DIVERSITY OF NATURAL ENEMIES OF PESTS IN VEGETABLES GREENHOUSES

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Introduction

Vegetables produced in greenhouses need repeated introduction of biocontrol agents to regulate population of different pests. In Quebec, 70% of vegetables greenhouses are 1000m^2 or less with diversified productions (1-6 different vegetables by greenhouses). Natural enemies (NE) from the landscape around are often observed in those greenhouses and could be interesting natural enemies of pests.

Objective: The first objective of this project was to identify potential natural enemies (NE) visiting the greenhouses and the parameters of the agronomic regimes and landscapes that favorize them.

Methods

- Monitoring inside and outside 15 greenhouses in 2020 and 2021 (Figure 1.)
  - Yellow sticky traps (3/greenhouses; 3/outside greenhouses)
  - Pan traps (3/greenhouses; 3/outside greenhouses)
  - Banker plants of wheat and *Rhopalosiphum padi* (3/greenhouses)
  - Visual observations (10 plants/crops/greenhouses)
  - Identification of weeds outside of the greenhouse (6-12 quadrats of 0,5m^2)
  - Sweep net outside of the greenhouses (10 sweeps/4 borders).
- Agronomic parameters inside and outside greenhouses were noted : crops, fertilization and irrigation regime, abiotic conditions (temperature, humidity in the air and soil) and pesticides used.
- Landscape parameters on 500m around each greenhouses

Discussion

- Up to 11 different species of NE were observed inside the greenhouses on different crops in 2020 and 2021 (Table 1).
- Between 3 and 17 different taxa were identified in pan traps inside and outside greenhouses in 2020 (Table 2).
- Abundance and diversity varied greatly between crops (Figure 2) and between the outside and inside some of the greenhouses (Figure 3).
- Identification of arthropods in the different traps will be completed during winter 2023 and all data will be analyzed with agronomic, meteorological and landscape parameters.

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Results

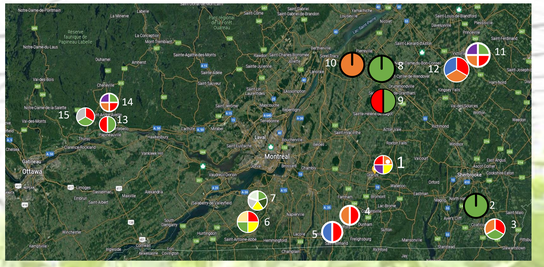

Figure 1. Localization, type of greenhouses (organic or conventional) and crops observed in the 15 greenhouses during 2020 and 2021.

Table 1 : Total abundance of natural enemies observed on 10 plants/crops/greenhouses between May and September 2020 and 2021 in 15 greenhouses

Order	Family	Species	Sites																													
			1		2		3		4		5		6		7		8		9		10		11		12		13		14		15	
			2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Diptera	Cecidomyiidae	*Aphidoletes aphidimyza*		16				4	2								1	1	1										1			
		Feltiella acarisuga																2														
	Syrphidae	Syrphidae sp.	1	5			1		14		1	1		4	1			4	4				1	12		3	1					
	Dolichopodidae	*Condylostylus* sp.						1		2		1		4											7		2					
Neuroptera	Chrysopidae	*Chrysoperla carnea*	11	2			1															7			1							
	Hemerobidae	Hemerobidae sp.		3									1		2			1						2								
Coleoptera	Coccinellidae	Coccinellidae		2						1											1		1		2							
		Psyllobora vigintimaculata																				42				1						
		Propylea quatuordecimpunctata		1			1		2						11		2		1				1		1							
		Harmonia axyridis		21					1								11	1	2				22		1							
		Coleomegilla maculata							1	1									1						2							
		Coccinella variegata	1						1										1			41		1								
		Stethorus punctum punctum																9			1											
	Staphylinidae	Staphylin												1		1							2						1			
Hemiptera	Nabidae	*Nabis roseipennis*																				4	4	1		2						
	Anthocoridae	*Orius insidiosus*	2	3										24	4			2		1	1	7										
		Orius tristicolor											1																			
	Pentatomidae	Pentatomidae sp.																								1						
	Miridae	Dicyphus hesperus	1	20			23	134																					1			
Hymenoptera		Parasitoid	12	53	12		6	6						5	10								45						2			
Arachnidae		Aranea		24				3		2		1		5				1			2		6		4		2					
		Total abundance	28	150	12	0	30	150	18	9	1	3	2	19	48	5	14	19	12	0	5	95	91	14	18	6	5	0	3	1	1	
		Richness	6	11	1	0	3	7	4	6	1	3	2	5	5	2	3	7	7	0	4	5	10	3	7	3	3	0	2	1	1	

Table 2 : Total abundance of natural enemies identified in 3 pan traps inside and outside 15 greenhouses during summer 2020.

Order	Family	1		2		3		4		5		6		7		8		9		10		11		12		13		14		15	
		Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In
Araneae		3	5	2			3		2	0	2		2			4		2	7	1			3		2		1	1	1			
Coleoptera	Carabidae		1	2		1		3	1						1	7		2					1	1								
	Coccinellidae	5		1		4	1	4	1				1	1		7		8	3		1	1	2	1	3		2	1				
	Monotomidae																											1			
	Staphylinidae	4	13	4	1	12		4	17	1	5	6	98	7	78	10	9	1	4		1	3	120		1	1	16	1	1	4	14	
Diptera	Syrphidae							1					9					3													1	
	Tachinidae	5		1				9	1	2	1	19				1							1							1		
Hemiptera	Anthocoridae		1			4					2	1	1			1	1	1		2											
	Lygaeoidea											1																				
	Miridae	2	1	3	1	5	9	11	1	1			2	1					3	2	2		1		1	1			2			
	Nabidae				1	6						1			1		1												1	2		
	Pentatomidae									1		1																				
Hymenoptera	Apidae	1		1				2	2			13	1											5								
	Braconidae	5	20	5		9	2		11	1	8	1	146	1	1			4		5		153	2	3	1	1		301	2	2		
	Cerophronidae	1	1	5	1	2	1		1			2	1	1		1	1	1				1		1			1	1	1	1	1	
	Chrysididae												1						1				1									
	Colletidae							1	2			1	12								1		1	4	1							
	Crabronidae												8																	1		
	Diapriidae	3	8	7	1	7	4		2		51	3	50	1	2		2	2	1		4		46		1	1		1	21		18	
	Formicidae	14	17	9	2	31		7	5	4	6	6	74	5	3	4		8		6	1	1	3	7	5	2	1	7	1	9	15	
	Gasteruptiidae														1																	
	Halictidae	2				1		2	25		7		268			1						1	2		3		1	1		1	1	
	Ichneumonidae			4		4		2	9		5		9			1		1				1	10		2	1	1				2	
	Megaspilidae																	1										1				
	Mutillidae												1																			
	Mymaridae		1	2	1	1		1			1		1					1		1			1	2								
	Platygastridae	3	5	14		1	1					2						1										1			1	
	Pompilidae												2																			
	Proctotrupidae			1		2																										
	Scelionidae			1		3					2		5		4		1			3	1	4				1			1	1		
	Vespidae	2	1	1				2					40			8	1	1	7			1	4	2		1	1		1			
Neuroptera	Chrysopidae																											1				
Total abundance		50	74	63	7	88	27	37	91	8	90	24	764	20	91	45	15	38	24	10	20	11	346	20	33	8	27	17	327	23	59	
Richness		13	12	17	6	16	8	10	16	6	11	9	24	9	8	11	6	16	7	3	9	8	12	10	12	7	11	11	7	10	12	

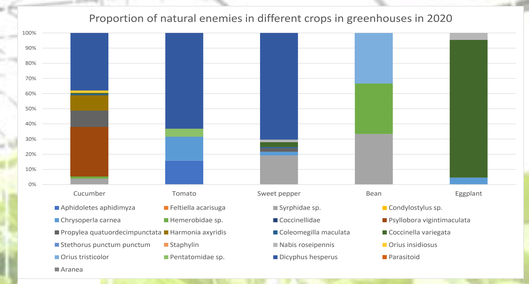

Figure 2: Total proportion of natural enemies in different crops observed inside greenhouses in 2020 and 2021 (10 plants/crop/visits).

Figure 3: Mean abundance of natural enemies in pan traps inside and outside 15 greenhouses during summer 2020. Note: Identification have been completed for 5 to 8 visits in 2020.

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