High Tunnel Production of Organic Raspberries.

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Background:

High tunnel production under Northern growing conditions can enhance the sustainability of organic berry fruit farming by the extension of the cropping season and the improvement of fruit quality. However, only marginal areas are organically-grown even though the market doesn't fulfill the demand for organic raspberry.

Project Overview:

The goals of this study were 1) to compare two organic fertilization management methods (liquid and liquid+solid) with a conventional culture grown under high tunnels and 2) to determine the effect of $CaCl_2$ spray foliar application on berry quality. A complete randomized experimental design with 8 replicates was established at Les Fraises de l'Île d'Orléans, QC, Canada and the combined 6 treatments were compared during 2010 and 2011. During the first growing season, no significant differences were observed in the soil nutrient solution, while soils of organic farming had higher content of N (28%), P (23%), K (46%), Mg (93%), Ca (17%), Fe (10%), Mn (17%) compared to conventional soil, resulting in higher nutrient leaf concentrations. At the end of the cropping season, higher (P<0.05) plant biomass (39-54%), yield (21%) and fruit size were observed under the organic production systems compared to the conventional system (P<0.01). Fruit quality was not affected (P<0.05) by $CaCl_2$ treatment. During the second growing season, similar results were observed with a net advantage for the organic farming.

Figure 1 The influence of three fertilization regimes on the total yield of raspberry grown under high tunnels expressed by g of fruit per linear meter (n=145).

Proc Mix

Treatments	P<0.01
Month	P<0.001
Treatment*Month	NS

Contrasts

Conv vs Organic	P<0.001
L vs L+S*	NS
+Ca vs -Ca	NS

*Liquid and solid organic fertilizers

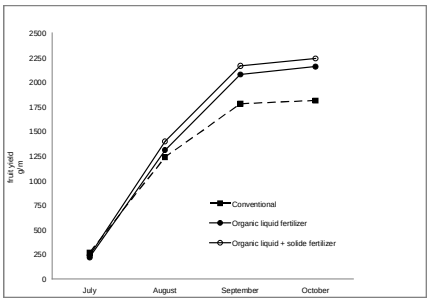

Table 1: Soil mineral content (Melich III) during the growing season 2010 (n=145).

Fertilization treatments	P (mg Kg^{-1})	K (mg Kg^{-1})	Ca (mg Kg^{-1})	Mg (mg Kg^{-1})	Fe (mg Kg^{-1})	Cu (mg Kg^{-1})	Mn (mg Kg^{-1})	Zn (mg Kg^{-1})	N tot (%)
Organic liquid fertilization									
July	168±3.01	305±13.69	1607±53.66	209±12.37	355±4.80	3.83±0.19	23±0.65	3.48±0.18	0,24±0.01
September	171±9.68	319±18.88	1472±61.22	180±7.76	308±8.38	4,14±0,19	17±0.60	2,86±0,15	0,21±0.01
October	183±12.54	339±16.26	1367±72.74	163±8.61	279±4.48	3.86±0.28	16±0.64	2.64±0.15	0,21±0.01
Organic liquid + solid fertilization									
July	158±3.26	275±9.48	1629±38.16	183±7.81	333±5.23	4.32±0.27	21±0.68	3,28±0.16	0,24±0.01
September	155±4.43	285±12.94	1514±61.33	167±8.86	308±5.58	4.66±0.24	16±0.46	2.96±0.14	0,22±0.01
October	162±7.33	306±14.19	1547±83.21	155±9.53	292±6.42	4,38±0.30	15±0.47	2,56±0.15	0,21±0.01
Conventional fertilization									
July	165±23.54	182±4.97	1311±37.24	81±2.03	309±4.15	4.19±0.21	18±0.38	1.49±0.06	0,17±0.00
September	113±2.29	216±11.91	1270±61.87	96±5.96	284±9.42	4.90±0.28	14±0.57	1.52±0.08	0,18±0.00
October	126±5.60	230±11.12	1336±53.37	97±4.11	261±4.94	4.62±0.26	14±0.61	1,27±0.08	0,17±0.003
P values									
Treatment	P<0.001	P<0.001	P<0.001	P<0.001	P<0.001	NS	P<0.001	P<0.001	P<0.001
month	P<0.05	P<0.001	P<0.001	P<0.001	P<0.001	P<0.001	P<0.001	P<0.001	P<0.001
Treatment*month	NS	NS	P<0.01	P<0.001	P<0.05	NS	NS	P<0.01	P<0.05
Contrasts									
Conventional vs Organic	P<0.001	P<0.001	P<0.001	P<0.001	P<0.001	NS	P<0.001	P<0.001	P<0.001
Liquid vs Liquid+Solid*	NS	P<0.01	NS	NS	P<0.05	NS	P<0.01	NS	NS

* Organic liquid and solid fertilizers

Conclusions: Soils of organic farming had higher content of macro- and micronutrients resulting in higher plant biomass, yield and fruit size of organic-grown plants compared to conventional plants. No effect of $CaCl_2$ treatment on fruit quality was observed. High tunnels extended the cropping season by ~40 days under Northern growing conditions and are a promising way to produce high yield of quality fruits.

Acknowledgments: This research was funded through Canada's Organic Science Cluster, which in turn was funded by the Canadian Agri-Science Clusters Initiative of Agriculture and Agri-Food Canada's Growing Forward Policy Framework and its industry partner, Les Fraises de l'île d'Orléans.