information event who intend to adopt new innovation	40	40
		Provide the name, degree completed and date of completion
# of persons who completed a M.Sc. or Ph.D. during project		Debora Bowser completed her MSc from the University of Guelph, Guelph, Ontario, in April 2017.

2. Executive Summary



Key Highlights -

Containerized plant production has become increasingly popular in recent years because it allows for faster plant growth and better plant quality. However, this form of intensified ornamental horticulture is associated with the use of large quantities of irrigation water and fertilizer, and could result in high amounts of nutrient runoff. Because the nutritional needs of ornamental plants vary greatly among species, the use of optimal fertilization application rates specific to each species/cultivar is vital for decreasing nutrient runoff while achieving favourable plant growth.

During the past year, we have carried out the following activities:

- Completed 2-year trials on two nursery farms to assess different nutrient management strategies on preventing summer dormancy of container-grown boxwood and yew.
- Completed two on-farm trials to determine the optimal fertilizer rates for 9 different container nursery species and used 4 different growing substrate types.
- Developed and published a fertilization guide for Canadian container nursery crop productions based on our research and information in the literature.

The final deliverable, the fertilization guide, will help growers to enhance their productivities and minimize environmental impact. Overall, the results are useful and readily applicable to container nursery crop production operations in Canada and similar climate regions.

Success Story

After communicating our research results to about 200 people through different knowledge transfer activities, some operations have started, or are in the process of starting, applying our results in their operations. For example, the involved fertilizer companies are using our data to guide their recommendations to nursery growers, and the involved nurseries are planning to use the fertilizer rates based on our research results.

We have trained a research technician, a summer interim and a MSc student. They may likely to continue contribute to the Canadian ornamental horticulture industry with the knowledge and experience gained through their intensive involvement in our research activities.

3. Objectives/Outcomes (technical language is acceptable for this section)

Introduction

Excess fertilization is not only costly, but can also injure plants and cause unnecessary nutrient runoff, resulting in environmental damage. However, insufficient fertilization can result in plants showing symptoms of nutrient deficiencies, reduce crop productivity, and eventually reduce the efficiency of other resource inputs during nursery crop production. When optimal fertilizer application rates are used, nursery crops will perform at their best, and growers will be able to maximize resource-use efficiency, which can improve profit margins while minimizing negative environmental impacts.



Objectives

This project objectives were to identify optimal fertilization rate recommendations for container-grown nursery crops in temperate climate regions.

Approach/Methodology

Trials (mostly on-farm) were designed to evaluate the minimum quantity of fertilizer and optimal fertilization rates/ranges required for economically important container nursery crops in Ontario, Canada.

Deliverables

The planned deliverables for 2017-2018 were:

- Optimal fertilizer application rates for four container nursery crop species using different growing substrates.
- A comprehensive fertilization guide for Canadian container nursery crop productions. This will result in 1 new practice for producers related to following the fertilization guide.
- A graduate with a MSc degree ready to be hired by the ornamental horticultural industry.

Results and Discussion

Different species have different nutrient requirement. When optimal fertilizer rate is applied, the plant performs its best which can often results in the highest resource use efficiency and economic benefits for the growers. The following are a list of optimal fertilizer rates for different species based on our on-farm trials in 2017:

1. Heuchera 'Red lighting' (1 gal): 18 g/pot Osmocote Plus 15-9-12, 5-6 month duration, topdressing.
2. Hydrangea 'Wedding gown' (3 gal): 28-42 g/pot Osmocote Plus 15-9-12, 5-6 month duration, topdressing.
3. *Miscanthus zebrinus* (1 gal): 21 g/pot Osmocote Plus 15-9-12, 5-6 month duration, topdressing.
4. Rhododendron 'Peace's American beauty' (2 gal): 58 g/pot Osmocote Plus 15-9-12, 5-6 month duration, topdressing.
5. Barberry 'Concorde' (2 gal): 41.6 g/pot Polyon 19-6-13, 8-9 month duration, incorporated.
6. Burning bush 'Compact' (2 gal): 13.9 g/pot Polyon 19-6-13, 8-9 month duration, incorporated.
7. Dogwood 'Ivory halo' (2 gal): 50.8 g/pot Polyon 19-6-13, 8-9 month duration, incorporated.
8. Potentilla 'Goldstar' (2 gal): 32.3 g/pot Polyon 19-6-13, 8-9 month duration, incorporated.
9. Rhododendron 'PJM elite' (2 gal): 41.6 g/pot Polyon 19-6-13, 8-9 month duration, incorporated.

By incorporating the results over all years, a comprehensive fertilization guide for Canadian container nursery crop productions was developed. The guide will help growers to enhance their productivities and minimize environmental impact. The guide provides recommendations on the optimal fertilizer application rates for different nursery species. In summary, all planned deliverables for 2017/18 were successfully achieved.

4. Issues

One challenge was that a large in-kind contributor (Fafard) was purchased by a large US-based company and has been restructured. The new company has declined the opportunity to continue with the project, which resulted in a gap for in-kind contribution. This was reported to the AAFC Program Officer, and a solution was presented at that time. Fafard was intended to be involved in the project by providing analysis services. Therefore VRIC managed to have certain samples analyzed by themselves and also managed to get about 30% discount for our sample analysis from SGS lab. This resulted in no impact on the deliverables or



scope of the activity.

Therefore one change to the budget which was approved in 2017/18 related to the making-up for lost in-kind. The PI (Youbin Zheng) previously worked for VRIC, and his time/contribution was not tracked in the original budget. Youbin now works entirely for the University of Guelph now and spends 2-3 days a week on this project. Youbins' salary from the University of Guelph can be considered a cash contribution to the project for this year 2017/18. This contribution would be equal to \$35,582 partner cash from UG. This is reflected in the financial statements from the lead applicant, VRIC.

In 2017/18 a new technician and a summer student were hired to conduct the work that would have been completed by the technician, Mary Jane Clark.

5. Lessons Learned:

For this kind of applied research, it is essential to get the end users, in this case the nursery growers and fertilizer suppliers, involved. This way, the research results can directly be used by the industry.

6. Future Related Opportunities:

Not that much new research needs to be done by academic researchers related to the specific plant species and fertilizers which were investigated in this project; however, growers and fertilizer suppliers need to work together using our research methods to determine optimal fertilizer application rates for new fertilizers and plant species in the future.

NOTE TO READER: This report has been edited from the original for formatting purposes only. There have been no changes made to the information provided by the researcher.