

Economic feasibility of pest management strategies on winter spinach under high tunnels.

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INTRODUCTION

Demand for local foods is an important driver of specialty crops production specially in urban and peri-urban areas.

We investigated the economic feasibility for spinach when using biocontrol strategies to address pest management in High Tunnel (HT).

DATA/METHODS

We collected data at two locations: Indianapolis and Lafayette.
 IND: Control treatment 1,056 ft²
 LAF: MEIGS (Purdue Farm) 12 biological plots.

Biological agents:

- *Chrysoperla carnea*
- *Adalia bipunctata*
- *Orius insidiosus*

Biopesticides:

- *Neemix 4.5 (Certis, MD)*
- *Pyganic (MGK, MN)*
- *Sil-matrix (Certis, MD)*
- *Water*

Tool reports include:

- Cost structure.
- Sensitivity analysis.
- Breakeven analyses: price, yield.
- Marginal benefit-cost ratio (MBCR).
- Return on investment (ROI).

RESULTS

- ❑ Control achieved the third-lowest marketability, 88%; and the lowest cost per ft², \$1.52.
- ❑ Family-owned HT farm with 2 acres of land to produce with organic practices 20+ types of vegetables. DTC sales with an average weighted price per lb. of \$10.82.
- ❑ Biopesticides were applied at the highest rate and the highest cost per ft² was Neemix, \$0.02; for predators was Adalia, \$0.41.
- ❑ Most profitable and cost-effectiveness, and highest marketability treatment were T7 and T8 under *Chrysoperla carnea*, according to MBCR and ROI.

Table 1. Economic performance of the spinach control treatment under HT.

Untreated control	
Marketability	88%
Marketable yield (lb./ft ²)	0.37
Revenue (\$/ft ²)	\$4.00
Costs (\$/ft ²)	\$1.52
Net return (\$/ft ²)	\$2.48

Table 2. Cost per ft² for biological control treatments on spinach under HT.

Type	Biological	Cost (\$/ ft ²)
Biopesticides	Neemix 4.5	\$0.0225
	Pyganic	\$0.0062
	Sil-matrix	\$0.0067
Biological agents	Adalia bipunctata	\$0.41
	Chrysoperla carnea	\$0.15
	Orius insidiosus	\$0.29

Table 3. Economic performance of 12 pest management strategies on spinach production in HT.

Treatment	Marketability	Marketable Yield (lb./ft ²)	Revenue (\$/ft ²)	Costs (\$/ft ²)	Profit (\$/ft ²)	MBCR	ROI	
T1	A + W	94%	0.39	4.27	2.12	2.15	0.45	101%
T2	A + N	97%	0.41	4.41	2.14	2.27	0.66	106%
T3	A + P	96%	0.40	4.36	2.13	2.23	0.60	105%
T4	A + S	95%	0.40	4.32	2.13	2.19	0.52	103%
T5	C + W	98%	0.41	4.45	1.85	2.60	1.38	141%
T6	C + N	99%	0.42	4.50	1.87	2.63	1.43	141%
T7	C + P	99%	0.42	4.50	1.86	2.64	1.47	142%
T8	C + S	99%	0.42	4.50	1.86	2.64	1.47	142%
T9	O + W	81%	0.34	3.68	2.00	1.68	-0.66	84%
T10	O + N	78%	0.33	3.54	2.02	1.52	-0.91	75%
T11	O + P	88%	0.37	4.00	2.01	1.99	0.00	99%
T12	O + S	89%	0.37	4.04	2.01	2.03	0.09	101%

- ❑ Orius insidiosus treatments recorded the worst-case scenarios.

TAKE-HOME MESSAGE

- ❑ Farmers: Help to understand the economic impact of using biocontrol strategies.
- ❑ Researchers: Study the impact of the biological with others crops and season
- ❑ Policymakers: Sustainable policies.

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