

Mass storage of honey bee queens overwintered at different temperatures in Canada



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Queen needs in Canada

- Queen breeding season in Canada Replacement of annual colony losses (25,7% colony losses in 2018)
- High demand for queens in Spring
- Dependency on foreign queens
 - Border closure possibility
 - Diseases, pathogens and genotype
 - Local adaptations

**Canadian anual Queen bee imports
June 2017**

Queen Bee Imports	Canada
# Q US	207,764
\$ US	\$6,788,322
# Q Other	18,216
\$ Other	\$565,719
Total Q	225,980
Total \$	\$7,354,041

Sustainable solution?

Queen banks

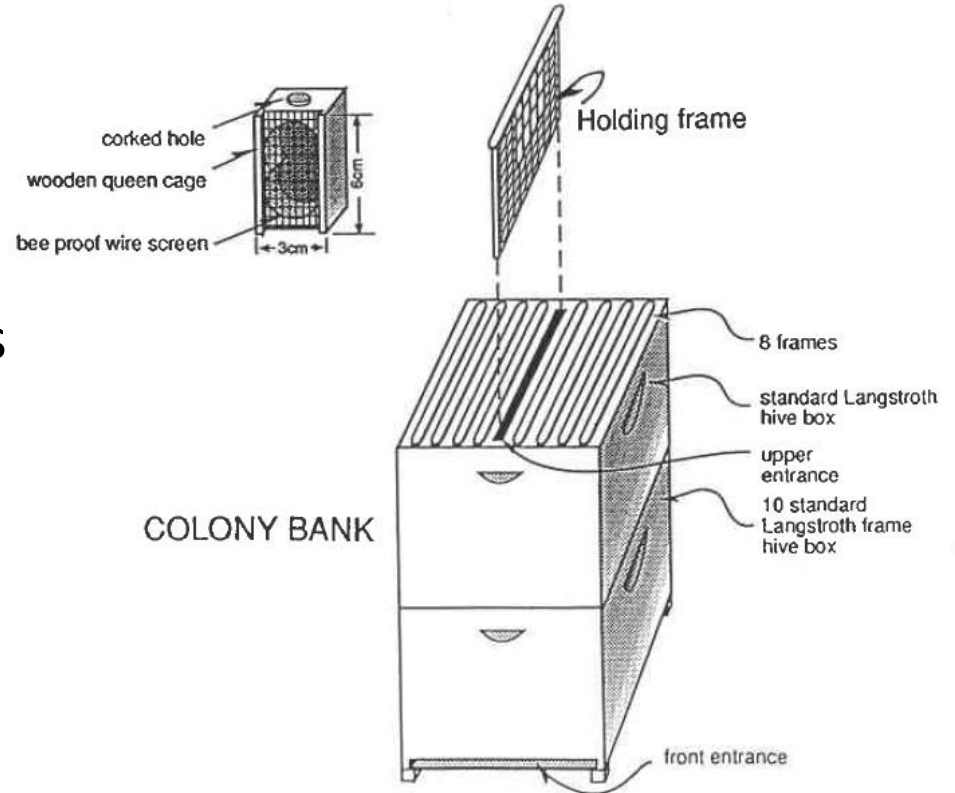
- Storage of a large number of queens in a single colony for few days/weeks
 - No laying queen
 - Constant renewal of young nurse bees
 - Nectar and pollen
- From September, formation of a bee cluster to minimize heat loss at less than 10-13°C (50-55°F)



<https://pollinator.cals.cornell.edu>

Storage and wintering of queens

- Technique to successfully and cost-effectively maintain queens overwinter in northern regions
- **Wyborn et al. 1993**
Outdoor technique
24-48 queens
60% survival over 6 months



Objectives

To assess the potential of **indoor** queen overwintering systems at temperatures below and above cluster formation to maximize queen survival and quality from September to April

- 1) To develop an indoor wintering technique for a large number of queen bees over 7 months
- 2) To test the effect of the banking temperature on the survival and quality of queens

Methods

- Formation of queenless banks in September 2018
- 40 queens/bank; 15 banks (600 queens)
- T° and RH% monitored inside colonies (Onset® Data Loggers)
- 3 overwintering rooms 4°C, 10°C and 15°C (Nov. to April)
- Control group : 20 free queens within colonies at 4°C



Methods

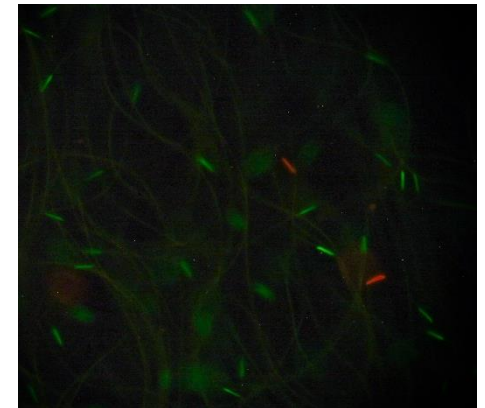
Evaluation pre storage (September 2018):

Queen's dissection

- Queen's weight and size
- Sperm viability % (Live/Dead Sperm Viability Kit))

Evaluation post storage (April 2019)

- Queen survival after 7 months of banking
- Queen's weight, size and sperm viability %

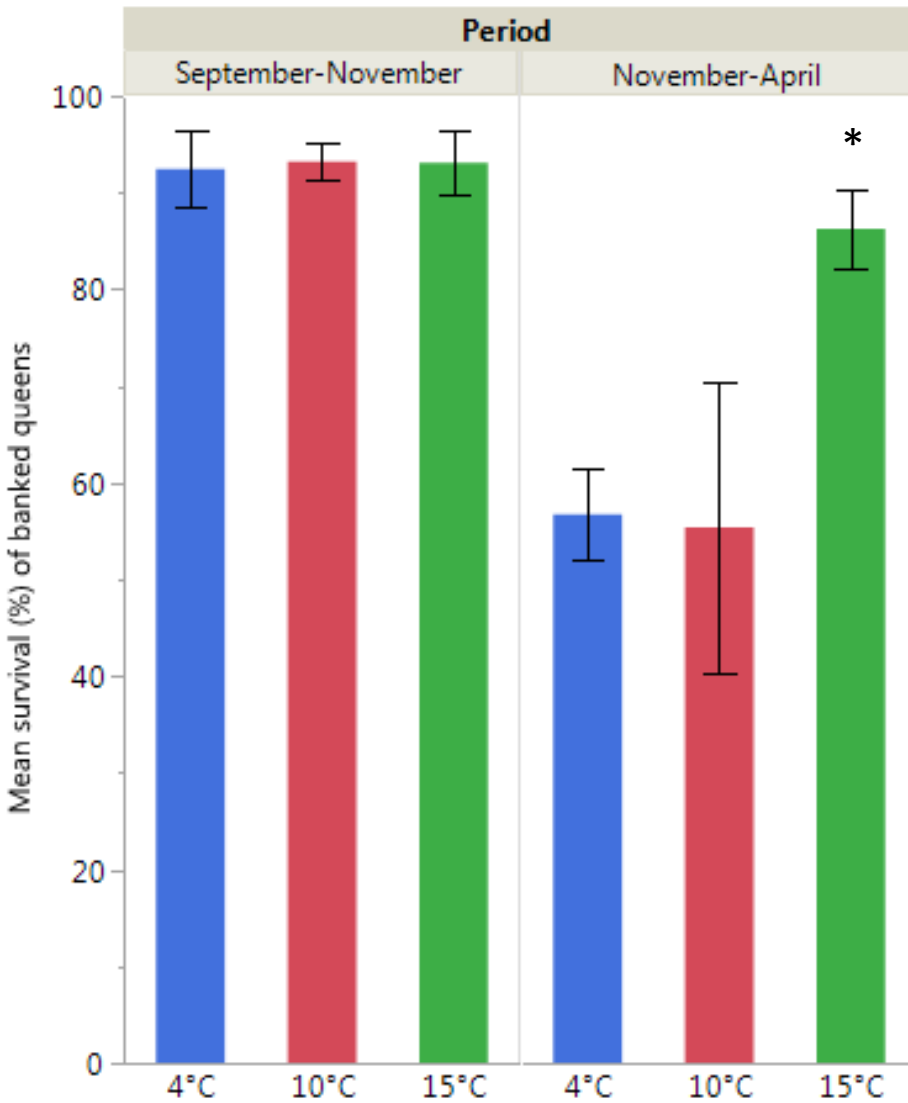


Results

Queen survival

	Period	Total number of live queens	Mean number of live queens/bank	Mean survival %
Outdoor	September 2018	550	37 ± 2	
	November 2018	512	34 ± 3	Sept – Nov. 93,1%
Indoor	April 2019	337	22 ± 8	Nov. - April 65,8%

Queen survival



Group	Live queens in Nov	Live queens in April	Mean survival % from Nov to April
4	173	99	56,9%
10	172	93	55,5%
15	168	145	86,4%

Queen's quality

Group	Weight (mg)	Abdomen length (mm)	Abdomen width	Thorax width	Sperm viability %
Before banking (N=9)	205,1 ± 13,9a	9,43 ± 0,67a	4,89 ± 0,54	4,84 ± 0,45	77,1 ± 9,6a
After banking					
Control group (N=7)	275,7 ± 19,1b	12,46 ± 0,59b	5,05 ± 0,3	4,77 ± 0,27	74,7 ± 15,3
4°C (N=14)	197,3 ± 15,0a	9,44 ± 0,86a	4,82 ± 0,19	4,82 ± 0,23	84,3 ± 3,2
10°C (N=10)	191,3 ± 30,6a	9,35 ± 0,98a	4,82 ± 0,42	4,69 ± 0,29	79,4 ± 11,0
15°C (N=15)	197,9 ± 20,9a	9,49 ± 0,75a	4,86 ± 0,21	4,75 ± 0,24	82,7 ± 4,6

Different letters within a column indicate significant difference (Tukey's HSD test at level 0.05)

Next

At 15°C: 600 queens for winter 2019-2020

Effect of the queen's density (40 and 80) on the survival

Effect of the queen position on the survival

Follow up of the queens after banking :

- Queen introduction success
- Colony performance (brood pattern and development, honey production, diseases)



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